Exploring the Role of Technology in Moving Rural Based Educational Institutions from Resourced Based to Resourcefulness Based

by

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Department of Curriculum and Instruction

Supervisory Committee

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Master of Arts, from University of Victoria, 2008

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Abstract

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ICT (Information Communication Technology) has enormous potential to positively impact educational institutions in developing countries. This thesis presents the results of a five month participatory study conducted in Bushenyi, Uganda on the impact ICT and ICT training had on a local primary school. This research specifically investigated the benefits and the problems associated with ICT in education, as well as, the impact of culture, training methods and research methodology.

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Chapter 1: General and Specific Focus

Purpose of Inquiry

The purpose of this inquiry is to exchange information on educational practice within a specific cultural context. My focus is on the use of ICT (Information, Communication Technology) in a setting that has limited resources to supply books and other print materials. This research will be done with the teaching staff at Kashozi Primary school, in Bushenyi, Uganda. The proposed study will use participatory research methodology.

I became interested in the role of education in global development as both an academic pursuit and as a concerned global citizen. Before I became a teacher I had an opportunity to travel and work in India. I saw poverty on a scale that seemed impossible to fathom. I also saw hope. As a new teacher, I taught in Thailand. In the midst of poverty I saw a steadfast faith that education was the path to a better life. In Peru, I taught girls on the outskirts of Lima who had very little; they hungered for knowledge.

It is easy from a distance to dismiss people in other parts of the world and pretend that their problems are not my problems. It is a lot harder when you are looking into their eyes and you realize that each person you see is your sister or brother. We share the same DNA, we share the same state that is humanity, and we share the same home.

How do I know working to improve the lot of people through education is worthwhile? I have been there. It is difficult to explaining something that is self evident when you live in it. Access to knowledge is central to the well-being of all humans. This knowledge is not confined to what we know and pass on to others. The experience of any individual is so limited. I have seen the rich tapestry of knowledge and understanding in

many places. I do not want to replace that with a cultural transplant. What I want to do is provide the tools of expression and communication so that people can access what they want but also add to the richness of human experience.

Description of the nature of the general concern and reason for an interest in the topic

For me ICT are important educational tools. It is inconceivable for me to imagine doing my undergraduate or graduate studies without a word processor and access to internet resources. Likewise, I cannot imagine my teaching without utilising the computer in some fashion. During my last practicum in my undergraduate teacher program I applied for a job overseas. When I told my sponsor teacher I was headed overseas to teach she told me that she did not think that she could ever do anything like that as she would never be able to pack up her resources to take with her, and without her resources she couldn't imagine teaching. It was at this point that I realised that I was not geographically bounded, held down by masses of books and papers because my primary outside resource, the internet, went with me wherever I went and all of the resources that I had developed myself would never fill any more luggage space than the size of my laptop. We cannot provide all the books to teachers and students in developing countries that equal the books that each child or teacher in developed countries have. There is neither the financial means nor enough trees to make this possible, and even if it were possible to replicate our education system, choosing what information that is relevant in one place and transplanting it is not the answer. Making available *all* the 'books' is now technologically feasible. Making available tools for recording and sharing ideas is now technologically feasible.

My teaching experiences have been in international school settings. The two schools that I taught in (located in Bangkok and Lima) catered primarily to local students but the staff of each school was made up of local and international teachers. Both schools used a partial immersion program where international staff taught in English and local staff taught in their, and the students', native tongues. The teaching methods used by the international staff varied from each other and from the teaching methods of the local staff. In both schools, administrators and teachers in positions of authority tried to foster an atmosphere conducive to sharing teaching strategies and methods. However, much of what was possible to share was not shared, due to attitude, language and cultural barriers. The types of teaching methods between the local and international staff had the largest degree of difference. In the case of the school in Peru there was an expectation that the international staff would informally share with the local staff the teaching methods from their own countries. This expectation and the known difference in pay packages between local and foreign staff created a situation in which the foreign staffs were viewed as having more expertise. The kinds of teaching methods that the foreign staff were expected to (and wanted to) share were more experiential, less teacher controlled. They tended to be more in line with constructivist theories of learning than the teaching methods employed by local staff. The local staff had a more teacher-centred approach. The foreign staff (myself included) struggled with frustrations brought about by the resistance to change from the local staff and by the issues of implementing transplanted techniques. In both of the schools I worked in, sharing, learning and change were slow. There was a resistance to change on part of the local staff and little recognition by the foreign staff of the knowledge and skills of the local staff.

While living in India, Thailand and Peru I was exposed to various aspects of poverty that I had never witnessed in Canada or other western countries that I had lived in and visited. Seeing glimpses of extreme poverty on a daily basis left me feeling that I needed to take a more active role in doing something to help to improve the conditions. In Peru I was presented with an opportunity to help teach an English class to native Spanish speakers living in the outskirts of Lima. In this impoverished area, nuns collaborated with poor women on various empowering projects such as learning to sew. The daughters of these women expressed interest in learning English. On behalf of these daughters, the nuns asked us to come on Saturday afternoons and teach the girls how to speak English. Knowing very little Spanish I was nervous, but my desire to do something was stronger than my nervousness and I accepted, along with another teacher from our school. We worked with these girls practicing speaking, reading and writing English. While the girls were good students, their progress was slow. I began to feel a bit discouraged and wondered if what we were doing was actually beneficial for these girls. A few months into our endeavour, the nuns invited us over after the class and informally gave us some background on our students. They told us about the kinds of places they were living in, the kind of education they were receiving and about the abuse, neglect and the lack of care from their public school teachers. We began to realise, with the help of the nuns, that what was important in our class was not whether the students learned to speak English or not. What actually mattered to them was that we showed up every week, that we made physical contact with them, that we encouraged them and most importantly that we cared. Although we had been doing all of those things, our focus had been on getting them to learn English. For me this realisation was important, I began to see that

the subject English was just the subject material and that there were far more important matters for these girls. The practice that we had transplanted into their context was not the most appropriate for their context. Without the collaboration with the nuns we would have missed the point completely and most likely we would have been discouraged by the 'lack of progress'. However, our practice did change and we became less serious about what had previously been our objective and we let our students' needs direct our lessons. Never has the concept of having to teach the whole person and respond to their needs been more poignant to me.

For me the combination of the two very different kinds of experiences (working in international private schools and in teaching English classes in the women's centre) have in part led me to this inquiry. In the outskirts of Lima I saw that there was a huge need for change in teacher practice before we can really say that each and every child is truly being educated. And from my international schools I saw the missed opportunity of collaboration.

I have since then attended University of Victoria masters courses for one full year and had the opportunity to be an intern in Delhi, India for three months working with PRIA (Participatory Research in Asia). My time at The University of Victoria and with PRIA have provided me with an opportunity to reflect on my experiences, have new experiences and to view my experiences through different lenses. I came to the University of Victoria because I knew that I needed to learn more and the more I have learned the more I realise I still need to learn and that my learning comes to me in many different ways. I am interested in doing research that matters and that will hopefully

make a difference in the lives of the people I work with, but I also know that what I learn from them and from the experience will be more than I could give back.

Why Uganda?

I have worked in environments where language was a significant barrier to creating newness. I have worked in areas where people looked for answers in having access to outside consultants and teachers. The school in Uganda is the perfect location. They are not looking for magic, they seek real answers. They speak the same language but they speak from a profoundly different background. I went to Uganda looking for a place where the challenges were significant, the willingness to work together was evident and the vision of what could be was alive. Rural Uganda and Kashozi in particular have all of the ingredients that I was looking for.

Why Focus on ICT?

In places where school resources are severely limited, computer technology has potential to provide educational resources at a fraction of the cost of traditional resource formats. The departure from traditional resources represents a literal paradigm shift from a resource based approach to education to a resourceful based approach. Historically, this region has been deprived of educational resources due to economic and social infrastructure restrictions. School systems in the developed world are resource based. Budgets, facilities and training all have a focus on maximizing that resource base. Uganda, along with many other developing nations, has been excluded from full participation in that type of education. Just as in the use of cell phones, where in many countries cell phones were not in high use initially now have a higher use than in countries that initially had a high use, countries such as Uganda have an opportunity to

pioneer new uses of ICT for the delivery of excellent educational services. It is widely presumed that land line infrastructure in many western countries has slowed the development and use of wireless communications. The vacuum created by not needing to support an existing infrastructure in these nations shaped the possibility of a more sophisticated network. This legacy of land line infrastructure did not exist in countries like Uganda, thus creating an opportunity for a different set of choices to be made. The lack of educational resources as well as the, so far, limited capacity to share information in developing countries may provide an opportunity for a new path to be taken in education that uses technology to provide 'new' paths that uniquely suit the situation. The ICTs have matured to the point of being very valuable in terms of accessing information, sharing information, creating new methods of delivery of services and providing a means of a two way transferring of educational know-how from place to place. A powerful concept in educational design is the concept of providing tools. When one provides a hammer and a saw and some nails, the provider has no idea what the recipient will make. The one thing that is known is that the outcome or product is unknown, has a cultural context and relies on the interpretation and creativity of the user. So it is with the connected computer. By providing teachers and students with existing word processing, on-line books and encyclopaedias, pod casting, presentation software and other media authoring software, we create an environment for creative expression, new styles of delivery of curriculum and *new* possibilities in sharing to flourish. A child in a remote village in Uganda might soon have first class access to knowledge and know-how. By bringing children on-line, they can share what they know and take their place as a world citizen, interacting with others.

This is a big dream. I think this is possible because of the confluence of technologies and ideas. There are two things that have brought me to this point, one is the development of ICT in which I have grown up and the other is my personal experiences as an educator and a learner.

Cultural Imperialism

Cultural imperialism occurs when one person believes that what they know is superior to another belief. The expectation is set that "if only others could be like me, problems would be solved". The truths that we live with need to become proto-truths. When they do we are open to change. We become open to newness. This research is not about transplanting ideas and seeing if they take, nor is it about an ethnographic study of 'foreign' ways of dealing with curriculum. It is about finding a new way that goes beyond simple adaptation that uses the resourcefulness of everyone involved.

Colonial influence is very difficult to escape, for both the colonizers and the colonized and can be disguised and transmitted through different means including ICT. If we only aim to provide access to existing digital resources through ICT then we will have only moved from colonialism to absentee colonialism delivered through a digital medium. The aim is to develop the skills and abilities in the teachers to be able to judge the usefulness and appropriateness of existing resources and to create resources that are locally and educationally relevant.

Why is This Important?

I confess that I am ideologically driven. I dream of a day when all people have access to information that will improve their lives. I dream of a day when all people can be considered creators of knowledge. I dream of a day when all people can focus on the

problems in the world in order to find new solutions. At the heart of that dream, there is a life-long pathway of education. I want to be there, I want to be the researcher, I want to be the servant, I want to take part, I want to be the witness. That is what it is to be a teacher.

I know that people seek out education and I can help provide it. There is so much more though. When I teach, I can influence my students and my students influence and teach me. It is an exchange in which we are all learners and we are all developing. When I work with teachers to develop together, new understanding of curriculum implementation and delivery, the positive effect is magnified. When two cultures touch, when two bodies of information touch, there is a chance for newness. The newness of understanding is greater than the sum of the parts. It honours what I know and extends it. It honours what others know and extends what they know. These extensions are the apex of where new understandings are forged, not Thai, not Ugandan, not Canadian, or anything that has existed before. The new understandings can be focused on how we better communicate. How we better articulate. How we better our understanding and love for each other. The idea of a cultural melting pot is an impoverished idea because we melt away that which defines us. The idea of creating a cultural tapestry is a little better but it requires little of us. Cross-cultural educational practice can become an exploration of newness where everyone is enriched and brand new techniques, understanding and methodologies are born.

My Questions

How can learning to use ICT for teaching impact rural based educational institutions?

- What are the benefits of incorporating ICT into teaching in a rural based educational institution, what are the problems?
- How does training, culture and the type of research impact the ability of myself and the participants to reach the goals of the research?

Rationale

Before the court of public opinion and before the assembly of United Nations, the international community was party to a collective vow to change the course of history by providing access to education and access to information: It says:

> *Article 13:* 1. The child shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child's choice.
>
> *Article 17:* States Parties recognize the important function performed by the mass media and shall ensure that the child has access to information and material from a diversity of national and international sources, especially those aimed at the promotion of his or her social, spiritual and moral well-being and physical and mental health.
>
> *Article 28* 1. States Parties recognize the right of the child to education, and with a view to achieving this right progressively and on the basis of equal opportunity. (Convention on the Rights of the Child)

Research Goals

Through this research I have tried to enable teachers to use ICT in their teaching in such a way that it is relevant to their local situation. Together we attempted to address the problem of bridging a gap between having access to ICT and being able to utilize ICT for teaching.

The participants and I attempted to reach toward this goal through training to use ICT specifically for teaching and reflecting on our progress.

Documenting of this research was in the form of written comments, discussions written down, journals, photographing and video recording.

Chapter 2**:** Relevant Literature

Need for Education in Developing Countries

There is an enormous need all over the world for education. “Primary education is the salvation of struggling societies,… every additional year of schooling – beyond providing the glorious wellspring of knowledge – brings with it the best chance to defeat poverty” (Lewis, 2005, p. 75). It can be difficult to focus on education when people are living in conditions of poverty, hunger, sickness, and conflict. “Poverty has multiple and complex causes. The poor are not just deprived of basic resources, they lack access to information that is vital to their lives and livelihoods” (Marker, Mcnamara, & Wallace, 2002, p. 9). Information and education, though it may not seem as initially valuable as food or medical care, can be a powerful agent in saving lives, improving lives and protecting lives. “There is a strong correlation between access to education and knowledge… and such key poverty indicators as infant mortality, family size, and women’s health” (p. 9). It is my belief that education in developing countries contains the possibility to radically alter the patterns of poverty and truly free people from its bonds.

Educational Programs in Developing Countries

Educational programs in developing countries carry enormous potential to positively alter the cycles of poverty but they also bring the potential to replicate patterns of dependency and powerlessness. Educators working in these contexts need to be acutely and continually aware of the issues and potential problems that can occur and authentically evaluate their actions at each step in the process, by involving the participants in the evaluation.

Importance of Context, History and Background

One of the first issues educators encounter when entering a new place is the importance of understanding context. Upon reflection, many educational development projects have stressed the importance of understanding context. For example Basile (1999) states that a "Study of Lesotho's modern educational predicament should begin from an alternative perspective… with due attention to the contextual complexities particular to Lesotho's history" (p. 200). Too often, educational methods, resources and ideas are transplanted from a context in which they are quite appropriate and successful to a new context where it is sometimes assumed, without consideration of context, that they will work just as well. This is often not the case. "The difficulty in the transfer of knowledge is that, in being a creative response to a situation, it is knowledge which does not exist outside of an actual practical action" (Orton, 2000, p. 149). Despite the problems associated with transported schooling systems in many previously colonised countries, the educational systems continue to represent the systems of the colonising country. "The education system borrowed from the colonial era, even if expanded and improved, is unlikely to produce a population that is highly educated and skilled enough to respond effectively to the present global changes, and to design creative solutions to the problems they cause" (Hickling-Hudson, 2000, p. 195). Arnove (2000) has "found transforming inherited educational systems an almost intractable problem" (p. 29). In Nicaragua, many issues arose when the government accepted textbooks from outside countries. Within the new texts the images and examples were often totally unrelated to local realities. There were frequent mistakes and inadequate translations. Examples of discrimination that had perhaps not appeared so clearly in the countries where they were

developed for appeared more clearly in local Nicaraguan contexts. Taking context into careful consideration is not always easy and is not always enough. Sometimes transplanted ideas, however carefully adapted to a new context, fail to take hold. This was seen in a multinational education project called IMPACT where context was considered very carefully-"in each new country the system was scrutinized and modified in order to adapt to local conditions" (Nielsen & Cummings, 1999, p. 113) but despite this careful contextual consideration and adaptation the project was considered a failure in many countries. What has meaning in one context often does not translate into another context; knowledge that is true in one culture is not necessarily true to another culture, and "whether the practitioners are encouraged to consider the issue or not, the greater part of even the technical knowledge they have to offer is far from being universal or value free" (Orton, 2000, p. 142).

> If the term "meaning" is defined as a historical construction, then its function is to interpret and guide action within specific social contexts. This contextual view of meaning counters the tendency to resort to some form of absolute truth as the sole basis to justify social change (Basile & Stromquist, 1999, p. 225).

Orton (2000) offers a way to view transported knowledge; "right from the start [participants need to] share an understanding that the usefulness of the knowledge being offered is yet to be proven" (p. 143). Taking this position in an educational development project can be useful in several ways: in recognising the power and importance of context, in emphasising that evaluation and adaptation of the knowledge is essential, and in reducing the power of the outside "expert."

> The power differential begins to be reduced as the foreign expert becomes recognised by both parties as not possessing some knowledge essential to creating a satisfactory outcome, knowledge in which the local, as local, is rich. As well the expert knowledge the foreigner brings becomes recognised as only potentially valuable, having to be put to the test in a new situation (Orton, 2000, p. 145).

Of course taking this position can cause problems. When an expert is no longer an expert and their expert knowledge is no longer solid, those expecting or depending on the expert to solve their problems may lose confidence in the help of the expert. "This is an obstacle – how to confront a group of students who, in perceiving that you are interested in knowing what they know, think that you are not capable" (Horton & Freire, 1990, p. 160).

Another obstacle that experts have to face in this situation is that they need to have the self-confidence to be able to relinquish their control and power of being the expert.

> "To create a collaborative relationship in and through their joint undertaking … requires expertise in more than the technical knowledge and professional artistry of their substantive field. In skill terms, they will need also to have developed interpersonal skills to lead and to take part in the conversations suggested; and in psychological terms, they will need to have developed a self-esteem which is not dependant on the privileged status and personal self-confidence of the technically competent professional" (Orton, 2000, p. 150).

Like any new way to do schooling, the teachers and the students will need to adapt and adjust to the new ways, and very often implementing something that is

different will take some undoing of previous expectations and understandings. “Since they’ve been told they can learn something, and what they’re to learn is the answers to their problems, they expect an expert with answers. Even if they haven’t been in school in a long time, they’re socialised by society to look for an expert” (Horton & Freire, 1990, p. 161).

From Expert to Facilitator

There is a transition that people who are in the position of expert can make to become a facilitator. “It’s a slow process, but once the people get comfortable with it, then they begin to see that you aren’t going to play the role of an expert, except in the sense that you are the expert in *how* they’re going to learn, not in *what* they are going to learn” (Horton & Freire, 1990, p.162). The role of facilitator is to not be the sole source of information and direction but to facilitate and nurture empowerment and leadership within participants. The facilitator is an equal participant and is one of many contributors to the project.

There is a place for expert knowledge, remembering that “use of expert knowledge is different from having the expert telling people what to do” (Horton & Freire, 1990, p. 130**)** and remembering that expert knowledge in any new situation is unproven.

Within education in developing countries the difference between content and process becomes very important. “They [have] had to learn to think, make decisions- not learn gimmicks, not learn techniques, but learn how to *think* (Horton & Freire, 1990, p. 164). “One of the tasks of the educator is also to provoke the *discovering* of need for knowing and never to impose the knowledge whose need was not yet perceived” (p. 66).

Empowerment

To truly provide sustainability and appropriate education, people who are oppressed need to become empowered to help themselves; this is not always easy as many people have grown dependant on outside help and are unused to having power. As well, people who help may be creating dependency while seeming to empower.

> A lot of people use organising to do some education and they think it's empowerment because that's what they're supposed to be doing. But quite often they disempower people in the process by using experts to tell them what to do while having the semblance of empowering people (Horton & Freire, 1990, p. 120).

Horton and Freire suggest that to truly empower, the organisation of a project needs to be done by the people that are to benefit from the project. This helps to avoid "the [seemingly] unavoidable fallacy of exchanging one form of dependency for another" (Basile, 1999, p. 213).

Flexibility

Another aspect of many educational development projects identified by researchers, related to success of an educational program, is the amount of flexibility built into or allowed within a project. Flexibility can be difficult to plan for and maintain as a project expands. "The inertia inherent in large, centrally run systems… the better organised, the more institutionalised, and the more centralised the bureaucracy, the greater the resistance to innovations" (Nielsen & Cummings, 1999, p. 127-128). In looking at the distance teaching centre in Lesotho, Basile (1999) noted that the "Service Agency should have been structured to respond to locally felt and articulated needs as

flexibly as possible" (p. 215). Basile experienced success when "the project [of teaching teachers] has attempted to give teachers the maximum flexibility to choose specific disciplines, the amount of time spent on each module, and when to study" (Araujo e Oliveria & Orivel, 1999, p. 171).

Culture and Change

Culture is an important element to take into consideration when working in a foreign context. It is essential that an outside helper actively seek to understand their host culture and to resist initially judging cultural practices from an outside perspective. In order to do this, an outsider needs to not only attempt to understand the cultural context they are entering into, but also be able to understand his or her own cultural practices and ways of thinking. That is not to say that culture should necessarily be maintained for culture's sake or that culture is static. "If it is cultural and historical, it can be changed, it's not unethical to put the possibility of change on the table" (Horton & Freire, 1990, p. 132). Freire also points out that "every culture has its negativeness and positiveness, and what we have to do is improve the positiveness and to over come the negativeness" (Horton & Freire, 1990, p. 143). This is not something that is easy to do and often requires a deep understanding of the complexities of a culture and high degree of sensitivity to find the right time to suggest change. "I think you always have to be conscious of going against the traditions of people. You have to really think seriously about that" (Horton & Freire, 1990, p. 136).

Respect and Confidence

Respect is closely related to empowerment. Myles Horton suggests "… that is the way you should deal with people, that you should respect them and let them develop their

own thinking without you trying to think for them" (Horton & Freire, 1990, p. 149). Basile (1999) noticed that in Lesotho "the [rural] client remained an object rather than a subject of education" (p. 219), changing the function of the educational process, so that anyone outside the system was placed into "duplicates of centralized organisational forms to the local level" (p. 219). Viewing people as subjects and participants of their own education requires respect, "respect for people's abilities to learn and to act and to share their own lives. You have to have confidence that people can do that" (Horton & Freire, 1990, p. 177). Horton and Freire noticed that in order to respect people and their ways of thinking and knowing, educators need to learn as well; "the educators … have accepted *to be educated* too" (p 156). Another dimension of respect is that oppressed people sometimes do not respect their own knowledge or see it as being inferior to other ways of knowing and doing. This occurs often in previously colonised countries where people's minds remain colonised. "You don't need to know the answer. You can help people get the answers… you have to respect their knowledge, which they don't respect, and help them respect their knowledge." (p. 55).

Limited Education of Teachers

Achieving Universal Primary Education[1] has become a goal for the UN and as primary education expands to provide for all children more teachers are needed. In some places where previously education has been sparse there is a severe shortage of teachers that have received formal teacher education and sometimes even basic education. "Most teachers had not even completed primary school (4 years of education). Logos II [a

[1] "Ensure that all boys and girls complete a full course of primary schooling" (UN Millennium Development Goals).

teacher training program in Brazil] had to make up for both basic schooling and specialised teacher training" (Araujo e Oliveria & Orivel, 1999, p. 169).

Motivation for Teachers

For many teachers in rural areas, attending teacher upgrade programs is difficult and sometimes costly. Many teachers are over worked and often women are expected to maintain a household in addition to their teaching job. The circumstance of many teachers requires that a successful teacher education program include consideration for how to motivate teachers to attend. In a teacher-training program in Brazil, teachers were motivated to attend upgrade classes by the promise of an increase in salary upon completion. For many, the possibility of furthering their education, when it was provided free of cost, was sufficient motivation.

Brain Drain

In addition to motivating teachers to attend teacher education programs there also needs to be consideration for keeping the teachers that received teacher education in the field of education. In Brazil Araujo e Oliveria & Orivel (1999) found that "most of the participants who managed to graduate [from the teacher education program] have refused to remain in their previous situation as rural school teachers" (p. 187) because the level of education was so low in Brazil at the time; once the teachers had completed their education they were able to get jobs in another location or in a field that paid better or had a higher prestige.

Distance Education

Transportation systems in rural areas of many developing countries are often unreliable and costly. "In many cases, there was no regular transportation, and distances

sometimes required a few hours of walking, usually at night" (Araujo e Oliveria & Orivel, 1999, p. 171-172). New technologies have huge potential to be able to educate people regardless of distance. "To succeed, the new project needed to meet teachers where they lived. Previous attempts failed, in part, because most teachers could not leave their homes, or classrooms to go to project classes" (p. 169).

Focus on Uganda

In Uganda there has been tremendous growth in the last six years in the educational sector. Ugandans have had and still face many challenges that do not exist to the same degree in most western countries. One of the biggest challenges for the educational system in Uganda is widespread poverty.

> Uganda is ranked among the poorest countries in the world, with the per capita income of US $370 (2002). About 35% of the population is living below the poverty line and the generally low socio-economic status of many families continues to impact negatively on the participation of their children in educational activities. Most families cannot afford basic scholastic materials like uniforms, or pens and pencils for their children. As a result, most of these children are a major source of labour to supplement household income. This has contributed to high rates of absenteeism, poor performance and school drop-out (Eilor, 2005, p. 94).

Widespread HIV/AIDS also causes considerable issues for education. Aside from the fact that the prolonged nature of HIV/AIDS exacerbates poverty, there is also an alarming increase of the number of orphans that are receiving little or no support from adults. These children are forced into positions of headship of households, are being cared for by distant relatives or are taking to the street (Eilor, 2005).

Conflict in northern Uganda is causing problems through the destruction of school infrastructure and equipment, a disruption of supplies to schools, abduction of children and trauma of children who are able to attend school (Eilor, 2005). There are other problems such as social exclusion, gender disparities, rapid population growth (growth rate 3.4% per annum; one of the highest in the world) and a lack of appropriate technology (Eilor, 2005).

In a review of the impact of the primary education reform program (PERP) Eilor (2005) identifies many lessons that have been learned in Uganda. The importance of national ownership for the reform was key.

> PERP is homegrown, reform planned and executed by Ugandans themselves, and it relies heavily on local expertise. As a result there is a strong sense of national ownership for it. It has become a rallying point for national development because of its potential for addressing national key development challenges (p. 92).

Other lessons learned included the importance of political commitment to upgrade socio-economic status of the people, ensuring sustainability through participatory community based support, creating a flexible, open door policy for outside funding and partnerships, supporting participatory governance that encourages grassroots participation in decision making, and officially recognising basic education as a right for all citizens and making it obligatory for the state to provide it. Within this recognition is the understanding that basic education is seen as an instrument for facilitating rapid social transformation (Eilor, 2005).

Potential of ICT

ICT as a Tool

"Technology is not an educational activity, it is a tool, a means to an end" (Gasperini & Mclean, 2001, p. 5).

Technologies are tools. They are very powerful tools that can present a new paradigm and new opportunities for teachers and students. In order to utilise these tools, educators need to understand the nature of the technology tools, their potential and their limitations. The computer is an interesting tool because it has clear choices for the educator. The educator can adapt the existing programs to fit the environment or can literally be involved in creating programs and other resources to suit the environment. Often educators have had to adapt business tools for classroom purposes and the results of these uses have been mixed.

> "ICT [Information, Communication Technology] can bring access to all kinds of learning material to anyone connected to the global information system. Print materials can be widely disseminated electronically, learning programmes can be structured to include a wide range of multi-media presentation techniques, learning material can be tailored to meet specific needs, and it is possible to update rapidly" (Lewin, 2000, p. 314).

Educators can take on the role of tool makers, and the array of ICT available now allow for this possibility. Educators can create tools and resources that are not just adaptations but are truly made for the specific climate and cultures within education. We have the possibility to move from a paradigm of IBM (International Business Machines) to International Education Machines, where the machines or tools are created for

educational purposes instead of simply adapting machines that have been designed for other purposes.

