ICT, MULTILINGUAL PRIMARY EDUCATION AND CLASSROOM PEDAGOGY IN NORTHERN UGANDA

by

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Abstract

The goal of achieving Universal Primary Education (UPE) has found resonance throughout Africa as governments embark on ambitious development agendas, and in Uganda specifically. Yet, arguably the fundamental prerequisite for attaining quality UPE, literacy, has had limited success: one in three Ugandans cannot read or write in any language. Illiteracy is especially acute in post-conflict Gulu, in the north, illustrative of how closely intertwined human security is to the ability to offer relevant, culturally appropriate and high quality education. Some argue that the poor progress on raising literacy levels is a consequence of education systems' disconnections from the cultures of their learners (Prah 2008), including quality multilingual education. The need to integrate the mother tongue into the classroom, including into second language learning is well established (Cummins 1981, 1993; 2000; Egbokhare 2004; Garcia, 2009). Identifying the best tools to accomplish this in African contexts, particularly where conflict is a factor, however, is much less well explored. This research seeks to understand how Gulu's primary teachers can use specific information communication technology (ICT) tools to support teachers who are struggling to teach the mother tongue with limited traditional literacy resources. It forms part of a larger project led by Dr. Bonny Norton, Dr. Maureen Kendrick and Dr. Margaret Early, to address language and literacy challenges in diverse African communities. In particular, this study serves as a response to the finding (Mutonyi & Norton, 2007) that ICTs offer untapped potential to raise learning outcomes.

Preface

This study forms one part of a larger project led by Dr. Bonny Norton and Dr. Maureen Kendrick, of the Department of Language and Literacy Education (LLED) at UBC. The purpose of this study was to address language and literacy challenges in diverse East African communities. The research took place at three teacher training colleges and six primary and secondary schools in Uganda. I was responsible for collecting data in the Gulu region.

This study has undergone an ethical review process at UBC, which was approved on December 7, 2007 by the UBC Behavioural Reasearch Ethics Board (Human Ethics Certificate # H07-01895 "Digital Literacy Project", expiring Sept. 29, 2012).

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List of Acronyms and Abbreviations

AJOL – African Journals Online
APTC – Acholiland Primary Teachers' College *(pseudonym)*
ASCII – American Standard Code for Information Interchange
AVU – African Virtual University
EFA – Dakar Education For All Commitments
ER – Educational Resource
ESA – Education Standards Agency
FOSS – Free and Open Source Software
ICC – International Criminal Court
ICT – Information Communication Technologies
ICT4D – Information Communication Technologies for Development
ICT4E – Information Communication Technologies for Education
IDP – Internally Displaced Person
ISP – Internet Service Provider
IT – Information Technology
L1 – First Language / Mother Tongue
L2 – Second Language
LRA – Lord's Resistance Army
MDG – Millenium Development Goal
MLEN – Uganda Multilingual Education Network
NGO – Non-Governmental Organization
NLS – New Literacy Studies
OER – Open Educational Resources
P1 – Primary Level 1
P2 – Primary Level 2
P3 – Primary Level 3
P4 – Primary Level 4
TESSA – Teacher Education for Sub-Saharan Africa
TPA – Teacher Preparation and Continuing Professional Development in Africa
TPACK – Technological Pedagogical Content Knowledge
UBC – University of British Columbia
USAID – United States Agency for International Development
UN – United Nations

Glossary

"Luo" and "Acholi" are used interchangeably to describe the most widespread language in northern Uganda. "Learner", "student" and "pupil" are also used interchangeably to refer to the children being taught by the participating teachers. The study participants are sometimes also referred to as "the teachers" or the "teacher participants". Participants are normally referred to by the first name only, and all names used are pseudonyms, including that of the teachers' college and the ICT lab manager.

An "ICT intervention" is generally used as a term describing any kind of project or effort to introduce ICT tools into a given setting, such as a training institution, school or organization. Often, it is used to describe a short-term project funded by an external donor, such as a foreign development agency or private foundation, as this is typically the form that such programs take in the Ugandan context.

"Web 2.0" is the term used to describe the new incarnation of the Internet, one that strives to be interactive and democratically organized. Examples of Web 2.0 functions include those that facilitate two-way communication, including online discussion, instant publishing, editing by consensus, and other characteristics of the new generation of websites and digital platforms.

Generally, "ICT navigation skills," "computer literacy" and "computer skills" are used in a limited sense to describe basic, mechanical competencies needed to access and use computers and software applications. Examples include being able to turn a computer on and off, use a keyboard, open a software program, transfer data, or locate a website. These terms are usually used to denote specific singular skills and are not intended to include broader digital literacies such as information literacy, critical media skills, or

multimodal literacy. The term "digital literacy" is generally used to refer to the broader range of intellectual skills and core competencies demanded to thrive in the unique information environment presented by ICTs, and which may differ significantly from the literacy demands of the pre-digital era (Gilster, 1997). Digital literacy is often pluralized to "digital literacies," in recognition of the multiple and varied competencies required to use ICT tools towards strategic ends (Snyder, 1999). As one example, it has been argued that digital media will mean more reliance on the visual over the textual (Snyder, 2002; Bezemer & Kress, 2010). The digital literacies approach derives from the view of literacy as a sociocultural practice (Gee, 1996; Street, 1984), by including the many forms of literacy that might be activated to meaningfully navigate digital media. This definition is captured by Gilster's (1997) assertion that digital literacy is a mindset rather than a skill or set of skills, and is ultimately about "mastering ideas, not keystrokes" (p. 15). A more detailed, and often cited, definition is offered by Martin (2005), and is the working definition for the current study:

> Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process (p. 136).

Finally, the following additional terms are used throughout the study, and their definitions in this context are described as follows.

- *L1:* refers to the first language learned and spoken.
- *L2:* refers to the second language learned and spoken.
- *Mother tongue:* first language and in the context of this study, usually an indigenous language of the area.
- *ICT:* information and communication technology, which refers to the use of technology to process information and facilitate communication.
- *Localization of technology:* software or hardware applications that have been adapted to meet the needs of a particular group, such as a linguistic group.

Other terms are defined within the text where they are first introduced.

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I am deeply grateful to the ten teachers who contributed to this study as research participants. These individuals have taught me more than I can ever account for, and I am forever indebted to them for their time, openness and good humour throughout the course of this study. Special mention is needed of the ICT Lab Manager at the teachers' college in the district of study for his unrelenting patience, support and valuable contributions in shaping the design and output of this research. He is an extraordinary asset to the teachers' college and to the community at large and I am confident he will continue to drive forward good planning around ICT4E in the district.

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Dedication

This thesis is dedicated

to all of the teachers of northern Uganda who served their country by making education available to the young during perilous and hostile circumstances, at great risk to themselves, and in particular, to those educators who perished during the civil war;

and,

to the north's current teachers

charged with the learning of the post-war generation,

and indeed, with some of the responsibility of making the present peace last.

CHAPTER 1:
Introduction

1.1 Introduction to the Study

Just shy of fifty years since independence, Uganda finds itself struggling to reconstitute its linguistic self, reconciling the pervasiveness and economic legacy of English with as many as 40 or more indigenous living languages. For over a decade, the rhetoric of the government towards local languages is one that is progressive and ambitious, and which purports to recognize and revitalize Ugandan native languages. Yet, tensions abound around the value and roles of widely spoken languages such as English, Luganda, and Swahili; and the possibilities and challenges presented by using local languages for purposes of education, entertainment, cultural vitalization, government, media and commerce. Reflecting on the emergence of this situation, more than two decades ago Abidi (1989) commented on the growing separation between language and culture, and its implications for Ugandans coming of age in a globally interlinked society where it was unclear whose needs the education system was addressing:

> In Uganda, we are passing through a stage where we read what others want us to read. The publishing industry is in ruins, printing facilities negligible, book trade in gloomy shape, yet writing talent in abundance—what a paradox. School children learn more about foreign countries than their own. They have no books in local languages. There is no institution working for the development of Uganda's local language publications. Schools have no priorities to teach local tradition and culture. In this situation, we are preparing our children to think in a foreign language (p. 47).

This study takes place against the backdrop of the tensions described above and how they vie with broader issues of identity, membership in a global community, and ownership over development and modernization processes. Evolving developments in language policy in education in Uganda make this a particularly opportune time to identify tangible tools and strategies that teachers can rely upon to prepare capable multilingual students (Aguti, 2002; Musamali, 2006; Mutonyi & Norton, 2007). The Government of Uganda has, over the last 20 years, embarked upon an ambitious approach towards recognizing and revitalizing many of its native languages (Government of Uganda, 1992), while also changing the language of instruction during the P1 to P3 years at the primary education level in rural areas from English to the local language spoken in a region. Further, the Government has adopted a Universal Primary Education policy, which has had a significant impact on the education system in that it raised enrollment levels without a corresponding increase in classrooms, teachers and school infrastructure. The Government also introduced universal secondary enrollment in 2007, which has led to rising enrollment at that level as well. Finally, the Government has demonstrated enthusiasm for harnessing the power of information communication technologies (ICTs) for education (Brock-Utne, 2002) in its policy discourse, if not in its actual service provision.

These various policies intersect in multiple ways at the sites of learning, far removed from the boardrooms and offices where they are designed. The Ugandan Government's announcement of free, universal primary education (UPE) brought unprecedented numbers of new pupils, drawn by the promise of free education, into classrooms that were already overburdened and under-funded. The education system,

contending with over-crowding and under-resourcing, remains severely strained years after the introduction of UPE. It is into this environment that the local language (L1) as medium of instruction policy has been implemented into primary schools, in 2007, though the policy was initially introduced in 1992. Like UPE, this new policy was also introduced in the absence of additional resources to facilitate its full realization, such as L1 textbooks, dictionaries, visual aides or teacher guides and thus makes the impact of the approach dubious at present (Aguti, 2002; Muslimi, 1999). This study considers innovative ways to address these challenges, drawing from the potential presented by information communication technologies (ICTs), which have emerged amidst a shifting approach to language of instruction in the Ugandan classroom.

Despite the challenges, UPE and the move to L1 instruction at the primary level also offer distinctive opportunities to make education in Uganda more relevant and more accessible to a greater number of learners. The policies are contributing to the development of curriculum that privileges bilingual education and which also takes advantage of local cultural resources. Uganda has also experimented with innovative literacy programs that emphasize use of the mother tongue and bilingual education, such as Break Through to Literacy (Letshabo, 2002), and hosts several national and foreign programs promoting the role of technology in education[1]. Some important efforts are therefore in place. What remains is to infuse the application of these policies with the necessary political and economic resources, and with the requisite social capital to ensure successful learning outcomes for students who currently attend school within a system

[1] For instance, see BOSCO (Battery Operated Systems for Community Outreach), an NGO operating in Gulu, or SchoolNet Uganda was an NGO founded in 1999 that worked to connect schools with hardware and software in order to help students develop computer proficiency and learn to communicate on the Internet.

that many Ugandans consider to be of marginal quality (TPA, 2010). A daunting challenge is the lack of local language teaching materials and reading material for students (Kisambira, 2007), as well as the tools that could facilitate the creation, spread and meaningful use of such materials, such as ICT-based tools. Muthwii and Kioko (2004) describe the consequences in such situations, throughout Africa:

> The dominant use of English in all school-books produces a people who say they cannot conceive of education in any other medium. In most cases, therefore, the children do not see the language of education at lower school operating in any other sector of life except in the home. Even in cases where efforts exist to implement the stated language policy, teachers in most communities find themselves unable to do so because they are hampered by a serious lack of instructional materials written in the mother tongue. As a result, the complementary relationship that should exist between the language of education and that of the pupils' wider socioeconomic context is lacking (p. 99).

Central to any endeavor to stimulate production and use of local language materials is the role of teachers therein and their capacity, motivation and power to negotiate what digital tools offer their professional practice, if, and when they are compatible with teaching in a local language. This reasoning informed the design of this study, which is the outcome of a collaboration with a group of teachers from northern Uganda drawn from three diverse schools in one district, who entered into a digital literacy experience and interacted with digital resources for the express purpose of generating educational content and lessons for use in primary classrooms where the

language of instruction from levels P1 to P3 is officially the locally predominant L1[2]. The participants, most of whom had little to no interaction with computers prior to the study, were trained in basic computer literacy skills, followed by training in applications targeted more specifically towards educators, such as online open educational resource (OER) collections. Thus they were introduced to computer hardware and software, and to documents they could generate using these tools. Throughout and following the training workshops, which took place over a period of three years, the teacher participants had ongoing access to computers to further develop their digital literacy and to the opportunity to create educational materials and pedagogical tools, as well as to expand their own repertoires of knowledge through access to new, interactive forms of information. The methodology is described in detail in Chapter Three. Several types of data were collected before, during and after the training workshops to elicit an understanding of the experience of the teachers in using ICT and in creating educational resources from ICT applications. Attention was paid to the modes in which teachers worked in a digital context (the creation of textual, oral, visual and mixed content), to the use of bilingualism in their materials, to peer collaboration strategies, and to dynamics between local and global identities as facilitated through the medium of ICT. The findings served to respond to the question of how primary teachers in Gulu, or similar multilingual African contexts, can use specific ICT tools to effectively teach the mother tongue in learning environments with limited traditional print literacy resources.

[2] In practice, the classrooms observed in this study more commonly relied often on English, used in conjunction with the L1. The reasons for this are described in Chapter Five.

1.2 Purpose of the Study

This research sought to better understand the possibilities presented by ICT tools in multilingual education in a region where unique challenges exist to raising literacy levels and making education relevant to both the local and global aspirations of learners. One of the challenges facing language education and literacy goals in Gulu, as in other parts of Uganda, is the lack of printed educational resources that can support teachers to prepare learners for success in a bilingual community. With dozens of languages spoken by relatively small communities of speakers, and insignificant resourcing support from the Government, Uganda's primary teachers struggle to teach indigenous languages with few formal print teaching materials, whether basic textbooks to maps, posters and visual material, readers, exercise books or other resources useful to the language classroom. Further, primary teachers who were trained to instruct in English have now been told to teach in another language, without being well supported to understand *how* to teach well in that language and what pedagogical tools might serve them in this new approach.

Such challenges, and the discovery of means to overcome them in locally relevant ways, need to be explored for meaningful change to occur in the education sector. It is likely that lasting solutions will be those that can successfully honour the desire to have a sense of belonging in both local and global communities, and that will prepare educators and learners with the skills and competencies requisite to participate in both kinds of communities. In particular, for ICT tools to serve language and literacy education in meaningful ways, relevance to the local and global identities of teachers and learners will need to be integrated into technology-based pedagogy. It is thus increasingly necessary to discover what strategies (and what kinds of literacy) might support such an integration.

To that end, this study's research question asks: How can ICTs be used by teachers to teach the mother tongue in post-conflict Gulu (northern Uganda), and ultimately to strengthen the pedagogical practice of local language medium teachers in this region?

This study examines ICT as a vehicle for content production in a bilingual learning context at the early primary level because of the persistent dearth of print literacy materials available to primary school teachers in the site of study. It recognizes the shift to digital literacies and their expanding, if uneven, role in learning throughout the world. In particular, this study responds to the finding of Mutonyi and Norton (2007) that ICTs offer untapped potential to raise learning outcomes in Uganda, and draws from a variety of literature identifying important, but often unexplored, roles for digital literacy in promoting multilingualism (Cummins, Brown & Sayers, 2007).

1.3 Expected Outcomes

This study has sought to identify findings from Uganda as the site of research that will contribute to emerging global theory and practice around developing teachers' digital literacies in multilingual societies.

Theoretically, this study seeks to focus on what might be learned from supporting teachers to create, use and share original materials in the mother tongue, with an emphasis on the role of teachers' motivations and practices in the process of digital content creation. A study drawing on data from Uganda can add findings drawn from an African context to the scholarship on digital literacies and multilingualism. This can assist in diversifying the representation, in international theoretical understandings

shaping these fields of study, by for example, documenting how issues of identity, language, and learning manifest in this particular setting.

The findings, as part of a larger research project on digital literacies and teachers in Uganda undertaken by faculty and students in the Department of Language and Literacy Education at the University of British Columbia (UBC)[3], can also be used in setting future research priorities for this ongoing initiative, building on the findings from the Gulu component of the study. Therefore, this study seeks to link to the results of regionally and internationally focused networks of research, complementing other findings and expanding shared understandings.

In terms of practice, the study contributes to identifying effective ways of integrating technology into pedagogy, teacher content knowledge, and teachers' content creation. Through the partnership with the teachers' college that participated in the study, experience drawn from the research process contributed to the College at a time when the College was determining how and whether to further invest in the ICT training program for pre-service teachers that had been established as part of a project funded by the United States Agency for International Development (USAID). Specifically, the training workshops around which the study was structured were designed and carried out in collaboration with the College's ICT Lab Manager, so that he would be able to use resultant findings and tools (such as the training curriculum and handouts developed) in his ongoing training activities at the college. The involvement of the teachers' college was intended to support local innovation in using ICT to address bilingual learning objectives in Gulu, amidst the new education and language policies for the primary

[3] Global learning networks (a project led by Dr. Maureen Kendrick, Dr. Bonny Norton, and Dr. Margaret Early); and Digital literacy in teacher education (a project led by Dr Bonny Norton and Dr Maureen Kendrick).

education sector. The pedagogical tools that emerged from this study and the physical hardware procured remained in the community at the completion of the study. Participants gained new skills and ideas that will hopefully continue to contribute to their professional development and to their teaching practice beyond the scope of the study.

Finally, it is anticipated that this study has added to the repertoire of lessons learned in ICT for education (ICT4E) in developing countries, and ideally, contributed recommendations specific to language and literacy learning within ICT4E (see Chapter Eight).

1.4 Situating the Study

English has now been a part of the language landscape in Uganda for over a century and a half. Associated with prestige, education, and access to political power, it is part of the social identity of many Ugandans who consider themselves part of the national elite. English also contributes to an imagined community of Ugandans striving to be "educated persons and citizens of the world" (Bernsten, 1998, p.104) and is associated with a Uganda seeking to open itself up to the world, taking part in global networks of commerce, culture and power. This situation is echoed in much of the African continent, with its roots lying in the colonial experience, where, as Muthwii and Kioko (2003) describe it,

> usually, the kind of education offered to Africans was one to prepare them for bluecollar jobs, and thus the local indigenous languages were used as media of instruction. This created a yearning for the language of the master, the language that gave access to white-collar jobs, European thought and other privileges" (p.

98).

The Ugandan Government has also opted to settle with English as a necessarily unifying force for a country made up of a plethora of languages, after having considered alternative national languages such as Luganda[4].

What, then, is the value of policies that insist on mother tongue literacy in the first three years of primary school in rural regions of the country, at the same time that Ugandans seek to entrench the status of English in the country? Many studies have convincingly demonstrated that students will learn better in a second language and in other subjects when they are also proficient in their mother tongue, including through school-based instruction (Cummins 1981; Klaus, 2003; Mehrotra, 1998; Obondo, 2007; and Williams, 1996), and this evidence from the research is reflected in the language of instruction policies of a growing number of African states which are introducing bilingual instruction and seeking an increased emphasis on the mother tongue (Albaugh, 2007).

Further, the arguments around linguistic competencies and language performance are also linked to larger issues of identity and autonomy within an increasingly interconnected world. This is also a world where sharp economic differences divide nations, and also sometimes run along linguistic borderlines. In such an environment, communication and language are about the ability to access the global conversation that shifts and shapes those borders. The metaphor of the global conversation is taken up in this study to refer to communicative interactions through information technology (primarily on the web) where listening and speaking takes place in a process which ultimately yields the kind of atmosphere, content and discourses which characterize the

[4] Swahili was re-added as a second official national language in 2005 at the behest of the Ugandan parliament.

information age. It is a site where speakers have the opportunity to influence the thinking of others, gain recognition, establish identity and participate in dialogue, as well as a site where listeners have access to a limitless bank of the source material for knowledge, that is, information. Thus access to this conversation, or lack thereof, is of great consequence.

Africa is largely missing from the linguistic constitution of the information highway. In one estimate, only 3% of content on the Internet originates from the African continent (Adegbola & Dada, 2003). It is perhaps then no surprise that one prediction claims that in the next 50 to 100 years, 90% of African languages will become extinct (Egbokhare, 2004). Should events transpire this way, there will undoubtedly be consequences from the resultant losses in linguistic heterogeneity. This is not to say that the continued growth of English speakers globally is a uniquely destructive force or that Africans cannot participate in the global conversation through the medium of English (and many of them do), but rather, that there is *value-added* in the contributions to that conversation that come in the form of African languages and worldviews. The co-existence of African languages with those languages that are more dominant online today can diversify the representation of digital information just as it can provide for more meaningful and relevant means of participation from Africans in the great global conversation impacting our collective social, political and economic futures.

Globalization ushered in, alongside the enthusiasm for the erosion of many kinds of barriers, eerie warnings of the divide that would result from the exclusion of some of the world's cultures from the information revolution, an exclusion that is facilitated by language barriers. Some point to the tensions, and presumably the consequent dangers which might arise from increasing divides and cultural clashes stemming from the West's

digital dominance (Keniston, 2001). At this maturing stage in the proliferation of digital information, it is increasingly critical to determine where there might still be opportunity to realize the original grand vision of a global, free, democratic forum where the presence of a diversity of languages and of cultural perspectives pave the way for what Ess, Sudweeks and Herring (1999) have called creative interferences. How can we move from alienation to integration and engagement, and from there, towards the meaningful participation of linguistic minorities in the information society? More specifically, how can indigenous African languages, and the worldviews and knowledge systems they carry within them, be vehicles for leaving the unique imprint of African voices and ideas in the digital world, as well as allowing Africans the right to hear what others are saying through the medium of ICT?

These problems are inherently linked to the new literacies, and to the role of education systems in either facilitating or undermining African access to these conversations. Researchers focused on multilingualism in education in Africa have embraced indigenous languages as sites of power and possibility, which can counteract some of the subjugation imposed by language loss, when strategically addressed (for instance, see Finlayson & Slabbert, 2004; or Kishe, 2004). This emerging approach has started to unpack some of the linkages between local language proficiency, the *right* to communicate in one's local language, to access media in the vernacular, and to participate in the production of texts in one's own language, a process and contribution to the 'global conversation' inherently tied to notions of agency and identity.

The New Literacy Studies posits that literacies are laden with ideology as well as rooted in culture (Barton, 2007; Gee, 1991; Heath, 1982; Kramsch, 1995; and, 1993;

Street, 2003). Context matters enormously, as does the learner's access to sites and structures of power. So while English does not necessarily threaten the survival of the local language (Bisong, 1995; Wallace, 2002), a detrimental dichotomization can nonetheless occur between worlds of 'primary socialization' (mother tongue spoken at home, with family, in the community) and worlds of 'secondary socialization' (such as school), when the local language is relegated to the household and/or community and English is the language for school, discreetly discrediting the indigenous language and favouring English or another dominant language as the serious, "real" language wherein education, scientific discovery and technological development takes place (Gee, 2001; Heath, 1986). This discrediting is often implicit, but erects fault lines that prevent African ownership over development processes, and limits the possibilities for how African languages can be used to achieve learning objectives in locally meaningful ways. As classrooms now taught in the L1 still face hurdles in reconciling the uses of a colonial language and an indigenous language, it would be timely to examine those practices that best support the learning needs of primary school pupils, and which allow them to embrace the identity they seek to build for themselves and for their communities. This may require approaches to teaching that put indigenous languages on equal footing with English in terms of their compatibility with formal classroom learning. ICTs could play a role in addressing this, if ICTs can find better compatibility with local languages.

Further, there are important arguments to consider with regards to the consequences of language loss and the responsibilities of states and communities to prevent language loss. Others have made powerful arguments in support of the need to prioritize the maintenance of language diversity (Abley, 2003; Batibo, 2005; Dalby,

2003; and Omoniyi, 2003). Access to resources and learning in one's language does not merely allow people to learn for purposes of functionality. English influences and shapes indigenous languages (Wallace, 2002), but indigenous languages also influence and shape English (Crystal, 2003). There is thus enrichment to be gained from enabling the active and versatile use of two or more languages in different spheres. The classroom, as one sphere in particular, is a critical starting point in countering language loss, serving as a pivotal site in terms of its potential capacity to legitimate and expand use of the local language beyond the world of primary socialization.

As part of any such process, it will be important to assess the values and attitudes associated with local language instruction and how these interact with the values associated with learning English. Can desires to be part of a global community (and to access the economic and political resources associated therewith) be reconciled with the desire to remain firmly rooted within a community's culture and traditions? A fuller study assessing the values, opinions and wishes of Ugandans in determining the applications of their indigenous languages could, in the future, be undertaken using Allard and Landry's (1992) model for measuring ethnolinguistic vitality. As stakeholders in the futures of their languages, teachers, learners, parents, community leaders and Ministries of Education, among others, should be consulted in the development of any new or revised language policy for primary schools and in the development of appropriate learning resources in local languages. As Bernsten explains, in this model,

> The effects of social, socio-psychological and psychological variables are considered in determining individuals' beliefs about languages in their speech community. The analysis includes measuring the demographic, political,

> economic and cultural capital of each ethnolinguistic group. This model should prove useful in analyzing attitudes and strengths of languages in very complex speech communities such as Uganda's *(*1998, p.105).

The broader region has much to offer Uganda in terms of precedents to draw upon. South Africa, which has 11 official languages, has its national curricula available in each official language, though continues to face the challenge of a system still dominated by English and Afrikaans, within a multilayered linguistic school environment. In Tanzania, the Kiswahili Linux Localization Project (klnX) is an open source software project started by the Department of Computer Science (DoCS) of the Tanzanian government in collaboration with staff from the Institute of Kiswahili Research (IKR) and College of Engineering and Technology (COET). The creation of open source, free software in Kiswahili makes it possible for anyone to create their own work, templates, websites and other digital resources in Kiswahili, as well as to search easily for any existing Kiswahili resources on-line, thus making ICTs compatible with an indigenous African language. Localization initiatives like this are a starting point in the creation of tools and on-line communities of practice within which educators and curriculum designers can develop local language resources.

Perhaps Uganda's richest potential resource is the interest of many Ugandan communities in the revitalization and preservation of their indigenous languages. The Ministry of Education might benefit from working more closely with the various speech communities to develop optimal learning environments for mother tongue instruction.

This study seeks to make a modest contribution towards a better understanding of what approaches may hold the potential to create such environments. Specifically, it seeks to understand how ICT, as a vehicle for mother tongue text production, can open new doors for learning and teaching in the mother tongue.

1.5 Assumptions

Several broad assumptions underpinned this study, drawn from the theoretical framework applied to the research and from my practice and experience as a researcher and as a practitioner in education design in developing countries. The main assumptions underpinning the study were as follows:

- Language loss is harmful to the pursuit of knowledge and enlightenment.