Re-visioning these possibilities is much stronger in areas where a legacy of use has not already established itself. Computer technologies are not just about ways of accessing information but they also can provide tools for sharing perspectives and for creating new architectures of understanding. “Technology is not an end in itself in these situations, but it is a tool to achieve wider goals such as eradicating hunger and achieving universal primary education.” (Boswell)

ICT Understood as a Cultural Artefact

ICT can influence the way that we interact with information and the use of ICT may have cultural impacts outside of the content of the information. Anderson, Holmqvist & Jensen (1993) ask if “technology carries its own immanent values, by means of which it influences and changes the surrounding culture?” (p. 317) When we look specifically at a computer, the integrated nature of information and technology means that the cultural influence of ICTs is dependant upon the information itself that is accessed through it, the way the ICT is used, as well as the design integrated into the ICT itself. “Technology is primarily influenced and formed by the culture within which it is constructed and used” (p. 317). ICTs are designed by people within a cultural context and it is possible that, through its use, ICTs can impose aspects of the culture of the people that developed it.

The ways that information is presented within ICTs can also influence how we perceive and value information. Presentation of data, as in traditional publication, can influence the perception of creditability and can influence how we value the information

contained within. For some people digitized information may hold more value than paper products or vice versa.

It is not yet known how these cultural influences contained within ICTs will influence people who have as yet had limited exposure to ICT.

Dissemination and Sharing of Information

"The widespread availability and convergence of information and communication technologies – computers, digital networks, telecommunication, television, etc. – have led to unprecedented capacity for dissemination of knowledge and information" (Arunachalam, 2002, p. 2). ICTs can also shape how we view and interact with the world. For many of us that have access to ICT and use it regularly, the ability to find and share information has become part of our normal day to day life, to be cut off from this ability to communicate and access information is difficult to imagine. That we can access information on most any topic that we can conceive of, send letters, photos and video across the planet at the click of a button or talk face to face to a person not physically present is the reality for many of us. Within existing ICT there is a world of possibility for teachers and students.

Wikapedia, an internet encyclopaedia that began as an empty shell created a forum for people all over the world to share what they know in an interactive way. A micro version of this in a classroom would allow a class to document what they learn and base their knowledge gain in the context of what they already know. Knowledge is power, but knowledge constructed within the framework of the culture and experience of the students is the basis of the connection between knowledge and human creativity.

"Access to timely and relevant information does make a difference to the life of the rural poor… new ICTs can play a role in this effort" (Arunachalam, 2002, p. 5). For example, when medical knowledge is available lives can be saved, when information about a persons rights is made available people can use this information to empower themselves to make positive changes in their community. Access to well thought out tools that can disseminate information as well as communicate information in a two way fashion can shape the framework of what is possible. Knowledge has many facets as it relates to students. The currency of the knowledge, the accessibility of the knowledge and the relevancy of the knowledge are all key factors that access to technology can assist with. ICT has the potential for people everywhere "…to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insights and needs back" (Arunachalam, 2002, p. 6).

Connected networks provide a larger world of information but also shrink the world in terms of communication. "The development of ICT infrastructure creates a panorama of opportunities to exploit the power embedded in sharing information" (Lewin, 2000, p. 313). We can dream of a day when all people can participate as equals with equal access to information and opinion forming, but how can it be realized?

Technology without an educational context and construct is just technology. Its presence can be of benefit but often it is only a pale version of what it could be if it were focused on the development of human potential, the job of schools. When we talk about bridging the digital divide, will we be satisfied with the fact that technologies are simply accessible or will we be able to move to a new place with new constructs?

Technology for a New Path

> "If global peace is ever to be achieved, global-scale education, with the use of the modern digital telecommunications, will be needed to create mutual understanding among nations, cultures, ethnic groups, and religions. The Internet is the future of telecommunications and can be a medium for building peace" (Utsumi, 2005, p. 1).

Education is about creating new dimensions of personal power. It is about sharing ideas. It is about building a new future. It is about building new hope,

> "…the hope that the use of ICTs could enable even the poorest developing nations to 'leapfrog' traditional problems of development like poverty, illiteracy, disease, unemployment, hunger, corruption, social inequities so as to move rapidly into the modern information age" (Arunachalam, 2002, p. 2).

Within the framework of traditional (physical) learning resources, there is little hope for change. The cost of physical resources to put poor nations on an equal playing field with developed nations is too great. Access to knowledge is the first giant leap for humankind. Most of what can be presented with physical books and expensive equipment can have an online analog. Many people have a tendency to prefer what is familiar, and when presented with unfamiliar alternatives to 'what already works' it is easy to reject the alternative and find fault with it unless there is a compelling reason to consider it. An online book to a teacher or student who has access to a library may not seem a very interesting concept, an online book to a teacher or student who has no library available may find access to online books far more compelling. Those of us who can have access to

virtually unlimited resources may have much to learn from what teachers unburdened by a paper dependant tradition do with access to this new form of resource.

New Ways of Learning

"The development of new information and communication technologies (ICTs) has been rapid and is transforming work and knowledge production" (Lewin, 2000, p. 313). ICT is changing some of the ways that people are learning as well as opening up new ways of learning. One way that it is changing is by placing learning in a global community. "A second generation of internationalisation is taking place in further and higher education" (Lewin, 2000, p. 314). In a global community, traditional boundaries are less apparent and this kind of global thinking allows people and organizations to take on issues such as world peace in a new way,

> GUS [Global University Systems] is a worldwide initiative to create satellite/wireless telecommunications infrastructure and educational programs for access to educational resources across national and cultural boundaries for global peace. GUS aims to create a worldwide consortium of universities to provide the underdeveloped world with access to 21st Century education via broadband Internet technologies. The aim is to achieve "education and healthcare for all," anywhere, anytime and at any pace. (Utsumi, 2005, p. 2).

In this context, where we live and where we were born has less significance. "Students no longer have to travel and stay for extended periods in developed country institutions to obtain international quality educations" (Lewin, 2000, p. 314).

ICT learning environments also allow for choice where there may have been limited options. "Connectivity and interactivity on the scale that the Internet can provide

create qualitatively different learning environments. Users can choose which networks to be part of and take the initiative in setting up their own" (Lewin, 2000, p. 314)."New ICTs will indeed transform access to information and educational services and the way knowledge is generated and shared" (Lewin, 2000, p. 319).

Issues for using ICTs in Development Contexts – The Digital Divide

"The "digital divide" refers to inequitable access to ICTs both between wealthy and poor countries, and within all countries, between relatively privileged and underprivileged groups" (Gasperini & Mclean, 2001, p. 3).

> "A person in a high-income country is over 22 times more likely to be an Internet user than someone in a low-income country. Secure Internet servers, a rough indicator of electronic commerce, are over 100 times more common in high-income than in low-income countries." (UNCTAD)

And as Lewin (2000) points out, "most [ICT goals] will not be realised for the majority of the population in many developing countries over the next decade… for the majority easy and convenient access will remain unaffordable and/or unavailable" (p. 319).

It is more than putting computers into people's hands. "Adequate hardware, software and connectivity are all essential if ICT infrastructure is to be sufficient to allow the opportunities identified to be turned into actualities. The three are inter-dependent" (Lewin, 2000, p. 315). Internet connectivity is a major consideration in developing countries as "the connection costs for Internet access in the poorest countries can be greater than in the richest" (Lewin, 2000, p. 316). "Relative to income, the cost of Internet access in a low-income country is 150 times the cost of a comparable service in a

high-income country" (UNCTAD). Finding relevant and affordable software is also an issue in developing countries; "the relative size of markets at a global level is likely to ensure that most applications are produced for rich country consumption and this is likely to continue to influence software and content development wherever it is undertaken" (Lewin, 2000, p. 319). The open source movement has done much to help in this regard. The open source movement has created a method for people to truly get involved in development issues that directly address problems of access to software. By using the skills and talents that they have, open source developers have taken significant steps in helping to make quality software freely available. Currently it is estimated that over 100,000 programmers have contributed to open source software. The movement is gaining momentum and more companies are contributing code to make open source software as good as or better than its commercial counterparts. The hope is that once more people get familiar with ICT, open source software can be used as a stepping stone for people interested in developing software that "adapt the technology to their needs and to their culture, not the opposite" (Arunachalam, 2002, p. 8). Currently the cost of hardware and software is well out of the range of affordability for most people in developing countries but these trends are beginning to change.

Beyond Access to Information

"Access to relevant information is only part of the story. People need to build skills and capacities" (Arunachalam, 2002, p. 10). Technologies can be made to not be dependant on the ability to read and communicate through written language for access. Adaptive technologies and alternative practices in presenting information can compensate to some extent for the lack of these language skills but more importantly can be

instrumental in the development of those skills in the individual in a private and non-threatening way. The capacity for educational design is not inherent to ICT but must be actively built-in. These built-in adaptive properties are the intersection where educators and technologists must meet. "Development priorities are to be analysed – hopefully by the "beneficiaries" – before deciding which technology is appropriate" (Arunachalam, 2002, p. 7). Applied technologies need a 'ground-truth' test. It is very tempting to prescribe technological fixes from a distance without taking the time to understand the real situation on the ground. Determining the appropriateness of technologies requires a willingness to observe, listen, infer, test proposals, involve local people and then deduce collectively what is needed.

Information Relevance

> "There is one thing that we can not separate from any ICT project in the Third World countries: the development of local databases and local web pages that are relevant to the people and that take into account their daily needs, their culture and their language" (Arunachalam, 2002, p. 7-8).

The most effective way to develop resources that are locally relevant is to get local people involved in using ICT tools to create the resources themselves. In this way the best "relationship with the local community is not of the "donor/recipient" type but one of "partnership in progress"."(Arunachalam, 2002, p. 9). There are many examples of resources being given with the best of intentions to local projects but the result is almost always cultural imperialism. There seems to be no great shortcut on the pathway to local relevance.

There are several other issues that Lewin identifies that will influence

the availability and impact of the development of ICTs on developing countries. [These] include political commitment to, or at least tolerance of, free flows of information within and from outside the country; macro-economic growth and stability which can permit the accumulation of infrastructure; and effective demand for the services, educational or otherwise, that can be provided through ICTs" (2000, p. 316).

Despite the challenges in bridging the digital divide there is tremendous hope. "By working cooperatively, we can transform the digital divide into a "digital opportunity", through a systematic approach towards a development that addresses all other divides" (Gasperini & Mclean, 2001, p. 6).

> "There is a challenge to explore in more depth how the development of ICTs can provide more benefits to more people, and contribute to the diminution rather than exaggeration of differences in levels of development and opportunities to learn" (Lewin, 2000, p. 320).

There is little doubt that human beings have the technologies and technology tools to empower all human beings through access to information, communications systems and tools of creation and expression. People can benefit through access to these tools to the point where their futures will be positively altered. The question is not whether we can provide access, but whether we have the willingness to turn vision and potential into action.

Chapter3: Methodology, Method and Context

The Methodology

What is Participatory Research?

Participatory research (PR), also referred to as participatory action research (PAR), is a research method that focuses on people rather than data and can be used as a powerful tool for developing schools and communities. "The basic ideology of PAR is that a self-conscious people, those who are currently poor and oppressed, will progressively transform their environment by their own praxis" (Fals-Borda & Rahman, 1992, p. 13). Participatory research is transformational, and as Paulo Freire stated it is also a belief "that people have a universal right to participate in the production of knowledge which is a disciplined process of personal and social transformation. In this process, people rupture their existing attitudes of silence, accommodation and passivity, and gain confidence and abilities to alter unjust conditions and structures" (Smith, Willms & Johnson, 1997, p. xi). Within this transformational research, researchers try "to respect differences, to hear discrete voices, to recognise the right to fellow human beings to act, live and let live" (Fals-Borda & Rahman, 1991, p. 33). The goal of PR is "radical transformation of social reality and the improvement of the lives of the people themselves. The beneficiaries of the research are the members of the community" (Hall, 2001, p.173).

Positivist Paradigm

Participatory research can be understood by looking at what it is not. Participatory research evolved from many researchers who "were beginning to object to the epistemological assumptions in much of the dominant research methodology of the day"

(Smith et al., 1997, p. xii), Traditional positivistic research is characterised by objectivity. This kind of empirical inquiry assumes a separation between the researcher and the subject of the research. Within this research paradigm the control and the results of the research are solely in the hands of the researcher. However effective a positivistic approach might be for traditional research goals, "traditional research models, particularly those with "outside-expert" approaches, have proven to be poorly suited to facilitating desired changes" (Holkup, Tripp-reimer, Salois & Weinert, 2004, p. 174) and in fact are contradictory to goals of participation and democracy (Smith et al., 1997). In contexts of social change "… it may be suggested that professional research is still rather "primitive" in its understandings (and in knowing how to understand) the complex forces – social, cultural, ethnic, psychological – which influence the course of an attempted social transformation" (Fals-Borda & Rahman, 1991, p. 19). "Community-based participatory research (CBPR), with its emphasis on partnering with communities, provides an alternative to traditional research approaches that assume a phenomenon may be separated from its context for purposes of study" (Holkup et al., 2004, p. 163).

Participatory: Research and Philosophy

Participatory research is an alternative way of doing research but "PAR [is also seen] not merely as a methodology of research with the subject/subject relationship evolving in symmetrical, horizontal or non-exploitative patterns in social, economic and political life. [It is] also part of social activism with an ideological and spiritual commitment to promote people's (collective) praxis"(Fals-Borda & Rahman, 1991, p. 25). More simply, participatory research "is a philosophy of life as much as a method" (p. 29). Participatory research is a different way of thinking about and doing research, it is a

different way of generating knowledge, for a different purpose, putting people first. Participatory research addresses issues of power and through its practice can change how a researcher looks at the world. Hall (2001) describes principles of participatory research. "PR involves a whole range of powerless groups of people – the exploited, the poor, the oppressed, the marginal" (p. 173). In PR the traditional "subject" of the research becomes an active participant. PR "involves the full and active participation of the community in the entire research process" (p. 173).

> Ideally, in such cases the grassroots and their cadres are able to participate in the research process from the very beginning, that is, from the moment it is decided what the subject of research will be. They remain involved at every step of the process until the publication of results and the various forms of returning the knowledge to the people are complete (Fals-Borda& Rahman, 1991, p. 7-8).

The goals of the research and the research itself are not in the control of the outside researcher. "The subject of the research originates in the community itself and the problem is defined, analysed and solved by the community" (Hall, 2001, p. 173). PR also goes beyond knowledge generation. "The process of participatory research can create a greater awareness in the people of their own resources and mobilise them for self-reliant development" (p. 173). PR is a more authentic or "more scientific method of research in that the participation of the community in the research process facilitates a more accurate and authentic analysis of social reality" (p. 173). Within PR the role of the researcher is not one of detached objective observer, "the researcher is a committed participant and learner in the process of research" (p. 173).

Aims and Goals of Participatory Research: Knowledge Generation

One of the goals within Participatory research, like traditional research, is to generate knowledge. However, within Participatory research the purpose for generating knowledge can be different. "An immediate objective of PAR is to return to the people the legitimacy of the knowledge they are capable of producing through their own verification systems, as fully scientific, and the right to use this knowledge- including any other knowledge, but not dictated by it- as a guide to their own action" (Fals-Borda& Rahman, 1991 p. 15). Thus, PAR seeks to not only recognise existing knowledge and create new knowledge but also to use knowledge to guide action. Knowledge that is generated through participatory research is created and owned by the community, for the community. "There is an obligation to return this knowledge systematically to the communities and workers' organisations because they continue to be its owners" (p. 15).

Reasons for Using the Participatory Research Method

Participatory Research is extremely attractive to many researchers working in the development sector because it has bilateral benefits. The nature of the methodology is that the participants will directly benefit by being involved along with the principle researcher. The research focuses on a real world problem with real world participants.

The idea of doing something that has significance to the people involved and the recognition of prior knowledge and experience within a cultural context is indeed very attractive. I am motivated and inspired by the idea that what 'we' collectively undertake will lead to discoveries that have direct benefit to all. In the past, we were not always able to demonstrate immediate benefit to the participants and we asked them to be involved for reasons that were external to their own well-being and sensibilities. Participatory

research is an enjoinment together. It is probably the only real way that research has meaning in an educational context that is based in a culture other than my own.

One of the first classes that I took when I began my masters program was on qualitative research methods. Prior to taking this class I had wondered how I was going to do the research that I knew was part of my program, I knew that I wanted to do something that mattered more than satisfying my own curiosity about my topic but did not know if or how this would be possible. We were introduced to participatory research as one of the several kinds of qualitative research that we were going to be looking at. At the time I did not know all the details of participatory research but I was hooked by the philosophy and went on to try to find out more about it. Participatory research has become a theme in many of my course papers. In the fall of 2006, I applied and got accepted to do an internship with PRIA (The society for Participatory Research in Asia) and saw participatory research in action. The participants that I met displayed a sense of empowerment that came from their involvement with PRIAs projects. Several people spoke with pride of their accomplishments and their desire to continue learning and working to help their communities. The methodology and the real world examples that I have seen seems to fit cross-cultural contexts better than any of the alternatives that I am aware of.

Data collection methods - PAR data sources and collection techniques.

"Methods and modes of action are formed over time through dialectic movement between action and reflection" (Kidd & Kral, 2005, p. 187). PAR is unique in its data sources and collection techniques and is uniquely suited to diversity and cultural experience. Participants are involved in all aspects of the research as co-researchers; as

such the participant-researchers are also the main sources of data. The researched and the researchers are one in the same. Ways to collect the data from the participant-researchers may vary in as many ways as there are participants. "[W]hen the purpose is collective knowledge production rather than individual sources of data, the approaches to research need to be different" (Hall, 2001, p. 175).

Participatory action research allows and requires participants to build records of their improvements: … records of their changing activities and practice, records of the changes in the language and discourse in which they describe, explain and justify their practices, records of the change in the social relationships and forms of organisation which characterise and constrain their practice and records of the development of their expertise in the conduct of action research (McTaggart, 1989).

Tools of the participatory researcher.

"Participatory research methods are by their nature largely determined by the context of the community in which they are practiced" (Kirby, 2000, p. 48). And while "it is easier to describe its ideology than its methodology" (p.48) there are several methods that are commonly used by participatory researchers. These methods can include "community meetings, video, photo-novels, drawings, oral history, storytelling, and shared testimonies" (p. 49) participant observation, narratives, archival research, interviews and questionnaires. The most widely used method is probably group discussion" (Mulenga 1999). Hall (2001) also suggests forms such as murals, drawing, theatre or poetry (p. 174-175). In all PAR methods, the approach is centred on solving a problem, the resulting action and the context.

Data analysis and Dissemination of Findings

All participants share analysis of the data. "Participatory action research involves not only keeping records which describe what is happening as accurately as possible but also collecting and analysing the group's judgements, reactions and impressions about what is going on." (McTaggart, 1989). Forms of recording included videotaping, photographing, writing and the production of digital documents to use in teaching.

Method

I was asked by the headmaster of Kashozi school to volunteer at the school and work with the teachers in the ICT department to find ways together to utilise the ICTs that are available. My initial plan was to spend a bit of time getting to know the teachers at the school, then talk to the teachers to find out what they would like to do with the ICT and what they know about ICT. My plan then was to have evening computer sessions where we could explore different ways that the teachers can use ICT in their teaching and their personal lives. But of course once I arrived at the school the reality of the situation altered my plans.

List of Sources

The sources for data for this research came from observations while working with the teachers, discussions with the teachers, written comments, interviews, and lesson observations. I had hoped to have five to ten teachers participating in the research but did not limit participation. Twenty one of the twenty seven teachers at the school participated in varying ways and degrees.

Recruitment

After my arrival at the school I asked the head teacher to allow me to speak at part of a staff meeting to tell the teachers about the research project. After an introduction by the headmaster in which he told the teachers about my research in his own words, I explained that I would be offering training sessions on using ICT in teaching as part of my research. I asked the teachers to consider volunteering to participate in the research, emphasising that the computer sessions were open to everyone with or without participation in the research. I handed out the participant consent forms and asked the teachers that were considering participation to read the forms over and if they chose to participate, to return them to me signed. Twenty four out of twenty seven teachers returned the consent forms fully signed, all teachers agreed to allow me to use video, audio and photographic representations of them. One teacher chose to use a false name and the rest chose to use their own names in the research.

Participation in the Research

Twenty four teachers returned the consent forms signed. Three teachers, though they never withdrew their consent to participate in the research, did not initiate any active participation through either coming into the computer lab for computer training or signing up for computer sessions. Of the twenty-one teachers that chose to participate, there were some teachers who only came in for a few computer sessions and provided me with some brief comments. Though each participant varied in the amount of participation in the research, eleven of the participants did extensive video interviews near the completion of the research period, eight teachers invited me to their classrooms to video tape them teaching in their regular environment and seven teachers invited me to video

tape lessons that they were conducting using some ICT. Four teachers analysed and compared the videos of them teaching in their regular environment and in their lesson that utilised ICT. The amount of time spent on the research and ICT training varied. One participant completed only three computer sessions before going on maternity leave. Some teachers worked with me directly on average two to three periods a week and some teachers I saw almost daily. Participation was entirely voluntary, although there were scheduled ICT training sessions, teachers voluntarily signed up to attend and were not obligated to come. Due to work pressures, many of them missed sessions on several occasions. Some teachers chose to stick to the training schedule and rarely sought out extra training sessions while other teachers came in often during their spare periods and free time to have extra training. I feel that the entirely voluntary nature of the ICT training, though it may have resulted in drastically varying degrees of skill, was the best approach. Teachers only attended when they felt comfortable doing so and when they felt that they had the time. Interest more than anything drove the active participation in the research.

Dissemination of Findings

Records of collected photographic, textual and video data were made available to the participants on an ongoing basis during the research period. At the end of the research period participants with video data were each given a CD with the video and some of the photographic data that was taken of them specifically. All photographic data was digitally copied and left at the school.

The final representations of the results of this study are presented on a website and can be accessed by all participants, partially as a result of their abilities gained

through this research. Representing the results of this research in web format is appropriate for several reasons. Through the research many of the participants gained the ability to access information from the internet and their ability to access the research in this format will be a testament to their success and learning. Though the majority of the participants have not gained the skills of website creation yet, presenting their work in this format gives the participants a way to contribute to, and a voice in the 'world's library'. As this research uses participatory methodology it is important to return the knowledge back to the participants. Due to the nature of the digital media included in this research and the current physical distance between the researcher and the participants, web format allows access to the entire document more effectively than other formats.

Web format offers the best available medium for integrating all the different formats of data collected in this research so that the images, video and audio are not simply elements that augment the research in an appendix but are actually an integrated part of the document.

Context

Description of School Location

Kashozi is located in south western Uganda in the district of Bushenyi, approximately six hours drive from the capital city Kampala. Bushenyi borders four neighbouring districts as well as District Republic of Condo and Rwanda. The nearest town to Kashozi school is Ishaka. Though the town of Ishaka is small, Kampala International University, western campus is located on the edge of Ishaka. The school is located in a rural area surrounded by tea plantations and local farms.

Kashozi Boarding Primary School - Description of the school

Journal entry (24 08 07): Imagine teaching in a school with only a room, a chalk board and some benches and tables. Imagine teaching from 7:30 am until 9:00pm, Monday to Friday as well as Saturday 7:30am to 1:00pm. Imagine teaching with no library, the only books available being government textbooks. Imagine teaching without a photocopier, without paper, except student exercise books, without art supplies. Imagine having electricity only half the time. Imagine every drop of water you and your students use has to first be hand pumped from the ground and then hauled in containers. Now imagine having computers and internet access at this school… Kashozi is such a school.

Figure 1. Kashozi School Sign.

The school is a mixed primary boarding school teaching children from primary one to primary seven (equivalent to grades one to seven in Canada). There are four main topics that are taught: English, Science, Mathematics and Social Studies.

Figure 2. Kashozi Students posing for a photograph.

System of Examination

All of the children are examined on the four main subjects. Primary seven students are examined on the entire primary school curriculum in their primary leaving examination (P.L.E.). Kashozi has a very good track record with examination results. Pupils taking the Primary leaving examination are required to pass in order to be eligible to attend secondary school the examination mark generally being the determinant of which secondary school they can attend.

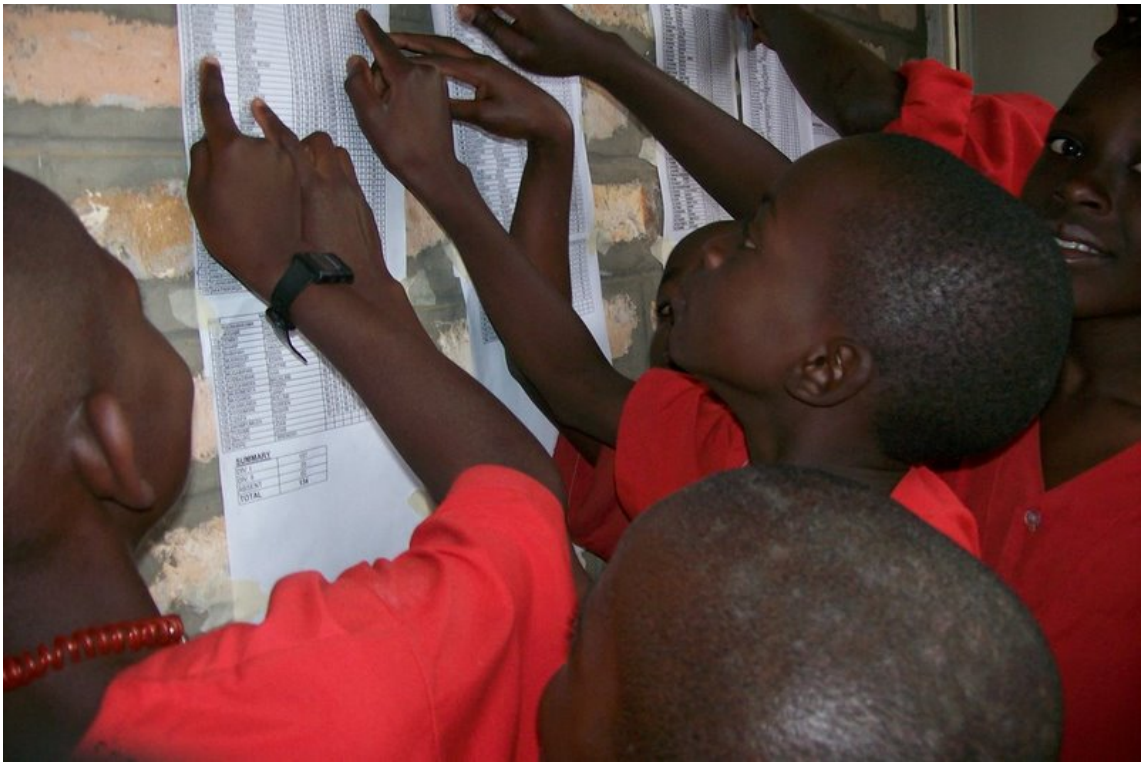

Figure 3. Kashozi students looking for their exam results.

Organisation of Administration

Kashozi has twenty seven teachers including a headmaster, one deputy headmistress and one deputy headmaster. Teachers are generally subject specific and each class has four teachers, one for each subject. The teachers move from classroom to classroom except in the case of the computer classes in which the children go to the computer lab.

School Schedule

Classes for the pupils begin at 7:30am after breakfast. The first three classes run until 10:30 when the teachers and pupils have their first break, the teachers have tea and the children have maize porridge. At 11:00 am the classes resume until 1:00 pm to break for lunch. Classes continue at 2:00 pm until 4:00 pm. 4:00 pm to 4:30 pm is the second tea/porridge break. 4:30 to 5:30 is the last class before dinner. From 5:30 pm for about one hour the children have sports (during the dry seasons) and then personal hygiene time to wash and clean their clothing by hand. Evening classes run from 7:30 pm until 9:00 pm, excluding the very young children.

During exam periods extra classes can be scheduled for early morning and evening until 10:00 pm. Saturday classes run until lunch. On Sunday children attend church and have free time or cleaning duties in the afternoon. The School year in Uganda is broken up into three terms. The school year begins in early February and ends early December with two breaks at the end of the first two terms.