Language diversity is valuable to cultural health in the same way that ecological diversity contributes to environmental sustainability. In international development discourse, there is little recognition that languages themselves, like ICTs, are vehicles to knowledge, and not simply neutral modes for communicating for development objectives. Kramsch (1993; 1995; 2009) has offered that language learning is a type of "third space" and that meaning in language learning is nurtured through contextual connections. An indigenous African language offers new opportunities for the generation of creativity, ideas, conceptualizations, cultural perspectives and local philosophies. ICTs are a means to open new channels for this knowledge-through-language for native speakers, as well as to expose other linguistic and cultural groups to diverse, valuable forms of local knowledge that may open new intellectual windows. Osborn (2006) points out that the rapidly increasing dominance and prevalence of ICTs, without a corresponding inclusion

of African languages, further endangers those languages and puts at risk the social identities of their speakers. Language is both a mode of expression for culture as well as an embodiment of culture, with some arguing that culture is the currency for development: "colonisation was about physical spaces such as land, natural and mineral resources while globalisation is about logical spaces such as cultural resources" (Adegbola & Dada, 2003, p. 7). Local languages, vast repositories of culture, preserve and strengthen cultural vitality that in turn may serve as a tool for viable, sustainable development relevant to the local community in question. Language scholars in Africa point out that using Africa's cultural capital for development demands a role for African languages, including in the digitalized world:

> in conjunction with a true rehabilitation of local knowledge mediated through local language, local language ICT competence will be one of the main factors in setting up a catalogue of indicators of communicative sustainability. … It will provide new insights into communicative roles and their significance for transfer of innovative concepts and activation of local knowledge through local language resources (Bearth, 2003, p. 3).

The idea that languages contain knowledge in and of themselves (as opposed to only serving as a vehicle for knowledge) is the hinge connecting the use of mother tongue to the pursuit of development objectives. In Mark Abley's survey of several endangered languages across the globe, ranging from Micmac in Canada to Maori in New Zealand and Gaelic in Ireland, he found the common reason why value was consistently found in saving small, obscure languages to be "the endurance of dozens, hundreds, thousands of

subtly different notions of truth" (2003, p. 277). This has been variably said in other ways: languages contain ideas, philosophies, heritage, metaphors, stories, worldviews, or histories; and that ethnolinguistic diversity has "the benefit of pan-human creativity, problem-solving and mutual cross-cultural acceptance" (Fishman, 1982, p. 1). Considering the African context, Egbokhare describes the connection between language and development as lying in "the function of language as a means of communication, a vehicle of culture and a documentary of folk wisdom" (2004, p. 4).

- Bilingualism and multilingualism are learning assets.

A growing body of literature supports that learning in a foreign language can impose limitations on educational performance when done in isolation from the mother tongue (Cummins, 1981; Egbokhare, 2004; Klaus 2003; Mehrotra, 1998; Obondo, 2007; Williams, 1996) and sociolinguists are increasingly turning towards multilingualism as an asset in educational development (Bialystock, 2001; Cummins, 2001; Goldenberg, 2008; Hornberger, 1995; Kembo-Sure, 2002; Martin-Jones & Jones, 2000). Nevertheless, there is still a persistent and ultimately validated association in many African communities with European languages to economic and educational opportunity. In the Ugandan context, parents and communities are largely unconvinced that the mother tongue as the language of instruction is the best approach for their children and continue to place emphasis on English or regional languages as offering more opportunity for advancement (Tembe & Norton, 2008). Looking at the African continent at large, Heugh notes that "while communities in Africa readily add to their informal multilingual repertoires,

postcolonial language policies often reflect a tension between the use of indigenous languages and the language/s of colonial rule" (2008, p. 355).

These perceptions and associations are not unfounded. Besides a lack of motivation attributed to the upward mobility English often represents in a globalizing world, there is also a lack of motivation on the part of information producers when it comes to small languages. Literacy rates are low in most small African languages, and therefore it is argued to be pointless to produce information that few people can read (Osborn, 2006). Yet it is this very perception that keeps indigenous African languages irrelevant. It has failed to be recognized that a lack of African content on-line and in print is both a symptom and a cause of the problem. If Africans have material to engage with that is linguistically and culturally relevant to them, there is a better chance that ICT resources can be effectively mobilized as tools for locally relevant literacy and learning.

- Culture plays a fundamental role in learning.

This assumption is premised on the argument that part of the absence of African voices in digital media is cultural irrelevance, local inappropriateness, and lack of mother tongue content of immediate value to users. Development *with* or through the mother tongue is not yet part of the vision of the development machine, and is rarely reflected in ICT policy or practice; though advocates of mother tongue for development such as Prah (2001) have argued for more emphasis on language and culture in development design. Similarly, Kramsch (1995, 2010) sees the ways in which language hinges upon its cultural environment as fundamental to the empowerment role that culture plays in language appropriation.

Visual materials that reflect local culture are relatively un-examined, yet may yield potentially useful applications. Such approaches transferred to ICT-based applications may help build a bridge to traditional African media modes, such as the oral forms commonly used in Uganda (Mushengyezi, 2003). Peacock (1995) found that bilingual learners in early stages of learning a second language (L2) are best served by textbooks which include visuals, language supportive tasks and other techniques which make the content comprehensible, yet African textbooks are rarely designed as such (Clegg, 2007). ICT platforms seeking to promote literacy in Africa may demand looking beyond text-based and language modes, towards the diverse modes imbedded in local cultural contexts.

Finding ways to interweave traditional forms of communication and information dissemination with new forms is instrumental in making successful transitions towards using ICTs for rehabilitating mother tongues. Education researchers have noted the often sharp divides between literacy practices expected in school and literacy practices out of school, which inherently influence each other (Heath, 1982; Hull & Schultz, 2002). The way in which language is used to bridge the various worlds that students occupy is a key determinant to the success of their learning. Kendrick, Jones, Mutonyi and Norton (2006) have called for new pedagogical tools and practices that integrate the multimodal practices common in Ugandan communities into the classroom, helping to utilize culturally specific multimodal tools in the service of learning and for meaningful, context-specific communication.

Responding to their findings looking at science knowledge among South African students speaking English as their second language, Fakudze and Rollnick (2008) believe

that positive emphasis and support on all of the linguistic tools at a student's disposal is to their advantage in successfully navigating learning in both the home and school worlds. Too often, however, the perception of English as the only path to participation in the global economy and information society means parents will let cultural attachments and mother tongues go in favour of giving their children a better chance at a prosperous future (Banda, 2003; Tembe & Norton, 2008). Giving relevance to local languages and finding ways of making ICTs compatible with the mother tongue will mean students can retain their culture and language without compromising on their globally-oriented ambitions. The expanded use of image relative to text, as well as other modes in the presentation of educational information in digital media (Bezemer & Kress, 2008) may afford new opportunities in African contexts to integrate locally meaningful content, such as by including images of locally recognizable figures or culturally relevant symbols and patterns. Banda (2003) has called for a "pedagogy of multiliteracies," where everyday literacy practices are used towards gaining the kinds of literacies perceived to bring about formal educational success, reinforcing the call made in the work of the New London Group (1996).

- Violent conflict impacts education and teaching.

The experience of a prolonged violent conflict leaves its residue on the education sector in a number of ways, which create a plethora of challenges, shaping the kind of learning environment children enter when they start school in the primary years. Many educated people may have fled during the conflict, leaving a dearth of human capital, including trained educators. Teachers and school administrators may have survived

traumatic events and live with any one of a variety of forms of resultant mental strain from anxiety disorders, chronic depression or post-traumatic stress disorder. School infrastructure may have been destroyed or damaged during the war. The location may have been inaccessible for periods, preventing the delivery of educational materials such as textbooks. The social fabric of communities is strained during conflicts with networks of support disappearing and distrust prevailing. Students may have difficulty concentrating in class if they have witnessed violence, lost a loved one, or live amidst economic insecurity at home. Donor governments and agencies may have been unwilling to invest in a vulnerable region, prioritizing programming to other regions instead, creating further inequity and disadvantage compared to other regions. These are only a few of the possible impacts of violent conflict on an education system.

While documenting the impact of these conditions is not an objective of this study, it is important to acknowledge the context in which data were collected and to note that human experiences of violent conflict are long-lasting and manifested in a variety of ways, years and even decades following the cessation of hostilities. For example, the teachers' college in this study was for many years effectively inoperable because of the conflict, and many research participants are survivors of abduction by the Lord's Resistance Army. Such experiences characterize this particular research site, and the lives of research participants, in unique ways.

Yet, just as war erodes education, education can also be used to prevent future conflict. The relationship between language and cultural expression, development, information and technology may hold particular value for changing the status quo in African communities chronically affected by violent conflict. Increasingly, research in

conflict and post-conflict societies is affirming the essential role of education in both preventing future conflict and in rebuilding from past conflict (Buckland, 2005). In particular, the use of ICTs to produce local language content in conflict-affected areas may hold potential for empowerment through cultural expression, strengthening of indigenous forms of education, and reinforcing the human right to access and use literacy in one's own language, among other benefits, all of which can play positive roles in preventing the outbreak of conflicts and in building social cohesion.

1.6 Significance

As ICTs emerge as potentially powerful tools to facilitate literacy and language education, *how* they are used will ultimately determine their success in African contexts. The degree to which local cultural content is integrated, and the formats used will have bearings on take-up, accessibility and impact. Further, *who* is empowered to use the tools, to what degree the various stakeholders interpret the purpose and validity of ICT tools, the circumstances in which teachers acquire digital literacy skills, and the availability of resources to meaningfully apply what ICT can generate in their classrooms are just some of the critical issues demanding deeper and context-specific analysis. It will thus be imperative to draw upon findings from the emerging studies of the new literacies (Lankshear & Knobel, 2003; Leu, Coiro, Knobel & Lankshear, 2008) and specifically on what they can tell us about the social practices of digital literacy, multiliteracies and multimodalities, in order to identify creative means of moving forward. This study has also sought to draw upon research that support the premise that multilingual education is an opportunity to improve the quality of education. Finally, this project is timely in light

of the need for further research assessing the application of digital tools for literacy and language education in the developing world (Snyder & Prinsloo, 2007). The study therefore seeks to contribute theoretical and practical findings for the use of ICT for mother tongue teaching and learning, of value to language education and literacy research focused on Africa.

1.7 Organization of the Study

This study is organized into eight chapters. Chapter One introduces the study, formulating the purpose of the study, expected outcomes, hypothesis, significance, and assumptions. It sets the stage by providing the rationale behind this topic and articulating the central problem under examination. Chapter Two reviews the literature informing this study, focusing on contemporary research in digital literacy as well as research that considers the links between ICT and mother tongue languages. Relevant recent literature on bilingualism and multilingualism focused on African contexts is included, emphasizing the perspective of multilingualism as an asset in language education. Chapter Two also identifies gaps in the literature and considers the expected contribution of this study.

Chapter Three describes the study's methodological framework, provides a justification for use of a qualitative case study, and introduces the participants, procedures, data collection, instrumentation and approach to data analysis. Chapter Four provides ethnographic information on the three focal participants, as well as general data on all participants. It also presents the study's context, looking at the language and education policy context, the transition to a post-conflict society, and at ICT's integration

into the educational system. The main research findings are then presented and described in Chapters Five and Six, organized according to major themes that emerged from the data. Chapter Five examines the teaching and learning environment in which ICT interventions occur among primary teachers in Gulu, examining how resources entering this particular setting react with their surrounding environment. Chapter Six presents findings that speak to the relevance, value and sustainability of ICT for education initiatives for teachers in Gulu or similar environments, focusing on what the teacher participants perceived to be the values (actual and potential) of ICT for learning and teaching.

Chapter Seven analyzes the results described in the previous two chapters, discussing their theoretical implications and their implications for the development of language education practices and policies in Gulu, with particular attention to the potential uses of ICT in teacher training in multilingual African contexts. Four major themes are discussed: (1) ICT, agency and teacher identity; (2) machine-centric ICT intervention; (3) multimodality, digital literacy and the notion of investment; and, (4) intersections between language, technology, pedagogy and content. Chapter Eight concludes with recommendations directed at the research community, education policy-makers and those engaged in designing ICT4E curricula for multilingual African contexts. There are five areas of recommendations, including multilingual content creation; localization; the notion of local stewardship over ICT resources; the need to create viable ICT learning environments for ICT, and consideration of issues related to educators and ICT in the social world. The chapter also contains a section with suggested directions for future research.

CHAPTER 2:
Literature Review

2.1 Introduction: Literature Review

Africa is endowed with overwhelming linguistic diversity, a wealthy resource for generating knowledge in the plethora of worldviews, philosophies, histories and cultural tools imbedded in this language cornucopia. Yet governments' use of African languages in the classroom has been a confusion of policy and practice, with only a minority of African states yielding any meaningful early results in using local languages in the service of learning. Consequently, African languages have largely been immobilized in terms of serving political, social and economic development ambitions. At the same time, the colonial legacies left in the form of the widespread use of European languages in Africa also do not appear to be significant catalysts for the growth of viable education systems. Muthwii and Kioko (2003) note that "the issue of school dropout is closely associated with that of language of instruction," (p. 101) and conclude from the dismal data on drop-out and failure rates from public schools in Africa that "it is not far-fetched to argue that many drop-outs can neither read meaningfully in an international language nor in their mother tongue" (p. 102).

The second Millenium Development Goal is to "ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling," but for Africa, based on recent projections, it appears that the best case scenario will be achieving 68.3% primary school enrollment by 2015 (UN, 2005), well below the original target of 100% by that year. Further, there are significant concerns throughout Africa over the quality of education in schools that are facing rapidly

mounting enrollment rates without the requisite investments in enhancing teaching, school infrastructure, learning materials and curriculum. These challenges remain in sharp relief in Uganda today (Ward, Penny & Read, 2006).

Yet, Africa is also at a turning point. Language and literacy research concerning the region is increasingly exploring the strengths that multilingualism brings to learning outcomes (Ajiboye, 2002; Bamgbose, 2000; and Brock-Utne, 2002), and from there, turning to the study and assessment of new strategies for better integrating African languages into modern classrooms. Non-governmental organizations, academic institutions and software companies are testing out projects, producing local language materials and using ICT as a means to facilitate new forms of communication in indigenous languages, such as the Kamusi Project, an online Swahili dictionary, or Kasahorow, a project focusing on developing technical standards for African languages. New and old institutions are giving a heightened place to African languages in their search for better language and education policies for the continent, such as the African Academy of Languages or the more recently established Language Technologies for African Languages, and the African Languages Technology Initiative. African scholars such as Kwesi Kwaa Prah are challenging long-established systems of classifying languages which they see instead as closely related dialects, and Uganda recently experimented with unifying three such dialects into a single regional language.

How African languages intersect with new technologies is a largely untended field, yet one rich with possibilities in light of a growing body of efforts showing how ICT can be manipulated to serve bilingual learning outcomes, as well as how technology can be adapted for users from non-dominant language groups through software and

hardware localization. Access to ICT resources, however, remains the primary challenge, including access to technological infrastructure, training, and appropriate applications for different African communities and institutions. Stemming from the latter is the need to find ways of engaging with teachers and communities in ways that allow for the meaningful and relevant use of technology within both their current language policy and practice, and with their communities' ambitions for different kinds of literacies relevant to their cultural, social, political and economic aspirations. As Braga (2007) asserts, "accepting the fact that what makes technologies good or bad is the use that social communities make of them, it is important to move beyond reproductive and deterministic positions and inquire how the power of digital technologies can be critically exploited to promote more progressive ends*"* (p. 183). Further, creating an enabling environment for technological innovation *within* Africa may do much to stimulate the integration of local languages with technology, as opposed to using 'imported' software and hardware created in foreign languages.

Research and practice in digital literacy is a field exploding with new literature, while advances and innovations in ICTs continue to be introduced faster than the academic community can keep pace with studying their impacts on our culture, economies, political systems, and society. A rich array of literature has been generated since the advent of the Internet and the introduction of technology-mediated teaching and learning in classrooms around the world. This literature is, however, more nascent for the field in sub-Saharan Africa, and there is even less data available from conflict-affected countries in Africa due to a lack of access on account of security risks, disengagement from these areas, and other factors. Nevertheless, there is a growing community of

education researchers at work contributing to a better understanding of how technology can be applied in the classroom in Africa and towards Africa's development more broadly (such as Evoh, 2007; Isaacs, 2005; Kawooya, 2004; Ngugi et al, 2007; Okidi Lating, 2006; Parkinson, 2005; Pasch, 2005; and Unwin, 2005). Experimentations in the field are also making early contributions to our understanding of the potential impact of ICT on education, through small pilot projects in some communities, such as UConnect's work in Uganda, and national and even continental school digital literacy programs in the development or early implementation stages, such as the New Partnership for Africa's Development (NEPAD) e-Schools initiative, launched in 2005.

This chapter reviews recent research informing the scholarly discourse on digital literacy, and in the second section, reviews some of the theory and literature on L1 and ICT. The research drawn from these two emerging fields is not exhaustive, but is that which is of greatest relevance to this study's research question. Each section also briefly reviews gaps in the current body of research and provides recommended areas for further study, which have influenced the direction of this study.

2.2 Theory and Research: Digital Literacies

'Digital literacy' is a young term, challenging the conventional use of 'literacy' as a process associated only with the written word in print. The introduction of the term is reflective of the increasing pervasiveness of digital media and ICT in our everyday lives and its necessity for work, school and other domains, and also implies that those lacking proficiency in using digital media are at a disadvantage, in its reverse association to a form of *illiteracy*. The study of digital literacy cuts across disciplines, and discussions of

the concept can be found in the domains of information sciences, development studies, sociology, education, communication studies and applied linguistics. A useful overview of the evolution of digital literacy is Dobson and Willinksy's (2009), which begins with the advent of electronic word processing to the introduction of the Internet and hypertext (or hypermedia), and finally to what the authors call the "emergence of a networked information economy" (p.287). Their review is oriented around "the implications of digital technologies for human engagement with the written word" (2009, p.291), and in their chronology of the rise of digital media, they put forward the evidence for any impact on literacy processes within each new stage of the digital revolution, calling particular attention towards the democratizing and educational potential of digital media and literacy.

This section will focus primarily on reviewing the notion of digital literacy as part of the paradigm of the New Literacy Studies within language and literacy studies.

The New Literacy Studies (NLS) represents an approach to the study and understanding of literacy as more than a skill-set for reading and writing text, but rather as a set of broader, complex social practices, and recognizes many different kinds of 'literacies'. NLS is a critical approach, which attempts to challenge traditional understandings of literacy (the 'autonomous model') and to shed light on practices normally not credited as literacies or necessarily as valued literacies. It further distinguishes between literacy events and literacy practices (Street, 1988), and views all thought as socially constructed. Social practices used in literacy shape what defines literacy in different contexts (Barton, 2007). Considering the advent of the digital age, Brown and Duguid (2000) call for a similar argument to be applied to digital media and

digital literacy, recognizing that it is social practices that shape and define what is done with the interpretation and use of information and digital literacy practices:

> The ends of information, after all, are human ends. The logic of information must ultimately be the logic of humanity. For all information's independence and extent, it is people, in their communities, organizations, and institutions, who ultimately decide what it all means and why it matters (p. 18).

The term 'New Literacy Studies' came to be coined by Gee (1991) and Street (1996). The work of Street in particular (2005, 2003) has been foundational to conceiving of literacy as a social practice, whereby literacy incidents, events and development are driven by where a learner is situated culturally, socially, economically and linguistically. The work of the New London Group (NLG) has taken this foundational notion to further develop a theory of multiliteracies, which they argue is needed in part for learners to effectively negotiate the multiple languages and cultural environments they will interact with in learning literacy/ies (1996). Studies into new forms of literacy, including digital literacy, are finding their roots in this social view of literacy as practice and process, as opposed to a skill or set of skills. Cope and Kalantzis (2000) began early on to lead the approach into an examination of digital literacy, suggesting that literacy practices must be broadened beyond the printed page, if learners are to successfully participate and contribute to the economic, social, political and cultural world around them. They also contend that the playing field must be widened to include a multiplicity of languages and cultures, to the benefit of all. Part of the NLG manifesto focuses on the need to better understand the potential interplay between the visual and written word in multimedia

formats to facilitate new ways of learning adapted to the needs of working in an ill-understood and ever-evolving technology-dependent era (2000). This and work that followed, such as the seminal International Multiliteracies Project (New London Group, 1996), called for a diversification of the global repertory of knowledge in terms of cultural (and linguistic) variety, and by a better understanding of new, multiple and mixed modes of expression—also known as multimodalities (e.g., see Kress, 2000).

As an introduction to some of the new digital-based literacies and how one goes about researching them and integrating them into the classroom, Leu, Coiro, Knobel and Lankshear (2008) provide a useful overview in several articles, exploring new forms of communication ranging from the trend of blogging, to manga art, to chat rooms in the seminal *Handbook of Research on New Literacies*. Other introductory works include those of Gilster (1997) and the work of Lankshear and Knobel (2003).

Many watching the ways in which new technologies are unfolding within the educational landscape are concerned with the relationship between language, social practice and power. The NLS propose closer examination of how literacy and digital literacies interact within the broader social worlds of learners, seeing literacy practices as not individual skill sets or competencies but rather as imbedded in other processes and in the environment in which they are practiced, as argued by Warschauer (2006). Critical literacy has meant approaching literacy, including digital literacies, as a practice of production, rather than only of the consumption of information (Knobel & Lankshear, 2002) and the approach calls for reading and writing to be examined as a meaningful practice bound up in ways of being in the world. Much of the recent research has emphasized the role of literacy in meaning-making for learners and in linking the local to

the global (Koutsogiannis, 2007). As Snyder (2007) points out, digital practices happen in "differentiated, situated and enculturated ways" (p. 173) with the implication that literacy goes beyond the mere acquisition of a script, with learners needing to learn how to apply the learning in specific purposes and for specific uses (Scribner & Cole, 1981) relevant to the lives they lead.

Related to context are issues of identity and their relationship to the conditions that either help or hinder an individual's learning and their connection to the social world (Norton, 2000). Identity shapes the experience of language learning, and identity is constantly being negotiated and constructed, and sometimes resisted. Norton's (2000; 2001) notion of imagined identities, drawn from her research in diverse language learning contexts, is one where learners can project a future vision of themselves and of their country in relation to others, beyond their present circumstances. Their engagement is an investment in a desired future scenario, at the heart of which lies a sense of identity that will be formed according to membership in the imagined community, and which has bearing on the ways in which learners engage with language and literacy in given cultural contexts. These ideas transfer similarly to literacy learning and engagement via digital media.

At its extremity, critical literacy theory has called upon the work of Foucault (1970), Freire (1970) and Bourdieu (1977), among others, to challenge the very structure of the educational environments in which digital literacy learning takes place. For instance, Janks (2000) questions whether "providing students with access to dominant forms is a way of maintaining the dominance of these forms" but also acknowledges the problem that "denying access to such dominant language uses is also a way of

perpetuating the marginalization of some students" (p. 185). Janks has influenced other research in considering how design may facilitate the realization of critical literacy education based on a sociocultural theory of language (2000).

Branching off from critical literacy, the NLS, led by Street (1984, 2005), Barton (1994) and Gee (1996, 2003), among others, has also steered much research towards an emphasis on interaction and social practice as the foci of study, in place of the individual; or, in other words, away from viewing the individual as the site of the 'problem' to be studied. NLS has built upon and incorporated earlier movements including conversational analysis, interactional sociolinguistics, sociohistorical psychology, situated cognition, cultural models theory, and cognitive linguistics, among others. The NLS also emphasizes context, situatedness and the identity of the learner as key determinants of learning success.

Several recent case studies have helped demonstrate the validity of approaching digital literacies from the NLS perspective. Facing the tensions inherent in the 'digital divide', researchers like Snyder (2007) are asking how we might engage young people who are not at the core of the dynamics of the globalized world, with new media in educational settings (p. 172). Others, like Braga (2007) looking at Brazil, Walton (2007) in South Africa, Koutsogiannis and Mitskikopoulou (2007) in Greece, Bulfin and North (2007) in Australia, and Mutonyi and Norton (2007) in Uganda, have taken up the question by looking at the various applications of technology in marginalized communities throughout the developing and developed worlds. These are important inroads in taking some of the theory into specific pedagogical practice and observing how technologies are negotiated, learned, resisted or adapted. Some dominant themes from

these case studies include a focus on spaces (bridging the home/school divide), local-global divides and partnerships, access issues, teachers' capacity and motivations for using ICT as learning tools, social awareness, the localization of ICT content and processes, and motivations and discourses in students' uses of technology.

The theme of multimodality emerges regularly within NLS studies. In information technology studies and in the field of information theory, multimodality refers to the integration of multiple forms of output of data such as audio, graphics, text and the accompanying ways of interacting with various forms of data such as by touching a screen, inputting speech, or inputting text. It is an approach increasingly applied within scientific fields, especially in the medical sciences (such as for three-dimensional image registration, to complement other data). Within literacy and language studies, multimodality has been studied through a communications lens for what it can unearth about the varied ways of making meaning from varied modes of presenting information. It might be argued that ICTs are inherently multimodal, in their use of mechanisms like hypertext, scanning, audio and multimedia formats used in websites and digital documents, among others.

Kress (2003) brought multimodality into pronounced use in the study of digital literacy, and following in this vein, Barton (2007) has emphasized how "print literacy is intertwined with other modes, especially the visual mode, and how reading changes as society shifts from a reliance on the page to reading the screen" (p. 24). Kress (1997) also posited that children are naturally equipped to understand and engage with their world multimodally before they are essentially "reprogrammed" to depend primarily on literacy in the printed word. The relevance of multimodality is linked to the finding that cultural

elements must play integral roles in digital literacy: "ICTs need to be conveyors of locally relevant messages and information that provide opportunities for local people to interact and communicate with each other, expressing their own ideas, knowledge and cultures in their own languages" (Adegbola & Dada, 2003, pp. 6-7). In many parts of Africa, alternative forms of communication from print literacy hold relevance, such as Ugandans' popular use of more traditional, oral forms of media (Mushengyezi, 2003), and ICT may offer a useful platform for integrating multiple modes, including image, sound and text in a way that corresponds to 'offline' popular communication forms and modes. Considering the case of Uganda in particular, Kendrick, Jones, Mutonyi and Norton (2006) have called for new pedagogical tools and practice that integrate the multimodal practices common in Ugandan communities into the classroom, helping to utilize culturally specific multimodal tools in the service of learning and meaningful, locally relevant communication. To this end, the New London Group's outline of a 'pedagogy of multiliteracies' is useful, where everyday literacy practices are used towards gaining the kinds of literacies perceived to bring about formal educational success (1996).

Within the realm of digital media and multimodality, Snyder's (1996) work on hypertext has examined in detail that new form of information representation prevalent in digital media. Her analysis concludes that digital literacy yields far-reaching potential for innovation and weaving together multiple modes, which appeal to different learning styles. Hypertext embodies plurality and therefore exposes learners to alternative interpretations, allowing a reader to challenge dominant interpretations and to construct their own understandings. It elicits engagement with the text as a reader navigates away

from one page and onto another, clicking words or icons of interest that lead to a fuller description, a contradictory point by another author, a new perspective on old material, and ever more sources of information. Snyder has described hypertext functioning as an endless labyrinth of information, where readers choose where they are taken, what they learn and perhaps most importantly, *how* they learn (1996), features which ultimately facilitate agency on the part of the information navigator.

The NLS have also garnered criticism. Stephens (2000) has suggested that scholars like Street may be too extreme in dismissing any view of literacy that is decontextualized, noting that this makes it difficult to draw out observations about reading and writing skills that may be applicable across differing contexts. She further notes that "looking at language independently of social context can have value at particular stages in the development of a literacy programme" (p. 12). Her conclusions are drawn in part from a review of Scribner and Cole's seminal study of the Vai in Liberia (1981), frequently cited as the first set of data and analysis that spurred the NLS. Stephens (2000) found that analysis of the process behind the study and careful reading of the Vai study's conclusions suggest that the dismissal of the connection between literacy and cognitive development was premature.

Brandt and Clinton (2002) have suggested that the NLS often exaggerate the power of local contexts, and romanticize local literacy practices while ignoring the technology of literacy and that literacy does demand imported skills to some extent. The NLS perspective has thus resulted in a theoretical blindspot. Brandt and Clinton point out that "literacy practices are not typically invented by their practitioners. Nor are they independently chosen or sustained by them" (2002, p.338). Literacy has both local and

foreign inputs, and the NLS have too often separated these phenomena in its overemphasis on context.

Stephens also critiques the extreme relativism of scholars such as Gee, arguing that there is utility in having 'correct' forms of language elevated above other forms in the language classroom, and promotes as an alternative, the *literacy for education* view (2000). Relativism in the NLS is also taken up in an earlier critique by McCabe (1998) of Street's work, work which McCabe suggests promotes "a relativist theory of culture which is philosophically incoherent and pedagogically disastrous" (p. 26) and which ultimately renders the role of the teacher futile. McCabe (1998) nevertheless still finds value in the NLS, noting,

> we need a comprehensive new settlement in the teaching of literacy which would include the development of methods that include the new media and a clear understanding of how to teach a standard which is no longer validated by notions of correctness. This is, for me, the lesson of the new literacy studies (p. 28).

Street (1998) responded to McCabe by differentiating between positive and negative relativism, claiming "relativism, of the intellectual and analytic kind, is too important to be left to the researchers" (p. 18) and argued in favour of the recognition of 'indigenous education,' referring to out-of-school literacy practices that learners bring into the formal classroom.

Another area of relevant research to consider within mother tongue and digital literacy or ICT is a small but growing body of work beginning to examine specific localization issues for technology in African contexts. Research and recommendations

have been generated that consider a range of technical issues from tone-marking (Ajiboye, 2002), the need for modernization and standardization of African languages as they are digitalized (King'ei, 2002), machine translation issues (De Pauw, Wagacha, & de Schryver, 2008), spell checker and morphological analyzer (Ondari & Ng'ang'a, 2008), natural language statements computing for database querying (Muchemi, 2008), among a range of other localization developments. Localization might evolve to draw more intense interest on the part of language and literacy education researchers focused on multilingualism given the many possibilities localization presents for supporting digital literacies in local languages.

Finally, access to digital literacy opportunities depends to a great extent on the state of telecommunications infrastructure in a given environment. A study that relied on a large data set from African countries over a period of 21 years, identified infrastructure as one of the three main factors leading to ICT adoption, the others being education and training, and economic development (Bagchi & Udo, 2007). Similarly, a study assessing telecentres in developing countries, including in Africa, named infrastructure restrictions such as low bandwidth as one of the key challenges preventing greater impact from telecentres (Latchem & Walker, 2001).

For the Ugandan context, ICT infrastructure is found predominantly in urban areas due to better infrastructure than is found in rural areas (Ssewanyana, 2007). The Ugandan Communications Commission (2008) reports an increase from two Internet service providers in 1996 to 17 providers by 2007. Kahiigi, Ekenberg, Hanson, Danielson and Tusubira (2008) note that the trend in Ugandan education to date has been to use ICT facilities mainly for administrative computing and computer skills learning, rather than

for e-learning, attributed to "limited infrastructure and resources, students to computer ratio, lack of online pedagogical skills among others" (p. 197). They have further found that there has been some progress in ICT infrastructure acquisition in Uganda and that affordable bandwidth will be essential for further development of ICT for education. Mobile communications technology, however, is widespread in Uganda in urban and rural areas alike. Ssewanyana (2007) notes that the Ugandan Government's liberalization of the communications industry nurtured a proliferation of private sector services, greatly increasing mobile phone coverage across the country, including among rural women such as through MTN's Village Phone Project. His research from Uganda has also found that the combination of women's access to mobile phones and to radio, besides leading to greater economic opportunities, has led to women's participation in debates and discussions related to politics, health agriculture, education, environment and gender, for example, when women phone into radio programs. Openjuru (2009) reports from a study conducted in a rural district of Uganda of how the widespread use of mobile phones has reduced the need for letter writing, except for important news or invitations.

A 2009 World Bank study (Mayer et al) synthesized the findings of several reports on public expenditure, spending needs, and sector performance in communication technologies, and found that the high end-user costs of broadband connections in areas that lack existing copper plants and which do therefore not effectively support cable modem connections is a major inhibitor to universal broadband coverage in Africa. The study calculated the gaps in investment in broadband coverage as follows:

> *Creating the broadband infrastructure needed to provide universal coverage for the 52 countries [of Africa] would require an investment equivalent to 0.13*

percent of GDP through 2015—translating to $13.0 billion, or an average of $1.6 billion per year from 2008 through 2015. The level of investment needed to cover the efficient market (only the commercially viable areas) in the 52 countries is just over half this amount —$7.2 billion, or $904.1 million annually. These estimates do not include the cost of computers, which could be significant, or the operating expense of Internet cafés unrelated to connectivity (p. x).

2.2.1 Gaps in the Literature: Digital Literacies

While much research has been produced that focuses on the low rates of Internet access in Africa (Oyelaran-Oyeyinka & Nyaki Adeya**,** 2003; Oyelaran-Oyeyinka & Lal, 2005; and Roycroft & Siriwan, 2003) and the subsequent lack of Africa-produced content, there is less literature that practically addresses ways to meet the challenges of *access*, whether through better resourcing, fostering political will and government action, supportive policies, or innovative new approaches. Part of the solution may be to foster more inter-disciplinary collaborations that bring together different threads of evidence and theory. Osborn (2006), for instance, posits that in Africa, there is little collaboration between linguists and ICT technicians. Such collaborations might address, for example, the potential impact of localized software and hardware, as mentioned above, for local language literacy. Other collaborations could help bridge study of new innovations with viable recommendations on how those innovations might be sustainably resourced, an ever-present challenge confronting those developing and testing ICT4E projects in Africa. Chitamu, van Olst and Vannucci (2003), Gebremichael and Jackson (2006), and Jensen and Richardson (1998), for instance, provide full arguments in support of the numerous possibilities for better resourcing ICT for Africa.

Research observing not just the digital literacy practices and outcomes (such as digitally produced lesson plans) among learners or teachers, but the *process* of acquiring those skills is sparse. Further, there is little research on digital literacy competencies focused on strategies supporting educators to produce educational content for local use. In particular, an inquiry into the enabling conditions that would support speakers to generate and share L1 literary material for use in L1 or bilingual classrooms would be valuable, as well as an impact assessment of such materials on learning outcomes.

Case studies of hybrid forms of learning would be useful in identifying how old and new forms of literacy can be effectively merged, reinforcing those literacy practices that serve learners, whether they are 'offline' or 'online'. Questions guiding such research might ask, what tools would help bridge the jump for learners to new technologies through 'traditional' methods? How can teachers become comfortable oscillating between digital learning practices and traditional literacy practices and texts? How can digital learning facilitate book learning and vice versa?

Study of the possibilities presented in peer African mentorship in ICT for mother tongue is largely unexplored. African-led initiatives, such as the work being undertaken by the African Language Technologies Initiative, demonstrate potential for adaptation by sharing strategies across African contexts. Similarly, the impact of events such as the annual *e-Learning for Africa* conference, wherein non-governmental organizations, research institutions, companies and others engaged in the development and application of ICT resources for education convene somewhere on the continent for several days of workshops, exhibitions and lectures, could yield interesting findings in terms of the role and potential of peer learning and regional exposure to new innovations in ICT4E. For

instance, showcasing successful initiatives, sharing tools and mentoring other institutions in the steps towards realizing similar projects in shared language contexts are promising forms of regional networking and knowledge-sharing that can be facilitated through conferences, exhibitions, exposure missions or by making software and instructional resources open source. Learning from the exchanges between African institutions and experts could highlight novel strategies that promote viability in African contexts, as opposed to strategies imported from outside of the continent, which may be less responsive to local conditions.

Hybridity between the local and global is emerging in the New Literacy Studies (Cope & Kalantzis, 2000; Street, 2003; Wallace, 2002). Yet, further research is needed into the efforts of minority language groups to establish local language content and how such efforts are received online by both insiders and outsiders, and how minority language content-writers negotiate virtual spaces for themselves. Are those spaces isolated or are they integrated into the mainstream forums of the Internet? How do speakers of languages that are poorly represented on the Internet represent themselves online? Who are their audiences and what are their investments in having an online presence? How do they find each other and build communicative communities? Researching such questions could shed light on the interplay between issues of identity, participation and cross-cultural interactions online.

The relationship between language and cultural expression, information and technology (and specifically, ICT4E) may hold particular value for changing the status quo in African communities chronically affected by violent conflict. The use of ICTs to produce local language content in conflict-affected areas may hold potential for

empowerment through cultural expression, for the strengthening of indigenous education, and for reinforcing the human right to access and use literacy in one's own language, among other benefits, all of which could be mobilized towards improving the quality of education in conflict and post-conflict environments. Further research from African contexts that shares evidence of the positive impacts from ICT-facilitated mother tongue content production and education on peacebuilding efforts could provide further exploration of this link.

A final suggestion for further research is the generation of student and teacher-created digital content in Africa and their classroom application. Students' use of literacy skills to create their own media for publication on the Internet is a practice that holds potential for the empowerment of disadvantaged groups of young people, as suggested by Braga's (2000) research among youth in Brazil. There is much focus on students' use of literacy materials, but little study of the ways in which students translate new skills gained through the use of new technologies to have a voice in the world. This is a rich area for study that could illuminate how learners use ICT resources to construct meanings and represent themselves and/or their communities to an outside audience. Some new work may start to fill this gap, such as Thomas's (2007) research examining how children construct their identities in multimodal digital worlds, but there remains a need for additional scholars to take up further research on this topic from diverse contexts. There is sparse material exploring the potential of working with teachers as partners in producing localized digital media for classroom use, though some nascent projects are working with teachers as advisors in creating or revising local language materials, such as the TESSA initiative (Teacher Education for Sub-Saharan Africa) which tries to connect

teachers and teacher educators by making open education resources available to African educators in nine countries (www.tessafrica.net); or various initiatives in Africa undertaken by the Commonwealth of Learning (www.col.org).

2.3 Theory and Research: Mother Tongue Education and ICT

The role of African languages, their promotion at the level of community, and their use in schools will have great bearing on the notion of an African renaissance, the agenda for a renewed era of prosperity and peace, first put forth following the end of the apartheid era in South Africa, in a speech by then Deputy President Thabo Mbeki. African language scholars increasingly view the revival of African languages as central to the continent's development ambitions (Moto, 2002; Prah, 2000; 2002b; 2002c; and Simala 2002), pointing out that being empowered to meet development objectives necessitates taking creative control, central to which is the use of one's own language to navigate and stimulate the desired societal change (Simala, 2002). The following section considers recent research focused on the potential of multilingualism in African contexts[5], with emphasis on the work of African scholars. It includes literature that brings forth evidence of the benefits of instruction and multilingual proficiency, as well as background to some of the common perceptions of African languages today. This section also identifies some persistent challenges to the role of African languages in education.

Obondo's (2007) overview of bilingual education identifies several themes found throughout Africa. One is the ongoing impact of colonial language education policies on

[5] As a general resource on languages and multilingualism, the Ethnologue (Gordon, 2005) is a key source of reference for detailed information on African languages, including Acholi, the language spoken in this study's research site. The Ethnologue provides up-to-date information such as the number of speakers of a language, language classification, dialects and orthography.

today's education systems in Africa, what Bamgbose (1991) referred to as the inheritance situation. This has meant that language policies in schools are largely based on historical precedent, on the practices of the previous British, French, German or Belgian governments, rather than on evidence for learning outcomes. In addition, the economic motivations associated with English in particular are powerful forces throughout Africa (Osborn, 2006). Kembo-Sure (2002) comments on this state of affairs: "a veneer of blackmail hangs over those who do not gain proficiency in a language as important as English" (p. 21). Nevertheless, a debate over the value and under-utilized role of the mother tongue in education has been alive and well in Africa since at least the 1950s (Moto, 2002). Yet, discussion of the use of African languages in education tends to be limited to a focus on the early primary years only in these debates. Recent research suggests that L1 education which abruptly ends after the primary levels, and does not include L1 instruction in "cognitively demanding subjects" is unlikely to raise school achievement levels overall (Clegg, 2007, p. 5), an argument supported by Cummins' (2000) work concerning cognitive academic language proficiency.

Silue (2000) faults the undue over-reliance on colonial languages as the culprit behind Africa's low literacy rates, noting that both conditions "have the same origin: the actual implementation of literacy-empowered education generally carried out through foreign languages" (p. 149). Harlech-Jones (2001) and Williams and Cooke (2002) also linked many of the poor indicators in education such as low literacy rates and high dropout rates to instruction only in the L2. An example of how instruction in L2 exclusively can inhibit learning is found in Cleghorn's (1989) work, where science learning in the primary years in some Kenyan classrooms was hampered by English

instruction in classrooms where English was a second language for both teacher and learners. Students struggled to make conceptual connections from science learning to their own worlds, without the assistance of local terms from the teacher. When the local language was used, in areas with limited enforcement of the English language medium policy, there was more uptake from students of the new ideas being communicated in the classroom (Merritt, Cleghorn, Abagi & Bunyi 1992).

There also appears to be a lack of government will in contexts across Africa to seriously examine the role of language of instruction in the achievement of learning outcomes, which serves as a detriment to the evolution of good language policy for education. Simala argues that to date governmental efforts in Africa concerned with revitalizing languages through school systems have been largely symbolic (2002), despite evidence that bilingual education systems play a crucial role in increasing the status of African languages (Wolff, 2006). Brock-Utne and Alidou (2006), in their study of language learning in Africa, found that students overall tend to have low L2 ability and undertake minimal literacy activities in L2. They also found there is an absence of the use of challenging cognitive activities, and memorization and rote learning are used more so than active learning approaches. Together, these practices have led to low educational achievement. Clegg summarizes this impasse, noting that "learners are often engaging in activities of doubtful pedagogical benefit in a language which they do not know well enough" (2007, p. 2), but acknowledges that successful school learning in L2 can take place under certain conditions such as when learners come from an educated family or have a sufficient foundation in the L1, findings that are also supported by the work of Heugh (2006) and Cummins (2000).

The status quo, however, is gradually changing: "In fact, the major innovation that has taken place in the post-independence period has been a move to extend the use of indigenous languages as media of instruction beyond the third or fourth year of primary school" (Obondo, 2007, p. 153), though this has yet to be the case in Uganda. Kembo-Sure (2002) argues that language planning models are increasingly accommodating minority languages, reflecting a growing understanding of multilingualism as an asset rather than as a deficit. Yet problems persist in the inconsistent ways in which African governments have included the L1 in education, where, for instance, a single African language in a multilingual country is used as the language of instruction (such as in Tanzania) or when students experience abrupt transitions from L1 to L2 from one grade to another.

A move away from heavy emphasis on the colonial language to a more robust consideration of the potential benefits of using African indigenous languages is surfacing, with energetic discourses evolving around multilingualism and bilingualism as assets (Merritt, Cleghorn, Abagi & Bunyi, 1992; Obondo, 2008; and Obanya, 2002), and around the promotion of the use of African languages in pursuit of development objectives (Prah, 2000, 2001, 2002a, 2002b, 2002c, 1995; Rubanza, 2002; and Silue, 2000) both from within Africa and within the field of literacy studies more broadly. There is a growing body of evidence that school learning in the mother tongue facilitates proficiency in learning a second language (Egbokhare, 2004; Mehrotra, 1998; Cummins, 1981; Klaus 2003; Obondo, 2007; Williams, 1996) and helps bridge and reinforce home-based with school-based learning, what Rubanza (2002) has argued can ensure concept formation in the place of interrupted learning wherein there is little connection between learning that

takes place in home, in primary school and then in secondary school. A closer integration of the kinds of learning occurring across these different sites can nurture important connections in learners' abilities to draw meaning from what they learn.

Bringing research-based evidence that attests to the value of using the mother tongue in education necessitates attitudinal shifts towards indigenous languages vis-à-vis colonial languages. Tembe and Norton's work in Uganda demonstrates one example of the powerful association of English with economic mobility (2008). In their study, parents felt strongly that their children needed English to succeed in the modern world and to become successful adults, and did not necessarily associate the mother tongue as a conduit to success that included better outcomes in English language learning. Silue (2000) reports that Ivorians' attitudes towards their national languages are highly negative on account of the French ideology and policy of assimilation applied in their colonies. Ajiboye (2002) collected data in Nigeria which revealed that "most adults with high socio-professional profiles do not have the required competence to source information from texts written in their mother tongues" with 70% being partial to European languages over their mother tongues, and while there is much interest in advancing literacy, there is little interest among the research community there to inquire after the language in which literacy practices are taking place (p. 125). In South Africa, Probyn (2006) found that teachers strongly preferred English as the language of instruction in place of mother tongues such as Xhosa, despite the fact that little exposure to English outside of school and other factors caused most learners to be unable to reach the required threshold levels for proficiency in L2. Cummins (1981, 1996) has also

discussed the prevalence of the belief that including L1 in education will be to the detriment of L2 learning.

Webb's (1998) work has explored those ingredients needed for such an attitudinal shift, including building the perception that multilingualism is a resource; and the role of acceptance, respect and building more positive attitudes towards multilingual speakers. These are issues that require macro-level change for countries and communities to create an environment that can foster motivation for advancing multilingualism, and effectively communicate the tangible benefits of multilingualism. In the classroom, other strategies are needed to help integrate learning in L1 and L2 and to bridge home and school literacy environments. Hornberger's conception of a *continua of biliteracy* considers these different environments, potential strategies (such as on the part of the teacher) and the roles of agency and power in successful policy and practice for promoting bilingual literacy (1995).

Others have offered up practical ways of moving forward, positing recommendations drawn from their research. Ajiboye (2002) has called for the creation of opportunities to use the mother tongue in speech and writing and to promote literary works in fiction and non-fiction in local languages. Prah (1995), Egbokhare (2004) and others have argued for the unification of related dialect clusters to reduce the overall number of officially recognized African languages, making for a more manageable number of languages to standardize and/or rehabilitate. A lack of local language teaching materials and textbooks is a factor in low educational achievements in Africa, and better resourcing can lead to better proficiency in L1 and L2 (Clegg, 2007), findings reinforced by research on the impact of instructional materials more generally which show that

curricula cannot be properly implemented when instructional materials are poorly resourced (Da Cruz et al., 2000; Lockheed & Verspoor, 1991), particularly so in poor countries with under-resourced education systems (Lewin & Stuart, 2003). Recent projects in Africa, described in Obondo's overview (2007), have demonstrated that the production of multiple indigenous language literacy materials is not prohibitively expensive. Heugh (2003) provides an example from a community in South Africa where local language materials were developed, L1 was introduced as a language of instruction and a linguist developed an orthography for the local language, all at minimal cost. Cleghorn and Rollnick (2002) have called for more investigation of the potential values of code-switching in the classroom towards facilitating learners' access to making meaning from knowledge.

Some of the literature derived from African research sites addresses the intersections between language and culture. For instance, Kramsch (1995) sees the ways in which language hinges upon its cultural environment as fundamental to the empowerment role that culture plays in language appropriation, suggesting literacy interventions wherein cultural elements are meaningfully included hold the greatest potential. Similarly, Prah (1995) also contends that "education must reach the urban and rural millions in ways which culturally speak to them" (p. ii), as literacy is an instrument of culture and therefore a force of cultural transmission, as also argued by Egbokhare (2004). These views are consistent with a broader view of multilingualism drawn from the NLS whereby literacy practices are perceived as referencing culturally-rooted ways of thinking and approaching literacy (Martin-Jones & Jones, 2000). Street views the next step forward in understanding the cultural inputs to literacy learning as determining "how

we can characterize the shift from observing literacy events to conceptualizing literacy practices" in methodology and empiricism (2003, p. 79).

Bearth (2003) takes many of the arguments described above and applies them to the study of ICT, and suggests that local language ICT competence will be fundamental to communicative sustainability in Africa. Adegbola and Dada (2003), two researchers in Nigeria who have been developing localized technologies for African languages at the African Languages Technology Initiative see culture as a new kind of currency for development: "colonisation was about physical spaces such as land, natural and mineral resources while globalisation is about logical spaces such as cultural resources" (p. 7). Indeed, Warschauer (2003) expects that the Internet's language make-up will become increasingly diversified, with people using the Internet "in their local language for local or regional communication," (p. 98) while using English for global communication. In some cases already, English is proving to be a unifying language in multilingual societies like India, while software localization efforts are initiating more content in local languages. Warschauer's research (2003) emphasizes the role of language in cultural capital in relation to new technologies:

> Language is one of the most complex and significant issues related to content and to broader issues of ICT and social inclusion. Language intersects with many other forms of social division related to nationality, economics, culture, education, and literacy. Language questions dramatically affect how diverse groups can access and publish information on the Web as well as the extent to which the Internet serves as a medium for expression of their cultural identities (p. 92).

Many Africa-focused scholars address the policy environment's impact on indigenous language survival and educational use, and seek to identify root causes for weak language policy. Many place blame on governments, while others note the neglected roles of community support and attitudes towards local languages. Obondo (2007) notes that in African countries with poorly conceived language of instruction and language education policies, the teachers are those left "trying to sort out the mess created by the legislatures" (p.158). There is little involvement from the grassroots in the formulation of language policy, despite the potential contributions from the community to indigenous language literacy (Kaplan, 2001; Tembe & Norton, 2008). Mufwene (2006) has argued that while globalization is often tagged as the culprit behind the disappearance of languages, language survival ultimately rests with the individual, and with communities of speakers and how they use their language in their daily interactions. Ajiboye (2002) has called for early exposure to the mother tongue, to lay the foundation in inculcating pride in the local language, which would rely on the community and on families before learners enter the formal school system.

In a pilot project in Uganda managed by SchoolNet Uganda where ICT was used for the creation of local content, including by teachers in one of the case studies, the first challenge identified was responding to the perceptions of local communities (Kisambira, 2007). People were protective over local information and traditions, and were unsure about whether to share it. Some also asked to be paid for contributing content, until they witnessed the benefit to the community. Teachers in particular were skeptical of the benefits of ICT and were uninterested, lacking awareness of the ways in which ICT could be used in their teaching practice. Schools were afraid of losing teachers who had

acquired new skills and might move on to better paying positions in other schools or communities. These are specific examples of reasons why community engagement is pivotal to the potential value that ICT interventions can bring to communities seeking to vitalize their indigenous languages, and to use them in the service of education.

Many of the scholars noted above point to the instrumental role of the community in nurturing the kind of sustainable mother tongue policies and practices needed for indigenous languages to flourish through education and conversely, for education to flourish from the value-added by integrating the mother tongue into learning processes. There is now a body of research evidence attesting to multilingualism as an asset in school learning. The literature suggests that for those seeking to mobilize the L1 towards better learning outcomes in African communities, the next step is in using such research findings towards instigating attitudinal shifts at the community level towards African mother tongues, as Webb (1998) argues is needed, for instance. Enabling environments and good policy are needed from governments, as well as adequate resourcing of learning materials, and engagement with the cultural context of learners.

2.3.1 Gaps in the Literature: Mother Tongue Education and ICT

An area of inquiry that has so far seen little in-depth exploration is the more macro-level consequences of African participation—through language and culture—in the 'global conversation'. This term is used in this study to refer to communication interactions through information technology (on the web) where listening and speaking takes place in a process which ultimately yields the kind of atmosphere, content and discourses that characterize the information era. The global conversation hinges upon the

relationship between information and power, and refers to those stakeholders who get to participate in and influence the dialogues that impact decision-making in multiple sites, from the most local to the most global. NLG (2000), making specific reference to new technologies, literacy and multimodality, have asserted that the primary place where discourses of identity and recognition are manifested is in struggles for access to wealth, power and symbols of recognition. They argue that diversity must be viewed as an *asset* for culture, business, civic participation and participation in public life. Language is the vehicle through which participation occurs and because of the dominance of a small number of economically powerful languages on-line, monumental barriers deny access to this conversation to masses of people from the developing world. This is to the great detriment of the global conversation, which remains more static and homogeneous and lacks the potential diverse contributions from the full assortment of the human population. It is simultaneously to the detriment of African societies where inequities are reinforced by unequal access to the advantages of language learning: "children who speak L2 better can get an education; those who speak it less well are held back" (Clegg, 2007, p. 4). Multilingualism is a tool by which interactions can increase, and thus access increases to those sites of power (Ryanga, 2002, p. 56).

Abley's metaphor of "subtly different notions of truth" (2003) or Barton's description that "we use language to imagine what the world is like and what it might be like" (2007, p. 17) are glimpses into what the potential contributions of more languages might be to the global conversation, and ultimately to the generation of new knowledge to the global repertoire. Kembo-Sure (2002) emphasizes that the languages must be recognized as invaluable heritage, "not only for Africa's posterity but also for the future

of linguistic science and the benefit of humanity in general" (p. 28). African linguistic scholars are recognizing language and culture as the path into meaningful participation (and importantly, leadership) to the global conversation, but the true work of realizing such processes has barely begun. Silue (2000) describes it as such: "a community's intrinsic capacities to set up development include cultural and intellectual resources to make sense of current events and to anticipate incoming ones" (p. 147).

Fully exploiting cultural and linguistic resources will demand a shift in focus to the notion of *agency* among communities of speakers and what ingredients are needed to facilitate reaching that point. In other words, African indigenous language communities will need to be empowered with the mindset, resources and practical tools that will allow them to participate in the enabling of their languages as strategies for a kind of development that is locally owned and relevant to their needs and aspirations, whether those aspirations are locally-oriented or globally focused, or both. Barton reminds us that at the centre of literacy uses and objectives are "people with intentions, meanings and values" (2007, p. 47). How these principles can find germane soil in social practices in L1 literacy and multilingualism is not well understood. Much more investment is needed in designing possibilities and solutions.

2.4 Concluding Notes: Literature

Drawing from the literature cited above, key challenges preventing the successful intersection of mother tongue expression and educational development can be summarized as follows:

- National and regional language policies that have failed to harness Africa's mother tongues in the service of improving educational outcomes;
- The need to alter public and government attitudes towards indigenous African languages, instilling pride, tolerance and respect for multilingualism and recognition for its role in leading to higher literacy and learning outcomes;
- A lack of access to ICT tools that would facilitate multilingualism in education and a lack of imagination and investment in identifying and developing technology-based tools for local language education (such as the slow progress of technology localization efforts);
- Cultural and linguistic irrelevance of ICT-based communication processes and content that fails to enable local ownership, agency and empowerment among users.

By 2012, the literature on digital literacies was a mix of both optimism and caution. While ICT tools offer unprecedented opportunities for increasing access to education and open learning, there are fears that the patterns in access to technology will simply reflect existing inequities, with access denied to the poor in an ongoing cycle of both information poverty and economic poverty, with the two closely related. Access and equity stand out as concerns for inquiries into the emerging potential of digital literacies. The less celebratory side of the information revolution is an information desert for the majority of the planet's citizens, commonly referred to as the digital divide, which Norris called "a new virtual Berlin Wall splitting rich and poor worlds" (2001). In April 1995, delegates at a conference in Addis Ababa declared that "if the gap between information

‘haves’ and ‘have-nots’ widens further ‘cultural, religious and ethnic ghettos’ will be created, leading to ‘religious and inter-regional conflicts” (Article 19, 1999, p. 23). Thus, issues of access must accompany any inquiries into how and why individuals engage with information technology in contexts of marginalization.