7:00 – 7:30	Breakfast
7:30 - 8:30	Period 1
8:30 - 9:30	Period 2
9:30 - 10:30	Period 3
10:30 – 11:00	Tea/Porridge break
11:00 – 12:00	Period 4
12:00 – 1:00	Period 5
1:00 – 2:00	Lunch
2:00 – 3:00	Period 6
3:00 – 4:00	Period 7
4:00 – 4:30	Tea/Porridge break
4:30 – 5:30	Period 8
5:30 – 6:30	Sports
6:30 – 7:00	Personal Hygiene
7:00 – 7:30	Dinner
7:30 – 9:00	Extra classes for older students

Figure 4. Kashozi pupils in class, playing sports, lined up for inspection, and schedule.

School Infrastructure

Classrooms.

Figure 5. Teachers and students in classrooms.

Administration block.

The administration block includes the Headmaster's office, book storage, the bursar's office and the Staff room. The teaching staff gathers in the staff room twice a day for tea and usually engage in lively discussions on various topics most often in the local language. The staff room is also where many of the teachers spend the two periods a day that they are not teaching and usually this time is spent marking.

Figure 6. Teachers in staff room.

Computer lab.

Each class takes two computer classes a week from one of the two full time computer instructors. The school has plans to utilise the computer lab to a larger extent this year as the teachers have a better idea of how they can use the lab equipment to facilitate their teaching.

Figure 7. Computer Lab at Kashozi B.P.S.

Main hall.

The main hall is where the children take all their meals as well as where they write exams, attend church each Sunday morning, have assemblies for events or when visitors come to the school and where they now sometimes watch a video on Saturday afternoons when electricity is available.

Figure 8. The main hall is used for events such as the dedication service (left) and for student meals (right).

Kitchen.

The kitchen is where all the food for the almost 600 boarding students, the teachers and the other staff is made. Wood is used to cook food.

Figure 9. Cooks in kitchen at Kashozi B.P.S.

The children's diet consists of maize porridge for breakfast as well as twice for break. Lunch and dinner include 'posho' which is made from boiling maize flour, 'matoki' made from a plantain that is boiled and beans. Twice a week the beans are replaced with meat or groundnut sauce, made from boiling ground up un-roasted peanuts.

Figure 10. Kitchen area where dishes are cleaned and firewood for cooking is stored.

Water sources.

There are three water sources at the school. Rain water is collected off the roof and stored in a cement container that has pipes leading to the kitchen area; this water is

used for cleaning. There is pump near to the playground and the main pump is located near to the teachers housing. Early in the morning you can hear the thump, thump as some pupils or kitchen staff gets a head start on getting water. The water pump is typically used most of the day as children are required to pump their own water for bathing and for washing their clothes. The kitchen staff pumps and hauls water to the kitchen for cooking and cleaning.

Figure 11. Water pump, water being hauled in plastic containers, and student laundry.

Playground.

The first time I was told we would go and see the playground I wondered when we were going to get there as all I could see was a field; I was looking for the play equipment that in my mind constituted a playground. During the dry periods the children all gather at the playground to play sports once a day. Many of the children often run and play in their bare feet. The school has a soccer and net ball field, soccer balls, net balls and volleyball equipment.

Figure 12. Students playing sports on playground.

Gardens.

The food gardens on the school grounds are maintained by different groups.

Figure 13. 'Matoki' growing on school grounds.

The avocado trees provide a treat for the children when they are in season.

Figure 14. Avocado trees and avocado growing on school grounds.

The tomato and cabbage garden is run by the school's scout group. They are raising money to purchase tents and other equipment for camping.

Figure 15. Scouts working in garden, cabbage grown by scout group.

Teachers' houses.

All of the teachers that work at Kashozi live at the school when school is in session.

Figure 16. Teachers' houses

Accommodation for teachers vary, some teachers have a single room that shares a wall with another room, these dividing walls do not reach the ceiling and sound easily travels from room to room, other teachers have houses with more than one room.

Figure 17. Teachers' houses

Dormitories.

The majority of the students at Kashozi board here during the school year.

Figure 18. Kashozi pupils in girls dormitories.

Latrines.

As Kashozi has no running water toilet facilities are in the form of pit toilets.

Figure 19. Student latrines.

Culture of the School

The school is very hieratical in nature; during my stay orders that came from the administration were rarely questioned and never directly questioned. The students are very well behaved and rarely disobey any directive from a teacher.

Teacher Training of Kashozi Teachers

Most teachers at Kashozi had what is known in Uganda as 'grade three' level training. Many of the teachers were part time students at the local University in 'holiday' or 'weekend' programs.

ICT Capabilities of the School Staff in General

Most of the teachers at Kashozi attended a basic computer course from the local university prior to this research. The comfort level with using computers varied from teacher to teacher. Most teachers informed me that prior to the research period they did not use the computers/internet connection available at the school. Very few teachers had email addresses, and that many did not know how email was used. The majority of work that was being done on the computers was done by the school secretaries. When a teacher needed a letter, exam or other document typed up, they would write it out and then the secretaries would type it up and print it out. The computer teachers would often type and send emails for some of the other members of staff.

Figure 20. Secretaries typing work for teachers and administrators

General Attitude Toward Learning and Willingness to Learn ICT

I found the teachers and the students of Kashozi both had a very positive attitude toward learning in general and specifically toward learning ICT.

Most of the Ugandans that I talked with, in and outside the school, expressed their view of education as being the path to a better life. During my time in Uganda I met some children that were school aged but not in school, they had been unable to pay for their school fees and barred from attending. Most of these children were only able to make it to the end of grade seven or lower, almost universally they expressed that their deepest wish was to be able to return to school. In many places in Uganda children living in poverty with or without parents often have to work to fund their own education; their desire to learn and be educated is so strong that they work at any job they can find to be able to fund their schooling. For most of the parents that I had an opportunity to talk with, their highest priority was to educate their children and send them to school.

Figure 21. Kashozi pupils learning mathematics using the computer.

My Situation within the School Community

The first few weeks in Uganda I had to remain in the capital city Kampala to get my Ugandan documents sorted out. After receiving my government work permit I moved to Bushenyi and stayed with the other teachers and the boarding students at the school. Initially I stayed with the deputy headmistress in her quarters within the school grounds and later during an internal housing shuffle I moved to other accommodation, also inside the school grounds, where many of the teachers resided. I lived at the school and participated in the life of the school for the majority of the research period. By living with the teachers and students at the school I had a unique opportunity to get to know the school and its members. In many ways my initial position as a guest persisted right up until the completion of the research period. Despite this however, I believe that I was able to integrate into the school community and life at Kashozi. The teachers that at first were participants in my research quickly became my colleagues and then my friends.

Figure 22. Christina Morgan in Kashozi B.P.S Computer Lab.

On the Ground

My Initial Plan and How it Evolved

My initial plan was to have evening computer classes with the teachers, but upon arriving I realised that I had made the assumption that they would not have evening classes for the pupils. In the initial weeks I was at Kashozi, as I was sorting out how I would conduct the training sessions, I tried to get to know the teachers and to engage their interest in the research and in ICT. For some teachers this was not difficult as they seemed to be interested right from the beginning of my story.

Engaging the Teachers

> Journal entry 24 08 07 Some of the teachers have moved from an original blatant curiosity of me and what I am doing on the computer (I had to learn that someone looking over my shoulder while I was writing a personal e-mail was not rudeness but just curiosity) to actively participating. It seemed that for some there was a necessary watching period that eventually broke the ice into questioning and finally participating and using the computer. This participation of the first teachers seems to have paved the way for the more shy teachers to come in and observe as their fellow teachers were working. For me learning to use the computer has always been hands on, but for many of the teachers at Kashozi, learning to use the computer began with watching.

Figure 23. Christina Morgan and Kashozi teachers in computer lab.

New equipment.

I came to Kashozi with some digital equipment that was donated to the school. Two digital cameras, three MP3 players, headphones, portable speakers, a CD-burner and rechargeable batteries were brought to the school. This equipment was intended to help enable the teachers to create their own resources but it also had the added effect of generating interest in the project.

Curriculum appropriate digital resources.

Knowing that the internet connection at the school would be slower than I was used to (equivalent of dial-up), prior to my trip to Uganda I downloaded and saved digital resources that seemed to fit with the Ugandan curriculum (I had picked up a copy of the national curriculum from the ministry of education on a previous trip to Uganda). These resources included digital children's stories, poems and songs, in audio, visual and

written format, digital videos, interactive flash files, Microsoft PowerPoint presentations created by educators, images, and entire websites. Almost all of these resources were available to the teachers through their internet connection. Having resources readily available without having to wait for download time seemed like a good way to generate interest in ICT resources as well as being a good starting point for teachers unfamiliar with the technology. When I first arrived, teachers would come into the computer lab and would ask to see some of the resources I had brought. Of all the things I showed them, the interactive flash files seemed to interest them the most.

> Journal entry 24 08 07 The enthusiasm for digital resources that I got from much of the staff at Kashozi was even more than I had anticipated. There was a critical moment with the headmaster in the first week. During the first month at Kashozi I spent most of my time in the computer lab. Between the regular computer classes, teachers would come in during their free periods and ask to see some of the digital resources that I had brought. In the first week one of the deputy heads, Benin, also a math teacher had come in and wanted to see the math resources, he seemed a bit overwhelmed at first with all the files so I asked him what his next Math topic was going to be. "Algebra" he said. I showed him the three algebra programs that I had. He was really interested and spent quite a while

just playing the math program himself, after a while he told me that he wanted to use them with his class so we began discussing how it could be done. Through our discussion Benin started telling me what he saw the benefits to be: the program gave automatic feedback to the students, the teacher could track the student results by the score, and it was fun… This is when the headmaster came into the computer lab, he stood for a while behind us, watched and listened to our discussion. After watching he asked me if I had anything on mean, median and mode as this was his next math topic for his class. I showed him the programs that I had, after looking at them and then using them himself he decided that he would bring his class in the next period he had with them, the next day. I frantically worked with the other computer teachers getting as many computers ready with the math program (how we had to do that is a whole other story of technical challenges!). The next day he arrived with his class and amazed me in his lesson, he taught his class as if he had been using the computer as an educational tool long before I arrived, though I was told that it was actually the first time. There were of course technical challenges and the fact that the

high student computer ratio made it 4+ students per computer, but everyone, myself, the headmaster, the students and the other teachers watching, thought it was a success.

Figure 24. Kashozi headmaster teaching lesson on mathematics using the computer.

Showing possibilities.

"One of the tasks of the educator is also to provoke the discovering of need for knowing and never to impose the knowledge whose need was not yet perceived" (Horton & Freire, 1990p. 66).

I tried to engage the teachers by using the technology myself in my own teaching and in using the media that the teachers and I had been collecting. A few weeks into my stay at Kashozi we had a sports day, as I was new to the school and was not given any

duties for the day I asked the headmaster if I could video tape the event. The next day I downloaded the video and photographs that the teachers had taken on the new digital cameras and produced a simple movie. Though watching it was a bit of a problem as there were only small computer screens or one small TV, the teachers seemed interested and even before the video was completed they became interested in the editing process.

During the holiday in August the older children returned to the school for extra classes and with a shortened staff, fewer teachers were coming in to learn with me. I offered to teach two of the classes to help out and to have an experience of teaching in their environment. I taught one class science and prepared a PowerPoint with images on the environmental topic. The PowerPoint was copied onto the working machines and my class came in and went through the self directed PowerPoint presentation. Though there were only a few teachers who came in during these lessons the presentation remained on the computers for a while and I came into the lab more than once to find a teacher going through the presentation.

> Journal entry 24 08 07 During this last week, the first week of the extra classes, I have been working with the schools' social studies coordinator. The Ugandan social studies program is fairly specific to Uganda and Africa and there are fewer resources on the hard drive than for other subjects. Moses and I have been working on creating some slide shows of photographs that he has learned how to download off the internet, the photographs illustrate many of the

social studies topics and issues that he normally teaches using only the text book which limits him and his students to only the images and text in the book. Moses got interested in teaching with this tool by watching me prepare for my science class, he asked me if there were images and information on African challenges such as AIDS, malaria, famine etc. I told him we could look and see what was there. We did a Google image search for famine and were accosted with a page full of images of starving human beings, though the topic and images were startling, Moses was thrilled with the plethora of images. I showed him how to save them from the webpage and he proceeded to collect images on famine and the other topics that he was doing we worked at it into the afternoon.

What the teachers told me engaged them

Some of the teachers were motivated to attend training sessions and become involved in the research because of an interest in a new person. The school had received visitors prior to my arrival but I was the first person to stay with them at the school and the first to work at the school for an extended period of time. I think it is safe to say that some of the teachers and students were curious about 'the visitor' and this provided some motivation to participate.

> Benon: “Through the practice of coming to eat and interacting with you, the way how you are using it, all the time you are with it, I said what is wrong with this gentle lady she is always with the machine and I tried to move with you, the way how you are interacting with the computer, then I also picked that, that more interest. To know why this one does not go without what, these machines the computers the camera so I picked interest through you. Yes through you”

Elijah, who had prior knowledge of ICT, was motivated to interact with me through our mutual interest in the field of ICT.

> Elijah: “My interest is increasing every day now with this computer knowledge, you may be having some knowledge but when you find another person in your field with some different knowledge you become inquisitive to know about that thing so your coming here has had an impact and I am always inquisitive to know what is taking place”

For Bago the new equipment was sufficient to motivate him to participate.

> Bago: “When you came at least when you talk of projector then definitely I will have vigour to go and see how does it work and the fact that I knew that at one time you will leave that means that I had to take consideration that if by the time you leave at least I must be able to have acquired that knowledge, I must be able to have known how to use the mp3, I must be able to have known how to use the internet, I must be able to know how to open an email, how to use an email with ease, so at least that one you encouraged me.”

The ICT training was offered for only a specific time period and it was offered free of charge. Training offered free of cost motivated Moses to participate.

> Moses: "I've been moving in towns and see people paying money to learn some computer skills, ICT skills and it is expensive but when this opportunity came for me I was interested because it was free of charge and another thing I knew it was going to help me in teaching"

Many teachers were aware that through ICT, information could be accessed and that this could help them in teaching. Motivated by the available information Nazarious became interested in the training sessions.

> Nina: what has captured your interest?
>
> Nazarious: Accessing information world over
>
> Nina: so before I came you had the internet, why didn't you use it then? What made you interested to start to learn it?
>
> Nazarious: Maybe the sensitisation… time and people to help me.
>
> Nina: so when you had the access to a person to help you and you had a bit of time? So you had the interest before but you felt that you had the access and ability now?
>
> Nazarious: Yes.

The teachers that attended training sessions in the beginning motivated other teachers to participate.

Charles: “I was inspired by other teachers I would see them coming here conducting a lesson then I would say why I can’t also have one here.”

Deborah: “Yes, after looking at other people I think I can also use them, if they are using, why not me. But when I tried I found that something that I thought was difficult was not all that difficult. It is a question of learning how to operate it.”

As confidence in their ability to use ICT increased teachers interest and motivation also increased.

Hesketh: “Though I knew how to open, how to go to some programs there are things which I have added on what I knew, .. the more I found out the more I get interested.”

John: “I am more interested now other than before because before definitely it was difficult for one to go to the computer and get anything on it because he lacked the skills and the knowledge after this research now one is able on his own to go to the internet, he is able to send the messages, he is able to send emails, he is able to download lets say even attachments which we were missing before so I feel definitely quite a lot has been learned has been acquired during the process of your learning here.”

The teachers who were coming into the lab became very interested, specifically in the interactive flash files that applied to their curriculum. The headmaster was particularly interested after teaching a lesson himself using one of these flash files with

his maths class and implemented a policy that the other teachers should make use of the resources.

> Journal entry 24 08 07 That very day the headmaster got the schedule altered so that every class would go into the computer lab for each subject once per week, this means that the students who normally had only one period a week using the computers would now have 5, one for computer class and one for each of their four subjects. The teachers seemed to like the idea, though as it was a directive from their boss, it is hard to know for sure. There was one teacher who raised a very legitimate concern that there might not be anything that applies to the specific curriculum that is being taught in a week. I suggested that this would be less likely if they came in advance to plan the lesson, and if there was not yet something on the hard drive that was applicable or was useful we could try to find something on the internet or develop something ourselves.

My Plan Evolves

> *Journal entry 24 08 07 The timing was not great as the students were entering their exam period and most of*

the teachers kept their classes away from the computer room for revision. This exam period was followed by a school holiday, so due to the circumstances the momentum that was there at the beginning was somewhat lost.

Figure 25. Students preparing to return home for school holiday.

Engaging the teachers – sign up for ICT lessons

Journal entry 24 08 07 I have taken this somewhat quieter time to write descriptions for possible computer sessions for teachers to sign up for. I am hoping that this might prompt some of the teachers that have not yet come in.

After having lost the momentum of the first month and having reflected on what we have accomplished so far I had a discussion with one of the teachers that helped me to realise that the teachers were interested but that they did not know all the possibilities for what I could teach them. I discussed with the headmaster whether it would be appropriate to create a list of the things that I thought might be useful to the teachers and let them sign up if they were interested. I emphasized that it had to be voluntary to come in to learn with me. Pulling on various discussions I had had with the teachers, I generated a list of topics that I thought would interest the teachers and left the sign up sheet in the staff room. Several of the teachers were so keen to attend the classes that they signed up for everything. Many teachers who had not ventured into the computer lab or interacted with me so far, signed up.

More new equipment

It was at this time that I took a break from Kashozi. The children were away from the school for the last week of their holiday and most of the teachers were headed home for a brief holiday. I had an opportunity to travel to Thailand for two weeks. In Bangkok I picked up some more digital equipment for the school with some money that had been donated. I brought back to Uganda a microphone, two portable speakers, a DVD player and a projector. In addition, three teachers had requested me to purchase a digital camera for them. After learning how to use the school's cameras they wanted to have their own, though it was a big expense for them.

Figure 26. Teachers receiving their personal digital cameras that they purchased.

The projector was a big hit with the teachers as it could be used to present digital material to a much larger group, prior to this when teachers presented digital resources to their pupils they would have to crowd around one computer screen and this was not practical for many of the large classes at Kashozi. I believe that having access to a digital projector encouraged the teachers to come in and learn to use ICT even more. Now the resources that they were locating and creating could be used effectively for the whole class or the whole school.

Figure 27. Students watching a film (left) and having a lesson (right) using the projector.

Description of ICT Interactions with Teachers

With so many teachers signed up for sessions I needed to organise a schedule to maximise the training time and due to the busy schedule of the school I needed to schedule the sessions during the teachers breaks. For some teachers this became a problem as they were often occupied with other school work during their free periods.

> Nazarious: Whenever I would be in need of coming then I would think of marking and evaluating the pupils, sometimes I would miss some lessons, sometimes I would fail to maybe do some assignments like when you say go and practice this and come back.

For other teachers the schedule did not give them as many training sessions as they wanted. This resulted in a busier schedule for some.

> Charles: Yah actually personally when you came I looked at my schedule and I started using that time very optimally because I would say at this time I would be in computer. I would make sure that by that time I have marked my work, everything so that I don't miss.

I tried posting a week or two at a time and after a few weeks of missed classes and doubling up I had a better idea of who was able to come in more or come in less. Though a week never went by without at least one session being missed I think that I was able to find a balance between structure and flexibility that suited me and most of the teachers. I generally worked one on one or with two teachers.

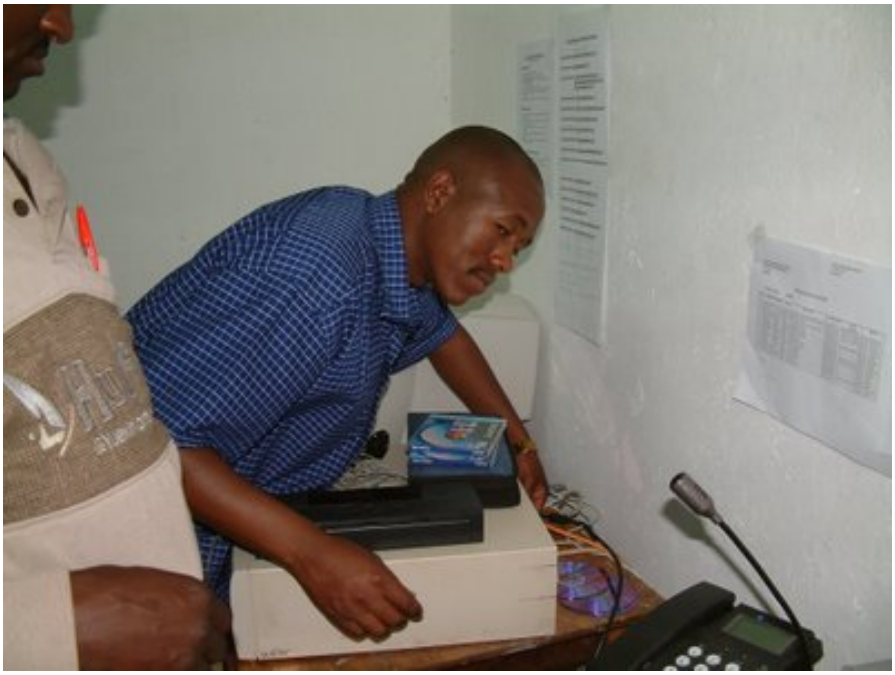

Figure28. Kashozi teacher learning to connect ICT devices.

The schedule listed specific topics for training but sometimes the teacher coming in would want to work on something else or learn something else. I let the teacher's needs and interest direct my training. All the training session were practical in nature, as the session took place we usually produced something that could be used by the teacher later in their teaching. Although often the hour was not enough to complete the product. Some teachers came in for extra hours in order to complete the teaching aid and some only worked during training sessions. More teachers started to do independent work as their knowledge, skills and confidence increased.

Figure 29. Kashozi teacher learning to use the digital projector.

I never gave any written instructions or readings, and only twice did I give 'assignments'; to use the mp3 players over night and to take the camera and try taking photos. These 'assignments' were optional. When the teachers were training on how to use the computer, generally they sat directly in front of the computer and had their hand on the mouse. I wanted the teachers to know that they were capable of operating the computer and other ICT equipment without me. I found myself answering requests to do something on the computer for a teacher with 'I could do it for you but then you won't know how to do it yourself, I'd be happy help you to do it or show you'. This quickly turned into 'nope I won't do it for you' followed by smiles and laughter as the teachers got used to me and my training methods. At the end of the research many of the teachers who trained with me commented that they liked learning through doing.

The things that I taught many of the teachers included: teachers who did not have email and wanted to have email, with guidance signed up for a gmail account and sent an email to a friend or colleague. Once they had used the email for a while they learned how to sent attachments, add contacts and other functions available in gmail. Many teachers also learned how to chat online using Google talk.

Figure 30. Kashozi teacher learning to use voice over IP.

Most of the participants learned how to use the digital cameras. This training was done by showing the teachers a few functions on the camera, (starting with how to take a photo and ending in shooting a video clip) and sending them out to try the functions. Most teachers seemed to enjoy taking photos and several became quite good at photography before I had left.

Figure 31. Kashozi teacher learning to use a digital camera, photos taken by Kashozi teachers using camera functions, sepia and black and white.

My training on searching the internet generally began with doing a Google image search on a topic they were teaching. This seemed to work well as the teacher could click on the search result of thumbnail images and easily select the images that they wanted to use in a PowerPoint presentation and download them. Often one of these links would open a page that had some textual information that would grab the teachers attention. Most of the teachers were very interested in accessing images on the web especially science diagrams and maps. Images would be downloaded and saved in a folder to insert later in a PowerPoint. Training on how to search the internet and filter through search results was more casual. Teachers who were studying at the university were particularly

interested in the textual information on the internet and would come in and ask for help searching for a specific topic. As more and more teachers started using email and doing internet searches the one (and sometimes two) computers that were hooked up to the internet became in demand. I overheard one teacher jokingly offer to pay the teacher on the internet to get off and let him have a turn.

Teachers also did training on how to make a PowerPoint presentation using the images collected on the web and to use the mp3 players, speakers and microphone to play and capture sound. Though I had drawn up the original list of ICT topics, as the teacher's skills and knowledge increased they made more requests to learn what interested them, going beyond what I had originally suggested. Some of the more keen teachers requested lessons in scanning, CD-burning, Adobe Photoshop, video recording and editing and making a simple website (blog).

The request to learn Photoshop and video recording and editing surprised me initially. I had wrongly assumed that the teachers would only want to learn things that they would be able to do with the equipment that they had, since my laptop was the only machine capable of running Photoshop and I would be taking it back with me along with my video camera when I left. I had assumed that these skills would not be of value to them. The teachers had fun in Photoshop manipulating the photos that they had taken and entertaining their fellow teachers with their results. Three teachers became quite skilled at video editing and improved in their skill of shooting video after trying to edit their first clips. In the end they were all able to produce their own movie(s). When I asked one of

the teachers why they wanted to learn this they told me “well you never know, we might have this equipment one day and then we will know how to use it”.

After the holidays the afternoon sports activities were suspended due to the pressure of the upcoming exams and the onset of the rainy season. Many afternoons during this time (there were no classes for the pupils and I had not scheduled any ICT sessions) groups of teachers would come into the computer lab to work on their digital projects or to get extra training. During this time the teachers were able to interact with each other in the context of what they had learned about ICT. This interaction motivated teachers who had missed sessions to come in and learn what their colleagues were learning and to teach each other.

> *Journal 24 09 07 I am starting too really like a time in the day called “Personal Hygiene.” This is the time in the day, just before dinner when the sun is setting, when the children are meant to bathe, collect water and wash their clothes. During this time many of the teachers who have been too busy to come into the computer lab come in. Today several teachers came in and for the first time since I have come here I saw teachers teaching each other how to do things on the computer, it was really great to see. The other thing that happened today was some of the teachers that I have been working with were looking at my research notes and were expressing their interest in*

participating more, they seemed to really like the idea that I would be interested in what they had to say.

Chapter 4: Data

The data contained in this chapter was received from interviews that were conducted near the end of the research period, Additionally, comments from interviews conducted informally after computer sessions and after the teachers taught classes using ICT, and from responses to a written questionnaire (see appendix) that I gave to the participating teachers at the beginning of the research were collected. The data came from many different teachers at Kashozi. Each teacher interacted with me and contributed to the research in different ways and to different degrees. Some of the data obtained from the teachers was written by the participants, some was written by me as the teachers responded to oral questions and much was video recorded. The kind of recording of data changed as the teachers became more comfortable with me and with using ICT.

The primary means of recording data was through the use of video. Eight teachers invited me into their classroom to observe and record their lessons, over 261 minutes of class lessons were recorded. Some lessons that used ICT were also recorded. Eight teachers invited me to record over 298 minutes their lessons that used ICT. Some teachers provided comments to me after ICT sessions and after conducting lessons using ICT, mostly due to time constraints, these comments were typed and not video recorded. Near the end of the research eleven teachers did video interviews with me totalling 418 minutes. In addition to this, over 10,000 photographs were taken by me, the teachers and some of the students. Over 20 hours of video was recorded by me and the other teachers of special and daily events at and outside Kashozi.

The written questionnaires and comments after lessons were typed and stored on my laptop. The video data was downloaded and stored on an external hard drive. My

journal entries were also written onto my laptop or typed from handwritten entries that were written on paper when the power/battery was out.

After the research period ended the interviews were transcribed. Themes emerged as relevant sections were selected from the transcriptions and other written data. The textual, visual and audio-visual data was then organized from a previous organisation of individual participants into themes and presented online, the textual and photographic information is presented in this chapter.

The chapter begins with an introduction of individual participants, as well as, a description of their ICT ability and opinion of ICT prior to the research. The teachers discuss the skills and knowledge that was gained through the research and training and how this impacted classroom teaching. Insights on the positive aspects of using ICT in teaching and the benefits ICT can bring to teachers, as well as the problems and issues associated are also presented in the teachers own words. Training, research methods and cultural implications are commented on. The chapter ends with a look at the opinion teachers now have of ICT and their plans for using ICT in the future.

Participating Teachers

(Teachers who participated in the research are listed here in alphabetical order)

Figure 32. Bago Birihanze is an English teacher. At the time of the research he was teaching P4, P6, P7.

 *Figure 33.* Benon Kaamu is the Deputy Headmaster of Kashozi, he also teaches mathematics to P7 and P6.

 *Figure 34*. Betty Rutafa teaches English. At the time of the research she taught P1 and P2.

 *Figure 35*. Charles Atuhaire taught science to P6 and mathematics to P6.