Yet, work in literacy studies that has reconceptualized the way that literacy is thought about—seeing it as situated in one’s cultural and contextual surroundings—has created possibilities for the manipulation of the intersections between multilingual literacies and digital literacy. Where new technological tools can be culturally appropriated and shaped by users to meet local needs in local contexts, this facilitates the agency required to seize agendas around language, nationhood and equitable development. Much of the literature draws on case studies and data where deficits are highlighted, such as home/school or school/community divides in literacy practices or language policies which are failing to raise learning outcomes. There is much need for literature that will illuminate possibilities and provide evidence for the value of specific models and approaches. As Brown and Druguid (2000) have asserted, “too often, we conclude, the light at the end of an information tunnel is merely the gleam in a visionary’s eye. The way forward is paradoxically to look not ahead, but to look around” (p. 6).

CHAPTER 3:
Methodology

3.1 Introduction

This chapter introduces the research question and design, describing the research methodology and its justification for application to this study. It describes the procedures, data collection methods, and instrumentation used in the study. It also provides descriptive information about the research site, participants, context and partnerships involved in realizing the study, as well as a commentary on limitations of the study. The analysis method is described, and some discussion of ethical considerations is included.

3.2 Research Question

This study engaged the following research question: How can ICTs be used by teachers to teach the mother tongue in post-conflict Gulu (northern Uganda), and ultimately to strengthen the pedagogical practice of local language medium teachers in this region?

In seeking findings related to this question, the unit of analysis was teachers' practices within the scope of their experiences in an ICT training focused on language and literacy practices in relation to ICT. In examining teachers' experiences, as they were observed in the study and reported by participants, social practices were inferred that were drawn from literacy events The environment in which these events and practices were played out had much bearing on the research question, in that the conditions of teachers' digital literacy and language experience were shapers of their teaching practice.

3.3 The Research Site

This study took place amidst three defining characteristics of the research environment at the time of the study: its transition from a site of violent conflict to a period of rebuilding and recovery, the transition towards several new policies introduced in the education sector and impacting primary schooling, and the introduction of ICT into the education sector by the Ugandan government. These characteristics of the research context are taken up in Chapter Four. This section includes a description of the research site.

The study took place in Uganda's northern district of Gulu, the capital of which is the municipality of Gulu and which serves as the main administrative and economic city of the northern region. Gulu is part of the Acholi-speaking region (a dialect of the Luo language family), which includes the sub-region of Gulu, Kitgum, Pader and Amuru; as well as some districts in southern Sudan along the border with Uganda. The Luo family of languages includes Acholi, Langi, Dophadhola, Kuman, Leb Thur, Palwo, and Alur, languages that are generally mutually intelligible and that belong to the Western Nilotic branch of the Nilo-Saharan group of Africa languages. This region is sometimes referred to as 'Acholiland.' Luganda and Swahili are also spoken to a lesser extent, and English is often spoken as a second language among the educated population.

Gulu municipality has experienced major changes in population size throughout the period of conflict on account of migration caused by the war. However, many internally displaced persons (IDPs) and refugees have returned since hostilities diminished significantly in 2005 and had largely ceased by 2007. The capital had an estimated population in 2011 of approximately 154,000 people, with 479,496 in the

district according to Uganda's 2002 census. Gulu is located approximately 330 kilometers from Uganda's capital, Kampala, from which it is accessible by road and air. Several private coach buses leave daily between the capital and Gulu, and there are also weekly flights on a commercial air carrier. The road from Kampala is unpaved and takes approximately six hours by bus, and accidents are common due to speed and poor road conditions. Commercial activity and trade has increased since the violence subsided in 2007. As an example, the first computer shop and Internet cafes opened in the last five years. Several hotels, restaurants and nightclubs have opened or re-opened and many NGOs have arrived in Gulu, providing foreign-funded development and humanitarian services ranging from HIV/AIDS prevention, malaria treatment and prevention, trauma counseling and rehabilitation support to war victims. Many IDP camps have been closing since 2008 as people return to their homes. However, the legacy of conflict remains ever present throughout the region.

More so than any other northern district, Gulu was the epicentre of a war spanning over two decades, between the rebel armed opposition group known as the Lord's Resistance Army (LRA), and the forces of the Government of Uganda, as well as the Sudan People's Liberation Army, among other regional players at various times. The conflict has been characterized by the systematic human rights violations inflicted against civilians, the often brutal nature of the violence perpetrated against civilians such as the sexual enslavement of women and girls as 'bush wives' and children forced to serve as soldiers, and forced to take part in hostilities. The conflict is also distinguished by its length, one of the longest running in Africa, which has caused deep fissures in the region's social, economic and political fabric. The insurgency in northern Uganda also

stands out for its isolation, and for the long period in which it was largely ignored by the outside world. Until 2003, the conflict was rarely covered in international media and there was little international humanitarian presence in the region, until a visit to the region by the United Nations Under Secretary General for Humanitarian Affairs, Jan Egeland, who declared it to be the world's worst forgotten conflict and called for international humanitarian intervention (BBC, 2003). Many northerners also felt that the conflict was ignored by Ugandans living outside of the region and by the government in Kampala. When I visited the region in 2005, as the conflict was just starting to recede from Gulu, I spoke with university students at Makerere University in Kampala who told me that they did not follow events in Gulu closely and that the war felt far away to people in the capital, who were disengaged from events there.

The lack of attention to the conflict from the outside world, and the failure to intervene with any sense of urgency, left the people of Gulu to 'go it alone', fuelling a sense of abandonment, and a somewhat justified perception of the apathy of outsiders. This history has implications for the role of a foreign researcher seeking to gain access in the region, making trust building with participants more challenging. There is some burden to acknowledge to local people recognition of the failures of the international community to intervene, to avoid suggestions (intentional or otherwise) of promises that cannot be kept, and a need to contribute something of value and of immediate relevance to a society that has suffered greatly.

The education sector in Uganda continues to face many challenges; however, in Gulu, public education is particularly under-resourced. Schooling was interrupted for many students due to war and resultant forced migration, and school infrastructure was

damaged. Some schools were closed during different periods of the war, when the risk of student abduction by the LRA (to serve as child soldiers) was high. Some schools in the district have only recently reopened, in the last six or seven years. There are very few instructional materials such as bilingual dictionaries, visual aides for classrooms or local language textbooks despite the Ministry of Education's local language medium of instruction policy. As a way of responding to a policy that has been announced but not meaningfully resourced, teachers typically innovate and improvise by creating their own local language literacy resources from discarded material such as bean sacks, newspaper or used paper. They also translate passages from English language textbooks for classroom use, in the absence of local language textbooks.

In general, teachers in Gulu have had little interaction with ICTs. Schools do not have computers on site and there are no resource centres or other sites where teachers can go to get online. While there is a growing number of privately-run Internet cafes in the town of Gulu, some of which also offer computer literacy courses for a fee, the hourly rates are unaffordable for most teachers. In the main primary teachers' college in the district, there is an ICT Lab on campus, which during the period of study had only seven working desktop computers for 500 students, and no Internet connectivity. None of the three schools included in the study had school libraries or any science laboratory materials. There is a recently opened Teachers' Resource Centre in the centre of town that is used by some in-service teachers for holding meetings; however, reportedly few teachers go there to borrow materials. At the primary education level, the policy in effect is that students learn in Luo (Acholi) and take English as a subject throughout levels P1-

P3. As of P4, the language of instruction is to be English. It is not known to what extent local language instruction at the P1-P3 actually takes place in all schools in the region.

3.4 Participants

At the inception of data collection, 11 research participants joined the study, drawn from three public schools in the district of Gulu: The Main Public School (four participants) and the Army Primary School (four participants), both located close to the town centre of Gulu, and the Orphan Boarding School (three participants), located slightly outside of the town centre. The participants included nine men and two women[6], who varied in age from their early 20s to late 40s, in addition to the college's ICT lab manager (male). All participants come from the northern region, though not all are from the district of Gulu. Of the teacher participants, three were selected as focal participants.

A common limitation of case study research is the risk of attrition (Duff, 2008), and indeed, over the course of the program, one participant stopped attending early on; and a second was transferred to another district just before the completion of the study. Another teacher joined in mid-way (and thus, less data was collected from this teacher), bringing the total to 10 participants by the final phase of the study. The teachers are self-selected in that they indicated interest when asked to participate in the study, with the support of their school principals.

[6] In Uganda, women represent approximately 39% of primary school teachers, according to the Global Gender Gap Report (Hausmann, Tyson & Zahidi, 2006).

Table 3.1: Study Participants

#	Name (Pseudonym)[7]	Sex	School	Position	Yrs of Experience (up to)
1	Christopher*	M	Main Public School	Teacher	5
2	June*	F	Main Public School	Teacher	10
3	Daniel	M	Main Public School	Teacher, Head of Infant Dept.	20
4	Simon	M	Main Public School	Teacher	5
5	Frank *(dropped out of study)*	M	Main Public School Acholiland PTC	Teacher Coordinating Centre Tutor	20
6	John*	M	School for Orphans	Teacher (Head of Dept)	10
7	Joy	F	School for Orphans	Teacher	15
8	Willie	M	School for Orphans	Teacher	10
9	Bernard *(transferred to another district before end of study)*	M	School for Orphans	Teacher	15
10	Davis	M	Army Primary School	Teacher	5
11	Albert	M	Army Primary School	Teacher	5
12	Kenney	M	Army Primary School	Deputy Head Teacher	20
13	Nick	M	Acholiland PTC (APTC)	ICT Lab manager	N/a

* *denotes focal participant*

Four of the male participants (Davis, Albert, Simon and Christopher) were recent graduates of teaching college, and two of those four participants (Simon and Christopher) were in the process of taking further examinations, by the final year of the study, to become eligible for university entrance. The other participants had between five and 20 years of teaching experience, and had all attended a primary teachers college, typically for a period of two years. Some, such as June, had further upgraded their training through diploma courses or by attending workshops organized by non-governmental organizations operating in the region. The teachers were teaching different grade levels at different points in the study, and some transitioned to teaching one subject for all grades, such as June, who was teaching P4 in 2009, but in 2010 was the music teacher for all

[7] All participant names are pseudonyms to protect the privacy of participants. The name of the teacher's college featured in the study is also a pseudonym.

primary grades. Teachers instructing P1-P3 were expected to teach all classes in Acholi, while teachers from P4 onwards taught Acholi as a subject. In practice, all the teachers in the study were using a mix of Acholi and English in the classroom, with varying levels of comfort, an issue that will be taken up in Chapter Five. Two of the participants had previously used a computer prior to the study's training. One of those participants, Christopher, had attended the local teachers' college when the ConnectED project was active and had sometimes used the computer lab at that time. Another participant, Frank, was a centre coordinating tutor[8], in addition to being a teacher, and he had some exposure to computers in the course of his role as a tutor as he had access to the college administration offices, where there were some desktop computers for staff use. More detailed data on the participants' previous exposure to ICT and the results of their self-evaluations in computer skills is included in Chapter Four.

From the 11 original teacher participants, I selected three as focal participants: Christopher and June from the Main Public School, and John from the Orphans Boarding School. Originally, I selected the three individuals because I felt they each represented different levels of comfort using computers, loosely categorized as (1) advanced; (2) medium; and (3) struggling. However, by the second round of workshops it was apparent that the participant I had deemed as "medium" (June) was also "advanced." Nevertheless, each participant presented unique illuminations to the findings, at the same time that common patterns emerged across the experiences of all three focal participants. The data collected from focal participants also assisted in giving more depth to data collected from the larger group. I undertook open-ended interviews with the three focal participants at

[8] In Uganda, centre coordinating tutors are based in core teacher training colleges and are responsible for outreach to a cluster of primary schools in a district and serve as a representative of the college, tasked with supporting learning improvement of pupils and with professional development for in-service teachers.

different stages of the training, with data collected from all 10-11 participants used to complement and better inform the data from the focal participants. Data collected from all participants included transcripts of focus groups, journal entries, classroom observation field notes, training field notes, participant assignments, correspondence, lab attendance records, and self-assessment pre-tests and post-tests.

In addition to the teacher participants, the APTC's ICT Lab Manager was also a research participant; however, he participated as the co-instructor of the training workshops rather than as a learner. Thus, a different interview questionnaire was used with this participant, and his experience and perspective of the training is unique given his particular role in the study. This participant also participated in the three focus groups. His insider perspective was essential to the research process and in many ways he was a collaborator in the research design and data collection, in addition to being a participant.

3.5 Research Design: Qualitative Case Study

This study falls broadly within the tradition of qualitative research, and specifically, uses a case study approach. Johnson (1995) has advocated for the use of qualitative research methodologies among those studying technology education and has urged educators to "engage in research that probes for deeper understanding rather than examining surface features" (p. 4). Qualitative research "uses a naturalistic approach that seeks to understand phenomena in context-specific settings" (Hoepfl, 1997, p. 47), thus taking advantage of the richer layers of details that can be gained by study of the broader environment of the phenomena, and this case study aims "to describe an intervention and the real-life context in which it occurred" (Yin, 2003, p.15). It aims to describe, theorize

and understand witnessed events and perceptions and understandings as communicated by the research participants. As the researcher, I intervened and influenced the research process by initiating a training and learning experience for the participants, which then became the site of my data collection. This method drew on theories of situated learning which emphasize that meaningful and effective learning takes place when the process of learning is connected to the learner's community of practice, cultural environment and context (Lave & Wenger, 1991). In Uganda, this necessitates working in a meaningful way with the community where the research is taking place, drawing on cultural elements in content creation, creating vehicles for participation and making space for the voices of research participants, and attempting to reflect multimodal forms of communication and learning in traditional African media, into the realm of ICT-based communication and learning.

The study's methodological framework is based in the analysis of a case study of a bounded process: an ICT training program for primary teachers, with a social action objective. The social action objective is to support local language medium primary teachers to gain digital literacy to the extent that it will support and strengthen local language teaching practice. Case study involves the thorough analysis of a singular case, such as the case of a person, group, episode, process, community, society or other unit of social life, and often involves intensive analysis of a range of data drawn from the case (Theordorson & Theordorson, 1969). Case studies seek to understand the case in as much detail as possible, in the defined context of the case. The approach can provide "access to rich data about others' experience that can facilitate understandings of one's own as well as others' contexts and lives, through both similarities and differences across settings"

(Duff, 2008, p. 52). Yin (2009) has described case study as inquiry that uses multiple sources of evidence to investigate a contemporary phenomenon in its real life context when the boundaries between phenomenon and context are not clearly evident.

The case study methodology presented a relevant design for this research setting. Case study is increasingly used in applied linguistics research, generating productive and influential studies (Duff, 2008), and demonstrates equal potential in rural African settings for the study of local language use in digital literacy. Part of the case study approach is to meaningfully condense, present and interpret large amounts of different types of data (Miles & Huberman, 1994), providing the opportunity for an in-depth analysis of teachers' language and literacy practices in relation to ICT. In this case study, I have thus sought to describe, analyze and interpret the multiple data sources gathered from the bounded process of the ICT training program I delivered for the participants in Gulu. This study engaged established qualitative data collection methods, with their origins in anthropology and sociology, and which are widely used in the social sciences, such as interviews, focus groups, participant journals and classroom observation. The ethnographic method of selecting focal participants from among a larger group of research participants proved relevant to the present study in light of the socio-cultural nature of my inquiry. The training experience as a site of study was an enterprise shared by a group of people who learned together over a period of three years. Further, that group was drawn from a larger social group sharing a common professional identity: primary school teachers in a district of northern Uganda, and each teacher shared a work place with at least two other teachers, as 11 participants were drawn from three schools. Thus, peer interactions were of great interest to me, in how they influenced the learning

experience and the participants' interactions with ICT resources, as documented through classroom and training observation and as reported by participants in interviews and in their journals. Street (2003) has pointed out, "The ways in which teachers or facilitators and their students interact is already a social practice that affects the nature of the literacy being learned" (p. 78). Further, it is helpful to observe the participants through the lens of a community of practice, as defined by Lave and Wenger (1991) and Wenger (1998), particularly in light of the study's social change objective of yielding findings relevant to the design of learning environments for ICT4E that can effectively support multilingual education in Uganda. Wenger argues that design can facilitate learning by being attentive to the twin concepts of social practice and identity (1998).

Ethnographic research traditions have been utilized by others in the field of literacy studies, notably Barton and Hamilton (1998) and Heath (1983), and are a useful method for the purpose of studying the shared behaviour and actions of cultural groups in naturally occurring settings given the inherently social nature of cultural groups (Wolcott, 1992). Further, ethnographic methods are valuable in their emphasis on context, allowing for a linking of the data to broader social, political and economic processes occurring in the lives and histories of participants. Close interaction and collaboration with participants and extended stays in the research site also facilitated analysis of the data from multiple angles (Miles & Huberman, 1994). The data collection methods relied on the perspective of participants, a quality of ethnographic methods that privileges the insiders' perspective as a means of conceptualizing and decoding the knowledge and behaviour of the group under study (Watson-Gegeo, 1988).

3.6 Research Methodology

This section reviews the research procedures, and describes the chronology of the methodology, data collection methods, and instrumentation.

3.6.1 Data Collection

Table 3.2 describes each type of data collection method and the purpose of the method for the study. Qualitative data, and some participant self-assessment data, were collected throughout the four field visits (which took place May 1-30, 2008; August 7-22, 2009; November 3-27, 2009; and May 31-June 17, 2010), over a three-year period (2008/2009/2010), through the following 10 methods.

Table 3.2: Data Collection Methods

	Data Collection Method	Purpose	Participants
1.	Semi-structured transcribed interviews	To acquire biographical data and information on the three focal teachers' work lives and working conditions; to acquire detailed information on the focal participants' experience in the training and on the application of their digital literacy in their teaching practice.	3 Focal Participants; ICT Lab Manager from APTC
2.	Training observation field notes	Field notes sought to understand how the teachers interact with the ICT resources and to understand their experience as digital literacy learners.	All participants
3.	Focus group	To draw out new data from the interactions between participants rather than merely between the researcher and a participant (Kitzinger, 2008), and to gather more detail on observations through less structured questions. A useful definition of focus groups is that offered by Krueger (1994): *The focus group interview taps into human tendencies, attitudes and perceptions relating to concepts, products, services or programs as developed in part by interaction with other people. We are a product of our environment and are influenced by people around us* (pp.10-11).	All participants
4.	Artifact/document analysis	To analyze the end product of teachers' interactions with technology in an unobtrusive way, which will demonstrate the decisions and choices they made as	All participants

	Data Collection Method	Purpose	Participants
		they created content, and what learning from their training is reflected in the materials, as well as their own innovations. Artifacts were located, identified, analyzed and evaluated (Goetz and LeCompte, 1984), and this method recognizes the relevance of *materials* to cultural interpretation and behaviour (Hodder, 1994).	
5.	Classroom observation	To draw out data from the observation of human interaction (Boyer & Simon, 1969), and specifically, to understand how the materials are applied in the classroom and to witness the pedagogical and social practices of the teachers.	All participants
7.	Participant journals	To collect unbiased data through participants' descriptions and reflections upon their experiences, in their own words (Giraud, 1999).	All participants
8.	Analysis of correspondence documents (emails, letters, meeting minutes)	Document analysis yields data such as "excerpts, quotations, or entire passages from records, correspondence, official reports and open-ended surveys," (Labuschagne, 2003, p. 101), which in the case of this study provides a record of participant experience and how it changed over the course of time, as well as the way in which the participants expressed themselves through the medium of ICT and what message they chose to prioritize in their correspondence.	All participants
9.	Self-assessments	The collection of self-assessment data demonstrated how participants perceived their computer skills prior to and after the training, providing a comparative illustration of the change resulting from the training experience from the perspective of the participants.	All participants
10.	Recording participant Lab Visits	Recording attendance in the ICT lab documented the number of practice hours participants undertook, revealing patterns that point to issues of access, motivation, and infrastructure conditions.	All participants

3.6.2 Procedures

As a study concerned in part with assessing the sustainability of a digital literacy intervention, the four visits extended over three years allowed me to observe how participants interacted with the ICT resources at different stages after they were introduced, and how the ICT resources fared in the site after their initial introduction.

The first visit occurred from May 1 to 30, 2008 in order to undertake basic background preparation. Preparation included identifying the three participating schools and the research participants, as well as initiating the partnership with a local primary

teachers' college. Preliminary interviews were held with teachers in two different districts in the region (Opit and Gulu) in order to identify key issues perceived by teachers and to gather contextual information on the education sector in order to refine the research question. I also identified a training site and assessed the technological capacity at the teachers' college. During this time, I learned about previous ICT interventions in educational institutions in the region and held informal discussions with a variety of informants to learn about the experience of prior ICT4E efforts. I also developed my understanding of the policy environment for primary education, observed language use in schools, observed common multimodal pedagogical practices in classrooms, and observed the conditions of public schools in the district. This visit complemented experience I had gained in a previous visit to the region in 2005 carried out for my Master's coursework. My earlier visit provided valuable background by which to measure changes over the years in the area, as my first visit had been during a period of ongoing though reduced hostilities between the Ugandan forces and the armed opposition group, the Lord's Resistance Army; while my 2008 visit took place in what was by then starting to be considered the post-conflict period of the region's 25-year civil war.

When I returned to Canada after the first field visit I started planning the training curriculum and additional data collection methods. For the curriculum, I used a combination of an existing basic computer literacy training designed for educators in Uganda with new lesson plans that I developed focused on open educational resources and other applications that would facilitate multilingual content development. The basic computer literacy training was the curriculum developed by ConnectED (Connectivity for Education Development), funded by the US Agency for International Development

(USAID) and implemented by the Academy for Educational Development/LearnLink. This curriculum was appropriate for the study's purposes as it was designed specifically for educators in Uganda, and had also been previously implemented in the district, among pre-service teachers. The ConnectED project's objective was to increase "computer literacy among teachers," to equip nine educational centers, one of which was the same teachers' college included in this study, and to partner with the Institute for Teacher Education (ITEK) "in preparing a multimedia, online teacher training curriculum based on a student-centered learning approach and the Ugandan core curriculum." The project sought to enable "teachers and student teachers to integrate information and communication technologies (ICTs) into the classroom," to promote the implementation of the UPE policy, and to "increase rural students' literacy, reduce inequities among children, and advance school administration and the professional development of primary level educators" (Wougnet website, 2011). The ICT Lab Manager at the primary teachers' college had been trained as an instructor in this program and had been working at the college when ConnectED was active. He was familiar with the curriculum and recommended it as the most appropriate for the purposes of the study. The ConnectED training included 30 hours of instruction and focuses on a set of specific skills (see Appendix A: ConnectED Computer Skills Learning Objectives).

ConnectED's suggested training timeline consists of three modules: 10 hours in five sessions of *Introduction to Computers and the Internet*; 20-24 hours in *Computer Applications (Direct Instruction & Practice)* which include Word; Web Mail/Chat; The Internet; PowerPoint; Curriculum/Digital Resource Library; and Excel, and up to 10 hours in additional (optional) *Advanced Workshops* which include: Inspiration;

Collaboration Tools; Project Based Learning; and three courses that were marked "TBD" in the curriculum: Creating your own Webpage; Web Quests; and Distance Learning (ConnectED, 2002, p. ii). In the study, the participants completed self-assessments in which they evaluated their competencies on a scale of one to five for each of the skills noted in Appendix A, the evaluation method also used by ConnectED. They were each provided with an instructional handbook to borrow during lab time, but which belonged to the college. There was also an instructors' handbook, which was used by the college's ICT Lab Manager, and myself as we together served as co-trainers. In using the ConnectED curriculum, I sought to provide the participants with a basic foundation of computer skills, and to observe the training experience in the context of the kind of curriculum typically used in foreign donor-funded ICT4E projects.

I returned to Gulu in August 2009 and we delivered the 30 hours of training to the participants in the college's ICT lab. Schools were closed for the summer, so this was an opportune time for the teachers to dedicate the time needed for the training. In addition to the training workshops, participants also had free time in the Lab to work on the computers for practice or to produce assignments. We also arranged several field trips to an Internet café, since the college's ICT lab did not have Internet connectivity. During this field visit I recorded observations in the training and lab sessions, collected email correspondence produced by the participants as data, and collected the pre-tests completed by the participants prior to the first workshop session. Prior to the training, I also conducted an orientation session with the participants that served to ensure a common understanding of the study's objectives and of the training activities, and was

also an opportunity for the teachers to ask questions and to influence the research[9]. During the orientation session, participants were also asked to share their expectations for the training. These were recorded, and each expectation shared by the group was addressed by the co-traners in order to clarify whether it would or would not be covered by the training. When feasible, new objectives were added to the training plan to accommodate participant expectations.

Following the training, arrangements were made with the participants and the college to equip the ICT Lab at the college with 12 new laptop computers, a printer, scanner, and projector, all of which were purchased in Uganda, with the support of a private Canadian donor whom I contacted to support this component of the study. I also purchased and provided CDs and flash disks to each participant, as well as other supplies for the training such as notebooks and pens. The primary purpose of the laptops was for the training of the study participants, and when study participants were not using the laptops, for computer literacy training of education students at the PTC, as a contribution to the college's efforts to integrate ICT into their teacher training. Thus, the laptops were placed in the ICT lab at the PTC.

In addition to the 30-hours of instruction in the ConnectED curriculum, I also designed additional workshops that the participants took during the following visit, in November 2009. These four workshops were included at the suggestion of the participants (such as using Wikipedia to prepare a lesson), the PTC Lab Manager (Power Point Presentations), or myself (An Introduction to Open Education Resources; and

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[9] The orientation session covered the following topics: Purpose of the research project; Background information and how the project was initiated; The schedule of activities for the year, plus discussion; The training format and outline; How data will be collected, plus discussion; Ethical issues, privacy, and permission procedures; Logistics: distribution of laptops, maintenance, etc; Questions and further discussion.

Digital Photography). Used cameras had been collected from donors in Canada, to facilitate the digital photography workshop. Participants signed out cameras from the lab for periods of up to 48 hours for independent use. There were eight cameras; however, two participants often borrowed a camera together for use at the same school. The participants also had additional workshop sessions for brushing up on Internet use and research, which consisted mainly of mentored practice time in the Internet café, in which myself, the college's ICT Lab Manager, and two volunteers assisted the participants to identify resources and information they wanted to use to design lessons or visual aides. During this field visit, I collected additional field observations from the training sessions and selected three of the participants to serve as focal participants, who participated in in-depth, semi-structured interviews with me. The first interview consisted of 15 questions divided into four sections: personal information and professional background; computer experience; classroom context; and, biographical information (see Appendix B). The first interview aimed to capture biographical information about the participant's life, career and any previous experience they had using ICT resources. It provided important context about the research site, as participants shared personal experiences of the conflict, and also described their family life and early education. I also distributed journals to all 11 participants and held an orientation session on participant journals (see Appendix C).

I also arranged for ongoing, independent open practice sessions at the ICT Lab for the participants. It had emerged that the participants were not visiting the Lab often after the first training because of the distance of the Lab from the town centre. None of the participants had access to a vehicle and the condition of the road made it challenging and time-consuming to travel by bicycle, the most common method of transportation used by

participants. Other means of transportation to the Lab were to hire a local taxi, which is prohibitively expensive, or to hire a 'boda boda' (a motorcycle taxi), which was still beyond the means of the participants. Thus, while I was outside of Uganda between August and November 2009, I wrote a grant application to raise funds to be able to provide each participant with transportation stipends so that they could more easily reach the Lab to use the laptops. Funds were successfully raised and by December 2009, we had instituted a system whereby each participant would receive the equivalent amount of US$4 in local currency per lab visit, which would cover the maximum charge of $2 for a boda boda ride for one person each way to and from the college. The budgeted funds allowed each participant a maximum number of 40 visits to the lab. When a participant arrived at the college, they signed a voucher and were given the stipend amount. This system also served to ensure that all visits to the lab were recorded, including the length of time spent there by each participant, the hours of the day when participants visited, when participants travelled to the lab together, etc. These data were included in the analysis.

For the following six months, participants visited the lab and worked there independently; however, under the supervision of the lab manager, who was available to assist them when needed. During this period, the participants were asked to use their lab time to produce, at a minimum, the following three assignments:

- A lesson plan produced with word processing software
- A photo essay
- A lesson made with Microsoft Power Point Presentation software

Most participants produced more than one of each type of assignment. After this six-month period, all the completed assignments were collected as data, in June 2010. Participants also practiced delivering their (Power Point) slide show lessons in front of each other and the instructors during additional workshop sessions. The participants then delivered lessons using the slide show software and a projector to their classes, and I recorded these lessons, producing digital video files of each lesson. The participants took one more workshop at this time as well, in using e-Granary, an offline repository of educational resources that can be connected to a network of up to seven computers, described as the "Internet in a box" (WiderNet.org, 2011). An e-Granary was provided to the ICT Lab by UBC for the teachers' ongoing access.

I also collected the participant journals at this time and provided feedback and further specific questions to each participant that would guide them in writing additional entries that would provide information I sought about their experience in training and using the ICT-produced resources in their schools. The participants then completed additional entries, before turning their journals over to me for a final time. I photocopied the content of each journal and returned the journals to the participants to keep for their personal use. During this period, I also designed and delivered another workshop for the participants, *Publishing OERs*, whereby the participants learned how to upload content that they created to public, web-based OER repositories. I undertook another round of in-depth, semi-structured interviews with the focal participants (see Appendix D), as well as with the college's ICT lab manager (see Appendix E). I also conducted three focus groups with the larger group of participants throughout June 2010 (see Appendix F). I held a meeting with the participants and the teachers' college in order to finalize an

agreement about access and use of the donated laptops. Minutes of this meeting are included in the data set. The meetings, interviews and focus groups were conducted in English.

Also, at this stage a new arrangement for the participants' computer access was initiated. It had become apparent that several challenges had arisen with the previous arrangement of keeping the laptops in the college's ICT Lab. Firstly, the teachers continued to find accessing the laptops at the lab difficult because of the long distance to the College from town and the irregular lab hours (teachers sometimes found the lab closed when they arrived). Secondly, when I first arrived back at the lab in June 2010, I found that half of the laptops purchased for the study, as well as the printer, were missing from the lab. I learned that the laptops had been borrowed by the College's staff and faculty and were in use in their various offices around the campus. This was clearly not the intended purpose of the laptops, and this was communicated to the college management. Upon raising the issue with the ICT Lab Manager, the laptops were quickly restored to the lab. After discussions with the participants and the ICT Lab Manager, an alternative mutually agreed upon arrangement was formulated, whereby half of the laptops would remain at the college lab, while the other half (two per school) would be placed in the participants' schools where the participants (three to four per school) would jointly manage the shared use of the laptops as a committee at each school.

Following the final field visit, over the next six-month period, I continued to collect correspondence as data. This included emails from the participants to me or to the ICT Lab Manager where I was copied and correspondence with the teachers' college. I stopped collecting data in January 2011.

3.6.3 Instrumentation

The following instruments were used in the collection of data during the study:

- *Word processing software:* The seven in-depth interviews were transcribed directly from the participants' speech into Microsoft Word documents via a laptop computer used in the field, and then backed up.
- *Digital audio-visual recording software:* Focus groups and classroom observation sessions were video recorded using Apple's Photo Booth recording software and a webcam connected to a laptop. The video files were then backed up; however some of the videos' sound recording was corrupted in both the original and the back-up files due to a malfunction common to the software application. The corrupted files were not recoverable; however, the video files still provided visual data of the classroom observation sessions.
- *Participant journals:* Lined notebooks were distributed to the participants wherein they recorded handwritten entries that I then photocopied for my records, while the notebooks remained with the participants.
- *Digital camera:* I photographed classroom observation sessions, training workshops with the participants, and examples of multimodal content in classrooms in Gulu. Digital photo files were then transferred to a laptop and backed-up. Used, donated cameras were also collected and distributed to participants, as well as camera batteries. The participants took photographs that were used in the educational resources they created within the scope of the study. The donated cameras became the property of the teachers' college with the intent

that they would be made available for sign-out from the ICT Lab by students and teachers.

- *ICT Hardware:* Laptops were provided for each participant teacher and housed in the teachers' college's ICT lab, and later some of the laptops were moved to the participants' three schools. Other hardware items used in the study for training purposes with participants included one E-Granary system and accompanying small laptop, printer, scanner, LCD projector, recordable CDs, USB sticks, and cables. The laptops, printer and scanner were purchased in Gulu, the LCD projector was purchased in Kampala, and the other peripherals were purchased in Dubai or Canada and transported to Gulu. These items were used by the participants to generate data I used for analysis, such as lesson plans and slide shows.

3.7 Research Partnerships

This study relied heavily on its partnership with the participating primary teachers' college. I consulted with the principal of the college at the outset of the study about the focus of the research and in the process of designing the methodology. A tutor from the college assisted me in establishing relationships with the three participating schools, securing permission from their principals to undertake the study, and in identifying the participants. In the selection and enhancement of the training curriculum, I worked closely from the beginning with the college's ICT Lab Manager, Nick, whose contributions were invaluable at all stages of the study. The local collaboration of the college, and their ICT Laboratory in particular proved to be instrumental for meeting

cross-cultural interpretation needs between myself and the research participants, for gaining insiders' perspectives on language and education issues, and for providing background to the education context in the region.

The college also served as the site for much of the training, providing me with the use of their ICT Lab, which I equipped with additional computers for the use of the study participants, and the college students when not being used by the participants. I also lived on site at the college during one of my field visits. I provided oral briefings and one written report to the college's principal on the progress of the study, and shared my methodology and preliminary analyses through frequent correspondence with the ICT Lab Manager of the college.

3.8 Data Analysis

For this study, the unit of analysis within the bounded case was teachers' practices within the scope of their experiences in an ICT training focused on language and literacy practices in relation to ICT. The language and literacy practices as performed by the participants in the workshops, practice time in the ICT laboratory, in their classrooms and in the preparation of their lessons and learning materials speak to the view of language as a social practice (Barton, 2007; Street, 2003), in which activities or events are seen as having an inherently social and cultural underpinning. These practices together formed the teachers' experiences that were studied within the bounded process of their ICT learning experience, followed by using what they could of that learning in their pedagogical practice. The focus on learning and teaching practice is also helpful given the use of the community of practice (Lave & Wenger, 1991) theory applied within the

methodological framework. The emphasis on the social aspect of language and literacy practices called for data to be studied as imbedded within the social context of participants, an approach well served by ethnographic methods. In turn, data drawn from within the bounds of this case led to findings relevant to the research question of how ICTs can be used by teachers to teach the L1 and to strengthen participants' pedagogical practice in the bilingual classroom.

This study employed an array of data types, facilitating a triangulation process, the practice of using multiple data sources to determine whether there is agreement across different data types in order to support the validity of findings. Triangulation can also unearth different perspectives on the same findings, giving different 'images of understanding' (Smith & Kleine, 1986). Triangulation is useful for verifying whether findings can be consistently linked across data sources, though perfect agreement is not necessarily required or even very common.

As data were being collected, I made notes in a research journal that served as a preliminary analysis and helped guide the refinement of my data collection procedures. These notes consisted of inferences drawn from observations and from the emergence of patterns across the data. Since my data were collected over a three-year period and in four stages, this preliminary analysis aided in designing each forthcoming data collection phase, and such analytic notes are considered processes inherent in qualitative research (Hammersley & Atkinson, 1995). A fuller, more formalized data analysis process was then undertaken following the completion of data collection. In this stage, I carefully reviewed each piece of data collected in each data type, searching for repeating patterns, which I highlighted as repeating ideas (see Appendix G). I recorded all excerpts with the

repeating ideas into a flow chart (Table 3.3). Organizing and displaying data in diagrammatic form facilitates the process of identifying interrelationships and connections across the data (Ritchie & Louis, 2003).

As Hoepfl (1997) points out, the challenge in working with qualitative analysis "is to place the raw data into logical, meaningful categories; to examine them in a holistic fashion; and to find a way to communicate this interpretation to others" (p. 55). In the next stage of my analysis, I grouped the repeating ideas into broad themes, a process known as open coding (Strauss & Corbin, 1990), in which conceptual categories are identified and labeled, providing the preliminary framework for analysis. In drawing out themes, I drew on the perspectives of the participants, taking guidance from the issues they emphasized. Below follows the five main themes that emerged from this process, with the main repeating ideas associated with each theme (Table 3.3).

Table 3.3: Themes from the Data

Theme 1: Language, Literacy and Educational Materials
Scarcity of educational material
Use of English in ERs despite L1 policy, Language of teacher preparation
Computers and Internet created for English speakers
Value for effort to promote L1
Theme 2: Environment into Which ICT is Placed
Interrupted process of accessing information
Resourcefulness, access requires motivation of time and resources
Practical uses of internet limited to what is efficient in this connectivity context
Incompetence, lack of will, lack of funds, or poor implementation from government
Theme 3: Identity and Investments
Concern with knowledge about Uganda, representation of Uganda to the world
Having a voice in the world
Expressions of inclusion / exclusion in a global interconnected community
Explicit recognition of significance and/or power of information society

Association of ICT to wealth, development, upward mobility, recognition
Theme 4: Content, Format, Mode and Utility
Errors and weaknesses transfer from print to screen
Use of internet or computers for teachers' knowledge enhancement
Teachers' use of diverse modes (audio, visual, text, motion)
Teachers' value of ICT's ability to facilitate diverse modes
ICT and classroom management
Theme 5: Navigating and Sustaining ICT Competence
Impact of early exposure to ICT on ability or comfort level
Linking old and new technologies
Protection and maintenance of ICT resources
Trend of machine-focused investments in ICT training/interventions
Social nature of ICT learning

I then synthesized the themes into theoretical constructs, which served as the foundational blocks for fuller theorizing. In this stage of the analysis, the data and the themes identified are re-examined to draw out links between the themes, what Strauss and Corbin (1990) have called axial coding, wherein a conceptual model begins to emerge. Once the theoretical constructs were identified I engaged my theoretical framework, drawing on relevant work by others to interpret and link the theoretical constructs in order to formulate a more complete picture of the phenomena observed. As Duff notes, "much case study research is embedded within relevant theoretical literature and is motivated by the researcher's interest in the case and how it addresses existing knowledge or contributes new knowledge" (p. 57). From there, I was able to use the analysis process to present a coherent theoretical position based on what emerged from across the data (see Appendix H: Analysis Synthesis Process).

Finally, to provide a more detailed view of key findings, two examples were selected from among the assignments that participants were tasked with, and described in-depth (see Chapters Five and Six) to better illustrate the analysis.

3.9 Limitations of the Study and Possible Risks

While this study aims in part to develop an approach that holds potential for adaptability elsewhere, findings from Gulu are in many ways context-specific. The way in which multilingualism is manifested in Gulu is both unique while at the same time shares many elements from other multilingual communities in Uganda and in the continent at large, a feature often found in case studies (Duff, 2008). While communities throughout Uganda are responding to the adoption of the L1 instruction policy, the interest, participation and goals of each community with regards to the role of local languages in their future are diverse. There are likely to be some limits to the general applicability of findings. Nevertheless, given the trend in African governments' shift towards bilingual education systems, it is anticipated that many of the findings are broadly applicable to other contexts, and will complement analyses carried out by other researchers in other locations. Further, by situating this study within the study of the new literacies and other emerging bodies of work related to understanding literacy issues in a technology-driven social world, the findings can illuminate phenomena from an under-studied region, helping build a more complete picture of literacy, bilingualism, ICT and teacher education in the developing world.

This study's participants consist of a small group of teachers plus the teachers' college ICT Lab Manager, in addition to other informants outside of the main participants. The selected participants reflect the diversity of schools in the district

studied, with the group representing three different schools: the main public school of the town, a boarding school located a few kilometers outside of the town for children orphaned by the war, and the army primary school, a model school originally established for the children of the local armed forces. The teacher participants include eight men and two women (plus one male participant from the PTC), represent several different age groups, and have highly varying years of teaching experience from being within their first two years of teaching at the time of the study to having been a teacher for two decades or longer. Three teacher participants were selected from among the group for more in-depth ethnographic study, to provide a greater level of detail on their personal and professional lives, teacher education experience, exposure to ICT, and their experience learning and using digital resources within the scope of the study. This additional level of information helped to fill in gaps of understanding that arose from patterns identified in the data collected from the larger group of participants and to validate findings from the larger group.

From a methodological point of view, there is a risk inherent in the perceptions of researcher identity within the research environment. As a 'western' researcher, from a wealthy industrialized country, working with research participants in an environment characterized by poverty and conflict, there are a myriad of potential pitfalls concerning issues of objectivity, perception, and expectations from participants. What the researcher is perceived to be associated with—material wealth, opportunity, a country of peace and stability—can and did colour interactions between the participants and researcher. Like studies in any location, there is the potential for expectations of receiving something material in return for having participated in an academic study. While these perceptions

are not necessarily avoidable, they can be anticipated and proactively addressed. In the findings chapters, I have attempted to draw out and discuss these issues in order to distinguish how they impact the findings. As a foreign researcher, cross-cultural and sometimes language communication was also a challenge; however, the local partnership with the teachers' college and in particular, the ICT Lab Manager, contributed a great deal to my ability to correctly interpret what was being said to me as well as to read behaviour and actions in the course of data collection. The Lab Manager also served as an interpreter to the participants, who sometimes struggled to understand my accent, local idioms, or technical explanations during ICT training sessions.

As Gulu has for over two decades been the epicenter of a civil, and at times a regional war and remains an isolated, inaccessible destination even to other Ugandans, there is a dearth of recent secondary data to draw upon from this specific region. Few academic studies, either qualitative or quantitative, have been undertaken in the education sector in Gulu. Seeking out Ugandan research where any data from Gulu were included as part of larger area studies, referring to evaluation reports from donor agencies supporting initiatives in the region, and consulting the websites and reports of non-governmental organizations working in the area of ICT4E have served as alternative information sources that I could rely upon to enhance my understanding with recent information from the region. These findings were then linked into a broader theoretical context by reference to recent studies in multilingualism, particularly from other African settings where possible.

3.10 Ethical Considerations

This study has undergone an ethical review process at UBC which was approved on December 7, 2007 by the University's Behavioural Research Ethics Board, within the broader 'Digital Literacy Project' led by Dr. Bonny Norton as Principal Investigator and Dr. Maureen Kendrick from the Department of Language and Literacy Education (LLED). This study conforms to UBC's Policy #89: Research and Other Studies Involving Human Subjects.[10]

This study sought to produce both practical findings and specific learning resources of relevance for supporting desired change in the primary education sector in Gulu. It seeks to honour an obligation to contribute research to an international academic community studying language education and literacy in Africa and as importantly, to Gulu's communities to the extent possible within the scope of the study, in an effort to respond to the call put forth by Boyer (1990) for a new scholarship, one which views scholarship as more than research, and which balances and integrates research, service and teaching more equally, an approach Boyer (1990) calls 'outreach scholarship'. Boyer emphasized the need to build bridges between theory and practice, and for a scholarship that has four components: a scholarship of discovery; a scholarship of integration; a scholarship of application; and a scholarship of teaching. This approach helps bring the advantages of the activist citizen to research, and the rigour of research to solving social problems, in collaboration with communities. Others in line with Boyer's thesis have dissected the need for a broader such scholarship in the discipline of education in particular, such as Cochran-Smith and Lytle (1990a, 1990b) looking at teacher education

[10] I have also successfully completed the Tri-Council Policy Statement for the Ethical Conduct for Research involving Humans (TCPS) tutorial. See: www.pre.ethics.gc.ca/english/policystatement/policystatement.cfm

and teacher researchers, and Sherman and Torbert (2000) examining universities' relationships with communities. Finally, researchers can play a meaningful role in "empowering language communities by educating them on language rights and duties, by exhorting them to mobilize their languages to their advantage, and by encouraging them to seek their reform where necessary" (Simala, 2002, p. 49). Such an approach calls for researchers to present data in such a way that it can be mobilized for change in policy and practice, and shared with communities.

3.11 Researcher's Background and Experience

As a researcher, I bring much field-based experience designing, managing and evaluating education projects in conflict and post-conflict regions in the developing world. As Projects Director for a Canadian charity supporting women's empowerment in Afghanistan[11], I oversee three field programs focused on education in that country: 1. Community Libraries and Book Development; 2. Investments in Public Education; and, 3. Literacy and Community Development. Approximately twenty projects are active in these programs, the largest of which is an in-service teacher training project called *Fanoos* ("Safelight"), which has so far trained and certified more than 2,500 teachers. *Fanoos* focuses on introducing Afghan teachers to active learning methodology and on enhancing their subject knowledge. I also designed Afghanistan's first digital collection of open educational resources, the *Darakht-e Danesh Online Library for Educators in Afghanistan*, which contains more than 750 OERs in three languages across 12 subjects for K-12. I have also been involved in increasing Afghans' access to local language print literature through the establishment of village library and literacy centres in rural districts

[11] Canadian Women for Women in Afghanistan (CW4WAfghan)

of Afghanistan, at the invitation of local communities, and have helped support several local language publishing projects. This work has allowed for much interaction with teachers and teacher educators, giving me unique access to awareness of the day-to-day challenges faced by teachers working in multilingual classrooms within severely under-resourced education systems.

I started my post-secondary studies by studying international development at McGill University, and wrote an Honour's thesis examining the history of regional collaboration among women's movements in the Maghreb region of Africa. I then went on to undertake a Master's thesis researching access to information within civil societies in oppressed and/or unstable states in the Middle East and Central Asia, and particularly, the role of language of publication in the utility of information used by civil society organizations with rights focused mandates (Oates, 2006). My Master's coursework involved field research in Gulu in 2005. At UBC, I joined the Faculty of Education's Language and Literacy Education Department as a doctoral student in 2007, completing my coursework with an A+ average, and moving to candidacy in 2009. My committee brings much experience to my project. Dr. Norton and Dr. Kendrick bring years of research experience in Africa and Dr. Margaret Early's expertise and experience from the Canadian Multiliteracy Project (www.multliteracies.ca) is an invaluable asset to the current study.

My academic research interest in the relationships between language and agency, and my experience working on the human rights and education agendas in countries such as Afghanistan led to the belief that teachers hold the greatest potential in using language to promote empowered literacy and responsible citizenship, and hence, to the current

research pursuits.

3.12 Summary

This study engaged teachers as research participants from three diverse primary schools in the same district of northern Uganda, in addition to one research participant representing one of the local primary teachers' colleges in the district. The research methodology took the form of introducing training workshops in digital literacy for in-service teachers and studying this bound event as a case study, using common qualitative research methods to elicit participant experience at different stages of their training experience. The unit of analysis within the bounded case was teachers' practices within the scope of their experiences in an ICT training focused on language and literacy practices in relation to ICT. The workshops were focused on generating both basic computer literacy skills as well as on content production skills. Over the course of three years (2008-2010), I visited the research site several times to develop and implement the intervention and to collect data at each stage. Primary data collected included participant journals, in-depth interviews with three of the participants plus the participant from the teachers' college, recorded focus groups with all participants, field notes from training and classroom observation, and collection of the assignments created by the teachers in the course of the workshops, among other data. The multiple types of data collected generated an integrated data set, and provided a rich foundation for the analysis process, which sought to draw out repeating ideas, themes and then theoretical constructs to facilitate interpretation of the data.

CHAPTER 4:
Context and Participants

4.1 Introduction

The question guiding this study asks, how can ICTs be effectively used by teachers to teach the mother tongue in Gulu, and ultimately to strengthen the pedagogical practice of local language medium teachers in this region? This chapter introduces the study's context, and its participants and their experience with ICT, setting the stage for the main findings presented in Chapters Five and Six.

4.2 Research Context

The following section will discuss three features of the research site of significance to the study. The first is Gulu's transition to a post-conflict scenario after more than two decades of violent conflict. The section then discusses policy transitions in the education sector particularly with regard to language, and finally, there is a discussion of the policy context of ICT in the education sector in Uganda.

4.2.1 From Conflict to Post-Conflict

Over the period that I visited Uganda for this study, important events were occurring in the aftermath of the two decades-long conflict afflicting the region. These events affected the lives of the participants and are sure to impact the post-conflict environment, helping to determine what kind of society will emerge in the North now that the war appears to be over. The period of study overlapped with a transitional period of some consequence in which various peacebuilding processes were consolidating and many social transformations were occurring.

As recently as late 2003, a BBC headline carried the assertion that the situation in northern Uganda was "worse than Iraq", based on a statement made by the United Nations Under Secretary General for Humanitarian Affairs, Jan Egeland (BBC, Nov. 10, 2003). At the time, the then 18-year-old conflict had descended into horrific brutality, with the LRA executing its war through the use of child soldiers, mutilations of civilians (cutting off noses, ears, lips, and hands), beheadings, sexual violence, and massacres of unarmed civilians, including children and the elderly. As many as 20,000 children had been abducted, half a million displaced due to the violence, thousands killed, and hunger became widespread as agriculture, markets and employment access were disrupted by the fighting (ReliefWeb, 2002). The North was a site of chaos and extreme violence that had largely been ignored not only by the outside world, but also even by Ugandans who lived in more distant, peaceful regions of the country.

Around this time, the first efforts at peace talks began, facilitated by local religious leaders. However, the challenge was that it was no longer clear what the Lord's Resistance Army (LRA)[12] was fighting for, and thus, how to negotiate with them. At the same time, for the first time the LRA was being significantly weakened as a result of a military offensive by the Ugandan army when the army was finally given permission to attack the LRA from Sudanese territory and to destroy the LRA's bases in Sudan. The number of attacks by the LRA became more sporadic.

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[12] The LRA is an armed opposition group founded in 1987 in the Acholi regions of northern Uganda, birthed from a (violent) spiritual resistance movement called the Holy Spirit Movement (based on apocolyptic Christianity) initiated by Alice Lakwena, and then taken over by Joseph Kony, who still leads the rebels today. The LRA has been leading an insurrection against the Government of Uganda since 1987, and has also waged war from or within Sudan, the Democratic Republic of Congo and the Central African Republic, however it is unclear what the group's ultimate political or military agenda is. It is also unclear whether the LRA has any specific political ideology, besides the mystical/religious ideology espoused by Joseph Kony, who considers himself a prophet of God who is fighting for the Ten Commandments. The LRA frequently issue contradictory messaging about their aims and their willingness to negotiate.

When I first visited Gulu, in 2005, the region was decimated. The town of Gulu appeared totally de-populated, as hundreds of thousands of people still languished in camps for the internally displaced. There was very little street life, and more caution than optimism among locals. There was some UN mine removal activity and World Food Programme warehouses, but otherwise few development actors in the region despite the enormity of the crisis, besides a small number of NGOs and UN agencies. That year, the International Criminal Court had announced that it was issuing arrest warrants for LRA leader Joseph Kony and other militants on charges of mutilating civilians, the forced abduction of minors, and the sexual abuse of children, among other charges. This news caused intense, but mixed reactions. For the first time, it appeared as if the international community was paying attention to the crisis in northern Uganda. However, the timing was poor, as it coincided with attempts at peace negotiations and many felt that this process was put at risk by the LRA leaders' presumed reluctance to come out of the bush and stop fighting if it meant they would face trial and prison sentencing in The Hague. Indeed, Kony has refused to sign a peace agreement unless the ICC charges against him are dropped.

When I returned in 2008, dramatic changes had swept over Gulu. The town of Gulu was bustling with activity and had become crowded, with businesses reopening. There were far more NGOs now operating in the region, many focused on peacebuilding, reconciliation, reintegration, trauma counseling, and rehabilitation. The atmosphere had changed dramatically, and locals expressed optimism for the future and seemed to have high morale, united in a sense of rebuilding and rebirth. The Acholiland Primary Teachers' College (APTC), a site of this study, had recently moved from temporary

lodgings in the town to land granted by the government, about five kilometers outside of the main town. Gulu University was newly opened. There was little rebuilding or infrastructure development. The focus of development, instead, seemed to be on psychological rebuilding. This pattern may prove to be significant in the sustainability of Gulu's peace in the long run.

Northerners were also beginning to explore how to document all of the atrocities that had occurred, how to honour the many victims of the conflict and how to educate new generations on the impact of the conflict. Nick, the ICT Lab Manager at APTC, was closely involved in initiating memorial activities, including the development of a proposal to build a memorial centre, organizing an annual march in Gulu called the Silent Walk, the purpose of which is to remember victims of the war, and leading a local youth peacebuilding group.

In May 2010, the president of the International Criminal Court (ICC), Judge Sang Hyun Song, visited Uganda for the first time to meet with local people and respond to their questions and concerns, before going on to the Review Conference of the Rome Statute, which took place in Kampala, May 31 to June 11, 2010. Joseph Kony was still at large five years after his arrest warrant was issued. Many Ugandans were frustrated and wanted to see the LRA disarmed for good.

Then, in July 2010, as I returned home from my last data collection visit, two blasts shook Kampala, killing 74 people as they watched the World Cup at a restaurant and rugby club. The Somali terrorist group, al-Shabab, claimed responsibility for the attack, blaming the participation of Ugandan forces in the United Nations peacekeeping mission to Somalia. Nick was planning to head to Kampala to meet with the Uganda

Communications Commission about extending Internet access to the APTC, when he heard of the attack and cancelled his trip. For him and others, the attack prompted questioning over whether this was a sign of worse to come and whether Uganda had been drawn into a raging international conflict that would usher in more violence.

These events formed a backdrop to the study, and for the most part, the outcome of many of these peacebuilding processes remains to be seen, though currently, the outlook is generally optimistic despite the tragedy of July 2010. Overall, it was an intriguing time to be in Uganda, as the country found itself at a crossroads in many ways: trying to consolidate a permanent peace in the North, balancing the desire for peace with the demand for justice, and entering into a new era of terrorism and globalization with implications for Uganda's role in the rest of the region, and in the world.

4.2.2 Transitions in Education

Uganda is presently witnessing an experiment in the convergence of several intersecting policies developed in relative isolation from each other: a policy of universal primary education; an emerging policy of ICT for education; and a policy of instruction in the mother tongue during the primary years. The UPE policy, introduced in 1997, led to a more than 200% jump in student enrollment almost immediately, deeply straining the school system which lacked the resources to meet the needs of the existing student population, let alone hundreds of thousands of additional students (UNESCO, 2000). Following the introduction of the UPE policy, Uganda established its Millenium Development Goals (MDGs) in 2000 as part of the Dakar Education For All (EFA) Commitments; and in 2001, the Education Standards Agency (ESA) was established and

began its work. In 2007, a draft communications policy was drafted aiming to bring on-line connectivity to all schools and public libraries in Uganda by 2010.