 *Figure 36*. Christine Kembabazi teaches P3 and P2.

 *Figure 37*. Debora Kinombe is Kashozi's Deputy Headmistress, she also teaches English to P7 and P6.

 *Figure 38*. Elijah Byaruhanga is a computer instructor.


Figure 39. Generous Kyomuhangi teaches P1-P3.


Figure 40. Grace taught P1.


Figure 41. Heskethbell Kamugisha teaches science, P4 and P5.


Figure 42. Henry Nyesiga is the head of English and he teaches P7, P6, P5.


Figure 43. James Nkwansibwe teaches mathematics P3and P4.


Figure 44. John Kateshumbwa is the Headmaster at Kashozi, he also teaches mathematics to P7.

 *Figure 45.* Martin Ndyazarwa teaches science.

 *Figure 46.* Moses Mwijukye teaches P6 and P7 Social Studies and is also the head of that department.

 *Figure 47.* Nazarious Matsiko Makundu teaches English to P5.

 *Figure 48.* Wilfred Namara teaches mathematics.

ICT Ability of the Teachers at the Beginning of the Research

At the beginning of the research period I asked many of the participants, who had signed the consent forms and were coming in to the computer lab for sessions, to tell me about their ICT skills. Because I had not yet developed a comfortable relationship with many of the teachers, the information was primarily gathered in written form. Below are the responses that I received.

At the beginning of the research Benon described himself as having 'moderate' ICT skills. "I have little time in my schedule for practice, I am lacking typing skills, at home there is no computer to use so I don't get to practice" Benon indicated that he felt

comfortable with Microsoft word and excel. Benon wrote that he was interested in developing his skills in using "Power point for presentation, internet explorer, e-mail and receiving." Benon felt that computers helped teachers to "save time, talk less, attract the interest of learners, make school work more practical for the pupils and covered more work in a short time."

Charles also described himself as having moderate ICT skills. "I can open computer and open some programs. If I am guided I can use computer in conducting a lesson. I can open email." At the beginning of the research Charles had an active web email account and felt comfortable opening email and programs. I asked Charles if there were any programs and/or skills that he would like to develop "Using the computer in my teaching lessons, using the computer for searching questions, computer networking… PowerPoint presentation". Charles described the benefits of ICT as "Simplifying my work, help me in my studies in case of search questions".

Christine described herself as having poor ICT skills and only felt comfortable "opening the computer." When asked if there were any programs and/or skills that she would like to develop Christine wrote: "camera, music" Christine saw ICT as having a benefit to teaching "because it saves time."

Deborah described herself as having poor ICT skills. "I have acquired very little skills due to lack of practice." Debora also indicated that she did not feel comfortable with any programs, equipment or skills in ICT. At the start of the research Deborah wanted to learn to "organize her work and to teach using a computer." Deborah believed that ICT could help her "do lessons accurately and in an interesting way as far as teaching is concerned. [And] improve the methods used in the teaching of listening skill in

English." At the end of the research period Deborah reflected on her ICT abilities prior to the research. "Before the computers have been here but I could not even type a single word of something, a paragraph of six sentences and even save it I had not got that skill. So at least now I think I can type a letter and print it out. Yah [now] I have got skills and knowledge."

Henry described himself as having moderate ICT skills. I have "little knowledge on the inside parts of a computer, little knowledge on downloading, little knowledge on internet." Henry was comfortable with "opening [the computer], opening a program, Microsoft word, excel, and PowerPoint." Henry wanted to develop his skills in "Internet, printing from internet, and getting information and storing on disks". Henry saw ICT as having the following benefits: "Getting information, learning new ideas and terms, process and compute my programs, teaching exercises [and] playing some games."

James described his ICT skills as "still very low, I am a beginner with no prior knowledge". James told me that he wanted to learn "general knowledge about the computer". The reason James wanted to learn the computer was "to aid me in my professional skills of teaching"

John described himself as having poor or very low ICT skills. "ICT is a new development for me which makes the skill level be elementary". When asked if there were any programs and/or skills that he would like to develop John wrote "Very much so". When asked what benefits he sees in ICT John wrote that "ICT can help teach children to get informed and that the community can be enlightened."

Moses commented that "my skills are moderate and needs to be improved." Moses had an active web email account and was comfortable with word processing.

When asked if there were any programs and/or skills that he would like to develop Moses wrote "Computer networking, photography and video computing skills, downloading and programs on the internet." At the beginning of the research Moses indicated that that ICT could help him; "It would help me download some information to help me in teaching, get skills in photographing to help me collect learning materials, getting basic skills to help me in the world of computers."

Nazarious told me "I have never used a computer." Though he had not used a computer Nazarious knew that he wanted to learn "accessing internet information, using a computer to deliver information, using a computer to deliver information to learners, using a computer for videos and audio recording information." Nazarious thought that computers "can help me access world wide information in my studies, It can help me, the school and the learners to compile and process data."

Grace described herself as having moderate to poor ICT skills. "As so far I know how to open and shut the computer [and] save information on the computer". At the beginning of the research period Grace wanted to learn "Typing the information on the computer, using e-mail, using internet" When asked what benefits she sees in ICT Grace wrote: "widens knowledge, helps sending messages, study purposes for the students."

Wilfred described himself as having moderate ICT skills. "Slow at typing, not well conversed with all ICT programs". Prior to the research Wilfred had an active web email account and was comfortable with Microsoft word. When asked if there were any programs and/or skills that he would like to develop Wilfred wrote "Internet explorer [and] presentation". Wilfred thought that ICT could help with "Conducting class lessons, story information, watching videos, class presentations [and] playing games."

Teachers' opinions of ICT prior to the research

During the interviews that were conducted at the end of the research period the teachers were asked to reflect on how their views on ICT may have changed through the process of the research. Most teachers' opinions on ICT use had changed. Prior to the research there were many different views on how and what computers could be used for. Some teachers viewed the school computers to be only for student use and learning.

> Moses: Before I met this researcher I thought these computers they were there for the learners to do some, to get computer skills and maybe do other things but now I've learnt that you can use computers in teaching other subjects.

> Bago: This computer here has been here for many years I found it here but I would spend a week or two weeks without entering it… you find that maybe there is a learner who knows computer more than the teacher because for them at least they had access to go there once in a week but teachers we had no access.

Many saw the computer as being too complicated to learn easily and were not motivated to learn about the computer because of this.

> Nazarious: I thought it was something so complicated because when we were doing some basics we would open and close then maybe type little material but with internet I thought that it was something that was complicated but I found that it is simple opening accessing information and now at least I feel computer, ICT is not something very difficult but it needs time, with time you learn it and like it.

Bago: Personally I took computers as a fairly complicated thing, a thing that maybe I couldn't imagine but as I learnt I noted that as long as you access the computer then you can learn skills you can get knowledge you can, all easily, not all that hard, not all that complicated.

Prior to the research teachers had access to the computers at the school but some did not view computers as being useful to them.

Charles: Before you came these machines were here but to me I was not having all that courage I was not having that motivation in myself because I would see the machines but they were useless to me it was not until you came that we see someone opening up an email and we feel interested.

Benon: I was not looking at it at the what, at the valued thing, I wouldn't because I had not applied it, I just go to the computer, just know very few things about the computer, but now with your research I have known the use of the computer sincerely.

Changes in Opinion

Through the process of the research and through the training sessions many of the teachers' opinions about ICT began to change. Instead of seeing computers as a tool for pupils and something that was not useful to a teacher, many teachers started to view their computers as tools for teaching.

Kashozi teachers began to see new possibilities of teaching and learning that he had previously not considered.

> Hesketh: Now I know that even a child can learn from a computer but at first I knew that to teach a child there must be a blackboard, there must be a teacher and there must be what, children in class then you present, but now I have changed knowing that if the computer is there the child can download even from the internet information, he reads, goes to the exams and he passes.

> Deborah: I used to think, in English how do I use a computer or projector to teach English? I used to think maybe Social Studies is referring to different places, maybe science is different experiments. But even English it can be taught using this technology.

> Moses: So now I have discovered that social studies can be taught using ICT.

As teachers practiced using ICT tools and got more comfortable with the computer their confidence and interest increased and their views on how they could use computers and their ability changed.

> Nazarious: I feel more confident.

> Betty: When I see things on a computer I just wish I could be able to use the computer.

> John: I am more interested now other than before because before definitely it was difficult for one to go to the computer and get anything on it because he lacked

the skills and the knowledge after this research now one is able on his own to go to the internet, he is able to send the messages, he is able to send emails, he is able to download lets say even attachments which we were missing before so I feel definitely quite a lot has been learned has been acquired during the process of your learning here.

Deborah: Sometimes a child will ask me how do I open to go to? I would say you call the computer instructor. This time I will not do it.

Even teachers who were comfortable with the computers prior to the research experienced a change in how they viewed the technology. Elijah, one of the computer instructors, discovered that there is more out there available on the internet than he had previously experienced.

Elijah: Before I hadn't, I was just an internet user, come to the internet send a message, email message and I end there but there are many things which I am discovering, volumes of books I have downloaded from internet.

ICT lessons taught

Several teachers provided me with comments after they had computer sessions with me. I asked the teachers general open ended questions (see appendix). Below is a summary of a few of the lessons and comments by the teachers.

After computer session on email and using Science CD-Rom Hesketh commented to me that using the CD was beneficial to him as a science teacher "[This CD is useful to me] by expressing the inner information about the subject matter, for example

I've seen the heart inside, I have been teaching theory, even for me I have never seen the inside of the heart, even other parts. So [with this CD] children could get the practical part of what they are learning from the class." After this training session Hesketh made plans to use the CD with his class "[To use this CD] I would just operate the machine myself and I explain as I show them the diagrams already illustrated in the computer." Hesketh also commented on what he had learned through the training. "I have learned how to open e-mail, how to use it, how to operate basics of the computer… The one which are useful to me, the e-mail, word, science CD explorer, even using the laptop, I have never used the laptop." At the end of the interview Hesketh told me that he "wanted to get connected to the internet, and express my feeling to other people [as well as learn] operating digital camera."

James and Martin had a ICT training session together on how to use Microsoft Word. Martin learned "how to open the computer finding the programs, how to use Microsoft word, inserting pictures, and saving them for future reference." James explained "I've learned how to open the computer, Microsoft word, save pictures, change the fonts." Of the lesson James and Martin both thought that "everything was useful" James commented that "it will help me make different docs." Martin learned that "I can now have my own text printed and saved if possible I can even print my own text and use it in my class". For their next session James wanted to "access the internet." and Martin "would like to learn how to used the internet, opening e-mails, and learn how I can use the computer in my class lessons."

Grace came in for an ICT session on basic computer skills.

> Journal (08/10/07) Grace came in today with a hand written document that she wanted to create on the computer, with a little assistance from me she has created her first word document. Grace is very good at doing the work herself and insists on undoing what I show her so she can replicate the process herself.

After the session Grace told me "I have learned how to open a computer, how to save information on the computer." She commented that the session "is very useful" and that next time she would like to learn to "make an exam."

After a lesson on basic computer use Henry "learned the difference between saving on the document and on the floppy." Henry told me that learning these skills is "useful to me…because I can use them in teaching, for example when I'm conducting a class, I can teach them how to save on the doc and on the computer." In the next computer session Henry wanted to learn "how to transfer info from the internet onto the floppy or flash disk and then print it."

Teachers' Assessment of What they Learned

Teachers commented that through the research and training they learned computer basics including how to open and close the computer, basic communication such as email and basic use of a digital camera. Other teachers learned slightly more advanced skills such as communicating using instant messaging and voice over IP, presenting using PowerPoint and internet searching. Some teachers described that they had learned digital

video editing and others explained that they learned about lesson planning to use ICT and that they were now better able to learn things on their own.

> John: [Kashozi teachers] have acquired the skills now which really help them in teaching. Those who are doing science go to the internet download the information they need with the use of the projector they are able to translate what they are learning… Definitely these skills were missing before.

Figure 49. Headmaster learning to use ICT.

Basic computer usage

> Betty: I have acquired the experience of opening a computer entering data closing it.

Bago: There is a lot I have gained personally as basic knowledge about computers that means even if I am not here I can go to the internet cafes I can go to where and I apply the knowledge.

Communication

Email

Nazarious: Sending messages by use of email receiving messages, reading messages, using email, opening internet then recording information.

Deborah: I had not opened an email before. But now I can, since I have my own email I open and read the text that are there and even reply them. I even write to other people who have not written to me.

Instant messaging and voice over IP

John: I was able to talk to my son who is not here something I had not thought would be possible so at least that skill I have acquired now, I am able to communicate.

Bago: I've gained a lot because that means I can send emails, I can talk, I can communicate. And at least I've learned a lot personally I think because computers they have helped us.

Internet Searching

Moses: In terms of knowledge I have learned a lot especially when it comes to the advanced stages of the internet using a computer in research.

Hesketh: I have learned how to explore some information from the internet for example… I also had other skills like downloading the pictures, searching the pictures to the lesson that you are going to teach.

Elijah: Yah I have learnt actually a lot there are some programs which can be got from internet, there are some writers of books which you can just get from internet and read it on your own you see I've learned that also, unlike sometime back when I would just sit on the machine send a message read an email message and I stop there.

Deborah: I've acquired a lot of skills I can go to the internet now and search information on it. I used to hear I got this from the internet but myself I could not really go there and get the information and now, it is a source of information that is really up to date. So I have gained the skills and knowledge of opening the internet search and get some ideas to pass on to my class if the topic I am dealing with needs more research I can now research using the internet.

Power Point Presenting

Nazarious: Using PowerPoint to display some pictures and message you want to deliver to the group.

Lesson Preparation

> Charles: [Learning to use ICT] has helped me in the sense that when I am preparing my lesson plan I usually have to come here [to the computer lab] and get more knowledge which used not to be because I was lacking some skills, now I can open up that and get the information… it has effected me positively in that I can now go, if I go to another school I can challenge them.

Using Digital Cameras

> Deborah: The digital cameras I had never used but at this time I can operated it and even I didn't know that you can get it, take a picture of yourself and have it there, but I have taken one of myself that is on my laptop, so the digital camera. And even the projector, I had no idea of using the projector and the digital camera but now I feel confident using the projector and the digital camera.

> Betty: I can use a camera for that matter I can take photographs, take video coverage review what I have done, so there, I'm an expert.

> Benon: I think it was the first time [for me] to have the camera, during your presence.

Figure 50. Bago photographing pupils with his digital camera.

Video Editing

Charles: [I have learned to use the] camera, and is it called a coverage, this one, (pointing) a video camera.

Nina: And you have even learned how to edit video as well.

Charles: Yah I have done the editing, I think I can now do it.

"I've Learned to Discover Things on my Own"

When I came to the school I brought an old external CD burner for the school to use to burn CDs but I neglected to bring the corresponding software and drivers. As the teachers began to use the cameras to take photos, some of the computers began to fill up with photos and this resulted in the computers slowing down. I suggested to the computer instructors that they might want to burn the photos onto a CD to free up room on the computers. When we realized that we didn't have the software or drivers for the burner I suggested that they could search on the internet and download them. At this point I was very busy with my training schedule and it was for this reason more than any other that I

didn't assist the computer instructors in locating and downloading the drivers. Elijah successfully located and downloaded the appropriate software and drivers and got the CD burner functioning independent of me.

> Elijah: I have learned to discover things on my own for example I downloaded something from the internet for the CD burner I tried it and it came out properly I have even tried to save it on that first machine, when Gilly first came we tried it, burnt some CDs and they started working.

Figure 51. Elijah using a computer in the computer lab.

What ICT skills did the teachers apply to their teaching?

The participating teachers varied on how and what skills they applied to their teaching. Some teachers were eager to try out their digital work with the children as soon

as they could and some were more cautious about moving from learning to use ICT to teaching with ICT. Many teachers started using ICT with their classes by bringing them in to use one or more of the interactive flash files. John, the headmaster was the first teacher to teach using the flash files during the research. Deborah, Wilfred, Henry, Bago and Benon also started using ICT with their students by using flash files. In order to use the flash files the teachers needed to know how the flash files worked, they needed to know how to turn on and off a computer, open the flash file in an internet browser and copy files onto a floppy and then onto a computer. Some teachers started using ICT with their pupils by making presentations. After learning how to use power point and creating a presentation for their classes, Moses, Charles and Deborah brought their classes in to conduct the lesson they had prepared the power point presentation for (several other teachers prepared presentation lessons for their classes but due to time constraints were unable to use the presentations). To conduct a class using a power point presentation the teachers needed to have first made a presentation. In addition to the basics, making a presentation involved learning how to download images from the internet or from a camera. As well, the teachers needed to be able to insert images and text into the presentation, move and resize the images and text, save their presentation and retrieve their saved file. To present to their class the teachers first needed to know how to use and set up the projector and how to use their power point presentation document in the presentation mode. As many of the teachers began the research period knowing little more about ICT than how to turn the computer on and off, to reach this level of competency in the limited time we had, impressed me.

Some teachers used ICT in specific ways. Hesketh used a science CD to present to his class, but first he had to familiarised himself with the CD and how to use the projector and speakers. Betty had her class listen to songs and poems in her regular classroom using an mp3 player and portable speakers. Betty first had to learn how to play the digital files on the mp3 player, download the audio files that she wanted to use and also how to use the speakers.

There were many other ICT skills that the teachers learned that did not directly impact their teaching or have not yet impacted their teaching. Some ICT skills such as recording sound using a computer and a microphone or an mp3 player were taught to many of the teachers but were not used in lessons. This did not occur either because they were not appropriate for the circumstances or because the school year was ending, and the teachers did not have much opportunity to try these new skills in their teaching. Other skills such as setting up an email account and learning how to use it did not directly impact teaching at Kashozi but improved the overall ability and interest in ICT for the Kashozi teachers.

Samples of Teachers' Digital Work

These samples of teachers digital work will need to be downloaded from the website (*http://ninathesis.org/?q=node/80*) or accessed from the CD.

How did ICT impact daily classroom teaching?

Charles: The knowledge of this ICT has broadened my experience in teaching because I can now go to the internet, get some information which I can use in teaching. I can even bring my class in the computer lab and conduct a lesson.

Figure 52. Charles teaching a lesson using a computer and digital projector.

Varied teaching methods

The teaching methods that a teachers uses are influenced by the materials he or she has access to, for many teachers at Kashozi learning to use the computer and accessing educational resources enabled them to use a different teaching methods that they had learned in their teacher education but had not been able to implement because of lack of materials.

> Charles: [Learning to use ICT] has varied my methods because we have been using some methods but now I can have the method of projecting I can say I will teach this lesson, the next lesson we shall move to projection.

> Bago: Learning of ICT has changed my methods of teaching because when we consider lets say for us, we had lets say the drilling method, we had the question and answer method, we had… and many others but then you would find that lets say the case of using the projectors those we learned them in collages but the

application of using them we couldn't. You find that you know there is the use of the projector, there is the use of lets say if you want, if you got let's say a work shop there is this slide presentation but you don't know how to use it, even at times you find you just read it in books you've never seen it but today I know that if lets say if you go to my topic I can use the projector as a method to present something and which makes learning a bit real compared to the other one telling them that there is this and this which they have never seen.

Figure 53. Hesketh teaching a lesson using a computer and digital projector.

Using ICT with Pupils

As teachers used ICT in their teaching and became more familiar with ICT and its possible uses they had many comments about the advantages and disadvantages that they saw and experienced.

Comparison of teaching using ICT and without using ICT

Several teachers participated in a video comparison of their teaching with ICT and without. Where I was invited to, I video recorded lessons in the regular classroom and lessons conducted in the computer lab that used ICT. Each teacher that participated in this aspect of the research watched the video recording of both of their lessons and then made a comparison of the two lessons.

Deborah compared two lessons that were video recorded and watched by her. She commented that in the lesson that did not use ICT the pupils "seemed not to be actively involved in the lesson, it was like you asked them to take part, maybe there was nothing really different to interest them." In this lesson Deborah used hand drawn pictures "first of all [the pictures] were not big enough for everyone, especially the people at the back to see clearly…only they knew that something was drawn but as you look from the back you can see that they were not clear." Deborah compared the hand drawn images to the images she used in her lesson using ICT. "When we used the projector everything was seen by even someone who was in a distance." Deborah also noticed a difference in the participation of the students "when we came to the projector lesson everybody was really willing to talk about the picture, whatever picture was there even when you are not given a chance of talking about it because they were almost real, but the other [hand drawn] ones looked to be a bit fake." Deborah pointed out that teachers' "who don't draw good pictures will be helped great to bring the real situation to learners". Deborah concluded that "where possible and if I have anything special to do I would use the projector so that

I bring the situation nearer, almost real to the learners."

Figure 54. Deborah teaching a lesson using a computer and digital projector.

Benon reflected that "when I brought the class, when I told the class before that we are going to go to the computer to learn about using this everybody was excited." Through watching the video of his lesson Benon commented that "with the computer teaching the teaching was generally lively and all the pupils participated." This enjoyment of the lesson seemed to make the time pass quickly. "I enjoyed the lesson I didn't know that I used one hour, it was almost 20 minutes." Benon also noted through watching the video that in his lesson using ICT "when you look at the video coverage of that class at one time there were some children who were just talking together."

Figure 56. Kashozi students using a computer in a math lesson.

Insights from teachers on using ICT in teaching

Class Control

The students were typically very interested in anything to do with ICT (The computers had been at the school for 5 years and though the power cuts often prevented the children from using the computers their interest in ICT has not diminished), many teachers noticed that this interest tended to promote better attentiveness during class and made the teachers job of controlling the class easier.

> Moses: Class control was very easy because when I told them that it was to be conducted in the computer laboratory students were eager and even stood outside the computer laboratory before the actual time and when we entered the classroom, rather the computer laboratory the class control was very good at the start and another thing children were more interested when we were in the computer laboratory compared to the other side when were in the local classroom

children were less interested others were laying on the desk, others came very late, other were asking me questions where can we start from, in other words can we jump a page but when we were in the laboratory the students were more interested.

Betty: You see when you are using a new technology learners become more attentive because they, that is something new if it is interesting learners pay the most. They attend to it so class control is there.

More Participation

In addition to better class control the students interest promoted better participation in the class work.

Moses: I discovered the following that when we went it the computer laboratory there was more classroom participation for the students than when we were in our local classroom environment.

Deborah: Doing it in an interesting way, it's like a game but they are learning.

Benon: Computers are good devices for teaching because they arose interest of the learners.

Moses: In fact for the first time this was the class that has really enjoyed what I was teaching them, they were following me, they had a great desire of learning, even their participation also increased compared to what I have seen in the classroom.

Deborah: They enjoyed the exercises. They added on their vocabulary in an interesting way.

John: All groups participated and did work at their own pace. All had opportunity.

Figure 57. Kashozi pupils using a computer

Motivation

Moses: It makes children become interested in the lesson because you have a variety of learning aids and another thing it creates what you call intrinsic motivation rather than a teacher using his energy and strength to create intrinsic motivation in the learner, the learner himself or herself is already motivated.

Benon: These gadgets it attracts the, it motivates the children. It motivates the children.

Charles: According to how I saw it, the lessons which I conducted in class was not like the one I conducted in here [in the computer lab] this one was more interesting than the other one.

Figure 58. Kashozi pupils using computers to learn mathematics.

Higher Retention

Pupils interest in ICT and their motivation to learn when taught using ICT seemed to promote higher retention in the lesson content.

Moses: Teachers need to create motivation and in most cases it is extrinsic but in classroom, rather in the computer the learner comes when he is already having, intrinsically motivated so that means that if we are to give work at the end of the lesson, I mean the activity the lesson that has been conducted in a room where you have ICT gadgets that one students are likely to score high, higher than the

lesson rather the activity which has been given after the lesson has been conducted in our local classrooms without any gadget.

Deborah: [ICT] makes the learning situation so exciting. And most of the learners learn in an exciting way, they get facts better when they are excited.

Moses: They can easily recall what they learnt when they were using this ICT gadgets compared to what they learned without these gadgets.

Deborah: Learning through using ICT is really interesting to the learners and the more interesting the lesson is the more they learn the concept quickly.

Time Saved - Cover More in Less Time

Several teachers noted that using ICT in their teaching allowed them to cover more curriculum content in a shorter period of time.

Benon noticed that he was able to cover more content in less time after using ICT with his pupils for the first time.

Benon: With computers we have achieved many concepts in a single period, when in class we have been doing one concept at a time.

Charles: The other one was a bit lengthy and this one was short, we covered a lot in a short time, where the other one we covered a little in a long time.

Hesketh: A lot can be covered in the shortest time, too much work when you have enough computers and you start you lesson, when everybody is directed to the

computer you begin that means that you cover too much work in the shortest time, and even the lesson will be lively because it involves practical.

Benon: Much work was covered in a short time using the computer because I [taught] mode, I did median, I did mean and during the class time you would do that one at a single [lesson], so you see in one hour I did four concepts.

Figure 59. Benon teaching mathematics using computers.

Elijah noted that in teaching the subject of computers using the computer and the projector saved time because the concepts could be learned faster when they were shown than they could when they were talked or written about.

Elijah: I can set an example where I was teaching a practical lesson I begin with the blackboard then later on I turn to the machine where the same things I am explaining on the black board can be seen on the machine and I always waste a lot of time trying to explain things on the blackboard which could be explained on the screen, so explaining on the screen captures the attention of the children more faster than when you are on the blackboard.

For some teachers the time was saved because the teacher didn't have to write the information on the blackboard as the class progressed.

> Nazarious: First of all when it comes to this old style of teaching where you need to write on the chalk board it also consumes time so it means if you have machines like this projector then you can cover a lot of things within the shortest possible time.

Easier for teachers

After her first lesson using ICT Deborah noticed that the jog of teaching was made easier for her.

> Deborah: [ICT] Makes teachers work easier, talking is limited, the directions are there so it makes it easy. I would like to have more lessons on the computers.

Bago noticed the advantage of providing auto feedback to the students through ICT.

> Bago: The advantage is that it has auto feedback and there is less waiting for the pupils.

Less blackboard writing also had advantages for Kashozi teachers.

> Moses: I discovered that when we are in local classroom there is, much is done on the chalk board, meaning that the teacher must write everything on the chalk board, meaning that the teacher is likely to be tired at the end of the lesson but in using ICT the use of chalk is less or is not there at times and the teacher, the teacher instead of using, instead of speaking much he uses the learning aids.

Betty: It would be both advantageous to teachers and students, teachers would get less load as they prepare and display work on computers so that each pupil is able to see.

Figure 60. Benon teaching using a blackboard.

Practical and Experiential

Some teachers found that ICT tools have the potential to make learning more experiential to practice or do what they were previously only learning as concepts.

Benon: So they are applying, the advantage is that they look at the practicability of the theory in class and then they do it themselves.

Nazarious: I can see it [ICT] is helpful because with it you can be able to I think you can be able to fulfill this thing of … what I hear I forget, what I see I remember but what I do I know. So with that one it means it will help me to have effective teaching.

John: The advantages are that the students get a lot of practice and they see a practical application.

Moses: There is a need for students to be familiar with what is happening or to be aware of what is happening in Africa and the good thing with this lesson, the thing they have seen have been from their environment and I think it will help them to realize the situation we are in.

Benon: They applied the knowledge of class, how to get things very quickly using the machines, it was a practical, very practical lesson.

John: [Using ICT] they were able to apply what they learned in class.

Figure 61. Kashozi pupils using a computer.

"Pupil centred not teacher centred"

Using ICT allowed some teachers to create learning environments that were more hands on utilising learning aids in their lessons.

> Betty: You see pupils learn better when they see, use their hands but at times lessons become teacher centred because it is the teachers work to do the teaching and at time even learning aids are few.
>
> Nina: So you see the computer as providing some learning aids?
>
> Betty: It provides a lot of, people see things by themselves they explore.
>
> Nina So the learning becomes less teacher centred.
>
> Betty: It becomes pupil centred not teacher centred.
>
> Nina: And you see that as a good thing.
>
> Betty: It is a very, very nice thing.

Quality of Resources

Prior to this research most of the diagrams and illustrations that the teachers used in their lessons were hand drawn by the teachers them selves, some teachers who saw themselves a poor drawers viewed the diagrams, maps and illustrations that could be downloaded from the internet as better than their hand drawn ones.

> Moses: I also discovered that diagrams and illustrations presented to the learners are well drawn because maybe they have been downloaded … Here in local classrooms you find that drawing diagrams is a problem to us as teachers you find that the way how we have drawn them is not the way how that diagram is but using ICT the diagram is real.

Moses saw how ICT could enable him to have better and more learning resources after using ICT in his teaching for the first time.

> Moses: One of the advantages I have seen is that in a classroom for my lesson I struggle very hard to get learning aids, how to fix them, present them and in my lesson fixing them moving them, putting them down, getting another one, but here it was organized it was a matter of clicking and getting the next… And it was big, my learning aids were big, so that everybody was able to see what I was explaining.

Figure 62. Moses teaching in a regular classroom.

Teachers Learning

Many teachers commented that they were also learning through the experience of using ICT to teach.

John: This [experience] helped me to have skills on computer, helped me as a teacher. Now I am better informed.

Deborah: I also learned to assist them to operate the computers, because they would get stuck and I would help them to unstuck. As much as they learned I also learned.

Problems or Issues that the Teachers Faced in Implementing ICT

As teachers got more experience using ICT in their teaching they noted some of the disadvantages and potential problems that they saw or encountered when teaching using ICT.

Time and Scheduling

Kashozi teachers are so busy with their schedule of teaching and their marking that it is difficult for most of them to find the time to even go to the computer lab.

Bago: At times you would find that there is a time table for that [using the computer lab] and lets say if they say computer lab you are accessing at five and at five you have got a lesson throughout the week, that means that for you, you are completely banned, you cannot go there.

Figure 63. Teachers marking in staff room.

Time for learning.

Time for learning how to use the computer is also limited due to the busy schedule of the school.

> Moses: Here at Kashozi is that we don't have, teachers don't have enough time to get more skills in computer so at times you find that we only know typing they don't have skills like printing, they don't have skills there.

During the research period teachers were offered free ICT lessons and, in so far as it was possible, at their convenience. Despite this, many were unable to come as often as they would have liked or at all due to their busy schedule

Nazarious: The limited time I think was the cause for not implementing what I learned into my classroom.

Bago: If at all you find somebody has received limited knowledge it is because of limited time.

Other things prevent teachers from accessing the computers when they had time in their schedule.

Deborah: These computers have been here for a long time but we didn't have time to use it at our convenience, we would be free to go there and learn but again these shortcomings. When you feel you are ok, you can go there, there is a class, when the class is not there, there is no power so there is all that kind of interruptions.

Time for lesson preparation.

To prepare lessons using the computer takes time particularly when you are learning at the same time, many teachers struggled to find the time to prepare their lessons using ICT.

Bago: Preparation time and you note preparation is hard because you need to prepare in advance.

Moses: I will use an example of what happened to me I was supposed to teach African challenges but first to download diagrams pictures and other information from the internet and I was supposed to cover it during the first week when the

school began but because of this congestion on the internet I was forced to teach that lesson on that topic at the end of this term that is how it has affected me.

Bago: Some teachers may see this as time consuming, it needs time to prepare for it and at times you find that the time table does not guarantee that, you need time in advance to prepare, but if lets say a person you got, my time table you find at times I've got around nine lessons a day and in a day we have got around ten hours to concentrate that means that every hour you are engaged and preparation is hard.

Nature of the Current System

Limitations of an examination system.

The current system of education in Uganda is examination based. Each pupil gets examined at the end of each year on the entire years' curriculum content. At the end of primary school (equivalent of grade 7 in Canada) the students take an exam on everything they have earned from P1 to the end of P7. The results of this examination determine which secondary school a pupil will be able to attend or if they will be permitted to attend secondary school at all.

Bago: At Kashozi here at school the problem would be we are much attached to examination, examination orientated and as a result we find that at times computer lessons or learning they are given a few lessons or at times, maybe in a week one period which may not be enough… Since it is not done at the final examinations you find that it is taken as a by the way.

Betty: This computer learning on the learner's side, you see they learn it, [but] it does not go on the report, it is not included on the promotion process, so in the timetable even [the pupils computer] lessons are fewer than then rest.

Anything that is not examinable is viewed as extra and a nonessential part of the curriculum. The teachers focus on the core subjects and what they know could be in the exam and tend to neglect anything that isn't examinable. This attitude is also reflected in the way the children view their education.

Bago: We know that in many classrooms at times most of our learners have got different attitudes towards these things that are not examined so it needs time for learners to know that you can learn even if you are not going to do an examination. For example if you go to class and teach and you don't give lets say an exercise or they know that this thing is not examined at P7 you find that the learning span, they don't mind very much because they know they are so much examination orientated their interest in on examinations.

Bago: The fact that it is not examined, it is not examined at any higher levels, at primary schools and secondary schools it is neglected, it is not taken as crucial, not until one gets to the university or to the tertiary institutions and takes it as a specific course.

Non-experiential based education.

The education system in Uganda is primarily is non experiential, classes are conducted as a means of transmitting information to students, often orally, and the exams

are written to test the recall of this information. The use of ICT in education can make learning more practical and create a new environments for the pupils to explore, discover and understand instead of simply being told facts.

> Bago: Our education system has been so theoretical and being theoretical that means that when you bring this ICT that means that you are going to make it a bit practical and vocational which is very complicated because if an education system is almost like 100% theory then to make it practical to bring in that thing for practical, it may be hard.

> Bago: Our education system is theoretical, it is more theoretical and as a result the government has not so much bothered about ICT.

Figure 64. Kashozi pupils learning in their regular classroom.

Ideas for implementing ICT into the current system of education.

Several teachers who saw the limitations for implementing ICT into the system of education also presented ideas to get past these limitations. One teacher recommended revising the curriculum to make it more experiential.

> Bago: The curriculum should be revised, they should make it a bit vocational, it needs to be vocational, people learning practical things rather than theory.

Another teacher recommended that if the subject of ICT was examinable then the teachers and pupils would be more motivated to use ICT.

> Benon: The ministry will provide some scholastic materials, will provide examination papers such that then it becomes part and parcel of the learning process of the country.

Bago suggested that the system of examination itself could be changed.

> Bago: Examinations, I note that there should be continuous assessment, in every aspect, let learners be assessed in every aspect. We have had a lot of school drop out because of examination orientated learning but if it is vocational and you find learners can learn, they are able to explore aspects where they can manage rather than forcing them to learn specific subjects.

Limited Technical Knowledge

Another issue that many teachers recognised as being a barrier to implementing ICT in schools was lack of technical knowledge.

> Hesketh: These computers they are not applied because of lack of technical know how.

> Nazarious: The people who are computer literate in Uganda the number is still little.

Some teachers were also concerned that their pupils would know more than they did about how to use ICT and that this could cause classroom management issues.

> Moses: I haven't got enough skills in computer and these children have got enough skills so for them they are at advanced level then where I am meaning that at times I can be challenged by students.

Fixing broken machines.

The computers that Kashozi owns are second hand refurbished machines that the school has had for five years. Older computers are much more likely to have problems and are prone to breaking down. Finding skilled people to be able to fix these broken machines is difficult.

> Deborah: We normally get problems with these machines they break down time and again and we don't have skilled people those who come to work on them sometimes they also don't know they just want money they tell you this is faulty

in this way and then you go in for that, they said you go for this one, when you go for that very particular thing they are telling you it does not work.

Betty: If computers were put into schools that would be nice because it would ease work but as of now I see it might be a problem because we do have few technicians.

Nazarious: To get technical people it is also not very simple then when it comes to this one it may consume a lot of time.

Shortage of ICT trainers.

Bago: People who know computers, they are few, so as a result even if the government decided to lets say implement the program that means that they first have to train those people to go and implement the program so they are limited.

When there is a lack of computer literate people there is also a lack of computer literate people who can train others to use computers.

Hesketh: Another issue is lack of trainees, we are lacking trainees, we would get trainees to train us and then become also expert like you.

Charles: We have very, very few teachers who have this knowledge now even I think it is a problem developing a curriculum for these students.

Cost of training.

Moses: In Uganda we don't have computer training in teacher training institutions so teachers who graduate they come out without computer knowledge meaning that they need to go back and study computer at a separate institution and you find that schools which are training computer skills they are charging a lot of money which an ordinary teacher cannot afford.

Education in Uganda is expensive for the average Ugandan and ICT training may not be the most cost effective kind of training to get, particularly if you don't have access to computers at your home or work.

Possible ways to increase ICT knowledge availability

Hesketh: "Then there is also lack of teachers these teachers, trainees, is a problem lack of trainees to train people how to use the computer this one could be solved by setting up institutions, set up institutions where they would train other trainees then those trainees will at least go."

Setting up training institutes or integrating ICT training into teacher training programs could help to increase overall ICT knowledge and skill in Uganda.

Charles: Possibly if they can make it a compulsory subject at O level so that when students finish senior 4 those who are joining PTC where they train teachers they can find it there, it is also examinable they can come with the skills and knowledge, they can teach it to the young children.

Generating more technical knowledge is a multi-faceted problem that would require several simultaneous approaches.

> Moses: Maybe the government of Uganda should start the teaching of ICT in tertiary institutions and teachers who are already in service should be taken for refresher courses and be given more lessons. Then the government should send, should buy computers and put them at least in every school in Uganda should have at least one computer just for students to know that this is a computer and if it is possible they can at least buy very many computers to schools and teach teachers, rather take teachers to refresher courses and instruct them how to integrate how to use computers or how to use ICT in teaching.

Electricity

> Benon: The national problem of power, power problem.

In most of Uganda hydroelectricity is available on an inconsistent basis. The load shedding of electricity means that sometimes the electricity is not available as much as half the time. Power can go off and on seemingly randomly and without warning. As well, winds in the rainy season can knock electrical poles down or electrical storms can blow out transformers (both of which happened during the period of this research). Repairing the downed poles and the transformers can take up to a week or more. Inconsistent electricity causes many problems to a functioning school (lights for evening classes) but causes even more problems for a functioning computer lab.

> Deborah: The problem of electricity is really a problem and I think it is hindering.

Aside from disrupting the functioning of the computers (computers were not designed to have the power cut off often without proper shutdown) and disrupting the teachers work, (when the power goes out while you are working any work that you have done since you last saved is lost) the unreliable power disrupts the children's classes.

> Deborah: Our electricity is not reliable when you are on it is off, when your lesson is over it is back so you really have ups and downs.

Electricity effecting pupils learning.

This unreliability of electricity has made using their computers as teaching tools even more challenging to the teachers at Kashozi.

> Moses: We have power program here power is always off that means that if you have prepared your lesson to use it, to teach it using computer that means you are likely to get a problem because you may be frustrated by power or electricity.

The regular computer classes are also disrupted by this 'power problem'.

> Elijah: Even here we have been having power shut downs sometimes you go without power for two days so you can't run your programs efficiently so even here we still have along way to go to incorporate ICT in our curriculum for the whole country… In my teaching these problems have been affecting me, especially here when we have several streams of classes we have stream one two three so a stream comes in you attend to it properly when there is power when another one comes in there is no power and yet they are supposed to be at the

same level so it has been affecting my progress you find one stream is far they are able to do ABC on the computers when others are unable to do it just because of power shut down.

Electricity effecting teachers learning

The 'power problem' also had a large effect on the teachers learning of ICT during this research. Not knowing when the power would be on or off made scheduling sessions very difficult and many times the lessons had to be rescheduled. As well the power sometimes would go off in the middle of a session often resulting in lost work and lost training time.

Betty: Here at school it would be nice but we have this power problem that is why I have missed some of my parts, by now I would be ok but when I came there was no power so there is that lack of power.

Betty: Mine mostly has been affected by power because in most cases I think I have tried to respond as scheduled … so power has let me down I think I would be more skilled than I am.

Infrastructure (no sockets in classrooms)

Many of the items that were brought to the school during this research were portable so as to enable the teachers to utilise them in their own classrooms, some of these items ran on batteries but some still required electricity and most of

the teachers were limited to using these items in the computer lab because most of the classrooms did not have sockets.

Bago: Taking the gadgets there it's hard because you find that some of the classrooms don't have sockets, in fact you find that most of them don't have sockets.

Access to electricity in rural areas.

When considering implementing ICT in other schools another problem was the lack of any electricity in most rural areas.

Bago: Another problem is lack of electricity, electricity here is limited to towns, urban centres rural areas don't have so as a result people are unable to use these electronic machines.

Moses: The computers we have in Uganda use hydroelectricity and most schools in Uganda are located in rural areas where electricity is not available meaning that if they get someone to donate a computer to them they will not be able to use that computer because they do not have electricity.

Charles: Of course some schools which would be using them they don't have power, you find power is a problem, they cannot have this hydro and they cannot afford generators so if it is there it is one and it is for office work.

Bago: We note that this one is still limited because of lack of lest say electricity in rural areas and as you understand these are electrical machines they cannot be used in those rural areas.

Possible solutions to the 'problem of power'.

Some teachers suggested that a change in government policy could widen the electrical grid to include rural areas.

> Charles: Possibly if it can be a government policy that this subject [ICT] is going to be examinable so every school must teach it, if they can extend electricity to those schools then it becomes compulsory.

> Bago: Rural electrification, if at least electricity is extended to rural areas, especially to public institutions, schools if they have electricity then they can implement information communication technology.

Other teachers suggested that the answer to solving the problem of power could be found in new technology.

> Benon: The solar power, even using them now if they bring them computers will be using and other gadgets will be using the solar energy without this hydro then the problem of power will be what? Will be solved.

Limited Access to ICT's

> John: The condition of equipment is there, is a problem, to start with these are very expensive to get and until very recently they were not even available to be got. So the problem would be one availability of the equipment, two the financing component.

Availability of the equipment.

Bago: In Uganda we note that in most of the schools, in fact it may be 2% of the primary schools, of all the schools by the way that access what, computer. That means that information technology, that communication is still limited.

Betty: You see it is expensive when we come to the nation, this technology's expensive and not all the schools do have it.

Bago: For example in Bushenyi, in this district out of over one thousand five hundred primary schools you find that there are around ten schools, not more than ten, around five schools that can access a computer, just one, one computer only around three schools can access computer learning for pupils, for them at least they have got computer labs, for the rest you find that the computer is there in the office and it gets used for that so the learners they don't use it.

ICT at Kashozi but not at home or other schools.

Benon: Then you find you are applying them here at the school you training pupils how to use computers but when they go to home those computers are not what? They are not there.

Betty: When we look at Kashozi we are learning it and some pupils after here won't continue with it so it becomes dead knowledge.

Access for teachers.

Benon: When I'm at home I cannot connect it to the internet such that the technology I find, I'm in the world , when I go home I'm at home, it is only when I join this laboratory that I am in the world.

Deborah: I have used ICT and I feel I will continue using it so long as I am in a place where these things are because I can be transferred to a school where there is no computer.

Even when the computers are available in a school access is not always possible.

Bago: You might find that there are limitations, limitations in the sense that maybe the computer lab may be closed, we don't have the internet to access.

The financing component.

Nazarious: First of all it is expensive, it is expensive.

Moses: The problem we have computers are expensive to buy.

Benon: And another one is maybe lack of funds to provide these computers.

ICT equipment is difficult to get in Uganda and what is available often costs more than what most Ugandans or Ugandan schools can afford.

Deborah: When we talk about Uganda as a whole not every school can afford even to buy one computer very few schools have very few computers while the classes are many.

Elijah: In some other schools they are economically poor you find some schools are not having enough money to purchase a machine the parents not being able to support the school so it becomes a setback to encourage ICT programs in schools mostly these rural areas you find the parents quite so poor and when you talk of ICT they think maybe you are learning crazy.

Deborah: They are expensive, very expensive and when you report that something is really down it is hard for you to convince that parent to replace. But I think that the few that are really there, we take care of them because now they have become part and parcel of us. And most of the teachers have gone back for upgrading so they find it's something useful to them, they also keep on treasuring them.

Hesketh: When it comes to buying the computer it becomes too expensive… people are lacking capital, a source of income, they are poor, even when you go back to the village now you can find very many children which should be in schools but they are not there, so meaning that the source of income is very low.

Poverty.

Bago: In Africa it is so much limited, the implementation is limited because most of the countries are poor and these electrical machines are expensive… the

country itself is poor and therefore the citizens are poor also so they cant manage and the government has not.

Moses: In Uganda ICT has not developed because, because of poverty, training is expensive, buying computers expensive because of that even some people don't know how computer looks like in rural areas, neighbouring this area you find someone who has never seen a computer.

Bago: Limited finds, that is poverty general poverty because almost all those factors, you find that they encircle poverty. People are poor, the country is poor.

Added cost.

In addition to the high cost of the machines having computers at a school means that you risk having those machines stolen. Schools that have computers often need to hire guards to protect the ICT equipment from theft.

Moses: You have insecurity, insecurity here where by you find that when you have computers at a school like this one you need to employ security personnel because computers here are considered as expensive item so if you buy two computers that means you need to hire two security guards.

Limitations of Existing Equipment

Bago: So to some extent the lack of facility limits what, the implementation.

The computers that Kashozi had were dated and frequently broke down or were incompatible with newer ICT equipment.

Bago: Here computers some are old maybe they are broken down.

Elijah: Then the machines we have sometimes let us down they are not up to date, they are not up to the required standard.

In almost every class that came to learn on in the computer lab, there were not enough computers for all the pupils.

Charles: You see these machines while they are working but some are not in good order so actually I think particularly here the machines are not enough for every child and in particular the learning students you find they are sharing so there are not enough.

Deborah: The machines are not really enough and if they are there the numbers of the class, if you really want to use the computers and the class is big, you have 30 and the class is something bigger than that 50 so you have pupils sharing.

Hesketh: The computers are not enough that is why you normally see that you group them, when they are teaching them, they group them, so that, a group a group, then you find that time also become a problem.

Benon: The other time I had five on one computer and if there are two on the computer then everybody would be able to do the work.

Bago: The learners they are many to occupy the computers, so there are not enough to accommodate all the learners, that is here at school.

After teaching his first lesson using ICT Benon commented that not having enough computers also hindered the ICT skill development of the students.

> Benon: The disadvantage was that there were not enough computers for all the students, therefore the children never developed the skill of using the computers.

Not having enough computers meant that the children had to work in groups and this created a situation where learners couldn't go at their own pace but had to keep up with their group and some students were forced to slow their pace to accommodate the slower students.

> John: The disadvantage [of this lesson] is that slow learners didn't keep up.

> Deborah: Disadvantages are slow learners depend on quick ones, because they have to work in groups. They would get more work done if they were not on the computer, because there would be more numbers in the text book to try than these ones.

> Bago: The problem is that there are not enough computers and many students, which makes it difficult to control the class.

Limited computer practice prior to the research period and never having used the computer to learn curriculum content meant that the students were also learning ICT skills at the same time as learning the curriculum content.

> Bago: The students needed more computer instruction, it will be better next time because now they have practiced.

Kashozi had one computer lab that could be used by one class at a time. Scheduling computer lab time became a problem for several teachers.

> Moses: The computer laboratory is one, that means it can accommodate one stream at a go that means if you prepare a lesson to use computers you are likely not to be fixed with line with the computer laboratory.

The ICT equipment was available for the teachers but they had to share the limited equipment between them. After some teachers bought their own cameras and laptops many teachers saw an advantage to having their own equipment.

> Deborah: I don't think that it is negative but it is just a limitation because I would say now I would be having something like a camera of my own, I would have a printer of my own so that when I come to actual preparation of my lessons I don't need to be sharing these things because we are many and the gadgets are few. So that one is just a limitation because of funds, the school cannot afford.

> Benon: The lack of enough gadgets to use that one has also hindered.

Attitude toward ICT

> Betty: It might be a culture for the government but you would find some remote areas where we have people who do not take interest in such so implementation wouldn't be easy.

> Benon: Here in Kashozi it's some community members that have not picked the interest that is why you see some teachers have dodged it and if some members of

the community have that bias then implementation, because they should be part of the implementers then it hinders that.

Elijah: To begin with some people have never been sensitised about ICT people just look at it as any other thing so incorporating the idea into the minds of those people who are supposed to use it becomes more difficult especially people here most of them found machines, found computers here they had not seen computers in any other place so to bring someone's mind to love ICT has been a problem so that one has been a set back to the school here.

Deborah: The barriers are attitude to teachers using these things because up to now there are some who are failing to come up and use the computers… so some people have got a poor attitude about using them, the reason why they have poor attitude I don't really see it because you would say if you were going to a class you have a learning aid, you are going to use it in your lesson and the learning aid is to help your learners learn more about that particular thing so when I find we still have such people I really find it a problem… Because we want something, our school mission is to provide quality education so we shall not provide quality education when we are refusing to use the current information or methods of teaching.

Deborah: So the barrier to change the attitude of these teachers is really hard to handle because to change an old persons attitude is really hard but we shall try. The good thing, the minority is like that, so I think with the majority of teachers we shall win them and make them change.

Sometimes limited exposure to ICT lead to the personification of computers.

Bago: In the past even teachers would hear that the computer deleted the name of the teacher and the teacher is not getting the salary because the computer deleted it, people used to take a computer as a person to the extent that somebody asked who is that computer? How much does he want? Meaning that people don't know completely they think that computer is like a god.

Ways to encourage people develop a positive attitude toward ICT

Benon: Just go slowly by slowly through sensitisation to those people with bias, with bias on it. When we sensitise them and mobilise them finally they will pick the interest and if it continues they become part of the implementers.

Illiteracy

Bago: There is illiteracy, many people in fact a very big percentage of Ugandans you will find that they are illiterate and with this you find that if somebody does not know how to read, does not know how to write it is hard to implement this.

Political unrest

Moses: In Africa you also have political instabilities we have very many countries in Africa which are affected by wars like Uganda, Northern Uganda, Sudan so you find that it's very risky to buy those computers and put them in rural areas when you know that at one time your area is likely to be affected by war and your computer will be destroyed or stolen.

Bago: We have had political unrest in some areas, so for example in Northern Uganda teachers have had war for over twenty years, you cannot implement such a program, maybe with other theoretical education you can go there, tell learners, they listen because if there are maybe bombs exploding somewhere they may listen but then these ones (ICT) need a stable environment whereby you are going to implement but if the environment is unstable then it is hard to implement.

Bago: Creating good political environment to make the environment conducive for the use of ICT, for example in Northern Uganda all the telephone lines were destroyed, the electricity wires they were destroyed, people had to be forced to go to camps, you wont take a computer to somebody in a camp.

ICT as teaching Aid

Bago: The learning of this ITC has facilitated as teaching aid.

Digital Camera

John: The cameras bring to the children or the students or the teachers situations where these people are not able to go, for example if you are teaching about the national park, you go to the national park take photographs of different animals, different species, different environments come here and talk about the national park, what is in the national park once you bring the pictures put them on the computer then the children see practically what takes place in the national park, although they are not physically there but then they are able to relate, to visualise what is actually the national park is all about.

Hesketh: When I need a learning a real learning aid I failed to get I may go to a neighbouring environment I get a photo ok, after getting that, I scan it then I bring it here for the children to know exactly what it is rather than talking when they are not seeing it.

Deborah: Like in P7 the first topic is baking so up to the end they were urging me to have the experiment or we move to the baker near and we see what is taking place but I failed because of funds. So if I used the camera, if I had a camera and I went to the bakery took the pictures and then I bring them to class at least it would mean something, it would be meaningful other than telling them the baker does this, he mixes this thing, I would just start from the beginning up to the end and then bring them the real situation.

Moses: I've used a camera in collecting the information I want to teach on especially taking photographs on some things I want to teach on.

Benon: We used the camera for the sports day, we picked the pictures we have come here combined the pictures into a video showing what then we have pressed them, put them using these projector, the children are able to see how they are, what they did exactly.

Bago: Is easy you take pictures, you show the learners pictures, but the other time you find that you do not access, even if you had lets say an animal you could not access but now when you visit a national park, I take pictures, I bring and then when I am to cover a topic you find that I got it and I can show my learners, if its

an elephant, 'have you ever seen an elephant?' 'No, this is an elephant, see how it looks like, the sound it makes is this.' So you find that this one has helped , it is helping in fact.

Figure 65. Deborah learning how to use the digital camera.

Video Camera

Having a video camera at the school saved money during school functions.

Bago: Likewise video cameras, those we have been recording, we have been getting videos. For example a school like this one who used to spend a lot on videos, the moment we would be having a function we had to spend around two hundred thousand to hire somebody to come and do that but as we have cameras

that means instead of hiring we do it and that one saves what, saves money instead of spending it.

Video cameras were also used in self reflection for teachers. Watching himself on the video of his teaching Benon was able to reflect on his teaching skills.

Benon: Personally I have never reflected myself in the way how I'm conducting teaching but with this improved technology after conducting the lesson I have come to see the movie, do we call it the movie or the video? Then I see the process the procedures and the mistakes I usually make and in the next period, therefore I cant repeat those ones. That's very good, very good.

Figure 66. Wilfred using a video camera to record a school event.

Laptop

Several teachers commented on the advantages of the laptop over desktop computers.

Deborah: The laptop is portable, when I feel tired of being in this place I can go to my home, after midnight I am free to use it but at midnight these computers the desktops, I would not access the time, so if I have these small group, the lab is under one persons supervision so I wont be using on weekends or odd hours, I will be using a laptop which is portable.

Hesketh: It stores power for some time knowing that if you have not saved your work you will still have some time to save when the power goes out compared to the other one which goes abrupt and you lose everything and you get discouraged even, you have typed a long time, pages, pages and the power when the power go off automatically you lose but with this laptop you can know it has gone you save my work, you save.

Benon: These laptops can take them directly to class not bringing the children to the computer lab, you take them to the class, using the projector in the class then you can convey your information… so the laptops you can take them at any point, even if it is at the playground you can just take it, so long as it is night and you can take the projector.

Though the teachers who bought laptops only had them for the last month and a half of the research period many were able to begin using them in their teaching and to further their own learning.

> Moses: I have seen my friend using it in a classroom he was teaching on English music instruments and music so he used a laptop in classroom I don't know how he used it but I saw him taking it there and I passed around and I witnessed the class control, class management and the motivation of the class.

> Benon: Last night, I think it was the night before I tried to open my laptop, then within my bed, I was just almost in my bed but the hand was reaching there I opened it, because the other time we had very little time because I was just going to prepare the class to come in but the time could not allow, so I tried to, which was put on my laptop, I tried to open and it almost confused me briefly but at the end I got it.

Digital Projector

When the projector was first brought to Kashozi many teachers saw the advantage for using with large groups. Prior to accessing the projector many teachers were reluctant to do presentation types of lessons on the computer because of the large class sizes and the small screens available in the computer lab.

> Hesketh: This one will benefit to handle a big number classes, automatically if you have a very big class and the computer is one, you just project it and you serve the whole.

> Nazarious: The projector, because this projector can help very many people access information, it can help very many people access important information. It is not personal but public so it helps very many people.

The projector was used to make presentation to the whole school, for entertainment for the pupils and for special events that the school had.

> Moses: The projector, that one is very instrumental in teaching, especially classroom teaching and as I have seen here at Kashozi they use it when they have some events like sports day, when we have visitors so it is very, very, very instrumental.

> John: We had church service here when we used the projector so all the program, all the music, all the thing was on the projector and people were just reading from the projector, from the screen, what was taking place.

Using the projector seemed to create some extra interest in the students and seemed to help with class control.

> Elijah: When I tried to use a projector some time back everyone's attention was in the projector unlike sometime back when I am explaining you hear some voices behind you but when there is a projector you see everyone's attention on the projector so I think it has in one way or another changed my teaching.

Benon: The control becomes ok when you are using the projector because that one you gather them and they are focused on the one and the control becomes at one point, everybody focuses at one point.

Deborah: The projector of course is really an important asset and we are thinking if we finish this phase we will look for a second one because we might find that one teacher is really in need of it and another is really in need of it since we have many classes, it has been, as part of learning it is one way of transmitting, of projecting the lesson in an exciting way and quick, because someone drawing a picture of a map or someone drawing a picture of a waiter in a restaurant takes more time other than projecting it.

Figure 67. Betty learning how to use the digital projector.