Of these many changes, the language of instruction and UPE policies were the most visible in this study. Every classroom that I visited in the North had a minimum of 100 pupils. The teachers participating in the study stated they generally did not know the names of their students except for those who performed exceptionally well or exceptionally poorly, and classroom management was consistently challenging. While there were usually at least some textbooks at the schools, the textbooks were usually reserved for the use of teachers, who use them to draw up notes to deliver lessons. Any additional copies were shared or had to be signed out of the library, if a student wanted to use a textbook outside of class time. For example, one of the focal participants, John, a teacher at the Army Primary School[13], had a single textbook that he used as a reference in preparing his lesson plans, but the children had no access to the textbooks at all (Interview, November 21, 2009). Another focal participant, music teacher June, describes the situation at her school, the Main Public School:

> Sometimes they share the textbooks because the population is many. You can have 100, or 120 for a single teacher. You may have only 90 textbooks or so. Sometimes we put them in groups when there are few books. The textbooks stay in the school. Because of the insurgency here, the pupils may leave and not return the books. We fear them being lost and damaged, so we keep them here. (Interview, November 18, 2009).

[13] The names of the three participating primary schools are pseudonyms.

The three schools in the study each had one computer on their premises (excluding the laptops later provided in the course of the study), which were reserved strictly for the use of secretaries or administrators; and were not used by the teachers. June explains, "Teachers here are not exposed to computers. They don't even know how to open it. You can interview one and ask them [pointing to some of the teachers sitting in the staff room]! That's why they have trouble using it in Luo. We just don't have access to computers. There is only one in the office" (Interview, June 7, 2010).

There were no school computer labs or libraries. The schools were doing their best under the circumstances, but it was clear that in general, the schools were poorly resourced. Classroom observation in the region during the study, beginning in May 2008, revealed an overall absence of literacy materials provided by the Ministry of Education or the schools' administrations. Almost all visible literacy materials in classrooms, such as diagrams, sets of alphabet cards, or maps on the walls and other visual aides, were created by the teachers themselves. The number of literacy materials on a classroom's walls was determined by each individual teacher's initiative to take the time to create such materials, outside of their teaching hours. Some teachers indicated they also translated English materials into Luo since the introduction of the language of instruction policy, so that they would have local language reading materials to provide to students. None had yet been provided by the government. A teacher at Main Public School, Christopher, explains: "the classroom is not well resourced. If you need other materials, you must buy yourself. Capital is limited. The government doesn't give enough for materials, so we try to improvise on our own" (Interview, November 16, 2009). Earlier

that year, he had provided the following example to me of his effort to show a video to his class:

> At times when you want to get that information, someone will deny you access. And even when you try, they refuse and you end up getting frustrated and you may lose hope. But you may also succeed. Like I tried to get one of these films, "12 Knights" … I tried to get it from my friend but he refused and he said it's expensive, it's important; it's from a video library. I asked him, can you take me there? But he said he didn't have time. So fortunately, I got it through one of the schools. But the other teacher said he would give me - first you have to get permission from the school to get a copy. At times maybe in the process of getting the resources, you find that you may have limited resources to get that one, like if you need a book to buy the money you have may be little. In the process of looking for the fixed price for the book you find someone has it but it's out of stock and you have to wait in vain, and you may not get it. And if you send an order you go and get it but at times they may say, "you don't need to pay, pay when it comes" but when you come back they have sold it to someone else. (Interview, June 9, 2009).

Figure 4.1

Alphabet cards and other signage created by teachers at the Main Public School, (May 2008).

Figure 4.2

Two teachers display illustrations they created after school hours for classroom use (May 2008).

During the period of the study, the language of instruction policy had been in use since 2007, a relatively short period of time. It was clear that the transition was not easy for the teachers who were more accustomed to teaching in English. Despite Luo being their mother tongue, the teachers participating in the study did not feel proficient in using Luo in an educational setting. The reasons for this are discussed in detail in Chapter Five. However, a bit of background information on the policy is useful to understand how technology and language intersect for Gulu's teachers presently.

The local language instruction policy dictates that for the first three years of school, lessons should be delivered in the mother tongue with English taught as a separate subject; whereas, previously the language of instruction was English throughout all levels. Now, from P4 (primary level 4) on, the language of instruction transitions to English. The change is based on a sound body of research that suggests children learn better in the primary years in a language they know well and a strong grounding in their first language will facilitate their learning a second language like English (e.g. Cummins, 1981; Egbokhare, 2004; Klaus 2003; Mehrotra, 1998; Obondo, 2007; Williams, 1996). To date, the local language instruction policy has only been implemented in Uganda for 10 languages out of more than 40. According to the Uganda Multilingual Education Network (MLEN), a coalition of organizations and individuals working to promote the cause of local languages, where the policy has been introduced, it has not been backed by proper materials or training for teachers (pers. communication, Nov. 15, 2010). They are recommending that the Ministry of Education and Sport establish a working relationship with the Local Language Boards (formerly District Language Boards) and establish a National Local Language Committee to supervise the implementation of local language policy in education. Further, the policy to date has mainly been implemented in rural areas, causing resentment and suspicion on the part of parents who believe that urban children are getting more exposure to English and will consequently have greater educational credentials. The role of the mother tongue in strengthening second language acquisition has been poorly communicated to parents and communities, as found by Tembe and Norton (2008). These challenges suggest there is still a long way to go in

order for the policy to meaningfully impact learning outcomes and consensus building over the value of the policy that still needs to take place within local communities.

4.2.3 Leadership, Education and ICT

As the terminology of ICT begins to enter the Ugandan Government's policy lexicon, sometimes at the behest of donors and international policy frameworks, this can be slow to manifest into adoption locally by regional and local leaders. A deficit of will on the part of policy-makers at all levels impacts the ICT environment in Uganda, determining whether good intentions and well meant goals can find fertile ground when it comes to implementation. This issue impacts any discussion of ICT viability in Uganda.

Local administrators may resist the impending changes and refuse to prioritize the new areas of focus when it is poorly understood at the grassroots level. This was the case in Gulu, where the APTC had traditionally marginalized the ICT program on campus. The computer lab, equipped with only seven computers for 500 students, was poorly maintained, under-staffed, and consequently, not well used. Recent principals were distrustful of ICT, according to faculty; however, by 2009, there was a new principal who was reportedly more open to strengthening the ICT support facilities at the College. Nick, the single staff person of the ICT lab, explained how funds were rarely made available for the Lab:

> There is always a budget to run the lab, like every year there is a budget we draw up to run the lab, like anti-virus, maintenance and purchasing more computers. But as time goes on, the budget does not get implemented, because they re-allocate money to feeding students, so you find it's not implemented. There is a slight difference in leadership. Because previously, the leader wasn't interested in

> ICT at all. At least this one is interested and once in a while he responds to requests; he really understands the potential of ICT to improve education and also the quality of education *(*Interview, June 9, 2010).

He adds, "at times you may need certain software that probably you cannot get easily - when you place a request to the college, they will say, we don't have money currently. So that problem persists until it gets worse and worse. Something that you cannot do without support. That is the main problem" (Interview, June 10, 2010).

Insufficient political will and a lack of coordination that fails to drive policy forward into implementation has contributed to a piecemeal introduction of ICT. ICT is nowhere near being integrated into the school system but is cropping up, rather, on a project-by-project basis. This has left the impression on Nick that ICT for education is not a serious priority among leaders, despite the existence of a policy:

> When it comes to, like um, ICT, especially when it's focused on education, it's really a non-priority. There are things which both nationally and locally it's seen as a priority, but not ICT for education. Always the key players, I mean the leaders as we say, how can one go hungry and yet there is money that could be used for ICT. So someone would think it's better to give someone food than to buy a computer for education. Always, it's not a priority. Say maybe an ICT program is being introduced then probably there is need for a gradual process that has to be in place so that those ones will address the attitude of the leadership (Interview, June 10, 2010).

In some instances, localized results have been achieved, but projects are not being scaled up into programs and there is an overall lack of consistent, coordinated ICT interventions. Consequently, in Uganda, too many of these unconnected, local projects have been heavily machine-focused, short-term and unsustainable. Investments were made in computers rather than in people who would know how to use, fix and maximize the potential of computers in local contexts over the long run, long after donor funds had receded. The tendency to focus on ICT devices instead of on those who actually use them are examined in Chapter Six, as are the consequences of this emphasis for the sustainability of ICT for education efforts in Uganda and elsewhere.

In the case of the APTC, Nick explains how the momentum of the USAID-funded ICT project, ConnectED, diminished quickly once the project officially finished in 2005 despite a massive infusion of funds into building and equipping a new computer lab for the PTC plus eight other teacher training institutions in the country (seven district colleges plus Kyambogo University):

> Most of the people who were recruited through the USAID project are gone now, because the college can't sustain them. Mainly the lab managers now are those who are just really interested in ICT, who are passionate, who have passion for ICT, that is why they are there, because they are not getting paid for five or six months. So most of them have something small, like a small business that they run to sustain themselves. Because it's not easy at the colleges (Interview, June 9, 2010).

The experience of the APTC is a mirror onto a policy that has been thwarted by a lack of systemic implementation. The rhetoric and intentions at the national government

level are misleading, since there has been little lasting impact of pilot efforts in ICT4E to date. Those efforts can be characterized as 'computer drops', whereby computers were dropped into a setting and expected to yield higher learning outcomes for educators. Those who participated in the USAID-funded project at the APTC did indeed gain computer literacy skills; however, they had few opportunities to apply those skills once the project finished. This, and other findings from this study, point to computer literacy skills being largely meaningless without continued access, a theme explored further on.

4.3 Participant Profiles

This section provides a brief overview of the participants' experience with computers prior to the study, and presents pre-test results and other data to this effect. It also introduces the study's three focal participants: John, June, and Christopher. These participants were selected from among the 11 original teacher participants to elicit more in-depth data about their experience interacting with ICT, and to track the details of their progress using the laptops. Biographical information is provided for each as well as brief 'ICT profiles' for each. The focal participant profiles capture three diverse experiences of what it's like to be a teacher in post-war Gulu, from my personal perspective as researcher, based on what I learned about each of these individuals.

4.3.1 Participants' Exposure to ICT

The following data provide a basic idea of the ICT ability levels of the teachers at the outset of the study, as well as the type of assessments often administered in a donor-funded ICT project, given that the self-assessment test was modeled on that used by the

Connect-ED project to train pre-service teachers in ICT. Over the course of the program, one participant stopped attending early on; and a second was transferred to another district just before the completion of the study. Another teacher joined in mid-way, bringing the total to 10 participants by the final phase of the study, with nine being consistent throughout the study. Because of these changes, a fully accurate assessment of all of the participants' ICT skills development over the course of the study is not possible.

At the beginning of the study, prior to any training, the participants were asked if they had ever used a computer before[14], and if yes, to state where and for what purpose. Of 11 responses, five responded in their written questionnaires that they had previously used a computer, and provided the following explanations on the forms:

> *Daniel:* When producing my research for my diploma after pursuing the course for a short while in 2007. But because of no access of computer the knowledge is wasted.
>
> *June:* I have used for many purpose depending on the purpose and the program in which the purpose needs, eg microsoft office, installing films, a bit of editing, etc.
>
> *Bernard:* Have been using a computer for typing and drawing tables
>
> *Frank:* Short study in class; Our making a Primary Teachers' Online Curriculum in Gulu PTC under KYU-ConnectED project[15]

[14] One participant completed the pre-test incorrectly and the portion of the responses that were spoiled have been omitted.
[15] This respondent was a tutor at the APTC.

Christopher: At Gulu Core PTC to get the knowledge of on computer or be computer literate, to making notes and other learning material as well as communications purposes

These statements demonstrate that the reasons and circumstances for computer use among the five respondents vary. Two gained exposure during their time at teachers' college (though other participants who are also recent graduates gained no computer experience at college). One is a college tutor and used a computer for work making an online curriculum. The other two respondents used computers for personal or professional purposes in the community.

When asked to indicate a response to the statement, "I feel comfortable using a computer", on a scale of 1 to 5 (where 1= not at all, 3 = somewhat, and 5 = very much), the average response was 4.5, suggesting that the teachers perhaps interpreted the question as inquiring about their comfort level in *learning* to use a computer as opposed to their actual ability to use a computer at the time that they answered the questionnaire, since some respondents who also indicated that they had never used a computer also responded with '5'. When asked to respond to the statement, "I think using a computer will be useful for my job as an educator", using the same scale, every participant responded with a '5', suggesting enthusiasm for ICT and an association between ICT skills and educator skills. Participants were then asked to check one of four options (*1. I can't do this at all; 2. This is very hard for me; 3. I can do this, but not as well as I would like; and 4. I can do this well enough*) for each of the following competencies:

- State the difference between computer hardware and software

- Turn on a computer and computer monitor
- Recognize CD-Rom disks and USB sticks
- Name basic computer system parts
- Logon to a computer network using a user name and password
- Use a mouse
- Use a keyboard
- Open a computer application using an icon
- Open a program using the START menu
- Know where to find the time and date on a computer
- Shut down a computer
- Save a document to my desktop
- Send a document to the printer
- Send and receive email
- Use the Internet to research topics

In the participant responses to the 15 skills self-assessed in the questionnaire based on the ConnectED Computer Skills Learning Objectives (see Appendix A), there were varied responses, suggesting that most participants had had some form of exposure to computers before, even if most had never actually used a computer. For example, six of the ten participants said that they could name basic computer parts; however, the same number of participants selected "I can't do this at all" when asked whether they can "state the difference between computer hardware and software." Half of the participants said that they knew how to turn a computer and computer monitor on, and four out of ten stated they could recognize a CD-rom or a USB stick. Half the participants said they could use a keyboard, and some may have been drawing on experience using typewriters or other machines (such as calculators) in responding to this question. Participants seemed more familiar with the hardware of a computer, but the vast majority of the participants stated either "I can't do this at all or "This is very hard for me" for the software questions, such as knowing how to send a document to the printer or using the Internet to search for something.

Understanding the context in which a teacher has been exposed to computers is important to explaining why some skills have been acquired and not others, and the ways in which ICT learning happens among Gulu's diverse teacher population, as well as how they understand the types of skills listed above. As Mishra and Koehler contend, "developing theory for educational technology is difficult because it requires a detailed understanding of complex relationships that are contextually bound" (2006, p. 1018), and others contend that a true understanding of how ICT tools work in specific settings requires localized study (Prinsloo, 2005; Warschauer, 2003). The following three participant profiles provide a more meaningful look into teachers' diverse interactions and experiences with ICT in Gulu, a snapshot of life in post-war Gulu from the perspective of teachers, and a glimpse into teachers' work environments in this setting.

4.3.2 The Three Focal Participants

4.3.2.1 Christopher

Christopher was born in 1985, the third of seven children. He is from Acholiland (born in what is now the neighbouring district of Amuru) and Luo is his first language. His mother was a nurse and he lived with his family in the hospital's residential quarters in Amuru until his mother was transferred to Gulu, where they remained throughout the LRA violence. Christopher recalls that time:

> When we came from our homeland, it was 1989. That was the war period. We stayed here in Gulu but when it was worse, normally our parents, who had young kids, took us out of the district to our aunt's to stay there when the situation was worse. But then afterwards, we came back. It's good, at the moment. We are staying in town. The town was more safe. It interrupted my studies, because you

> cannot have time to concentrate, you cannot sleep. By 7:00, you have to sleep, there is no time (Interview November 16, 2009).

When Christopher's mother passed away in 2000, his father, who had a background in accounting and had also worked before as an electrician, supported the family working as a quartermaster in the military. Christopher attended Gulu College Secondary School, and immediately joined the Teachers' College thereafter. He has taught at the Main Public School since 2006, where he teaches P5-P7, the same primary school he attended as a child. He also worked briefly for UNICEF before teaching. Besides his education at teacher's college, Christopher also holds a certificate in literature from a joint program of Gulu University and Makerere University, with a focus on writing primary-level reading material in Luo and English. He lives in his father's home in Pece in a house the family built, but he would like to get married one day and have a family of his own.

Throughout the training Christopher was consistently curious about nearly everything. He told me, "I need to learn new things daily" (Interview, November 16, 2009). He was keen to learn everything possible about computers and stated that he admired people who could comfortably navigate all the complexities of computers:

> If a computer is broken, they can just fix it. Once also I would like to be a very good technician, I need to be like all round, if I can do something, that is what I hope (Interview, November 16, 2009).

He spends time in the homes of his friends who own computers so that he can get some time to practice typing and explore all of the software programs that a computer comes

with. He is a film buff, music enthusiast, athlete and avid reader. He wants to learn how to drive and jokes that his students ask if he can drive and he tells them that he can, when he really can't. Christopher is very social and his more advanced computer skills meant that many of the other teachers turned to him regularly for help in the lab, which he was glad to offer. He often played a supportive training role during workshop sessions. Among his career goals, Christopher wants to become a writer, a desire that was evident in his writing Wikipedia entries on Uganda during visits to the Internet café. He explains:

> I want to write books about my country, about my district. My ambition is that the pupils I'm teaching, that I can teach them to be good citizens, so they can be self-reliant and serve their nation, and to have a better community (Interview, November 16, 2009).

Christopher was among the graduates who attended the APTC during the USAID-funded Connect-ED project in which the APTC participated, and Christopher used the computer lab extensively. At that time, the computer lab had Internet access, the high monthly connection fees paid for by USAID. When the project ended, the high connectivity costs could not be sustained by the college and for the past six years, the lab has had no Internet access. Christopher's time spent in the lab during his teacher training years set him apart in many ways from the other participants. His computer skills at the inception of the study were far more advanced than the other participants, and he learned new skills quickly, often teaching himself more complex tasks that were not included in the training curriculum. During the training workshops, I observed his ability to learn new things through his own experimentation. While most teachers were learning the basics of the computers and struggling to differentiate between a typewriter and a

keyboard when using a word processor (for instance, teachers were pressing the 'return' key after each line as one would on a typewriter), Christopher was using footers and organizing his writing using more advanced formatting. The lesson plans he prepared on the computer had a greater level of detail in their preparation, more use of images, and he tended to make his documents bilingual or in Luo more often than the other teachers.

Christopher's exposure at teachers' college to computers had evidently made a marked impact and he sustained his skills despite not having regular access to computers at work or home; however, outside of the college and the study's workshops, he had been largely unable to apply those skills in his career. He was particularly resourceful in seeking out ways to spend time learning new programs and keeping his skills up to date, a characteristic that emerged for the next teacher, June, as well.

4.3.2.2 June

June was 31 years old when I first met her, a music teacher at the Main Public School, where she also lives in school housing with her two young children. She had done her teacher training at the Kitgum Core Primary Teachers College, and earned a further diploma in 2005 from the Onyoma NTC College. She has an assertive manner and a "no-nonsense" attitude. She started her teaching career at the Uganda Martyrs private school, and now has experience teaching P2, P3, P4 and P7, though she is presently teaching students in all primary levels as the school's music teacher. June describes her beginnings in her typically matter-of-fact style of speaking:

> I was born on November 11, 1978 in a place called Adilan in Pader district. So, we were 12 children all from the same family. We are now nine, the others are

> dead. We have three boys, two died and we are left with only one. He is teaching here in the same school, over there, in that class [points]. My mother and father are both now dead. My father died when I was in [secondary year] 4 and my mother died when I was in the PTC, so I was taken up by my eldest sister. Her husband is a doctor. He paid for me to go to school. So when I completed in 1999, I was done [with] the PTC. I started working in 2000. At that time, I met a man working at World Vision. We stayed for one year together, but unfortunately the man died. So we had only one child. (Interview, November 19, 2009).

Then, in 2005, June started a relationship with another man, also a teacher, and they moved in together. Eventually, she had a second child with this man. June was not aware that the man in fact was already married, and indeed, had four wives and was planning to marry a fifth. The relationship turned abusive:

> So when he was bringing another wife, he mistreated me so much and he would throw out my properties, saying I should leave his house. I was completely traumatized. I didn't know where to go. My parents are dead and I have no relatives to support me. I had two children by then. The eldest was one year and two months, when I gave birth to another. There was not proper spacing - When the children were very young, my husband mistreated me. I reported to the LC[16], they couldn't even help. So he wrote a letter to my brother. When your parents are dead, your brother stands in for them, takes the helm. So he wrote to my brother and said he no longer wants me. So my brother accepted him and told him to go away because he was beating me hard. There was a day he forced me - he beat me

[16] Learning Centre

> up and he said he would kill me if I didn't leave his house, because that house is now meant for another woman. So fearing that, I started packing my things and I started renting a small house. I rented for three months (Interview, November 19, 2009).

For three months, June anxiously wondered about where she would live and how she would manage on her own, now caring for two toddlers by herself. She approached the school for help, and the headmaster was sympathetic to her situation and provided her with housing on the school premises. When she teaches in the day, her children are left at home alone, the four-year-old caring for the two-year-old. At one point, during an interview in the schoolyard, the two children peered out from behind her house and June explained to me how she checks in on them during her breaks. As a single mother, June is struggling to make ends meet and reports that she does not receive any help from her former partner:

> So I am struggling up until now with the kids, bringing them up, feeding them, taking them to the hospital. Sometimes, I would ring him, because there would be no money in the house. Sometimes he would come and bring sweets only to the house, it doesn't help. So I told him not to do that again (Interview, November 19, 2009).

Despite these personal challenges, June was consistently very focused during workshop sessions and a remarkably fast learner, though she sometimes appeared distracted or lost in thought. A few years older than Christopher, she had not had the

opportunity to try out computers during her teacher training, but she did know how to use a typewriter and she applied this experience to learning how to type on a computer:

> I did have experience using a computer before, but on my own. First I studied typewriters. In 2000, there were few computers in the northern region. So when the computer came, I used the knowledge from the typewriter to the computer. But then I didn't know how to call it. It was through friends that I used a computer. I have a friend here with a laptop and the school has one computer, but it's meant for the secretary only. I mostly used Microsoft, because it's easy (Interview, November 18, 2009).

She is also a gifted teacher, evidently passionate for the subject she teaches, music. She quickly recognized the potential of computers to teach music multimodally. She used video and audio recordings with her students that she downloaded, projected musical notes in a Microsoft Word document for the class to follow along, and also displayed scanned photos of pages of a storybook that narrated the story from a local folk song (see Chapter Six). She interacted with the students while using these tools, having them respond to what was before them: singing songs, repeating specific musical notes, and responding to questions about the story images. She often signed out one of the cameras that had been provided as part of the study, photographing her choir group, a colleague's wedding, a concert and other events in the community, integrating the photos into her lessons.

Particularly in light of the adversity she has faced in her life, June's case study illustrates well the resourcefulness required to access and make relevant use of ICT in an environment like Gulu's, and the ways in which a creative arts teacher can make use of

the multimedia potential presented by ICT tools. June is expressive and direct, and her journals and interview responses provide thoughtful criticisms and reflections on the challenges and opportunities presented by ICT for Gulu teachers.

4.3.2.3 John

The third focal participant, John, is a teacher at the Orphan Boarding School (OBS), a school for children orphaned by the LRA war, in a more rural part of the district, a few kilometers from town. Many of the students at OBS, who can study there up to the P7 level, were abductees. Boys were soldiers and porters while many of the girls were 'bush wives', a euphemism for girls forced to serve as sex slaves to commanders in the LRA. Some of the students are infected with HIV/AIDS, and most students had significant mental health challenges given their experiences in the war and separation from their families, from post-traumatic stress disorder, anxiety, depression, to 'night terrors', a word commonly used in Gulu to describe nightmares and hallucinations based on memories from traumatic experiences of violence. Thus, teaching at OBS presents an additional level of challenges to an already burdened education system and the 'usual' challenges such as overcrowded classrooms and lack of literacy materials. John has a leadership role in his school, as a head teacher. Despite the extra needs at OBS, the school is particularly under-resourced, as compared to other schools in the district. The students have no access to textbooks. John has one copy of the textbook, which he uses to deliver lessons. He teaches a P3 class in Acholi, and a P7 class in English.

John was born in 1980, into the Patira clan of the Acholi tribe, north of Murchison Falls National Park, several hours' drive from the town of Gulu in what is now Amuru District. He explained his family background:

> I'm from [an] extended and polygamy family with one aunt and two uncles. My father had three wives, giving birth to four of us and I'm his third born child but first born of my mum. My mum died in 1992 when I was 12 years and my follower was three years [old when he died], and my dad and one co-mum [died] in 1995 leaving us in the hands of [another] co-mum who kept us to date (Interview, November 21, 2009).

In 1998, John finished high school and attended teacher training college from then until 2001, at the APTC, earning a diploma in primary education. Upon graduation, he immediately started teaching. He had hoped to keep studying but could not afford to: "I thought of upgrading myself in profession, but due to financial problems, I pursued a diploma in primary education through the in-service programme from 2006 to 2009 January when I finished studying Language Education (literature) and Social Studies" (Interview, November 21, 2009).

John loves reading novels and is keenly interested in literature, often using his time in the Internet café to look up word definitions and read about grammar and English literature. I would observe him searching for Shakespeare plays, which he would download to his USB stick. John is very quiet and kind, often shy during workshops, but handles his classroom assertively. He is different from Christopher and June in that he had never before used a computer or typewriter before this study. When he signed up, he said that he wanted to learn how to use a computer because he hoped it would make him

a better teacher. He immediately had many ideas of what he would use a computer for, including making lesson plans, creating teaching materials, tracking student results and sharing information with others. However, he was unable to find ways of accessing computers outside of the training, unlike Christopher and June, and he consistently struggled in the workshops, relying on help from other teachers to keep up. His lack of access to computers was detrimental and he yearned for private practice time to grasp the skills and speed up his typing. He views the Internet as a way of participating in international scholarship communities, a world he strives to be a part of, and which for him reflected access to the highest standards of knowledge generation.

4.3.3 Previous Exposure to ICT and Access

The two factors that seemed to serve as advantages to Christopher and to June were previous exposure to computers, and their own resourceful practices in seeking ways to access computers despite not being able to personally purchase a computer. However, both were among those participants who had used computers prior to joining the study, which seemed to have played a role in inspiring their efforts to seek out opportunities to use computers. Both wanted to borrow computers occasionally, primarily to practice their skills, and to not lose what they had earlier learned.

Christopher said that it had taken courage to seek out computer learning under the circumstances, and described how he "came independently to learn and self-trained whenever I was out of school and to try to find out about computers" (Interview, November 16, 2009). Christopher often went to the homes of friends who owned computers where he would practice his typing and explore the software programs on the computer. He also visited Internet cafes when he had the time. He borrowed a friend's

laptop and brought it into his class to show his students. He said he was anxious he would lose the computer skills he had gained in teachers' college, plus he also wanted to learn new things on the computer. Christopher describes how he found offline tools of interest on his friend's laptop:

> There was another one, Learning Essentials for Students, which is under Microsoft Office. So that one is also, you don't use Internet, you just download it on to the computer. It has other programs like Student Papers and Reports, Presentations: How to Present; I happened to get that one. There is also Charts and Diagrams. We have Research and Brainstorming. We have features like Organizational Tools, Language Arts in the social studies. Unfortunately our local language is not inside that one (Interview, June 9, 2009).

On another computer, Christopher found an edition of Encarta Kids that had been installed, accessible off-line, and he used the search function to browse entries for animals, plants, people, history, science, sports, body parts and biology. He found games, reading and writing programs, and also used the Encarta Dictionary to find words and check his spelling. Christopher was also one of only two participants who visited the net cafes, and paid to browse the Internet, outside of the workshop training. He explains how he would check the various net cafes around the town to find one that wasn't too crowded:

> I normally visit the net on Friday at this time [10:00pm], then Saturday and Sunday, then Wednesday I go during lunchtime. I go to Nile Computers, where we used to [go for training workshops]. And if there are many people, I go to Ma

Computers. And there is one - next to, opposite - there is another computer centre there (Interview, June 9, 2009).

Originally, all the participants were also given access to the laptops that were donated to the study as well as the desktop computers in the college ICT Lab through the provision of transportation stipends to visit the lab. Since the PTC is located five kilometers outside of town, this presented a barrier to many of the teachers. For every visit, up to 40 visits in total, a teacher would be given the local equivalent of approximately $4 ($2 for each direction), which would cover the costs of a motorcycle taxi to and from the Lab. The frequency of visits and payments of stipends were recorded by Nick, the Lab manager. The number of hours in three months of lab visits are presented below, for December 2009, and January and February 2010.

Table 4.2: Participant Lab Visits

PARTICIPANT	**Dec-09**	**Jan-10**	**Feb-10**	**TOTAL**
Davis	62.5	84	0	146.5
John	81	81	0	162
Joy	77	87	0	164
Christopher	71	81	0	152
Albert	63	70.5	0	133.5
Willie	0	75	68	143
Bernard	76	67.5	0	143.5
Kenney	72	0	59.5	131.5
Daniel	75	0	83	158
Simon	75.5	0	59	134.5
June	76	0	69.5	145.5

PARTICIPANT	Dec-09	Jan-10	Feb-10	TOTAL
Frank	59.5	0	0	59.5
TOTAL	788.5	546	339	1673.5

The teachers tended to come for long periods of time when they visited, usually between five and nine hours per visit. Often they came in partners or in groups, with other teachers from the same school. All but one teacher visited the lab in December; however, lab visits declined somewhat the second month, and more so the third month. This may be on account of challenges teachers sometimes faced in the lab, such as power outages or arriving to find the lab closed during regular business hours. The average participant spent more than 145 hours each in the lab over the three-month period presented above. The two participants with the strongest level of skill, Christopher and June, spent a fair amount of time in the Lab (152 and 145.5 hours respectively), however, other participants who struggled far more during the workshop sessions, spent more time in the Lab, such as John (162 hours). Joy spent more time than any other participant in the Lab (164 hours); however, Joy is the participant who progressed the least overall and who completed the fewest assignments.

This data seem to suggest that those with any previous exposure were less reliant on practice time in the Lab; and that Christopher and June were also accessing the computers of friends or colleagues in town, and not reliant solely on travelling to the Lab. Nick suggested that access to computers outside of the College was making an important difference in skill and comfort level for some participants:

> Apparently, access to computers from elsewhere, say for the case of Christopher, June and Willie, who after every school hours, works as a volunteer at secretarial

> bureau in town (Christopher, I mean), this can also enhance their skills and better abilities to use computer for content development. There was addition[al] effort to reinforce learning beside practice time from the lab (pers. communication, August 1, 2010)

Nick also noted that the level of focus and attention to teaching-related activities in the computer lab varied among participants:

> Taking another case, Albert. I hope you remember that Albert and many other teachers would have a task, but they lost focus and concentrate on some other things of little relevance like playing music and games etc. This can also affect the proportionality of time taken vs ability developed. This has been critical during skill development phase, before content creation and information access and sharing phase. Therefore due to extrinsic factor like extra access to computers facilities may increase potential of skill development but also intrinsic factors such as interest with focus double potential of better skill development (pers. communication, August 1, 2010).

Unsurprisingly, there are different motivations for different teachers, and in most cases, there are a mix of reasons for accessing computers. Some teachers perceived computers and the Internet as a means of making friends internationally, getting the latest updates on popular culture such as downloading hits from Ugandan music groups, or simply as a means of entertainment. For others, computers were more often recognized as a tool for increasing efficiency: a way to more quickly prepare lesson plans or maintain student records. For some, the primary value of a computer was to prepare lessons and

classroom materials in a multimodal way. And for many, computers were recognized as a career enhancement tool, both in providing a new skill that could improve employability but also as a way to capitalize on opportunities, such as being able to type a professional job application letter or apply online for overseas study opportunities. All of these investments will be explored more fully in Chapter Six.

4.4 Summary

In this chapter, the research context was described, focusing on three conditions influencing the study environment. The first was the transition from an active conflict to a dormant conflict in Gulu. The second condition discussed were the significant changes in educational policy in Uganda foremost of which is a newly introduced policy making local mother tongues the language of instruction in the first three years of primary school, Third was the introduction of ICT into teacher education curricula and challenges facing the effort to integrate ICT into educational training facilities like teachers' colleges. The study's participants were also introduced, presenting information about the skills with which they came into the study, including the differing types of previous experience with computers. The role of this previous experience is highlighted in the description of the focal participants and biographical data indicate diverse life experiences, including struggles with adversity. The 'snapshots' of the three participants begin to tell something of the relevance, uses and meaning ICT has for their lives, setting the stage for themes that will be explored more fully in the next two chapters.

CHAPTER 5:
Placing ICT in Gulu – The Learning, Teaching and Connectivity Environment

5.1 Introduction

Chapters Five and Six present findings organized according to the five main themes identified in the data analysis. Chapter Five deals with Theme 1 - Language, Literacy and Educational Materials (Section 5.2 of this chapter); and, Theme 2 - Conditions Impacting Local ICT Use (Section 5.3 of this chapter). Chapter Six deals with Theme 3 - Identity and Investments; Theme 4 - Content, Format, Mode and Utility; and Theme 5 - Navigating and Sustaining ICT Competence.

The themes of this chapter relate to the teaching and learning environment, in other words, to the real life context in which ICT interventions occur in Gulu, focusing firstly on the role of the mother tongue (L1) including the language of teacher preparation vis-a-vis the new language of instruction policy for primary schools, the roles for English and Luo as perceived by the teachers, the lack of local language literacy materials in the classroom, the challenges of spelling and language standardization in using the L1 on the computer, and the perception of the teachers that computers are "planned in English". The chapter goes on to present and discuss findings related to the state of ICT in teacher preparation and classroom pedagogy in Gulu at present, the perceived value of ICT for contending with large classroom size, and reviews technology conditions in Gulu through two highlighted examples. The first example presents findings from a workshop on open educational resources (OERs) with the participants, and the second considers data from a workshop using an LCD projector and presentation software for lesson delivery. Finally, the chapter concludes with a section on findings related to ownership and access issues

that emerged to present challenging implications for the sustainability of the study's anticipated social action outcomes, and indeed, for any ICT4E efforts in Gulu or similar environments.

5.2 Language, Literacy and Educational Materials

As described earlier, Gulu, like other rural regions of the country, has adopted the local language, Luo (also called by its dialect name, Acholi), as the language of instruction for the first three primary years. This study captures this transitional moment in time in one local setting, and how the policy is actually implemented by teachers and schools in that setting, relative to the ideals embodied in the policy. What emerges from the data is a disconnect between the policy and practice, whereby teachers struggle to use their native language in the context of the classroom, in a society that has come to assign certain roles for the local language and certain roles for English, practices that have turned out to be difficult to adjust. The new language policy in education has created tension between these roles, yet there is inadequate support to assist teachers in the evolving role of Luo as a "classroom language", rather than only serving as a "community language".

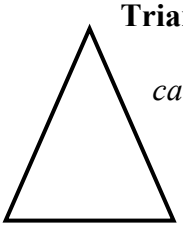
At the outset of the training, Nick and I communicated to the participants that they could use their ICT training to create educational resources in Luo to help them deliver L1 lessons, as they were expected to do now by the Ministry of Education. We also discussed extensively the ICT for mother tongue education focus of the research, which the teachers seemed to enthusiastically embrace. During the orientation session, the teachers expressed their support for mother tongue content as the purpose of ICT learning, sharing comments and stories about the importance of finding effective ways to

preserve and promote their language through the classroom. However, when the teachers began to hand in their first digital educational resources and lesson plans, most were in English. Luo was used mainly to label items, or the Luo text was included that would be taught to the class, but the main instructions in a document were in English, with the exception of one participant (Christopher) who tended to write his lesson plans in both languages.

For example, in a lesson plan by Kenney on the topic of food and nutrition, several tables appear with columns for the name of the food type in English, then in Luo, with the final column used for photos of the food type. However, all the rest of the lesson plan is in English, both the teacher's notes, as well as the key lesson points the teacher communicates to the students, such as:

> ***Proteins*** *(Body building) cam madongo kumwa*
> *These are food which helps our body to repair worn out parts. Protein helps in the growth of the body. An example is meat, milk, chicken, bean, and fish, groundnuts, liver, and Soya beans.*

Or, in another example from Kenney:



Triangle

This is a figure with a three side. In local language the shape is called latwoke adek

(Lesson Plan, Kenney, n.d.)

When the local language was used in lesson plans, it was generally not for the instructional purpose of the teacher, but rather as notes about specific vocabulary in the local language that should be presented to the learners during the lesson. During a focus group session, I inquired why most of the educational resources, whether lesson plans or

items that were used with students such as slides, were predominantly in English (Focus Group, June 5, 2010). Several reasons emerged from the responses of the teachers, detailed below.

5.2.1 Language of Teacher Preparation

Several of the teachers explained that even though Luo was their native language, they attended both grade school and teachers' college in English, and their reading and writing abilities in Luo were limited. They found writing in Luo time-consuming, and were accustomed to preparing their lesson plans and other materials in English, which is how they were taught to do it in teachers' college. All of the teachers told me that they found reading in English easier than in Luo (Focus Group, June 5, 2010). They were unfamiliar with the Luo versions of the terms most commonly used when planning lessons or making up classroom exercises, or with regards to the curriculum. A teacher from the Army Primary School, Albert, explains: "Because from the institution, we have been taught how to make it in English. That skill, we learned it in English… I can read something in English very fast, but when you bring something written in my own language, my speech just reduces because I am very slow in Luo" (Focus Group, June 5, 2010).

John told me, "It's not because it's easier but preparing something in Luo makes it difficult for me. Because we had little time to work on this in the PTC because of the power that was absent there, so I was making it at the computer centre where I was paying, so I had little time… there was not enough time to prepare it in Luo" (Interview, June 10, 2010). Typing in general was tedious for many participants who were new to

computers, but typing in Luo was especially time-consuming, and participants reported often feeling rushed in the Net Café, which charges per time used on the Internet (usually approximately 1,500 UGX per hour, or about $1 - $2). In his journal, John wrote, "I found preparing [the] lesson presentation on power point is easier in English than in Luo. In Luo, every words are incorrect in the computer because the computer is planned in English." June told me,

> I am more comfortable writing in English. I have a greater vocabulary in English. It's because of the foundation. When I was still young, I was not exposed to local language, so I was losing it. When I started studying in P2 or P3 they were using English, so I wasn't exposed much to local language. The policy is changing. We are going back to our local language. You have to get books and read more to learn the local language so you can teach it. Even some teachers have difficulty even writing the words. There aren't many books in Luo, there are few. So it's hard for them to teach it (Interview, June 7, 2010).

Nick supervised the teachers over the weeks that they were preparing their educational resources. His explanation for the predominant use of English is that the teachers are slow typers and that typing in Luo slows things down even further, leading them to fall back on English, to save time:

> I think there has been that question of which language these lesson plans should be in, or the materials that they are producing. But somewhere we, at some time, we agreed that both should be in English and in Luo, and some people did it, but since some people have just started it and the speed is slow, some people did their

> English part and never got to doing their Luo part, so that is what happened. But, uh, they were aware it's supposed to be in Luo (Focus Group, June 5, 2010).

Nick is referring to the period between workshop training sessions, when participants were coming to the ICT lab at the college for independent practice time and to work on creating digital educational resources, which they used in their classes, as well as sharing them with Nick and me. The teachers and Nick often talked together about ways of supporting each other to create the resources, and over the course of their practice time many reported that if they were to prepare something in Luo, they would first need to write it in English, then translate it. It was too difficult for them to create the resources originally in Luo. Thus, the initial enthusiasm for the opportunity to gain computer literacy for the purpose of creating learning materials in the local language dissipated when the participants were confronted with the constraints from the time it takes to think, plan and write in Luo, a language they have not traditionally used in an education or work context. Further, they felt that the computer was designed for use in English and was insufficiently compatible for use in their first language. These findings are explored in the following sections.

5.2.2 Luo for Speaking and English for Writing

What emerges from participants' statements is that Luo is considered the language for speaking, while English is the language for reading and writing. The mother tongue is reserved more for use in the community outside of the school/workplace context, while English is the language of education. Participants have settled into habits of language use that have proved difficult to transcend despite the introduction of the L1 language of

instruction policy for the early primary years. Participants have little in the way of support for adapting to the change, and often fall back on the use of English for teaching tasks.

Christopher describes the separate uses for Luo and English:

> You know in Luo, speaking, it might not be easy but writing the others letters whereby if you are speaking. Like if it is a name, like nyero [pronounced eneero] you find that it is n-y-e-r-o. So, the way you pronounce it, is different from the way you write it. So it makes speaking easier than writing. Ya. So with English and Luo, at least you find that in your lifetime, you learn English. But with Luo, you speak it, but with writing, there is a little bit of it, but with English it's always [for writing]… by the time, you are reading, you are writing, and speaking [in English]. So that is a problem with that (Focus Group, June 5, 2010).

June describes Luo and English as having "different roles" and elaborates:

> There are different accents from English to Acholi. The head teacher recently, in our last meeting, said when you are speaking to kids from P4 to P7 you have to use English. When you speak to any kids in P1 to P3 you have to use the local language. At home we use the local language. And in any environment where English is not spoken, I use the local language. Like, I am in two choir groups with church. So at that time, I use Acholi because some of those people don't speak in English. Mon Pi Dongo Lobo ("women for development"), a group I am participating in… when we go there, the major language is Luo because there are some women who don't even speak English, but there are others who understand.

> Generally people who speak English are those who have been to school (Interview, June 7, 2010).

John uses English at school and Luo at home and in the community:

> In the computer I am more comfortable in English. At school, me I like English, even in my class when I am teaching, I am just using English. At home we speak Luo. Most of the community in which I live are Luo speakers. At times occasionally when I am in a community where only English is spoken, I find myself very comfortable there. But it's not that common in my environment (Interview, June 10, 2010).

Christopher provides further examples of when Luo is used instead of English: "Like if we are educating kids on sanitation and hygiene, we would use Acholi" and specifies that "you have to use the local language for people who are illiterate", adding that he makes a conscientious effort to use both languages, albeit in different situations:

> if you decide to use English, fine. If you use Luo, fine. It depends who you are talking to, if it's someone who does not understand the local language, you use English and if they don't know English, you use Luo. I use the languages about 50/50. I try to balance them. Like in school, it's mixed. In the lower form, it's the local language. And in upper form, it's both. You find you balance them. At home, we use the local language. But if you used English, they would also understand. You can use it freely (Interview, June 9, 2010).

The participants can transition into Luo for conversations in the community, on issues like health, hygiene, women and development or for local storytelling and cultural

activities. In another study in Uganda (Prah, 2003), national NGO workers point out that they also use local languages like Acholi and Karimojong when they talk to rural people about herbal medicines, crops for animals and nutrition because it makes locals more trusting and open to collaboration: "many people have knowledge but cannot express themselves in English. Such people express their ideas in their own languages" (p. 39).

Although English is useful as a uniting language for Ugandans, John is also wary that it's associated with the elite and he avoids speaking English among rural people:

> Luo at times, I just speak it because it's the first language of the community. In town or in other communities there are other groups and if we commune ourselves together, it's only English that unites. Because we have so many languages, we use English as a uniting factor to join us together. But at home, I speak in Luo just because all my family members are Luo members. And when I go to the villages where I come from, when I speak in English they say, "you are showing off" so it makes me restrict [my]self to use Luo strictly to avoid those words from the community. It's a common way, to think you are bossing with the English, because most of them don't understand it. It's like you are abusing them and showing off, they don't understand (Interview, June 10, 2010).

The teachers are conscious of a class difference whereby English is associated with prestige, a characteristic that can have a negative impact in a rural setting. Further, there are few literacy resources in Luo to support the policy implementation, in either the community at large or in the school system. Those resources that do exist in the schools are still in English, pre-dating the new policy. June explains, "When I'm in school, I use English more. I use Luo outside of school. Sometimes I speak to the teachers in Luo, but

usually in English. The lessons say we have to speak in English" (Interview, June 7, 2010). She adds how she is more comfortable reading and writing in English, given there is little reading material in Luo:

> I have a greater vocabulary in English. It's because of the foundation. When I was still young, I was not exposed to local language, so I was losing it. When I started studying in P2 or P3 they were using English, so I wasn't exposed much to local language. The policy is changing. We are going back to our local language. You have to get books and read more to learn the local language so you can teach it. Even some teachers have difficulty even writing the words. There aren't many books in Luo, there are few. So it's hard for them to teach it (Interview, June 7, 2010).

From these statements, it can be surmised that English is a classroom language; the language in which one has been trained in the teaching profession, and the language in which one teaches. Luo is reserved for interactions outside of school, in the community and in the household. These different practices are reinforced by the association of English as a prestigious language, one that might imply "showing off" when speaking among rural people who are not literate in English.

Despite the teachers speaking Luo as a first language and their embarrassment using English in the community, this separation of uses has resulted in their lack of comfort using Luo in a formal educational setting. Similarly, a study by Margaret Akinyi Obondo of a group of Luo speakers in Kenya found that rural children had stronger competencies in Luo than did urban children in the performances of Luo narratives (1996). The urban children used English in school and though Luo was their first

language, they were less comfortable telling stories in Luo. At the same time, however, there is a thirst for information and education to be available in local languages among rural and peri-urban Africans, according to Prah (2003), whose evaluation of telecentres in Uganda supported by the Ottawa-based International Development Research Centre (IDRC) found that when digital content (in this case, on CD-Roms) was made available in select local languages (including Acholi) following professional translations, it made the computer users feel that it was "possible to present scientific materials in African languages," undermining the view that "Africans generally do not want to acquire scientific or technological knowledge in their own languages" (p. 31).

The findings presented in this section suggest that despite the Ugandan Government's rhetoric valuing the preservation of indigenous languages, little has in fact changed in the division of language uses, with English still commonly associated with and used for education purposes; and Acholi used outside of formal education settings. The dearth of L1 resources and training in both the school and the community that could serve to make Luo relevant for a wider variety of settings has played a role in entrenching this separation.

5.2.3 Lack of Local Language Literacy Materials

My field observations found that when there are in fact textbooks available in Gulu schools, they remain the old English versions that pre-date the L1 language of instruction policy. By 2010, local language textbooks had not yet been distributed to schools in Gulu, though the shift to L1 instruction had been in effect since 2007. Several teachers reported hearing that the new textbooks were in the process of completion, and

would be of superior quality to the old ones; however, no one had yet seen the new editions. Besides textbooks, there were no storybooks, printed visual aides or other literacy materials in schools in the Acholi language, and local language reading material is rare in the community at large, given there is no local language book publisher printing in Acholi. There is a single local language print news media source, the weekly, *Rupiny* (as well as an Acholi language radio station).

June explained the situation at her school, the Main Public School, which is the first school in the district to have integrated the new policy, emphasizing that it remains in an experimental phase, seeing "if it will work":

> Some of the textbooks are updated. Some are from some years back but are still stored at the library. The quality I think is different. For instance, P4. It's a transitional class. The Main Public School and Army Primary are pioneers because they are first - the government started introducing the thematic [curriculum]. They were the first pupils introduced to that. It's now four years that the lower classes are being taught in the local languages. The government is writing new books for these children. Because they are changing from local language to English. You use the local language and then you start mixing. They are trying to implement it and see if it will work (Interview, November 19, 2009).

ICT instructor Nick explains how the challenges are not unique to Gulu schools:

> …like the idea of teaching local language has just come. And most of these people I think they are still learning how to read and write in the local language, like they are in P1, even some of us at the university… So [the teachers] are in the transitional class where it has been introduced. So they are also just learning. We

> always have a workshop here, and some of these challenges that they are bringing up, it also exists in other schools, and for other teachers. So translation is one of the things - there are words that you find in English, and really they are using it, they know it very well, and when it comes to using it in Luo, it becomes very difficult, and at times, there is no substitute word (Focus Group, June 5, 2010).

Usually any Luo resources used in the classroom have been translated by the teachers from English rather than created in Luo originally. The administration for the most part still expects documents to be handed over in English, a practice entrenched by the fact that many senior administrators come from other districts where Luo is not spoken. Senior education officials, such as principals, tutors and academic heads are occasionally transferred around the country, reinforcing the role of English as a lingua franca.

Christopher explains who typically might see a lesson plan prepared by a teacher, from school officials to Ministry of Education officials inspecting schools and teachers operating in IDP camps in the district: "we have the head of the department. They first see it, then you take it to the academic head to see, then maybe the head teacher will also now see it. Like, also the high authorities, like inspectors in the camps will come to supervise, to see how it is there, and they will see" (Focus Group, June 5, 2010). June explains that she uses English at school: "I use Luo outside of school. Sometimes I speak to the teachers in Luo, but usually in English. The lessons say we have to speak in English" (Interview, June 7, 2010).

There is thus obviously a disconnect between the language of instruction policy and the actual implementation, given school authorities still expect to approve lesson plans in English only, and are sometimes unable to understand the local language of the district in which they work if they come from somewhere else. One teacher, Willie, explains how preparing something original in Luo simply creates more work for teachers, who will then have to translate it into English too: "we don't like these things in Luo, because maybe if you write one part in Luo, then maybe you have to translate another part into English" (Focus Group, June 5, 2010). Christopher says he prefers to continue the practice of using an English lesson plan to deliver a Luo lesson:

> You know, we can write the lesson plan in English but we can deliver it in Luo, in the local language. So most of these books that we are using, they are in English. So it is for [us] now to change them into Luo. So we can write in Luo, or we can write even in English, but we find that it is easier to first write in English and then translate it into Luo (Focus Group, June 5, 2010).

These statements show that the teachers struggle to use Luo in the classroom and do not feel proficient planning a lesson plan, communicating with colleagues, or writing in Luo. If something needs to be prepared in Luo, they first write it in English and then translate it to Luo, suggesting that thinking and planning for school and work-related tasks is easier in English in these circumstances. However, Luo is their first language and widely used at home and in community settings, particularly in rural areas. English has become the language for education, and is used for text-based communication, while Luo is the language for use in the community, used largely for oral communication. The mere

declaration of a policy change does not on its own change entrenched attitudes and established language practices.

5.2.4 Spelling and Language Standardization

Another challenge facing the teachers in using the local language with ICT is that Acholi is not used in any standardized way across the region or even within districts in terms of its writing system. The teachers were unsure of which spellings to use, and at times, which words to use. Dialects and spellings vary significantly across the Acholi-speaking districts, which include Gulu, Kitgum, Pader and the newly created district of Amuru. The language itself has at least 12 different names and spellings: Acoli, Acholi, Akoli, Acooli, Atscholi, Shuli, Gang, Luo, Lwoo, Lwo, Lok Acoli, and Dok Acoli. Nick explains:

> somebody from, say maybe, from Gulu or from Kitgum, speaks not the same Luo from that person, from say Amuru… And like sometimes one thing will mean something else… something exists in one dialect, and it's not there in the other one. Or the other dialect has a different word for it (Focus Group, June 5, 2010).

In the 1930s, a movement to introduce a phonetic alphabet for Acholi and other African languages was introduced by the colonial-era International Institute of African Languages and Cultures (IIALC), following the launch of the Institute's efforts in 1927 to "unify disparate African spelling systems" (Peterson, 2006). Today, however, Acholi uses five vowels, 16 consonants (including the compounds bw; pw; and ny) and two semi-vowels (w and y) from the Latin alphabet as its writing system (thus all the letters from the English alphabet except the letters h, q, s, x, and z.)

Study, documentation and advocacy around the standardization and preservation of Acholi has been slim over the last century, and especially sparse over the past forty years, following some modest interest in the early 20th century from Europeans seeking to document languages in the region. In 1907 the IIALC published *An Outline Grammar of the Acholi Language* (Kitching), followed by *A study of the Acooli language. Grammar and Vocabulary* (Crazzolara, 1938). *A New Acholi Grammar* was published in 1955 by a Ugandan writer in Kampala (Malandra, 1955). In addition to only one more recent text, a language textbook for foreigners (Okidi, 2000), these early texts still serve as the main authoritative sources on the language's orthography. There is no consensus as to whether the language has a standardized orthography or not (PanAfriL10n.org, 2012). What is clear is that standardization does not exist in practice, and this poses one further challenge to the teachers perceiving Luo as viable for educational purposes. The issue is of some consequence. As Muthwii and Kioko (2003) point out,

> whether an African country adopts a monolingual, bilingual or multilingual language policy, the question of which variety will be taken as the standard in the education system is an important one. In the case of African indigenous languages the issue of standards translates to the choice of the variety to be used, since several dialects of the same language often exist (pp. 102-103).

However, work has started in Uganda into the facilitation of language standardization by clustering similar dialects. The effort to create a new language, Runyakitara, from four closely related dialects, Runyankore, Rutooro, Ruchiga and Runyoro, in 1990 is generally considered to be a success story, enabling standardization

and L1 instruction among a resulting larger group of speakers. This approach has been advocated for other Bantu dialects that are mutually intelligible[17] (Prah, 2000; 1995) and guidelines for harmonization and standardization have already begun, which "open the way to the identification of large speech communities which can access shared written forms" (Prah, 2003 p. 2). IDRC contends that this would "represent a major breakthrough in the rendering of literacy enhancing materials and knowledge empowering data from grassroots societies, and pioneer a new approach to development in the region" (Prah, 2003, p. 6).

5.2.5 "Computers are for English"

Finally, the teachers found the computers unaccommodating for the local language. This perception was primarily manifested in their experience using Microsoft software programs, which would not recognize Luo words, underlying non-English words in red, a visual symbol that something is incorrect. In training and practice sessions, I often observed the teachers expressing that they were annoyed with the spell-check feature of Microsoft Word and how it would automatically change Luo words to an English proximate, a feeling echoed in their statements in a Focus Group session and in interviews. As new computer users, the teachers did not know how to deactivate the spell check feature, and English is the automatic setting for this application. Further, Acholi, and no indigenous African language for that matter, is on the language menu in

[17] Sharing 85% of words or more.

Microsoft[18]. The teachers expressed the oft-repeated belief that computers were "for English" and were "planned in English".

Daniel gives an example: "there is some vocabulary in Luo when for example when you want to type 'lokema' (that is children, huh?), then it will change it back to 'locomotion' so that some words were being changed back" (Focus Group, June 5, 2010). John explains that "it takes longer to make it in Luo. Up until now, if I make it in Luo, it shows errors… the computer is planned in English. Every word is underlined. It's somehow tedious rubbing all those" (Interview, June 10, 2010). He adds:

> I can write in English better than in Luo. Using pens and other things I am well conversed in both languages. When we use a computer it is not easier, because of the underlining. I don't like it. And it takes longer to type because of all the time you need to correct.

John wrote the following in an entry in his journal, "the challenges I met yesterday was making lesson in Luo. Almost all words are underlined due to wrong spellings. It made me change to making lessons in English" (n.d.)[19]. Albert adds, "there are some words in the local language which are very close to the English word, so when we are typing it on the computer, the computer will go and change it, thinking you want to write that one but you don't know. But it corrects you! It will turn it into English words" (Focus Group, June 5, 2010).

While there are no letters or sounds in Luo not found in English, there are letters and sounds in English not found in Luo, including 'h', 'q', 's', 'v', 'x' and 'z'. According

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[18] Microsoft does however include languages such as Latvian, Finnish, Irish and Galician, which have a combined total number of speakers of about 11 million; languages with considerably fewer speakers than major African languages like Swahili, Hausa or Yoruba, *each* of which have more than 20,000,000 native speakers.