Scanner and CD Burner

Bago: Scanner, scanner I used to see them in town, that you go there for scanning but today I know that if you have information you go there scan. CD burner the same, you can now as you have cameras you have computers, you record your information, you record your music you go there and burn it on a CD and play it instead of going maybe to buy the CD or taking money for somebody to burn for you somebody can do it for himself or herself.

Moses: The CD burner I have seen because the school now is keeping a lot of its information on CD which have been made here at school and in town it is very expensive to make CDs but now the school has been able to make CDs.

Speakers, Microphones and MP3 Players

Deborah: When you tape someone acting the dialogue then you let that very person hear how he has been reciting it where the errors have been made and where he has been corrected, I hope it will improve on their learning skills, especially their speaking skills. And I think it is helping in teaching the listening and the speaking skills. The listening and speaking skills have really been underrated because of lack of some of this equipment, but this time it's ok, very ok… things will be more lively so they will learn, very interesting, they will be eager. And if we had not been able to record the voices of the learners themselves but this time we record the voice of a child she feels very excited when she hears her own voice, these voices have been of other people but this time you say you

are going to act this you read as you are taping that very person then afterwards you say we are going to listen to someone else they say oh no it's so and so from our class rather than hearing somebody else from outside.

Bago: I can record, lets say a voice, present it, a speech, then I give learners lets say some listening exercises because I've got the voice recorded then give them listening. But the other one you find that you cannot access, you don't have a way to record that information you do not have what so you tell them at times, because in English you are supposed to test the four skills, listening, reading, writing and speaking but at the end you will find that most of the teachers will concentrate on writing and maybe reading and speaking but listening not the same. And when you go to the examinations you test the writing and reading because there is no speaking, we don't have any speech. But with this at least now today we know it is possible, if our curriculum could be adjusted then you find that we are able, a school like this one is able to test all the four skills.

Figure 68. Wilfred using mp3 player.

Printer

Bago: Printer, printing, we used to type but you would find that you needed to consult the computer wizards to come and help you, to print for you, now I know that if I have something I type my information I process my data then after that I go to the printer, I produce it myself.

Creating relevant teaching aids - "The learning becomes real"

John: Maybe the difference would be that what has become good now is the teaching has become more real than it has been that is a difference because definitely with this equipment which is modern it brings learning nearer to being real so people see real things.

Deborah: So the learning situation becomes real to the learners than when you are really talking to this person because he looks at you like something different and from them you are the sole source of the information.

Betty: When someone is teaching about plants you may teach through those within your reach but there are a variety of plants, but using a computer you may bring a variety of plants pupils see them they compare structures, their features and so teaching would be come more real.

Bago: The computer makes them more practical, it is like you have visited the farm, you have visited the farm, if you are covering the animals lets say you can say to the children look here this one is a cow this one is this one, this one lives in

a pen, this one lives in a den, this one lives in a sty. And because the computer can give you that, you see the pig in the sty, this one the lion is in the den, so at least it is like you have gone to the national park.

Internet, assessing the 'Worlds Library'

Benon: You get the information which you don't know.

Nazarious: You can access information from different areas, you compare, so there is an advantage of comparison, you compare world issues in one location so you need not to travel to look at maybe something but you research and use it in the same location so that one is advantageous then you can keep the taught message for future reference.

Nazarious: We can compare Uganda with the rest of the world we look at the challenges we are having in Uganda we look at the challenges other countries are having, we think of possible solutions and if need be we make consultations of how they had to overcome those challenges so that we can develop, as we are developing we become developed.

John: If you download lets say the information, from the internet this one is not easily obtained and it is quick to obtain the information using the technology rather than going to the library to make massive reading you just open the button to the internet, get the information that you need on the spot, you pass it on to the children. So that is the advantage of the computer technology rather than the system of using libraries, libraries take long to get information and the

information you get is not easily translated and transformed into the learning situations but with the information technology you just have to download what you need and on the spot it is used in other words it saves the time for both the teachers and students and it is quick to pass on and it is relevant in life.

Bago: The internet is the biggest source of knowledge and therefore most of the things that are in the curriculum, when you make a research you go to the internet you get that information even if you have books here to help you, you get that information from the internet, you find some topics, topics are there, you get topics from the internet so that means that you can implement the curriculum with ease and effectively, you find that the learners can learn and get the required knowledge.

John: When you go to the internet you just download and you get the information so I think that it is definitely advantageous to students because it is accessible and within reach.

When gathering resources from the internet some teachers found that the information wasn't always as local as they would have liked as a starting place to teach their pupils, the digital camera was useful in getting the local images that were difficult to find on the internet.

Deborah: Some of these things would be real, like what I am teaching about the restaurant, I would go out with a camera, go to a restaurant, take the pictures of that particular restaurant and then I would bring them to class. Because the food

we are serving here might be different then the food from different places, when I go to the internet I will get the food from those places, especially the European countries. So when I go to our local restaurants here, the food they are used to, the waiters the way they are dressed they are used to and the general appearance of the restaurant would be nearer to the learners imagination then when they see things from afar. So the cameras would be helpful to me in particular when I am teaching on concepts which need to be real.

Some teachers after using interactive flash files with their pupils noticed where improvements could be made to better suit the local situation.

Bago: To improve the program it would be better to have several of the same type of program but with new words for students to practice.

Can ICT tools Educate Us?

Benon: Yes, at times I would give negative what? Responses, before you came if a child would give lets say a wrong answer at times I would yes I have already taught that child at one time you passed that one, then at times I would get a cane and please you are not supposed to hurt which was the method of teaching but with these technology when these children started using the computer there are some, when finishing some problem you see the reward from the computer "thank you, well done, you have tried, try again" even if somebody fails there were those sweet words which attract the learner to continue, yes so it has changed me positively, now I am also, I have borrowed that knowledge and that method of

doing things… Yes that word I just got it from the computer, when I was trying the other terms of the mean and mode it said “well done, you have tried can you try, that is the right answer” and it said “this is the wrong answer, you try again” so those are the words that I am using in class yes “well done, try again".

Benefits of ICT for Teachers at Kashozi

Deborah: With this ICT I find it really benefiting everyone, the learners and the teachers.

John: The computer technology the computer knowledge is really relevant and necessary at this stage of development.

Moses: Students who are unable to move I may say using their legs will be able to move using their mind, they will see the world beyond their house and they will be able to relate what they have seen maybe from diagrams, from pictures the current issues they will use that knowledge to help them on how to live or on how to work.

Charles: The students of course will have to benefit from the teachers having brought the broad knowledge they benefit directly.

Bago: If schools could let’s say access the computers then they could do, facilitate the learning process, it would be easy to enhance the curriculum and the implementation of the curriculum.

Charles: I think this technology and information from ICT it helps a teacher by broadening his experience.

Eases Teachers Work

Many teachers commented that in lesson planning ICT helped to ease the work

Benon: You do things in a short period of time if you want any thing to do with the computer you just get it.

Moses: For teachers when you are using ICT it is less tiresome, one lesson preparation takes, it's very easy to prepare for a lesson because if you have access to internet you can download pictures, download some work some questions for the students so it does not, it is less tiresome.

Benon: The preparation is easy, once you become, everything is there you just go on the internet you download the information, then you print the information, the information. So the preparation of the teacher becomes easy, but on the other hand becomes a part of the difficult because lazy teachers who don't plan it becomes difficult. Those who get the text books and go to class and teach now, with ICT, it become a problem for them, you must create room for preparation and which is good for teachers, it does not encourage laziness, it does not at all encourage laziness.

Some of the educational programs and games, particularly in mathematics gave feedback to the pupils and the teachers on the progress of the pupils work and the

accuracy of their answers. For some topics the practice questions that the students did on the computer were marked by the computer.

> Benon: It eases the work of the what? Of the teacher. There is not time of getting time that he is going to mark, that time can be used to provide other concepts, other concepts can be provided because that time is what? Eliminated. At least when you are teaching you leave about twenty minutes for evaluation so with this technology the evaluation goes as you finish the problem you correct yourself, he corrects himself.

Traditional lessons at Kashozi can tend to be teacher centred where the teacher spends a lot of the time talking. Deborah commented that lessons using ICT tended to reduce the amount of talking by the teacher.

> Deborah: When using something like a projector or a computer for lessons it lessens the work of the teacher the talking is not all that much because when you are using, the instructions are there then the children have to do the work according to the instructions.

Due to lack of educational resources many of the teachers draw diagrams, pictures and even maps on the blackboard for the pupils to copy into their books, for teachers who were weak in drawing skills the resources that ICT made available were very attractive.

> Moses: It helps a teacher in that some diagrams are not easy to draw some maps are not easy to draw, so diagrams, illustrations are well drawn and well elaborated which makes the lesson become more interesting.

Betty: When you are comparing for example when you draw, sketch a drawing on the chalk board it is poorly drawn but you can take a photos of it, for example if it is a good plant, a frog, I don't have frogs in my class, if I take a photo of a frog and bring it to my class and show them the real photo, the learner, some learners will not know what frogs are, they will see a real photo of it, not a drawing, because I am not a good drawer.

Elijah: I think so if ICT is incorporated into our curriculum very many things would change .. because from the information I have got from you at least there are things which have been simplified you don't need to labour to go and draw maybe an insect put it on a piece of paper begin showing the children it on the manila paper but if you have a computer, just put it on every computer and let the children see or maybe put it in one computer maybe project it and everything becomes so easy, this one the programs you brought us I have seen if this one is incorporated into our curriculum things will move along nicely.

One teacher even noticed that there was less chalk board writing for the teacher when using ICT, an advantage for those teachers with poor handwriting skills.

Moses: My handwriting which is not all that good the students wouldn't get a problem reading my handwriting if it is, if the information is in the computer.

English Pronunciation

Deborah saw ICT helping in learning English pronunciation.

> Deborah: With the English, it is a foreign language, it is our second language and we have difficulties in teaching it, sometimes when we come to vocabulary we pronounce the words in not the right way, so if I want I can uses these ones, this ICT to get some of these pronunciation of these words, the right ones using this technology to the learners rather than distorting the meaning of the whole thing so with English it is going to help us a lot.

Improving Teaching Methods

As part of the research some teachers agreed to let me video tape them teaching in their regular classrooms and then in the computer lab teaching a lesson using ICT. Near the end of the research these teachers watched the videos of their teaching. Benon commented to me that he learned about his teaching by watching these videos.

> Benon: Personally I have never reflected myself in the way how I'm conducting teaching but with this improved technology after conducting the lesson I have come to see the movie, do we call it the movie or the video? Then I see the process the procedures and the mistakes I usually make and in the next period, therefore I cant repeat those ones. That's very good, very good.

International Communication

> Benon: A child getting an education in Uganda is mixed lets say with a Canadian child you would find that they are at the same footing, but now if the child now have finished the primary level in Canada and the child has finished the primary level in Uganda they don't meet.

Entertainment

Benon: You can just get entertainment as you are receiving the entertainment you are doing other work you have the entertainment to entertain you but you are also doing the other what? Other work, using the same what? Using the same machine… So computers are really very great and they are user friendly even if you don't have anybody there you can get everything there, even if you don't have somebody, you cant say that I am bored when you are alone, no, when you have the computer I have a friend.

ICT's and Social Position

Elijah: For example we have been seeing some of these digital cameras with the journalists who were, and usually in towns not in the villages like this one.

Betty: Yes because when I it has influenced me so much because when I went out to the other party ah, I was a model, I felt I was because I was using my machine the camera and I was able to use it.

Dissemination of Information

Bago: Then still this ICT would assist to lessen the expenditure of the government because people are able to compute information with ease other than today, most people still depend on manual labour to enter and compute the data which is very complicated, time wasting even when you consider the stationary which is very expensive and still data at times data they fail to get statistics, to present statistics,

they have failed, you find you are looking for certain statistics you cannot get because somebody maybe had put it on small paper, did not process that data to get complete information.

Training and Research Methods

John: Definitely [the ICT training] made it possible for teachers to acquire these skills which has helped them as teachers and which has helped also in their day to day teaching.

Deborah: I think maybe you have used the best approach to get me to get interested in these things because I have been here with these things there was no time and yet we remained in the same situation because our curriculum is examination orientated so you are trying to have the work done, marked and then you practice a lot of questions since we are always examined, but this time how ever much busy we were I would spare time for those lessons I think your research has helped me a lot, the approach you have used to let me have access to these things here I had before.

John: I believe everybody here, let it be the students, let it be the teachers, let it be myself definitely we are better than you found us.

Deborah: Your approach to training teachers has been nice and that is why the majority, I think, how many have failed to turn up, I think four out of the twenty seven. So you see that it is a great, great impact that has been.

Compared to Past ICT Training

John: During this period teachers have been able to physically use the computers they have got the skills which they didn't develop because they were, they were learning computer as a lesson, they were learning computer as a lesson, so as you go to class you pass examinations but what they were not leaning is to teach using computers so that was the component which was missing, it was greatly missing because they didn't teach them how to teach using computers they taught them knowledge about the computers and maybe manipulation of the computers but the skills about using, teaching using computers had been missing so they have only acquired them during the period of your stay here.

Moses: The skills I have learned with the researcher are different from the skills I leant in my certificate course because my certificate course was dealing with the computer but this one is also dealing with getting data from outside using it on the computer and producing a quality thing that can be used by very many people because now what we are doing with the computers it is connecting data and using it to help very many people but the other time it was getting data and using it to help yourself.

Deborah: Your character as a person has really changed the attitude of people to use these machines. Because we had these people they were coming from the university to come and teach us here, people pulled out of classes because you could not be allowed to ask a question and yet we were learners, learners don't know. Maybe they were not trained teachers or you could really, all that you have

taught us could have been paid for heavily and yet we have not paid you anything. We really have not done anything like payments are concerned.

One on One

Nazarious: Person to person one would get enough time to ask questions then to get effectively involved in doing something and one would easily correct his or her mistakes.

Betty: When you are one learner you ask here and there where you don't understand so this research has helped most of us and me more especially because I could ask where ever I went wrong or where ever I didn't understand.

Benon: The other ones most of them we had very little time we would use almost two hours and it was almost a rush the teacher was handling more than 10, all the members of staff who attended and he could not attend to individual problems in fact he was going with the quick learners, those who had some little knowledge about the computers, by the time he would mention those the students were already there and for us who were pioneering the use of the what, we were neglected what, we were neglected behind so we were not benefiting much as with you because you have been attending to almost two or one so most of the time we are attending to that.

Availability

Several teachers commented to me that having me available to them helped them to learn to use ICT was beneficial.

> Nazarious: I could ask questions and maybe getting the machine would not be a problem.
>
> Charles: When I get a problem I ask you, you tell me.

Competent and Polite Trainer

> Hesketh: Here what I observed you were, you are well competent with what you are teaching… in Uganda we are lacking trainees otherwise people could get interested in ICT but the problem when you have a bad teacher even these children will hate you… if you were rude we wouldn't come, ... we wouldn't come, we would say I'm tired of you, if you were rude we wouldn't come, that means teacher/trainee learner relationship was good and we also gained interest, that also brings interest to us, we are very interested by the way.

Learning by Doing

> Betty: When I was enticed to learn using my eyes, my hands, my ears I became more motivated and I wished I could learn more.
>
> Elijah: So we have had a chance to touch a digital camera, we have had a chance P3 in fact to be sincere I had never seen it in my life… MP3 you can use it

effectively or you can use it with out fear unlike when you see something at a distance place then you begin talking about it when you yourself has never used it, but now we are using it, we are talking of things we can use.

Bago: We used to learn that there is a projector, personally I had never touched on a projector.

Deborah: As they teach using them they also learn some of the things because as you use the computer and the projector and you make a mistake when you correct it you are learning so the teachers increase on their knowledge.

Bago: The previous ICT training was "More theoretical than practical, studying lets say maybe, at times even you find you go to the computer you learn, you are given handouts, you read, just read and then to do. So this one has been more practical, in fact I have not seen any theory because I have not written anything, I have not writing anything and I feel that I can do.

Appropriate Training Content

Hesketh and Benon both commented that compared to their previous ICT training this training was relevant to their teaching.

Hesketh: PowerPoint program, they taught us how you can, lets say you have a meeting and you want to put your information in a chronological order so as you talk somebody keeps on scrolling and you get what the right information but not showing us how you can get a picture and merge it to, to the information you are

talking about. For example if you are teaching immunisation you can look for a nurse immunising children on the internet, download then you bring them and then it becomes more knowledgeable then theory.

Benon: Here you are getting the knowledge which you know you are going to just use but then we were looking at the computers as I told you earlier just for the purposes of passing the examination to have that document to use it for other requirements when they come but now we know the computer is part of the life.

Learner Directed

The training was directed entirely by the individual needs and wants of the teachers.

Deborah: You could tolerate individual differences… everybody has been treated in his or her own way and accommodated, as a result everybody is saying I wish the year would extend so that we can learn more because we have not learned up to the end.

Free and Optional Lessons

Elijah: You know in Africa here in most cases knowledge is in a way somewhere or somehow you have to attend or go to a collage and acquire the knowledge but here we are acquiring free knowledge this is something one cannot believe.

Bago: Those people who wanted had to come and people came, a few did not but many came because it was out of will.

Research

Bago: We have been learning through research.

Deborah: These computers I would sit there, if I wanted something done by them I would ask these people this time I think I will have less problems with them. I would or course, as an administrator I would ask them to do it on my behalf but there are certain times they delayed me, I just go there and do it myself. So your research has really helped me a lot.

Nina: Before I came did you use the computer very much?

Betty: It wasn't very much because even people didn't have much interest

Nina: And after having some training on how to use the computer you come into the lab more.

Betty: People are aspiring, I am even aspiring at times you have been seeing us people come to your neck seeking you

Bago: At least we have gained a lot from you. That is through experience, sharing.

Cultural Interactions and Differences

Aside from my time spent at the school I also had many opportunities to travel outside the school to visit different places in Uganda. I was able to visit places frequented by tourists, the capital city and smaller cities and several remote rural villages and the homes of people living in these villages.

Bago: Other than your research you have been involved in all aspect of life, when you note in the village, you have been there you have seen how people live, how people behave, here with your research you have been with us you have seen how we behave and at least now you can make a comparison of at least two classes in Uganda the peasant at the local level and lets say the middle class of Uganda and then you have seen how people live in towns so at least you have seen all aspects other than if you came and you reached here in Uganda and maybe you would be telling people that Uganda is like this and maybe you would be giving a wrong impression but now what you say, at least you know, you have moved and you can even make conclusions to other areas you have not gone, that one I appreciate very much.

Many of the teachers that I interacted with became my close friends. As time passed I got to know them better and we were able to have discussions about our cultural differences outside of ICT and education.

Benon: I think me with you the culture sincerely speaking has not, you have almost, the same way how I can interact with a Ugandan is exactly the same way, even you are more better than some of them because the little, you are here for almost 6 months, my interaction with you is more better than some of the people I have stayed with here for about three years ago, sincerely speaking, because we have interacted, talked much, share cracks, chat, so the interaction really has been good, completely good, more than so it has not.

Nina: It has not been a barrier.

Benon: It has not been a barrier and the language automatically talking to a Canadian to see that we can chat, automatically I've enjoyed that one and even I believe it has improved on my fluence of speaking English, it's true, it's true, I've never spent about an hour talking English, but the little time we have moved together all the time we are not quiet.

Nina: Yes, that is true.

Benon: We are not quiet and if anything, I've not mentioned this when I go to town near here they ask where is you, where is this English person, but now you are not with the English person ,… so the interaction and language really has been good.

Gender Equity

One aspect that became a topic of many discussions was our difference in how we viewed children and women in society, in particular the rights of children and women and our ideas on what is meant by equality.

Bago: Children rights, women, to you women are like other people, where us here, we see women as vulnerables. In fact when we are giving examples of vulnerables you find we say disabled, the handicapped, the women, the children. So you do not… the distance a women is from the man. And at least your attitude now has shown that at least people have changed, they know that here teachers know that women are people like others, the can perform in society, they are human beings.

Language

Though we all spoke English language barriers existed between myself and many of the people living at Kashozi. Several of the teachers I interacted with commented to me or other teachers that they sometimes had difficulties understanding me when I spoke to them. This was also sometimes true in reverse, on occasion I struggled to understand what some of the teachers were trying to convey to me.

> Moses: The researcher, at times there is an explanation, an explanation which one want to, to maybe to emphasise but you find out that the language is hindering him or hindering that person with the researcher because we don't know English very well to interact or to emphasise some things with the researcher.

The Opinion of ICT Use in Teaching at the End of the Research Period

> Charles: I think I cannot now spend a day or two without coming in to use the computer. I have developed a positive attitude towards ICT.
>
> Benon: At this point at least I can, I'm not truly an expert but I'm computer literate.
>
> Bago: Today I note that at least now when I am going to teach a topic if I fail maybe to get books to consult I go to the computer lab and I get knowledge.
>
> Benon: I was just needing somebody to guide me now I can guide myself… Yes I've gained that confidence.

Nazarious: My teaching was more theoretical than practical and in some way it was more teacher centred than pupil centred but this time I am looking forward to changing some of my teaching techniques to make it pupil centred rather than teacher centred because of the instance of what I do I know.

Moses: It's my wish that I will be conducting my lesson using some skills got from the computer for example using the Microsoft PowerPoint preparing notes, lesson notes and maybe putting, saving them on computers so that the learners can copy them from the computer.

Benon: Since the head teacher now is computer literate, the majority of the staff are computer literate so according to the school timetable then we shall put the specific time for the what if you have seven periods at least two periods must be put to the children on the what on the computer.

Moses: Next year if I'm to teach physical features I will use camera, I will use a camera move around take pictures of different physical features of my area then make a Microsoft PowerPoint presentation on that meaning that, meaning that in the future if someone comes to, asks to see me, to assess my lesson in future it will be quite different from the lesson I taught in 2001 for example.

Deborah: The classroom even it can be taken there, so is the projector, that is why in fact I was saying there are few classes which have sockets in them so one of the things I have already recommended to the headmaster is to have sockets in almost

every class so that when I feel like using laptop and a projector I don't need to come to the computer lab, I have to remain in my class and if there is a computer class here, things will be done, we shall all be served at the same time

Moses: I hope that maybe in the future we shall be recording our lessons so that if in 2008 I teach a lesson on forests in Uganda I can record my voice I can record what ever I have used then 2010 if I am not around, for example if I'm sick I can leave it behind for those who will be around to used it and teach my lesson perhaps when I'm absent.

Deborah: I have liked it. I will always be using them. So long as the computer lab is not occupied I will fix my lessons.

Benon: That one that one through the meetings once it is followed as part of the implementer and the supervisor of the policies passed down then I must participate in that.

Nina: And that is a policy that the school is going to have next year?

Benon: Yes, I believe we are going to have that policy because we must use these gadgets.

Nina: So what is going to happen to the teachers that aren't computer literate?

Benon: That are not computer literate, they find their own way, they will push themselves out and those who are computer literate will come because if it your time to take the children to the computer and you have nothing to tell them to the computer what else do you need, you have failed today, next day you have failed now we say please you have not conducted the computer lesson yesterday, today

you have not done it, put in written form why you have not done so, what it means now that I don't know computer."

Nina: Since those teachers haven't learned the computers yet, will you give them an opportunity to learn from the computer instructors, from the other teachers?

Benon: Yah, yes that opportunity is there, those with interest, but the institution will make them pick the interest if they want to be part of the school.

Bago: But to me at least I think that learning is going to continue. Because people have tasted, I have tasted and they have known the taste, how good the thing is.

Moses commented that in the future he hopes that ICT access for children will allow them to do internet research themselves.

Moses: Making children get information on their own from the computers without assistance whatever from the teacher.

Several teachers commented on their plans for future learning if ICT.

John: Some teachers have learned more things than others so the way we think we are going to learn from ourselves is to organise maybe some internal workshops, some internal courses for teachers who have got more skills to teach others. So in so doing I think we shall sustain the program to continue.

Nazarious: I will continue if I get access and somebody maybe to help me where the need be.

Betty: I think I will continue to learn because we learn from friends some are ahead of me I know so I will just acquire experience from those who know.

Moses: I'm going to buy my gadgets and learn by doing.

Elijah: I believe they will continue to learn because you have seen the times they come to the lab here some of them come here to do their own work which was not the case.

Nina: They never came before?

Elijah: Someone used to take a week without stepping here but your coming has done something so I believe they will continue coming.

Conclusion

The data was collected over a period of 5 months in a rural school in western Uganda. The data represents a composite of my observations and inferences, my interaction with staff and administration, my ICT training sessions, and more formal interviews and questionnaires. The baseline data was gathered via questionnaire and the final data was gathered using video taped interviews. The training methods were varied and the research plan was impacted by the participants as we went along. The data gathered provided a broad spectrum overview of the impact of ICT training and exposed many significant issues pertaining to its use and effectiveness within this environment.

The data is more than sufficient to provide a basis for credible deductions. The data is augmented by the fact that each teacher was supplied digital copies of their interview and had an opportunity to amend their comments. Further ground truth was

anticipated by using an interactive web portal in providing access to the research. Through the website records, I know that teachers from the school have signed onto the site and have had an opportunity to review all of the information. They have been provided every possible means to involve themselves in the data and its subsequent interpretation. In providing this interactive environment, I feel confident that the data and the subsequent deductions and conclusions have been validated.

Chapter 5: Analysis of the Data

This analysis begins by discussing how Kashozi teachers went about learning to use ICT and to create digital teaching resources and the learning patterns that emerged from the group. How the teachers felt ICT had impacted their teaching and the potential for further implications is discussed. These impacts include how accessing ICT allowed a greater variety of teaching methods, the effects on pupil participation, motivation, and retention, how ICT impacted lessons making them more experiential and easier to manage, and the effect ICT had on teacher time and ability to access quality resources and new kinds resources. This chapter also covers the problems and issues of implementing ICT into teaching that we encountered during the research. The issues include factors related to attitude, time and scheduling, limitations of the current system of education and of the current equipment available and problems arising from limited technical knowledge, access to ICT and infrastructure. The impact of the specific training methods and the research methodology is discussed. Cultural interactions are described and discussed from different perspectives, including living in a collective culture, as an outsider, living with an outsider, gender equity and language.

How ICT impacted daily classroom teaching in the Kashozi setting

As a result of this research the teachers at Kashozi were able to access digital teaching aids through ICT that had previously been available but inaccessible to them, partially because of limited ICTs but primarily because they lacked the necessary knowledge and skills to access the resources. For example, the computer lab was closed for regular classroom use and only available for training pupils about the computer.

While the school had made a substantial investment into ICT, the benefits and pay-offs were not obvious. The machinery was antiquated, and much of the time unreliable for a variety of factors. The concept of using ICT for learning content related to the curriculum seemed to be missing and replaced by putting the machines into a special place and under the control of specially trained people. The computer did not seem to have a place in the ordinary everyday experience of the regular classroom. This perception is wide-spread and exists in many institutions throughout the world.

I did not actively promote the digital resources to the teachers; I showed the interested teachers what was available. However, once I showed the resources that were available and showed the teachers how to access them, most teachers were eager to use some of them in their teaching. They quickly adapted their teaching methods, with little or no help from me, to accommodate the new resources. All of the digital resources had a 'ground-truth test'; there were many digital resources that did not interest the teachers and they selected out the ones that were relevant to their teaching. As well, some of the resources were not able to function well with the equipment that was available at the school. The resources that were utilized by Kashozi teachers were selected for their lesson relevance and for how well they were able to be used with the existing equipment.

Some of the types of resources that the teachers did not find useful interested the students, in particular, the interactive and audio visual stories. The pupils would frequently request to play/watch the stories when they came in for their computer classes. Due to the large class sizes the computer classes were often divided into groups with one half or only one third of the students using the computers at a time. During these classes the computer instructors would ask me to 'do something' with the waiting pupils on one

or two computers. The pupils were very enthusiastic about these stories. In Uganda stories don't play a large part in the national curriculum and Kashozi teachers are very focused on preparing their pupils for their examinations. Stories that were not local and were not relevant in their teaching were not used. However, for the pupils, listening to stories from far away and even interacting with some of these stories captured their interest.

Figure 69. Kashozi P1 class watching an animated story.

Steps in Learning to Use ICT in Teaching

Though every teacher at Kashozi went about learning ICT in a slightly different way there were some patterns that seemed to develop from the group. Many teachers followed similar general steps in learning how to use ICT in their teaching. Though these patterns could have been unique to the Kashozi situation it was useful to identify the

patterns that emerged during this process. Knowing roughly what 'stage' a teacher was at helped to direct the interactions and training and may help future ICT training.

Developing an Interest

The first step for the teachers was to gain interest in ICT. For some that interest already existed and the research simply presented an opportunity to learn. For others there was little or no interest in ICT prior to the research period. For these teachers, developing an interest in ICT came from curiosity in a new person or in new equipment, or from wanting to do what their fellow teachers were doing. At the beginning of the research period very often I would encounter a crowd of teachers around one computer watching as one brave teacher tried out an educational game for the first time.

Trial without Pupils

Once a teacher had sufficient interest in ICT he or she began to try using it his or herself or with other teachers. This was a period of apparent fun for the teachers involved as they played interactive educational games and tested each other on their knowledge. One series of games in particular on labelling the countries in Africa was popular with the teachers as they played and compared their scores with one another.

Lesson Planning and Execution

As teachers got more familiar with the interactive files they began to think about using them with their students and this involved discussion and planning. Several teachers began discussing with me how they could use the flash files with their classes. The headmaster was the first of the teachers to do this, bringing his class in just a few days after first learning to use the flash files himself. Several teachers came into the computer lab during this lesson to see how the headmaster was using the computers to

teach mathematics. After this first successful lesson, other teachers began to come in and use these interactive programs with their pupils which encouraged teachers who had not yet used the computers with their classes.

Critiquing Existing Resources Leading to Creation of New Resources

Though the teachers were very enthusiastic about the resources, especially the interactive flash files that were available, very soon they began to pick out areas where they would like to improve and change these resources to better suit their teaching. This led many of my sessions with the teachers into developing skills to create their own resources.

Creation of Relevant Teaching Aids

Kashozi teachers learned to create their own resources by manipulating available digital information from the internet. Eventually they learned to create their own primary digital data in the form of sound files and photographs. Though our progress was cut short by the end of the school year and the end of the research period many of the participants were able to create at least one digital teaching aid to use with their pupils.

Teacher Becomes Investigator/Researcher

Only a few of the teachers reached a stage of investigating the effectiveness of their new resources. After creating and using resources some of the teachers were able to reflect on the effectiveness of their resources and the way that it was used in class. Plans were made for the next time and a few teachers began revising the resources that they had used or began creating a second or third resource, implementing the knowledge of what they had learned from the experience of their first attempt.

As researchers investigating the effect of their resources and of using ICT in teaching, Kashozi teachers found that ICT had effects on their teaching and on the pupils in a variety of ways, discussed below.

Varied Teaching Methods

Kashozi teachers had been trained to utilise teaching aids and resources but in an environment where the resources were limited, this training was not put into practice. Accessing resources, during the research period, enabled the teachers to try out different teaching techniques that had been difficult or not possible without resources. The positive responses the teachers got from their pupils were encouraging to many teachers to continue using ICT.

Increased class control, more participation and better motivation

Several teachers reported to me that their class control was better in their lessons that used ICT and that the pupils participated better and were more motivated to do their work. I believe that the increased participation and motivation by the students came out of an increased interest either from the novelty of the ICT equipment or from access to more information. This increased participation and intrinsic motivation would have naturally made classroom management easier.

Time Saved - Cover More in Less Time

I witnessed many teachers' first lessons using the projector and presenting visual and audio information to their students. The teachers usually took what was a typical lesson in their curriculum books and gathered digital information about it. The lesson was presented in sequence as it would have been presented verbally in the regular classroom. Without fail, every lesson presented with the projector that I watched was completed

earlier than what the teacher had planned. The teachers were very impressive in their ability to revisit the presentation and gather information from the pupils on what they had learned, but the plan was always to go through the presentation once. Almost every teacher commented to me after their first lesson that they were able to cover much more in less time using the computer and projector than they normally would in their regular classrooms.

From a Canadian teachers' perspective Kashozi has a gruelling schedule for its pupils, they are up in the early hours of the morning and are in lessons until sometimes as late as ten at night. When I asked the teachers why the schedule is so full, invariably I got one of two answers: that the students were bored if they were not in class or the teachers needed the time with the pupils to be able to cover all of the curriculum and exam content. The pupils seemed to be able to learn the material faster when ICT was used in their lessons. Many things may have contributed to this increased speed of learning including the new teaching strategies that were being used, accessing and interacting with richer learning materials and a higher interest for both pupils and teachers. Covering curriculum/exam content in lessons that use ICT seems to have potential to assist change in teaching/learning that could reduce the need for late night classes for pupils. Further research is needed in this area.

I also witnessed Kashozi teachers spending a tremendous amount of time marking. Large class sizes and the fact that every one hour lesson period was expected to have practice written activities that had to be marked and returned to the students. As well as, what seemed like continuous practice exams to help prepare the pupils for their

final exams meant that much of the non teaching hours for each teacher were spent marking.

One teacher noted that, particularly for mathematics, having the pupils work on the computer not only provided instant feedback to the students and teachers, but also eliminated the marking for the teacher, leaving more time for planning or working one on one with the students. Using ICT for student practice may have the potential to better maximise the learning time of the pupils by giving instant feedback as well as reduce the marking work load for the teachers freeing up time for other things such as lesson planning.

In addition to providing relief from the continuous barrage of marking, teachers found ways to use spreadsheets to calculate marks and perform other calculating functions, which would have normally been performed by hand. The more familiar the teachers became with the tools available to them, the more ways they discovered to ease some of their more time consuming activities.

Higher Retention

A few teachers made a point of commenting that they had witnessed higher retention in the curriculum material that was covered in lessons using ICT. There were no comparisons of test results or any analysis done on this claim but it was clear to me and many teachers at Kashozi, that the pupils were more interested when ICT was used in their lessons. This interest may have come from the novelty of the ICT equipment and/or use of photos and interactive visual and audio resources might have enabled students who prefer visual learning to learn and retain the information better. I observed several lessons where photographs or animations were presented to the pupils and they had an

opportunity to ask questions about the visual data they were seeing. This kind of lesson tended to have a higher degree of student participation. These new resources enabled new kinds of learning where pupils were encouraged to explore and ask questions. I observed a science lesson on anatomy become a lesson of exploration with the teacher and pupils, instead of a one way transmission of information. The lesson became directed not just by the teacher or by the curriculum book but primarily by the interests and learning needs of the students. Further research is needed to determine if the use of ICT in a similar setting does enable higher retention for students.

Practical and Experiential

Lessons at Kashozi tended to not be very experiential; this is something that I witnessed during my classroom observations and was told by several Kashozi teachers. Very often the practical element that could have naturally taken place was eliminated because of lack of funds. (To do a science experiment requires equipment, to see first hand an English topic such as baking requires the funds for a field trip to the local baker). However, with ICT it is possible to do a virtual science experiment, practically apply mathematical concepts to a virtual, but realistic, situation or visit the local bakery through photos that a teacher took and presented to her class. Over and over again Kashozi teachers commented to me that ICT enabled them to make learning practical and real for their pupils where previously lack of funds has stopped them.

Quality of Resources

Many teachers were impressed with the quality of resources available to them on the computer and through the internet. Maps were correctly represented; animal and human anatomy could be seen as a diagram, a real photo or as a moving organ.

Photographs showed things that previously had only been visualised by description and the teachers no longer had to struggle to draw on the black board or on paper. In an environment where paper resources are minimal and costly, ICT has the potential to be able to assist teachers to increase the quality of visual educational resources that they use in their lessons. Some teachers noted that for some topics it was difficult to find images on the internet that were locally relevant or that were close enough to the children's real life experiences.

New types of Resources for New Types of Teaching

One science teacher, after seeing a virtual human heart pumping virtual blood commented that though he had been teaching about the human heart for years he had never seen how it moved and pumped blood through it. When he showed the heart to his pupils he was very pleased with the result. What had normally involved a lengthy explanation and many drawings of the different heart chambers, the pupils learned by watching an animation of a pumping heart and asking questions for clarification. These new types of educational resources didn't just improve the resources for the existing method of teaching, they actually effected the way that the material was taught. What was once a very teacher centred lesson became more pupil centred. Being able to access educational resources seems to have potential to have an effect on *how* curriculum is taught to students. Instead of the teachers being the centre of the lesson and the primary source of information, accessing educational resources can create space for pupils to seek out knowledge from other sources. A teacher can become a facilitator, helping pupils to learn how to find information and to effectively use that information, rather than the pupils simply memorising it for a test.

One participant told me that the computer had taught him to be a better teacher. In Benon's first lesson using ICT he used several interactive flash files with his pupils where they were given a set of instructions to follow and questions to answer. When the pupils chose the correct answer the flash files responded with a positive comment such as 'well done' when the pupils chose the wrong answer the programs gave feedback to the pupils that the answer was incorrect but to 'keep trying'. Benon witnessed the effect that this positive reinforcement had on his students and decided that he should try to use similar phrases in his classroom. He told me that he now uses phrases like 'well done' and 'keep trying' to encourage his pupils and that it has had a positive effect in his classes.

One of Kashozi's English language teachers also commented to me that using ICT helped to improve English pronunciation. As English is a second or for some a foreign language, some teachers struggle with speaking English, which is the national language of instruction. Deborah told me that hearing English being spoken through the computer programs helped the teachers and pupils to improve their pronunciation of English words. English is the national official language but is a second language to most. ICT can enable people to access more spoken English but due to most English audio being from North America or Europe it may not do much to assist teachers or pupils to practice English in the local dialect.

However, the ability to record teacher or pupil voice opens up potential for different ways of learning to listen to and speak English. Several teachers expressed excitement at the potential for new ways of teaching English as they learned to record their own voice using ICT. Most teachers learned to record their voice near the end of the

research period and therefore didn't have a chance to implement or try out any of their new ideas for using audio ICT equipment. More research is needed to explore the potential in this specific area.

Internet, Access to 'the World's Library'

For many teachers learning how to access the educational resources and the communications available on the internet had a big impact. Teachers delighted in sending emails to each other and have continued corresponding with me via email. Being able to speak to a son who was studying far away using voice over IP on the internet for free and accessing resources for their university studies were some of the ways that the teachers benefited personally from the internet connection.

Internet access and a little bit of training on searching and downloading data also impacted teaching at Kashozi, as it opened up many teaching possibilities through the image and text sources of information, as well as ideas for teaching. Many teachers at Kashozi saw the impact of being able to find resources on the internet during the school's science fair. I worked with the science coordinator to locate instructions for simple science experiments that would demonstrate concepts that the children were learning in class. The experiments resulting from the downloaded instructions as well as the digital experiments that were demonstrated on the computers made the science fair a success in the eyes of the teachers and the visiting parents.

The ease with which the digital resources could be changed and adapted to use with their classes was also a benefit to the teachers, without a photocopier or a printer that was always functioning, adapting the limited book resources that the school had access to was challenging and often involved hand drawing or traveling into town to do

expensive copying. With the computer and digital projector the teachers could find audio, visual and textual information on the internet and quickly adapt it for use with their students without the hassle or cost of paper copying. Digital data from the internet also had the benefit of being in colour and had a much wider selection to choose from. As well, new types of educational resources were available such as audio, video and interactive programs.

Problems or Issues in Implementing ICT - the Digital Divide up Close

Though there were many successes and many lessons on the benefits of ICT in rural based education learned through this research, there were also problems that were encountered. Some of the problems were specific to Kashozi and some can be extended to or applied to other rural Ugandan schools. ICT may have the potential to have a greater impact on the teaching at Kashozi and/or other rural schools in Uganda but there are many issues and barriers that need to be addressed.

Time and Scheduling

Though I spent five months at Kashozi working full time training the teachers who were interested, many teachers struggled to find the time to be able to take advantage of these free lessons. At Kashozi the teachers' schedules are as gruelling as the pupils. Incorporating ICT into teaching does hold possibilities to reduce a teacher's work by having their pupils learn faster and by having the computer do some of their marking. However, the teachers have to first find the time within their existing system to learn how to use ICT. For many this was just not as possible as they would have liked.

Preparing lessons for presentation or for pupil work on the computer is time consuming, particularly when you are learning how to use the computer at the same time.

Some of the teachers I worked with were only able to prepare one lesson for presentation on the computer and some were unable to find the time in their busy schedules to even create one presentation, though they indicated that they were interested and wanted to. Some teachers couldn't even find the time to come in to preview the available flash files to see if any were applicable to their lessons. With such busy schedules, it could take many years before the teachers at Kashozi will have had enough time to build up their digital resources to have the possible time saving benefits from incorporating ICT into their lessons.

Limitations of a Non-Experiential and Examination Based System

The system of education in Uganda has placed such value and importance on the examination system that in the real every day world of a Ugandan school like Kashozi, anything to do with the exams typically trumps everything else. Exam results have almost become the only practical measure of success for a pupil at Kashozi. Examinations test students' knowledge of the information learned in class. While it may be true that Ugandan schools tend toward non-experiential based teaching due to lack of funds, some Kashozi teachers believed that this practice has become so prevalent that it could be difficult to convince a teacher or a pupil that they could learn the information better if they were able to experience rather than just talk about the curriculum content.

Though several teachers commented on this as a possibility for other schools, I found that at Kashozi the majority of the teachers were very interested in making their lessons more practical and learner centred. They saw value in teaching practically what they had only previously taught as information.

Limited Technical Knowledge

The limited access to people who are proficient at ICT poses several problems for educational institutions in rural Uganda that use ICT. When technical knowledge and skill is rare, there is a shortage of ICT trainers as well as technicians who can repair broken machines. In Uganda ICT training is expensive and trainees often need to travel long distances to attend classes. This cost barrier and limited access to machines has kept the number of people with ICT skills low. As most institutions in Uganda cannot afford new computers, the computers that they have, if they have any, are refurbished and second hand and are typically prone to breaking down. Having to repair broken machines can create a problem for institutions like Kashozi, as repair costs are high and skilled technicians are scarce. Occasionally, the machines that the school had needed to be taken to nearby cities (over two hour drive) or the capital city (six hour drive) to be repaired, adding to the cost of the repair. This lack of skilled technicians can result in machines not being repaired properly or having long delays between breaking down and fixing.

Electricity

I learned firsthand what it is like to teach, work and live in an environment that has sporadic electricity availability. I got used to hearing the phrase "power has come/gone." This on/off of electricity was very disruptive for the pupils and teachers alike. I quickly learned to recharge all my electrical equipment whenever the power was on and it took me several weeks to get out of this habit when I returned to Canada. At Kashozi, I was mostly exempt from the frustrations that the power disruptions caused to computer users because of my long lasting laptop battery, but at times the 'problem of power' became frustrating, even for me. In the middle of the research period a storm

knocked down an electrical pole and the school was without electricity for over a week. I spent the first few days naively thinking that it would be fixed in a day or two as my laptop battery slowly drained and finally died. I began to realise how dependant I was on electricity. After spending five days without being able to do any training sessions, boil water, recharge my batteries or check my email and resorting to actually writing with a pen and paper, I started feeling kind of disconnected. On the weekend I took a rare trip into town purely to get an email fix and recharge my batteries. In the internet café as I was typing an email and just about to send, the power went off. The café's desktop I was using went off and my email was gone. I headed back to the school with my friend, disappointed that my trip to town had been a waste. Later in the afternoon, seeing my frustration, my friend offered to take me back into town. This time, not wanting to experience loosing my email I brought my laptop. As I was rewriting my email I got a 'sms' from another of my friends at the school telling me that the power pole was finally up and the power was back on. With relief I returned to the school, happy to put the frustrating day behind me.

The setbacks and frustrations that I experienced in that week, Kashozi teachers experience almost daily, though admittedly they are much more graceful and patient than I was about it.

Without being able to depend on the electricity at the school it still surprises me that the teachers were so interested in using the computers in their teaching. One teacher that spent a lot of time training with me commented that he was very unlucky. For several weeks in a row every time Charles had reserved the computer lab to do a lesson with his class the power was out. We finally were able to have his class come into the lab when

the power was on, but much later than he had planned to do his lesson. Another teacher was making her first presentation to her class, she had worked for several days getting her lesson prepared. On the day of the lesson her pupils arrived excited and found their seats. Less than five minutes into the presentation the power went out, though there was no guarantee that the power would return Deborah and her students waited patiently and the power came back on and luckily remained on for the remainder of the lesson.

The 'problem of power' also had an affect on the teachers who were learning how to use the computer. I was constantly rewriting the training schedule to accommodate the teachers' timetables and more frequently the power outages. Very often, to avoid losing work and time, the teachers used my laptop in their training sessions. I could be found more than once training teachers in the dark, as the room where the internet was available had no windows.

The desktops that the school owns were not designed to be 'unplugged' without a proper shutdown and the continuous off and on of the electricity was slowly damaging the already old machines. The two computer instructors that worked at the school spent much of their non teaching hours attempting to repair broken machines.

During my stay in Uganda I had a chance to visit some villages that were even more remote than Kashozi. In these places there was no electricity available at all. Though the load shedding that Kashozi teachers had to deal with caused many problems, complete lack of electricity would make implementing any kind of ICT program virtually impossible, without alternative power sources, for the schools in these remote villages.

Limited Access to ICTs

Access to ICT and specifically computers is extremely limited. To get a computer new or second hand one must travel to a city and most often the capital city. For many Ugandans the travel costs alone are prohibitive and for most individuals and schools even a second hand machine is beyond the scope of their budget.

Most of the possible solutions that could be found for the above problems are cut short by the lack of funds. Poverty in Uganda is widespread and it is difficult to go anywhere in the country where this poverty is not felt. When people are dying of AIDS and children are orphaned each year, where diseases like Ebola scare away outside help and conflicts in Uganda and neighbouring countries drive up the prices of everything from fuel to food, it is difficult to convince or justify spending scarce money on digital equipment. It is especially difficult when these machines are likely to have problems, when there are very few people who know how to repair broken machines and there is the added cost of security to protect the investment. Yet in the face of overwhelming odds there are public schools like Kashozi who have decided that it is worthwhile to make connected computers available to their teachers and pupils.

Attitude Toward ICT

Many of the participants mentioned that in Uganda some people had negative attitudes about ICT. Aside from the four teachers at Kashozi that for reasons unknown decided not to participate in the ICT training that was offered, I did not encounter a negative attitude towards ICT. In contrast, most people that I met and talked to were excited about the possibilities of ICT.

Limitations of Existing and Available Equipment

Most computers are not designed for environments where electricity is unpredictable. Most computers require maintenance and repairs and like vehicles this typically increases as the computer ages. Computers that are designed to work in environments like this are very expensive and well beyond what a public schools budget could accommodate. The computers that are available to a school like Kashozi are already aged and therefore more prone to breaking down. The software availability and reliability were also a persistent limitation on the use of these machines. As well, much of the newer accessory equipment and the corresponding software, such as digital cameras and mp3 players, cannot connect with the older computers as they do not have connecting ports like USB or the hard drive capacity for the programs and data. At Kashozi, in addition to all of the other unpredictable things that the teachers had to consider when planning, they could not be guaranteed that the machines, mice, keyboards or monitors would be in good working condition for or throughout their lessons.

Training and Research Methods

ICT Training for Kashozi Teachers

In my discussions with the teachers that I worked with, there were frequent comments about how the training sessions I was doing were very different from the training that they had received previously. Many commented on the positive aspects about the computer sessions. Learning in small groups or one on one, this small instructor-learner ratio enabled the training sessions to be more flexible and be more directed to the needs of the individual learners. Being learner directed, the training content was appropriate and fit the needs of the trainees. Learning by doing was not only

a way to maximise our time, but it was felt by the participants that this was an effective and less stressful way to learn. Teachers also commented that having the training offered for free, my being available to help with their learning as well as their teaching and being able to use ICT at their convenience were positive aspects. Many of the specific aspects of the training were not planned for but evolved out of the situation, trial and error and what we eventually felt seemed to work for the teachers and for myself. The unstructured, informal nature of the training may not be appropriate for other training circumstances but it seemed to work well for the teachers that participated in this research. Instead of focusing on qualifications for completion of a course, the teachers directed their own training. The teachers were able to learn skills that were immediately useful to them, that they could put into practice right away.

Impact of Participatory Research Methodology

Participatory research is a method that focuses on people rather than data. I did not go to Kashozi only to observe and report on my observations, nor did I go to just train teachers to use ICT. I went to Kashozi with the intention of doing research in which I would be a participant and an observer. Instead of having subjects I would have participants and together we would actively work to create new pathways for teaching. Had I gone to Kashozi as a passive observer or as simply an ICT trainer, the teachers and I would have had a very different experience. However, by following participatory practice in this research I also learned how to be a better ICT trainer as well as a researcher.

When I arrived at Kashozi, I was introduced to the teachers and many others as 'a computer expert.' Soon after I arrived at the school I was asked to look at a modem that

was broken to see if it was fixable. I began to wonder then if my communication with the school had been flawed and if they had a different idea about why I was there. I went to look at the modem and concluded that it was indeed broken. I am not what anyone would call a computer technician -- I use computers like cars, I'm a good driver but if it breaks down I call a mechanic. I actually had no idea how to fix the modem or even if it was fixable. All I could do was confirm that it was in fact broken and then admit that I had no idea how to fix it. I then had a discussion with the headmaster stressing that I was an educator not a technician and that I wanted to facilitate the teachers to use the computers to teach. The headmaster was completely on board with this idea, once it was understood, and I started working in the lab with the teachers.

As the research went on, I was confronted with other misinterpretations about what my role at Kashozi was. Some teachers came into the computer lab less than an hour before the lesson that they wanted to have with their classes and had mistakenly assumed that I would be teaching their class. I politely responded that I would be happy to help them prepare for their class and help them during the class. Sometimes this resulted in discouraging the teachers from coming in. However, I believe that for most teachers, in the end they learned to use the resources in a way that was useful to them, using methods that they were comfortable with. As well, they learned quite a bit about how to use ICT through the experience of jumping in and using it.

Many times I was asked to do things for various teachers, especially teachers in management. My response most of the time was that I was happy to show them and help them, but that I wouldn't do it for them. My objective was to empower the teachers to be able to use the ICT equipment themselves in ways that were useful to them.

I wasn't always successful at this. Occasionally my impatience and wanting to get a job done would get the better of me and I would agree to finish work for teachers. I even occasionally did work for them instead of being patient and waiting for them to complete their projects. The few times this happened it usually backfired because instead of helping, I created a situation where the confidence and ability of the teacher was not strengthened but reduced. Though it may not have helped the teachers, I learned that my participants were better off when I let their needs and their time frame dictate the pace and content of the training. I believe that for the majority of teachers, as they got comfortable and had an opportunity to practice what they were learning, that they developed confidence and ability in themselves to create and use digital resources independent of me.

Cultural Interactions and Differences

When you are living in the midst of a culture that is initially unfamiliar to you, you learn quickly to adapt and integrate yourself to it, particularly when you are the only one who is an outsider. In most ways, I believe I was fairly successful in adapting and integrating into life at Kashozi. There were a few things, however, that I continued to struggle with throughout the research period.

Individual vs. Collective

The culture that I grew up with in Canada is a very individualistic culture; I am used to doing things for myself and taking care of myself. Living in Uganda was not the first time that I had lived in a collective culture but it was the first time that I had done it without any other 'outsiders' and within a group of people that had not had very much experience with 'outsiders.' For the most part, participating in a collective culture is a

wonderful experience, people help each other out when they need help and there is a friendly welcoming atmosphere where you can depend on your friends, family and colleagues for all kinds of things. However, within this collective culture, individuals don't always get to make decisions for themselves; there were several times when decisions were made for me or on my behalf. It was not until this happened to me in Uganda that I truly realised how individualistic I was and how much I value being able to make even simple choices for myself.

Always the Outsider

Another aspect, which is not new to me but is something that I still struggle with, is being always seen as different and as an outsider. My physical appearance, including my clothing, hair and my skin colour, stood out at Kashozi immediately identifying me as different. I was a foreigner or more specifically I was called a 'mazungu' a term loosely meaning a person originating from Europe. My accent and the difficulty that many people experienced, at first, in understanding me further identified me as an outsider.

In an internal housing shuffle, I got moved into one of the new teachers' houses and needed to hang up curtains before I moved in. I asked the headmaster if I could have some nails and a hammer. He told me that he would send a man with the hammer to hammer the nails into the wall. I replied that just a hammer would be fine as I was capable of hammering nails myself. Knowing me better at this point and knowing that I liked my independence, he smiled and told me that it wasn't because I wasn't capable of using a hammer, but that I was a guest at the school and that as a guest I needed to be taken care of. Light-heartedly, I asked him how long I had to live there before I wasn't

considered a guest anymore. “One year” he replied, as I was sent off with the promise of a hammer and a man to hammer my nails for me.

Within the school grounds the students, teachers and the other staff got used to seeing me and eventually I wasn’t a novelty to be stared at. Outside the school grounds, particularly if I was alone, people tended to stop and stare as I passed. On one occasion a women dropped the bundle of sticks she was collecting to stare at me in shock as I passed her house. Dealing with this celebrity like status was difficult at times; I struggled with feeling like I was fitting in at the same time as always remaining an outsider. I was told by a friend that even if I lived the rest of my days in Uganda, most Ugandan people would always see me as an outsider.

Living with an Outsider

Living in a culture that is different than your own can be a challenge, just as having someone living in your midst that has a different culture can have its own challenges. Many times while at Kashozi I over heard teachers telling one another what they had discovered about Canada or Canadians as they repeated some fact that I had mentioned in a previous conversation. Occasionally, in discussions with my colleagues my comments were followed by looks of shock or the exclamation “I can’t believe that,” as an aspect of my life (that had seemed normal to me) was compared to the local culture.

While I was in Uganda, my mother came for a short visit in October and was staying with me at the school. During this time when I was talking to a couple of teachers about a gift for my mother to take back to Canada with her, she came up and asked what we were talking about. I told her smiling, “Never mind just wait over there, I will be right back” and then I turned her around and gently pushed her away from the bag with

the gift so as not to ruin the surprise. For my mother and I this was normal behaviour, but the Ugandan teachers that witnessed this interaction were shocked at my behaviour toward my mother, I heard one say "and that is her MOTHER!" Laughing, I reminded them that my mother and I were from a different culture. Other teachers were equally shocked when they discovered that I was letting my mother cook for me. She was my guest and my explanation that this was normal for us fell on deaf ears; I was in Uganda and therefore I should treat my guest as a Ugandan would.

Gender Equity

Being a women living in a different culture, where women have different roles, can also pose challenges. At one point during the research, feeling comfortable that I had successfully adjusted to life at Kashozi; I had made friends and though I continued to be treated as a guest, I was starting to feel that I had figured out somewhat what life for a Kashozi teacher was like. In one of my training sessions with a teacher that had become a friend of mine, we had to restart the computer and as the start up music was played, without thinking, I whistled along to the tune. Charles who was sitting beside me turned to me with a shocked look on his face and in response to my surprised expression he told me "You can't do that!" At first I wasn't sure what he was talking about so I asked "Can't do what?" "Whistle." he replied. Charles then explained that there was a taboo against whistling. As I made a mental note to not whistle again while in Uganda I recalled that I'd heard other people whistling at the school, when I mentioned this to Charles he told me that yes, men were allowed to whistle but not women. My curiosity piqued, I asked him why women were not allowed to whistle if men were allowed. The only answer I could find from the teachers was that there was a taboo for women and that

if I whistled my lips might remain in a whistling position. Later I jokingly asked what women could do that men were not allowed to do, "Breastfeeding" I was told with a smile. What was interesting to me was that up until this point, I had witnessed men and women being treated differently. I had been treated differently, I thought, because I was a foreigner. However, I had not felt that I was being treated differently or had different rules applied to me because I was female. I soon discovered many other things that I was not allowed to do because of my gender. Learning about these 'rules' for women led to several interesting discussions with teachers at Kashozi. In these discussions I struggled with my dual role as an outsider to the culture and as a woman who was living in the culture, though temporarily. Though I wasn't aware of it until the end of the research period when one of my participants explained it to me in an interview, many of the teachers saw me as an advocate for children and women's rights. Bago told me that through our discussions and interactions, many teachers had come to understand that I viewed women as being equal to men and that this had helped teachers at Kashozi to "know that women are people like others, [that] they can perform in society, [and] they are human beings." (B. Bago, personal communication, November 23, 2007).

Language

Some teachers and many of the students struggled to understand my speech. Interestingly, I was mostly able to understand what they were saying to me, though sometimes I clearly misunderstood the meaning. These misunderstandings of meaning led to some embarrassing situations for me as well as humorous ones that I later recalled with laughter. Occasionally, some teachers experienced slight frustration as I struggled to understand what they were trying to explain to me. I usually discovered that my

misunderstanding of meaning was a result of not understanding an aspect of the culture more than misunderstanding language. Unfortunately some teachers really struggled to understand my words, though I tried my best to speak clearly. During my mother's visit Benon overheard me speaking rapidly to my mother and surprised he turned to me and asked me what language I was speaking, I told him I was speaking English but he was convinced that we had spoken in another language. Another teacher informed me, after I had been at the school for almost a month, "Today was the first day I've understood anything you have said." Not being able to understand me created a barrier for some teachers, as they feared that if they couldn't understand my spoken words that they would not be able to learn to use ICT from me. For many teachers their struggles to understand me became almost comical and lead to some funny and interesting discussions as we tried different ways to make our meaning clear, but for some it was clearly difficult and uncomfortable.

Respect and Confidence

Though we had many differences of opinion, particularly regarding gender equity and the treatment of children, both the Ugandan teachers that I interacted with, and myself held a respect for each others culture. Together we were able to discuss how we each viewed our respective cultures and what the differences and the similarities were. I think that for me and the teachers that I interacted with, the cultural interactions were both positive and educative.

Changing the Landscape of Learning

"The medium is the message." - Marshal Mcluhan

Participatory research is about the medium as much is it is about the message. In 1964, Marshall Mcluhan coined the phrase, "The medium is the message". The concept takes on new meaning when applied to ICT. Inviting people in to be a partner in understanding the implications for teaching with ICT has had implications for change in all aspects of the teacher-learner-knowledge relationship. For teachers, it enables them in a very real way to learn new pedagogical methods, transferred through the medium. It has given them an opening to be teacher-researcher and to begin to discover new ways to learn, motivate and participate. It has given teachers a new role of senior learner, where they are entering an arena of discovery rather than being a conduit of information.

When teachers use ICT it opens up a whole new world for students. Students can experience things that were totally out of the question without ICT. They can experience the world of knowledge through the availability of electronic books. They can experience of exhilaration of having the keys to the 'printing press' and having a voice of their own. Students can be guided into a world that is so much richer than the village in which they live and yet paradoxically, small enough to discover on their own.

Putting this research up on a web site and then providing tools to interact and participate provides not just ground-truth of the common experience of participatory research but also provides an avenue for continuous growth and learning for all involved. ICT provides a venue for educational change that impacts virtually every aspect of pedagogical practice and invites people in from where they are, to a journey of explorations that will make education stronger and will make the people involved

stronger. The medium is indeed a critical element of the message and it is a message of hope. Ugandan teachers may well discover that the web tools provided by an open-source tool like Drupal (www.drupal.org) may give them a means to create and share on a scale that a few short months ago would have seemed incomprehensible. They have seen the example of what a web site can be and that it can be shaped and moulded into almost any form that they want. They have experienced what others have done and now know that the tools for them to share and learn from each other are now available.

Chapter 6 - Implications

This research has documented, in a tangible way, moving a rule based educational institute from a situation of limited access to educational resources to accessing a wealth of resources. It has then, from a wealth of resources, shown a situation where teachers create resources that include locally relevant data and are a reflection of the current reality of the educational situation. As well, through the use of ICT, this research has given voice to its participants in a way that extends beyond the local Ugandan primary school context.

The Most Significant Aspects of this Research

How ICT has had an Impact

At Kashozi, accessing ICT impacted the teachers personally and professionally. Teachers were able to access resources for their teaching that were otherwise inaccessible to them in the form of maps, coloured images, interactive programs as well as audiovisual elements. Teachers created resources that uniquely suited their teaching environment and were locally relevant. Teachers were able to use ICT to ease their work load both in student feedback and in their time spent teaching. We cannot know if this impact is a lasting one or if the exciting prospects that the teachers experienced will wear off as a novelty or if they will persist and expand beyond the scope of this research.

Teachers were also personally impacted by using ICT. Teachers who were students at the local university accessed relevant and up to date literature related to their courses and assignments. Having and using ICT gave teachers social clout with their peers and provided entertainment, near the end of the research period several teachers started trading videos that they could watch on their computers. Using email, chat and

voice over IP gave teaches a way to communicate with each other and with the outside world.

Students were impacted by the wider variety of teaching methods and higher quality of teaching aids that were used in their lessons, including ones that helped to elicit more pupil centred lessons. Through the use of ICT, students were exposed to new resources and new types of resources. Students experienced more hands on, experiential learning using ICT and their interest, motivation and participation increased.

ICTs play a part not only in how the teachers were able to access and create educational resources but also in the participation of the analysis and reporting of the research. This participatory research was done by myself as well as the participants and therefore needs to be returned to the participants. Using a website to 'return' this data to Kashozi teachers incorporates into this process an element of ICT that was a significant part of the training and research period. As well, putting the research data online has enabled the participants to have a voice in the representations of themselves and of our shared experience, collaborating at a level that would not have been possible without this use of ICT. Using the website has allowed us to incorporate video data. This medium of video recording provides authenticity that cannot be shown in any other way.

Successful Strategies for Impacting Teachers

Though there are many barriers to making ICT equipment available, this availability is not always sufficient to enable teachers to use ICTs to access educationally relevant information or to create their own educational resources. At Kashozi, training was needed as a second critical component to enable teachers to access and create digital educational resources. Through this research we discovered that in order to make training

relevant and useful, it should be directed at the needs of the trainees including the specific content of the training and the scheduling of the training sessions. Trainees should be actively involved in the design of the training and this should be assessed on a continual basis to ascertain its effectiveness. As well, the training ideally needs to be locally affordable or free of charge, be learner centred and practical, and have a trainer-trainee ratio that can accommodate individual differences.

The Evolution of Resource Use

Learning to use computers to learning through using computers.

When I arrived at Kashozi the computers were being used almost solely for pupils to learn to use the computer, though the original intent was for the teachers to also use them. As teachers began their ICT training they began to recognise ways that they could use ICT to teach subject material. Many of the teachers were attracted to the idea of using ICT in their subject teaching as it seemed to engage the pupils' interest and it was a fun way to learn. Interactive files were used to teach everything from mean, median and mode to irregular verbs to how the heart pumps blood. Through using ICT to teach subject material the teachers easily made their lessons interesting and experiential for their pupils. Just as in the past we have moved from penmanship to authorship Kashozi teachers and pupils have begun to move from learning about the computer to learning through using the computer.

New teaching aids and new pedagogical questions.

How readily available a teaching aid is will often be a determinant of its use. To use an image in their teaching, Kashozi teachers who have access to ICT have the option of hand drawing an image on the black board, (which will get erased), on paper, (which is

expensive and will get damaged) or downloading a image file and presenting it to their class using ICT. The first two options are more time consuming and most likely in the last option the quality of the image would be better. Downloading an image from the internet also creates choice for the teacher. Where choice was previously limited, the selection available from the internet opens up new pedagogical questions about what kind of visual information best suits the lesson. Once choice is presented, appropriateness also becomes a valid question. When teachers were faced with not finding appropriate images on the internet they began to look toward creating their own images using ICT. Digital cameras were used to take photos to present students with local but largely otherwise inaccessible images.

Having choice in what resources to utilise within the classroom required the teacher to consider the appropriateness and value of the learning resources compared with one another. When you only have one resource, little thinking is required. I witnessed Kashozi teachers discussions and considerations over which resources would be better and why, questions that they did not have to consider when the resources were limited to one.

How ICT Seemed to have Changed Classroom Dynamic and Teacher Behaviour

Where ICT was used at Kashozi, lessons became more interesting, more experiential, and more pupil centred. Teachers learned the use of positive reinforcement not only in their classes using ICT but also in their regular classes. One of the impacts of having access to a large array of learning resources was that the teachers began to evaluate those learning resources. This placed the teacher in a position of senior learner in the learning environment for at least a few lessons. This new place was very exciting

place for some Kashozi teachers who had previously not had access to a constant source of new material. For those few lessons the teachers' role moved from content dispenser to senior learner, a very significant shift in their role and responsibility and one that was embraced with enthusiasm.

Questions Raised by the Research and Issues that need to be further Addressed

What factors affect collaborative data gathering and sharing?

The research model focused on collaboration between the teachers, administration and researcher in situ. The degree of collaboration is extremely significant. It is difficult to measure but it also makes the research unique. I have tried to engage the participants in training exercises where they learn by doing. I have observed in classrooms and asked teacher participants to reflect on their practice relative to the changes that they were making as a result of the training experience. I also independently observed these changes taking place. I have interviewed them using various forms of recording media to make sure that their voice has been heard and I have posted the results for them to continue to be engaged in the process, even though the formal data gathering period has long since come to an end.

Of all of the factors related to collaborative data gathering, the time spent getting to know them as individuals and ensuring that they had something to gain by fully and openly participating was the most critical. It was also necessary to have many ways for teachers to express their opinions. For some, protracted conversation and learning to trust the trainer/researcher were critical before they would open up. For others, the reflection time and formalized recorded interview was the time when they felt most compelled to engage. I could not have known what would trigger the deepest

involvement in the data gathering and therefore it is critical to have multiple methods of data gathering stretched out over a period of time. Future research and future researchers doing this type of research need to build in as many points of contact and as many points of gathering data as possible. Future work will need to take into account the need to clarify, in the minds of the teachers, why they should bother with this or put more bluntly, 'what's in it for them'. The more these factors are built into the research to more likely the results be authentic.

What specific opportunities are there for ICT to be a catalyst for change?

ICT content has embedded pedagogical design. On the surface, the teacher can be attracted to resources by the level of glitz and operational appeal but underlying each resource is design. How is the information presented? What is the scope and sequence, how does it engage the participant? What kinds of questions and answers are used? What types of evaluation methodologies are used?

Kashozi teachers quickly discovered that using certain resources had remarkable and positive results in student learning and behaviour. On the most basic level, students responded better to real color maps, pictures and professionally drawn illustrations than they did to teacher hand drawn maps and illustrations on the chalk board. Teachers witnessed the level of engagement of students significantly change when the content was engaging and the scope and sequences were carefully laid out. They discovered that the time between a student answer and when the student was rewarded or corrected was significant. They discovered the nature of the feedback to the student, that using positive feedback had significantly different responses than negative feedback. They discovered that the machine had infinite patience, where that was not always a

personal attribute of the teacher. They discovered that they could critically evaluated resources and methods to discover why it worked well or did not work well and that they could incorporate those things in environments without ICT present. When a teacher uses ICT well, they can bring the world into the classroom. A world of books, a world of pictures, sights and sounds and also a world of pedagogical design that can be learned from, both good and bad.

The teachers also discovered that there were things to learn for them personally. They discovered that they can make their own resources generated from ICT tools and they can share those resources locally. They discovered that while they can take things into the classroom, they can also generate resources incorporating their own environment and their own pupils. They discovered that it is not always best to be a stand up and deliver as an expert but sometimes sit on the sidelines and be the senior learner. They discovered through the use of ICT that when the classroom door closes, you are not alone, you are amongst the work and understanding of colleagues around the globe, and you have a chance to observe and grow in becoming a better practicing teacher. That knowing about others way of teaching and schooling opened up possibilities for critical questioning of their own system as well as, a more realistic sense of the pitfalls of other systems. The teachers began to discover that they could be self-directed rather than text-book directed and that they had a lot more tools in their tool kit to use and master.

Are there opportunities for continuous staff development sustained after the formal research period is over?

Part of the project was to introduce materials and allow teachers to explore. These digital resources were left at the school. Training to search and find resources on

the internet opened up the world wide web of resources. Basic ITC equipment, computers, hard drives, digital cameras, MP3 players and digital projects were introduced as tools of the research to see and hear the experiences of the participants as well as, be useful tools for education. This equipment that takes in the environment in the form of text, pictures, video and sound were used to document the research but were also left for teachers to continue to explore and use. Software such as Flash and Power point that had been previously present, became authoring environments to begin to create one's own home-grown resources. This constitutes a treasure chest of resources yet to be discovered and created.

The teachers were also introduced to powerful tools of communication. Voice over IP software for voice calls, email for text and file transferring and chat systems for real time text based communication. These varied communication-lines connect the teachers with each other and also with teachers outside of Uganda.

The web site (www.ninathesis.org) allows the participating teachers to see the research evolve. There are online tools where they can leave comments. They can also see that the research that they participated in has been viewed from many parts of the globe. What happens in their little school in rural Uganda is now accessible throughout the world. They can see that hundreds of people 'know them' and what they are doing. ICTs, if they catch hold, can be transforming technologies. There seems to be a threshold to be crossed where the trouble associated with its use is worth the effort it takes. At Kashozi I believe that threshold has been crossed, there is no going back, only going forward into a new, connected world where learning is continuous.

What mechanisms can be put in place to provide opportunities for sustained cross-cultural contact?

To reach out over time and distance is something that human beings have long strived for. ICT allows us to communicate on a daily or even moment by moment basis. In so far as talking, pictures, video are capable of transmitting culture, culture is being expressed bi-laterally. The most significant aspect, however, is that people can find a space in which to communicate. ICT space is a tolerant space, whereby one can be Ugandan but can also participate in an emerging 'world culture.' Many ITC tools inhibit users from knowing what gender you are, what race you are, what age you are or where you live. The space is a space of equals where what you say is the only basis upon which you can be judged. It provides a relatively new opportunity, particularly for those who have been oppressed by cultural norms. It allows us to rise out of the constraints of culture and change and when we move back into our culture we have changed. Even if it is just a little. Over time, we will expect to be treated according to our ideas and dialog rather than by our appearance.

What mechanisms underlie the seeds of continuous growth?

Human beings are born to learn. We know that this is a life long process. It is the underpinnings of hope and it is the underpinnings of change. What do people need to foster continuous growth? What is required are tools of access, and skills associated with access. There is a need for a physical infrastructure that allows for access and there is a need for a social infrastructure that encourages access to information in a free and unfettered way. There is a need to make sure that people's basic needs are taken care of for empty stomachs and the prevalence of sickness and disease trump other initiatives

such as accessing information. However, these powerful basic needs that people have that are not being met are in part caused by a lack of information.

There is much being done to close the gaps but there are many forces operating in the other direction. It is clear that one of the most potent seeds for continuous growth is our willingness to care about what happens to our brothers and sisters and our preparedness to provide a level playing field of opportunities for growth.

What is the role of assessment and how does it impact ICT delivery?

Assessment is the keystone of education. How we assess, what we assess and what we do with the results defines to a significant degree what happens on a day to day basis in our classrooms and indeed how we think of curriculum and instruction. The connection between assessment and classroom practice is very clear in Uganda. A good test result on the Ugandan national tests is a ticket to further education. Further education is a pre-requisite to a better set of economic opportunities.

A rigid standardized test based system seems on the surface to be very attractive. It provides accountability. It provides a way of sorting students for further educational placement and opportunities. When I first arrived in Uganda I was interested in the opinions of the teachers of their examination based system, most were in support of it or were ambivalent about it. As the research progressed many teacher started to discuss with me the system of examination and the limits it had for learning. Though I held my own opinions of exam based systems I wanted to not impose my ideas and instead try to understand how the teachers saw their own circumstance. What I experienced was a transformation of the way that many teachers viewed their examination system. Kashozi teachers began to see exams as a limiting factor for change, for classroom innovation and

for teachers' and students willingness to teach and learn things not found on the test. Many teachers expressed to me how they felt forced to teach to the test. Tests, as they are used, demonstrate what one does not know and then moves on to the next subject and in the context of Uganda where national exam results can take months, exams are used solely as a determinant of the next years placement for students. Teaching to an exam system forces curriculum to be compartmentalized, and teachers are relegated to the role of dispensers of knowledge and administers of assessment. The result of a 'stand up and deliver', over and over again until 'they have got it' teaching method becomes the natural outcome and the common method of teaching at Kashozi. Teachers spent vast sums of energy on this process because that is how they, their students and the school are judged and Kashozi's reputation for achieving high exam results is what attracts families who can pay higher school fees that the institution functions on.

ICT has provided some of the seeds of change. ICT on an individual basis can provide instant feedback and encouragement for a student. A test cannot provide instant feedback nor is it designed to operate from the basis of encouragement. The test results come long after the test and there is little to no opportunity for use in the teachable moment.

ICT provides glimpses of other objectives than the objectives set out by a test driven process that are both engaging and that set in motion the seeds for possible change. Learning to use ICT did not alter the assessment paradigm at Kashozi but it appears that it has the possibility of doing so over a longer period of time, just as it has the possibility of changing the view of what happens on a day to day basis in our

classrooms. Its very presence in the lessons of the Kashozi teachers have already prompted debates on assessment, the beginnings of possible change.

What are the implications for recognition of newly acquired skills?

When teachers have skills and space to select their own resources, make their own resources and communicate with others about pedagogical matters, the fundamental role of the teacher has been shifted. Teachers are free to be researchers in their own classrooms. They are free to be on a continuous learning path themselves. They are free to explore with self directed learning, machine directed learning and evaluation. The net result is that debates and discussions begin. These lead to experiments within the classroom to see if this or that is more (or less) effective. It changes the teacher's role from an information conduit to a researcher and perhaps eventually to an experimenter looking for ways to more fully develop the human potential of those who come through their classroom door.

ICT provides a connection to the outside world, a world or resources, books, ideas and broader views of human development than any one person could have generated without that contact. The implications seem to be that the teachers without resources now have the keys to the printing press, to the library of human experience, to a communication infrastructure that spans the globe; they have the keys to entry into the global village. The power to access information and the power to change are now in their hands.

What implications are there for teacher training?

The implications for continuous teacher training/education are profound. There are, however, two aspects of motivation to consider. First is the intrinsic motivation to

want to obtain new knowledge. At Kashozi the thirst for knowledge seems to be strong and the teachers seem to be willing to go to great lengths to improve themselves as they bring more and more into the classroom through the ICT conduit. The second, extrinsic motivation, is much more difficult. For example, teachers at Kashozi do not get paid any differently for improving their teaching. Pay increase comes only through formalized recognition through schooling and degree granting and moving from teacher to administrator. The enthusiasm for teachers to improve their teaching may become blunted at some point if there is not external recognition of their efforts or no means available to increase pay.

Teacher training/education institutions have done a remarkably poor job in making available ICT and ICT training to rural teachers in developing areas. ICT offers potential for becoming better trained in the formal and practical sense but institutions have largely done a poor job in providing the leadership needed in this area. Some progress has been made but economic barriers, bias against ICT based instruction, poor connection between teacher training institutions and schools, and a lack of ministerial support have all stood as road blocks to teacher development. The strong and still unrealized potential remains.

What are the conditions necessary for ICT to continue to spread into other impoverished areas?

To increase the accessibility of ICT for teaching in Uganda, other factors need to be addressed. On the equipment side, ensuring that there is enough equipment for class sizes and teacher access, as well as ensuring that the ICTs are in good working condition and are compatible would greatly improve the ability of the teachers to implement ICT

into their teaching. Providing teachers with time for learning ICT as well as lesson planning is also an important consideration for implementing ICT into teaching.

Other factors need to be addressed on a larger, national scale such as providing stable electricity and low cost internet connectivity to educational institutions. These improvements that enable access would greatly assist schools in Uganda like Kashozi that are trying to implement such programs.

Importance of this Research

It is clear that ICT provides access to resources. The redress of access to resources is only one step along that path. If it stops here we have only moved from colonialism to absentee colonialism delivered through a digital medium. Providing access to information is powerful but it is just a step along the way. We must not stop with simple access to information or we will only create digital consumers.

Re-dressing the balance between access to resources and the human capacities for resourcefulness is indeed a difficult matter. What is needed is to create an environment where people establish a system that fosters the development of people. This is not an easy task. Outside trainers have many issues to contend with in terms of influence and dependence. As an outsider to Kashozi I struggled with these issues. As the research end date was determined by the school year and not the natural end of the project many teachers felt that their training had been unfairly cut short. Throughout the research I struggled with the ways that I was knowingly and unknowingly culturally influencing the teachers at Kashozi, through the different ways I expressed my beliefs and through the influence of the technology that I trained them to use.

Curriculum is not about what we study but rather about the development of personal power in the areas that develop of thinking, resourcefulness and insight. The signs that we are on our way toward that agenda are not in how many good resources are available at Kashozi, but in what is being accomplished in the area of developing human beings who have a voice in the world that matters, having the means to contribute to humanity and solve problems that face all of us. I believe that Kashozi teachers are a step closer to reaching this goal.

How can we use ICT tools to magnify the human potential, that is, the true goal of education? How do we use the powerful tools of access to information, information, communication and expression in ways that move to obliterate hunger, poverty, environmental degradation and the legion of other things that diminish the human spirit? We have the possibility of levelling the playing field and moving to a new era of human existence and to use our tools to make sure that the haves and the have-nots are not perpetuated. The development of ICT and the ways in which ICT was used at Kashozi gives us a small glimpse of what is possible. Unlimited access to book information when there are few books, access to ideas, knowledge, new ways of doing things and new ideas that lead to questioning and critically evaluating are all part of this project.

The importance of this research is that it shows a glimpse of what using ICT in education can do for a school like Kashozi. Access to technologies and powerful tools are not enough however, we need teacher training/education that really grasps what powerful tools can do and where they can lead us. We need to understand what kinds of education results in a paradigm shift that we have glimpsed and believe is possible.

Doing things ‘together’ is a complex art, not a trivial statement. Designing this report to be ‘on the web’ is one small step that has been taken to make sure that the voice of the participants, researchers and other interested parties can be heard. It is also a way to ensure that the information is truly representative by engaging the participants to provide ground-truth.

The challenges to understanding the impact of powerful tools and guiding their use and experience is very complex but in trying to understand it together, we all move in our understanding of what it is to educate and what it is to be a classroom researcher and what is to be involved in magnifying human power and potential, one child at a time. If we care about what happens to us as a family of people, we must continue to try to understand how we can magnify that which is the best of what we have to offer as a species.

Figure 70. Kashozi teachers working together on a computer.

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Appendix

1. Letter of invitation from the headmaster of Kashozi School

2. Consent form for participants

3. Parental Release form to use images of students

4. Questionnaire given to participants at the beginning of the research

5. Interview and/or focus group questions

Kashozi Boarding Primary School
P.O. Box 361
Bushenyi-Uganda
Mob. 0772487168
E-mail Johnkatesh@yahoo.com

11/11/2006

Hullo Nina Morgan,

RE: LETTER OF INVITATION

This is to Invite you to Uganda and Kashozi Boarding Primary School in particular as a volunteer attached to Information Technology IT. (Computer) Department effective from February to December 2007.

Everything to facilitate your stay in Uganda has been organized and is ready.

We look forward to receiving you as per program.

Hope to hear from you.

Regards,

--
John Kateshumbwa.
Headteacher,
On behalf of the School Management Committee
Kashozi Boarding Primary School.

Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based

Dear Sir/Madam

You are being invited to participate in a study entitled 'Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based' that is being conducted by Christina Morgan.

I am Graduate student in the department of Education at the University of Victoria and you may contact me if you have further questions by speaking directly to me at any time during the research at (INSERT LOCAL NUMBER) or after the research is over by phone at 1-250-474-3609, email at nmorgan@uvic.ca or by mail at P.O. Box 455 Malahat B.C. V0R 2L0 Canada.

As a graduate student, I am required to conduct research as part of the requirements for a degree in Education. It is being conducted under the supervision of Kathy Sanford. You may contact my supervisor at 1-250-721-7762 or email at ksanford@uvic.ca

The purpose of this inquiry is to exchange information on educational practice within a specific cultural context with a focus is on the use of ICT.

Research of this type is important because in places where school resources are limited, computer technology has the potential to provide educational resources at a fraction of the cost of traditional educational resource formats. As more children have the opportunity to attend school, educators will need to find new feasible ways to educate using new formats of educational resources.

You are being asked to participate in this study because you are a member of the teaching staff at Kashozi school where the research is being conducted.

If you agree to voluntarily participate in this research, your participation will include:

- Attending informal evening computer sessions,
- Interviews with me,
- Group discussions (most likely to take place during the computer classes) and
- Classroom observation by me when and if you are comfortable and have invited me to observe. (I would be interested to see the ways that you are using ICT, skills or information that you may have gotten from the computer sessions)

Participation in this study may cause some inconvenience to you, including the time it may take to learn about the computer, time for participating in interviews and group discussions. It is estimated that your participation in this research will take 2 to 5 hours of your time per week.

There are no known or anticipated risks to you by participating in this research.

The potential benefits of your participation in this research include learning how to use computer resources in your teaching.

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will be removed and will not be used in the study, if this is your wish. Your employment at Kashozi will not be affected in any way if you choose to withdraw from the study. During the study you may decline to answer any questions posed in interviews or in group discussions.

I would like to use audio and video recording as well as still photography to record interviews, group discussions and classroom observations, these recordings may be used for analysis and in presentation of the data. This kind of recording will only be done with your consent. Consent for using these recording devises will be asked for prior to each discussion, interview or observation. You will have the option at any time during the study to review any recorded data that has been made of you. Please tick the box to the right, to indicate your consent to use the audio, video and still photography that may be taken of you ☐

To make sure that you continue to consent to participate in this research, I will ask you for your consent before each interview, group discussion and observation done for this study.

It will not be possible to protect your anonymity due to the fact that all data collection will take place in person to person interactions. In other words I will know who you are and will be able to associate your data with you.

Your confidentiality and the confidentiality of the data will be protected by using a false name in all reporting of the research, if this is your wish. If you would like me to use your real name please tick the box to the right. ☐

It is anticipated that the results of this study will be shared with others in the following ways:

- In the thesis of the researcher.
- In ways that you and the other participants collectively decide to use it.

Data from this study will be disposed of by erasing the electronic data.

In addition to being able to contact the researcher and the supervisor at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting Human Research Ethics Office at the University of Victoria (ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researcher.

Name of Participant	*Signature*	*Date*

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based

Dear Sir/Madam

I am conducting a study entitled 'Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based' with the teachers at Kashozi Primary School.

Part of my research involves recording audio, video and taking photographs of the teachers while they are teaching.

The image of your son/daughter was captured on video or in a photograph and with your permission I would like to use the images in the reporting of the research.

You may contact me if you have further questions by speaking directly to me or phoning me at (INSERT LOCAL NUMBER)

If you would like to give permission for me to use the image/video of your child, please sign your name below.

Thank you,
Christina Morgan

I _____give permission for Christina Morgan to use photographs and/or video of my child _____that was taken at Kashozi Primary school.

_____	_____	_____
Name of Child	*Signature*	*Date*

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based

Can you describe what you think your level of competency is for using ICT?
(Tick on the line where you think you skill level is at)

Very good----------moderate ----------
poor

Comment on your skill level for using ICT
-
-
-

What if any are the specific programs, equipment and/or skills that you feel you are comfortable and/or proficient at?
-
-
-

What if any are the specific programs, equipment and/or skills that you would like to learn or further develop?
-
-
-

In what ways, if any do you think the computer/ICT can benefit you personally, the school, the students and/or education in general
-
-
-

Exploring the Role of technology in moving rural based educational institutions from resourced based to resourcefulness based

What do you think, if anything, have you learned from the computer sessions and/or the experience of using ICT?

From what you have learned in the computer sessions and/or from using ICT? What specifically do you find useful? What aspects, if any, of the computer sessions are not useful to you?

Describe/discuss any (positive or negative) impact that the computer sessions and/or using ICT has had on your teaching.

What ways, if any, have you or would you like to use the computer equipment and/or digital resources in your classes? How would you go about doing this?

What would you like to focus on/learn during the next computer session?