[19] The teachers did not date their journal entries.

to the participants, there are also embellishments to words that are difficult or not possible to write on an English keyboard. Christopher provides two examples: "Luo is not difficult to type in, if it's people's names. But say, like tomatoes, it's *nyanya* in our language. So that one, when you're spelling it, the combination of that letter 'ny' is different between how you say and how you spell it" (Interview, June 9, 2009), and,

> Like in our language, you see 'queen'… in a different way, how we pronounce it. We call it 'anayado' which is a queen. So, in Luo, you would go like this [demonstrates underlining with his pen] that is how to relay how a queen is beautiful like the moon, so we don't have this word here in, so there is a problem here if you are writing or using the computer, you don't write this one, the computer is not recognizing it (Focus Group, June 5, 2010).

While the successful spread of Unicode as the dominant character encoding means that modern ICT applications need not be English-centric, existing multilingual tools are not in wide use in Gulu, and had not been made available to the participants. Opportunities to strengthen teacher preparation and teacher practice through the integration of multilingual pedagogical tools in ICT are discussed in more detail in Chapter Eight.

5.3 Conditions Impacting Local ICT Use

This section describes conditions that impacted the introduction of ICT tools among the teachers in Gulu. These conditions include the type of preparation that teachers have in relation to ICT training and previous exposure to ICT tools, the

particularly large classroom sizes teachers are expected to manage under the UPE policy, and the conditions in Gulu of local infrastructure impacting the viability of ICT use.

5.3.1 Teacher Preparation

This study found that exposure to different technological tools, including both computers and typewriters, in teacher college succeeded in imparting skills; however, there were few mechanisms in place to ensure these skills could be put to use in education settings post-training, unless an individual went to extraordinary measures to find ways of accessing and using computers. Considering the low salaries teachers in Uganda earn[20], in most cases this is not likely to occur.

Gulu district has three teacher training colleges, the APTC which is the local core teachers' college, a church-run PTC, and a national teachers' college. ICT has not had a meaningful or lasting presence in any of these institutions to date. The national PTC has just recently partnered with a local NGO, BOSCO, to establish a lab of eight computers with web access and focused on Web 2.0 skills; however, it is too early at this point to gauge the impact or sustainability of this initiative. USAID's Connect-ED project mentioned earlier included the APTC as one of eight teacher colleges in addition to Kyambogo University which participated in two phases of this project, the last of which ended in 2005. A one-room computer lab with a small attached office, some of the hardware, program handbooks, and a trained ICT lab manager remain from this project at the college; however, Internet access ended when the project finished, and the hardware has been deteriorating since then. Of the 10 computers provided by USAID, seven remain

[20] Primary teachers in Uganda earn approximately 275,000UGX per month (2011), or about USD$112. Secondary teachers earn an average of 450,000UGX. Ugandan teachers, through their unions, have long been lobbying for salary increases, asking in 2011 for a 100% pay increase. The GDP per capita in Uganda is reported as USD$1,300 per annum (CIA, 2010).

in the lab and three of those are only semi-functional. Support for sustaining the lab post-USAID from the college administration has been modest, though the college has continued to fund the salary of the ICT lab manager and at the close of this study (January 2011), was preparing to approve an assistant position for the lab. A small number of students continue to use the lab between classes and enjoy the assistance of the lab manager. However, as computers and other equipment such as an LCD projector break down, there seems to be little priority placed on replacing or repairing them. For instance, two of the lab desktop computers left from the USAID project were not in use because of problems with their monitors. Used monitors could easily be purchased cheaply in Gulu; however, this was not done by the college, to Nick's frustration, and therefore two computers were rendered inaccessible to students, out of a total of only seven in the lab.

Two participants who had previously used a computer and in one case a typewriter, stood out among the other participants in that these foundational skills helped them learn new software programs on computers quickly. They were not weighed down with needing to learn their way around a keyboard, so they could focus on developing skills in how to use the software.

Christopher was a student at the APTC when its USAID-funded Internet lab was still active and the computers were newly arrived. While Christopher retained his ICT competencies, he had to innovate ways of gaining access to computers, usually borrowing those of friends or saving up money to go to an internet café. Computers were not integrated into his teaching with any regularity, and his school did not have an infrastructure supportive of using computers in the classroom. He describes a time in

which he wanted to provide a handout to pupils based on web content he thought would be useful in his class:

> So in that website for the *New Vision* [a daily national newspaper], they published about how to do - like something like mathematics, English, sounds, they do it weekly for the people to do. So I tried to get that one to give to the other pupils in the higher level, so they [would be] happy. I tried to make it with that one, only that I could not print them out because the printer at the school could not print that long number, so I got 50 so they were sharing (Interview, June 9, 2009).

June had previous experience using a typewriter and this put her at a notable advantage using word processing software and writing emails for instance, suggesting that a typewriter can impart foundational skills that are useful to gaining computer skills. The slow pace of typing was a blockade for many participants. In the workshops in the ICT lab, many participants were visibly stressed trying to complete a task because of the time consumed in typing something when they were trying to also learn other word processing functions and familiarizing themselves with the hardware of the computer. They would become focused on getting their text typed out and trying to increase their typing pace, and distracted away from picking up other skills in the workshop, such as learning formatting features or keyboard shortcuts.

In an email on January 12, 2010, Nick wrote me the following update on student assignments: “On the outcome, you could have also noticed that most of them are very slow in typing and request for frequent support which I provided”. Earlier, on December 26, 2009, Nick wrote about one participant in particular who struggled to complete her assignment, weighed down by slow typing:

> Many of them are still developing their skills in typing. My friend [Joy] could not complete a page, she tells me she always gets very tired typing. I have her work, incomplete, with me, I felt very sympathetic and almost requested her to leave her hard copy behind with me. SPEED is everybody's challenge, they all apologize for that and thanks us for our patience, please what strategy do we suggest?

There was little access to deliberate ICT learning opportunities within teacher training institutions, nor in the school system where the teachers were then employed. A lack of access and practice time with computers generally translated into limited productive abilities on the rare occasions that teachers were actually able to spend time using computers for their teaching practice.

5.3.2 Classroom Size

As described in the introduction to this chapter, Uganda's education system has been greatly impacted by the introduction of several new policies over the last two decades. One of these policies, Universal Primary Education (UPE), immediately led to a spike in enrollment at the primary level, across the country, from 2.8 million in 1997 to 7.6 million in 2004 (UNESCO, 2000). The Government had done little to prepare the education system to receive the huge number of new pupils, and the existing infrastructure was deeply strained. One of the challenges is the ongoing shortage of trained teachers needed to accommodate the much higher numbers of students, as well as a lack of classroom spaces and resources like textbooks. With the introduction of UPE, the pupil-teacher ratio went from an average of 31.4 during the period 1990-1996, to 61 by 1999. It has decreased slightly since them, reaching 50 by 2005.

In Gulu, however, primary classrooms typically accommodate more than 100 students per teacher. June describes one of her classes:

> At the moment I am teaching a P4 class. There are three streams. First, there are 105. In P4 middle, there are 103 and P4 West, there are 110. There are too many to learn their names. You learn only the most stubborn pupils and the bright ones. But the shy ones, you never learn their names, only the ones who are active in the class (Interview, November 21, 2009).

The teachers expressed that one of the main advantages of ICT to them would be dealing with their large class sizes. This seemed to be confirmed in their view once they had delivered lessons using a projector and computer. They found they could sustain their learners' attention longer because the computer allowed them to use a mix of textual and visual materials, as well as audio and video. Christopher remarks on this during an interview June 9, 2010:

> Like the UPE came and it improved literacy by almost 90%. Many children are in school but the teachers are few. The problem is these few teachers have these many pupils. So if teachers are trained to lead classes with the help of ICT, so using technology to teach, it would be very effective. Like a simple example of using a projector, people are able to see, read and even hear some of the things that the teacher is explaining, so it's really very, very important.

The role of ICT in managing large class sizes is discussed further in the next chapter, in the sections on multimodality and on classroom management.

5.3.3 Technology Infrastructure in Northern Uganda

Enabling conditions for ICT in Northern Uganda face numerous constraints. The first major infrastructural challenge is poor electrification. Municipal power in Gulu is unreliable and often off for hours at a time, while generators are expensive and require a steady supply of fuel to be powered, an additional high cost. At least during the period of study, the PTC did not have a generator and when the power shut down, the computer lab closed too. Students often lost their work when this happened and I observed them visibly frustrated as a result. Because the length of power outages was unpredictable, computer users would not know when they might resume working. In town, some of the net cafes had generators but it would take time to switch to the generator and long interruptions often ensued when no fuel was to be found, or a generator broke down.

During the ICT training with the research participants, workshop sessions were frequently interrupted at the college due to power outages. When this occurred, we would move out of the lab to a classroom and would hold an impromptu theory lesson, wherein the teachers reviewed functions of a computer without the opportunity to apply their learning on a computer, or hold a discussion where participants had a chance to ask questions. Nick and I used a flipchart to draw a computer screen and explain functions this way, as an alternative to using the projector to demonstrate the functions in real time. Alternatively, on three occasions we hastily arranged a bus to come to the college, when the power stayed off for more than 30 minutes, to transport the teachers to an Internet café in town, as the cafes typically used generators when the power went off.

On August 20, 2009, we arrived at the Internet café; however, its generator needed repairing. We walked to another café in the town centre, but it was crowded and

the network was working too slowly to function. We returned to the first net café and the power had by then returned. The teachers settled in and began using the computers; however, after about 25 minutes, the power went off again. We decided to end the lesson and to try again the following day. This was an extreme example, but an illustration of how unpredictable the power connection can be and the legwork sometimes involved in powering a computer. It can often be a drain on time and resources, and presents one more disincentive to computer access in the region. Our training, and consequently my plans to record observations of the training experience, was characterized by a continuous need to improvise due to the unpredictable and unreliable connectivity environment.

The situation improved somewhat when the laptops were purchased by the second training phase of this study, in November 2009, as the batteries could allow lessons to carry on for 90 minutes or longer without power. Thus, while the projector was not usable without power, teachers could have time for independent practice and to work on the educational resources they were preparing as assignments. It necessitated some trial-and-error to learn the importance of keeping the computer consistently connected when there was power, when teachers wanted to continue working during power outages.

In terms of online connectivity, there is little use of dial-up Internet connections in Gulu given that telephone landlines are uncommon; most phones used by Ugandans today are mobile phones. Broadband access is typically used, and some users connect to the Internet via their mobile phone accounts; however, this option is expensive as charges are per minute and based on the size of data transmission. Nevertheless, mobile telephone technology is a sector experiencing rapid growth and expansion in Uganda and it can reasonably be expected that new developments will soon reach the northern region.

For broadband connections, an access site with a modem must be within a reasonable distance (up to 160 km) from a cable modem termination system at a cable operator facility run by an Internet service provider (ISP). The modem at an access site is connected to the modem termination system by one of two types of cables, either a coaxial cable or a hybrid fiber coaxial cable (with optical fiber). In the case of the APTC, because of its location well outside of the main town, local ISPs have not yet laid cables in that area. Besides the college, there is presumably little market potential for Internet access in the area, which is largely residential with little commercial activity. When Nick approached an ISP to discuss connectivity for the college, he was told that the college would need to pay the costs of laying the cables to reach the site in order for the company to make access available in that location. The cost was prohibitive and the college consequently has no Internet access. The discontinuation of Internet access when foreign donor assistance ends is not uncommon in ICT interventions in Uganda. In another ICT project, funded by the Canadian Government supported International Development Research Centre (IDRC), a post-project evaluation determined that "problems of service provision" at a telecentre including connectivity were occurring "since the IDRC pulled out" (Prah, 2003, p.34).

At Internet cafes in town, 12 or more computers are sharing one or two connections, to reduce costs, making the connection per user extremely slow. At this speed, many web-based functions are disabled, such as the display of graphics, webmail features, or streaming; and with too many users, the Internet may not be functional at all. Experienced Internet users in Gulu were attentive to high traffic periods on the Internet,

trying to avoid times when too many others were on-line, since such little bandwidth was being used among multiple machines. As Nick explains,

> Our internet here is very slow. It's seasonal. Like some of us who upload things on the Internet, you have to do it at some expense - like you wait until people are asleep, then you do it. So when other people are resting at home, you are on the Internet. Like once in a while, it disturbs my family because I have to stay on the Internet like up to 11pm or 12am. So you do it at some expense. The internet is very, very slow (Interview, June 9, 2010).

Besides Internet cafes, access is available in the local Human Rights Centre library, and inside other NGO compounds, but most are generally restricted to staff only. In Gulu, I came across no instances of residential Internet access, unsurprising since residential electrification is also sparse, and very little ownership of personal computers. In general, accessing the Internet is beyond the means of the average teacher, and since the Internet functions particularly slowly in Gulu, the costs rise as it takes longer to carry out simple tasks on-line, such as opening a browser or navigating from page to page. June describes an experience when she tried to view photos and video on-line:

> Internet is so interesting. When you go to the Internet, you feel like not leaving you forget about all other things. There was a day I was dressed up. I went to the café and I paid some money and I went to Youtube and I was looking at the pictures and the videos which are there. You pay per second, so the money was not enough (Interview, June 7, 2010).

Besides paying Internet connection charges, the cost of owning a personal computer is also beyond the means of most teachers. Christopher provides some calculations in his journal: "computers are expensive of which for a teacher to buy a computer he/she needs to save his/her salary for one and a quarter years, i.e. one new PC Shs 1.5-2 million Ug shillings trs are paid gross 210,000 and net pay 199,500 monthly." June adds, from her journal, "When you want to use the Internet you have to go to a 'café' and pay some money for you to have access to. Therefore, when you have little money it would not be possible to explore many [things] in the websites as you are charged per the minutes." She adds that independently accessing training is costly as well: "most computer centres, you have to pay money to learn, so it's very costly for the teachers and their salary is very small. We got only 200. So you have to pay maybe 300,000 UGX to learn just one program, like Microsoft" (Interview, June, November 18, 2009).

John describes in his journal an unsuccessful attempt to use the net café on his own: "I went to the Nile Net Café trying to print a letter to my uncle. I spent an hour printing. The computer I was using was not functioning well. Some buttons never work well. The facilitator there was alone and busy serving only those ones using the Internet." The staff person on site seemed to be prioritizing customers who were spending more money by using the Internet, instead of using a Word Processor offline. In the same and other net cafes, I often witnessed customers seeking assistance from the single staff person, who was also trying to troubleshoot connection and other technical breakdowns, settle payments, and log on and off arriving and departing customers. When power was cutting in and out, there was further chaos, as people waited for slow-coming assistance.

The teacher participants are new computer users and need extra time on-line as they continue to learn how to operate a computer, navigate the Internet, and increase their typing speed. John describes this problem during an interview: "Up until now I haven't gone to use the Internet since you were here last. I got lost. It calls for continuous practice. Because I was introduced that time to it, I could use it, but if I went on my own, because I am slow, it would cost me so much money" (Interview, June 10, 2010). The teachers brought up the speed issue often and wanted to understand why the Internet in Gulu functioned so slowly. On August 20, 2009 (during a power outage), Nick and I held a discussion to understand bandwidth and connectivity issues in an effort to clarify this challenge for the participants.

Electrification and broadband access in this region are two infrastructure issues that must be addressed before computers can be seriously discussed as valuable, relevant tools for educators in Gulu, and indeed in Africa at large. A 2001 study found that, besides affordability, the greatest barriers to more equal ICT access were the inequities in broadband access, in addition to linguistic, content, and skill deficits (DiMaggio & Hargittai, 2001). In the long run, reliable and affordable power and the provision of broadband from reliable, accountable ISPs will make computers far more viable for a far greater number of people. In the meantime, to make computers usable requires significant resourcing of a mini-infrastructure set-up on any site with computers, a costly endeavour. Computers are thus made accessible on a piecemeal basis, project-by-project, when robust national policy implementation would create an environment where ICT would quickly spread amidst enabling infrastructure, and projects could turn to focusing more

on skill development, content literacy, and local stewardship over technological resources. Nick captures this point in the following statement:

> ICT is an expensive adventure. It requires some capital, it requires some resources at the initial stages, like purchase of hardware, software and training, staff resource and all that. But if it takes off, it can make a very big progress - it can make a positive turn. So when you spend - there is what is called spending to save. You spend some money on something but you would even save twice that money you have spent when, like, you are trying to address a problem or something like that. So, for example, maybe training teachers, buying books, all that… if you install a computer lab and computer system, it will probably be a one time cost, not recurring *(*Interview, June 9, 2010).

In the meantime, various initiatives have sought to implement stopgap solutions to make the Internet work in African environments where power and broadband is limited or inaccessible. These include battery-operated or satellite-powered computers, intranets, or off-line databases like E-Granary or an off-line version of Wikipedia, such as WikiTaxi. These alternatives are important intermediate means of accessing information amidst an environment that puts Internet access out of reach for most people. However, in the long run, the only sustainable output will be to invest in infrastructure nationally that will support broader, affordable, and more reliable access. Africa does not present an environment inherently at odds with connectivity. Diverse geographical and climactic environments around the world have successfully introduced reliable electrification and broadband access. The lack of connectivity infrastructure is profoundly a problem of government will and a lack of coherent policy. It may also be a result of economic

conditions that have failed to facilitate investment in connectivity infrastructure; however, more often, the challenge is not necessarily the need to allocate state resources towards connectivity but rather to create a policy environment favourable to private sector investment and development of the connectivity environment in rural areas in particular.

The problems presented by the connectivity environment are illustrated in the following two examples taken from the experiences of the research participants in attempting to use computers to create educational resources for use in their classrooms. In the first example, the teachers were asked to download an open educational resource (OER) from the Internet, during one of their sessions at the Net Café throughout November 2009 to use with their students in class that month. In the second example, in the same period, the teachers used Microsoft Power Point to create a lesson and presented it to their students using an LCD projector.

In both cases, the connectivity environment's unreliability and the barriers to regular access result in *truncated learning*, whereby the skills development in computer literacy of the teachers is constantly interrupted by connectivity and access issues, deleterious to their overall learning experience. Technological practices are unlikely to become embedded in a given setting when the machines and networks of practices are disrupted (Prinsloo, 2005). In the example below of the use of an LCD projector in the classroom, it can be argued that not only is technology ineffective when it is not accessible regularly, but that it can put learners and teachers at a disadvantage, when troubleshooting connectivity problems take up so much time and resources, eating away at the limited classroom time for the learners.

5.3.3.1 Un-connected: The OERs Workshop Experience

OERs are "digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research" (Hylén, 2007, 30). As open-source material, OERs can also be adapted by users and then re-shared in their revised form, under the limited licensing restrictions that characterize OER content. OERs include any form of learning materials varying from entire courses, course reading material, to short fact sheets, diagrams or images, lesson plans, games, lectures, and more. The OER movement is a sub-movement of the broader open source movement, which aims to increase access to digital material (such as software) by reduced licensing or copyright restrictions, and more generally part of the evolution of the internet towards Web 2.0 (which emphasizes interactability and invites user-generated content).

For the OERs exercise, the participants were introduced to the concept of OERs, the principles of the global OER movement, and then to several specific OER tools. Participants reviewed one set of global OER tools (OER Commons; Curriki; and Connexions) and a set of OER tools targeted at Africa specifically (TESSA; Merlot Africa; Aluka; and African Journals Online [AJOL]). All seven of these tools are free web-based repositories of OERs; however the size of the collections varies vastly, as does the degree of interactivity (for example, TESSA does not invite users to upload their own open content, while the user's ability to upload content is a fundamental premise of the OER Commons).

Nick and I first introduced the tools to the participants via flash frames of pages of the websites shown on a projector to explain how the sites worked, rather than a live demonstration since there was no Internet connection in the ICT lab at the college that

would allow for this. Several samples of OERs that can be found in the digital repositories mentioned above were reviewed with the participants, who discussed ways they could use these resources in their teaching. After the demo, the teachers then tried out the tools on-line on their own at an Internet café in town.

At the Internet café, it was observed that Curriki and Connexions each consistently took 10 minutes or longer to load and the teachers quickly became frustrated as they waited, the initial momentum of the demo session receding. The OER Commons and TESSA loaded comparatively faster, but the teachers could not easily navigate through the resources due to the slow loading time. In one net café visit, Christopher spent an hour trying to alternatively use AJOL, Wikipedia and WikiEducator. He was able to access the latter two, but was unsuccessful loading AJOL (Interview, June 9, 2009), and no one in the net café was able to access Aluka, a digital library of scholarly resources "from and about Africa" (aluka.org). In my observations of the workshop session, Merlot Africa, ironically a version of the major OERs website Merlot designed specifically for Africans to use, could not be loaded at all.

In subsequent visits to the Internet café, the teachers relied only on the sites they had been able to access relatively quickly the first time, in particular TESSA, which incidentally had the smallest collection of documents, including resources that were designed specifically for the curricula of Uganda, Kenya and Tanzania. I observed that speed for ease of access became the main factor in participants choosing which sites to visit. June explains, "The problem is that at the café, the Internet is so slow, you find your mind is being consumed when the computer is not yet even open" (Interview, June 7, 2010).

Wikipedia consistently loaded faster than any site and the teachers visited that site most often. Besides the speed factor, they also found its functions and content easy to use and understand. Following the OER sites workshop in the net café, the teachers participated in a debriefing back at the college on November 19, 2009. The consensus was that TESSA, Wiki Educator and OER Commons were interesting from glimpses of them but too slow to really use (the other OER sites were unable to load at all), but overall "Wikipedia was the best", as expressed several times by different teachers then and at later occasions. In his journal, Christopher referred to Wikipedia as a "revolution".

Nevertheless, the slow connection sometimes made Wikipedia, along with all websites to which access was attempted, slow too. Christopher says, "I've been using photos that I downloaded from Wikipedia, but during the daytime it's so slow and I couldn't access it easily. I tried to, but I did not because it was slow" (Interview, June 9, 2010). June explains how the Internet can provide her with more current information than the outdated print material the school provides,

> There was a day I went and looked in Wikipedia, and I looked up… I don't recall now, something, which was urgent, when I went. Sometimes they give more information than the textbooks we have. The textbooks are outdated. The Internet is more current than the textbooks. The information was accurate. There is newly created information there (Interview, June 7, 2010).

John found Wikipedia easiest of all to use and came to rely on it in his Internet research: "Wikipedia, it was the first time you introduced for us the Internet, you showed us that. And I became interested in that up to now. I got used to it. Like when you're at home and your mother cooks beans, you get used to it, so you use it" (Interview, June 10, 2010).

Google was also popular among the participants because of its speed firstly, and secondly, because of its efficient search methodology. Google has a Ugandan edition, which prioritizes search results originating from Uganda. Christopher regularly used Google as well as Google Scholar and Google Books, all of which have comparatively fast loading times.

For the participants, the practical uses of the Internet to their teaching were limited to what is efficient in the particular connectivity context in which they live. Although they are aware of the vast amounts of information on every topic on-line, they restrict themselves to using the few sites that load relatively quickly, when time and funds are scarce. Unsurprisingly, people will use what they can easily access and easily understand. Yet this truism seems nevertheless left out of the design of many initiatives targeted at African and other developing world audiences. Research into three IDRC-funded rural telecentres in Uganda in 2003 also found that connectivity challenges derailed the learning and development objectives of the effort. The lack of Internet access "frustrates the whole purpose of producing content materials [in local languages] on the World Wide Web" (Prah, 2003, p.48).

5.3.3.2 Un-connected: Projectors Without Power

A second example illustrating the typical connectivity environment is shown when the teachers wanted to deliver their lessons using a Microsoft Power Point file and an LCD projector. The teachers had done a workshop in Power Point at the ICT lab with Nick and myself on November 18, 2009 and had been mentored in the ICT lab throughout the following months during their lab practice visits. In general, most participants had become proficient in using text and images in their slides. They had a

refresher workshop in June 2010. The teachers enjoyed using Power Point and they chose lessons in the units they were teaching throughout June to deliver with the projector. The ICT lab's existing projector was broken and showed slides only in black and white, with poor resolution. In August 2009, Nick and I had purchased a new projector from Kampala for the lab that the teachers could sign out to borrow to deliver lessons at their schools.

I observed each of the teacher participants delivering their lessons with the projector and in almost all cases I observed numerous challenges, most of which related to the connectivity and classroom environments. For instance, the classrooms are kept cool by open windows; however, this led to too much light for the projection to be visible. In some cases, the teachers decided to reduce the natural light by hanging pieces of dark cloth over the windows, but this stopped the breeze, causing the classroom's temperature to rise. I observed how the more than 100 children in the class soon grew uncomfortable, sweating and fatigued as a result, diminishing their concentration and interest in the lesson.

One teacher, Albert, was preparing to present his lesson with the projector, at his school, Army Primary. The walls of his classroom were painted dark yellow but were chipping and dotted with holes. The walls and the chalkboard were too dark and uneven to use as a screen to project on. Albert and another teacher went off to find some unused white flipchart paper and tape, while a third teacher attempted to keep the children occupied by singing a song. Albert returned and they used four blank flipchart sheets held together with masking tape, which periodically slipped off the walls and had to be re-

taped throughout the presentation, interrupting the lesson and distracting the teacher (Field Notes, June 8, 2010).

Classroom construction in Gulu poses both advantages and disadvantages. Classrooms are integrated with the outdoors in an environment where schools generally do not use electrical power. There are no glass windows, but rather shutters that can be opened to let a breeze through the class during hot weather. However, when the elements are severe, such as very hot weather or cold rain, this set-up is not conducive to the use of ICT tools like projectors and laptops. For instance, June describes her classroom at the Main Public School:

> There are not enough desks to sit on. Others sit on the floor. The desks are not enough for them. In some other classes are squeezed, the desks are few so the majority sit on the floor, and the windows are open so when it's raining, they suffer a lot. Sometimes it even affects our teaching. The wind is blowing inside and the rain too, and the children have to stand sometimes, so it's difficult. For sitting, it's first come, first serve (Interview, November 18, 2009).

I observed another Power Point lesson delivered in Christopher's classroom at the Main Public School (Field Notes, June 10, 2010). The classroom had no electricity that day, as the municipal power was out. The school had a generator but no fuel was on hand. I provided approximately $10 for fuel and a school guard left to purchase some fuel in a jerry can. When he returned, the generator needed to be moved outside of the classroom and an elaborate system of extension cords and adaptors was connected to a power bar to power the computer and projector. The cords went out the window where they were connected in turn to the generator. At first, the power was not reaching the power bar and

we disconnected everything and restarted. The cords ran along the floor and were easily tripped over or pulled out as people stepped over them. It took approximately 45 minutes to get the power source working, and the involvement of four staff plus myself, during which time the children sat in the class waiting, with no instruction taking place. The generator's hum then continued throughout the lesson, audible from outside.

In June's music class, midway through her lesson, the projector overheated and shut off (Field Notes, June 10, 2010). In this case, June carried on with the lesson, as she was only using the sound on the computer at that point in the lesson, in order to play an instrumental clip. Meanwhile, I tried to restart the projector after waiting for a few minutes for it to cool off. The projector over-heated numerous times in other classes due to the high temperatures and in most cases, the lesson was briefly interrupted to restart the projector and the teacher would lose the flow of the lesson during these interruptions.

When John was ready to deliver his lesson at the Orphan Boarding School, the laptop he had his file on was no longer working as a result of having been infected with a virus. His file was transferred to a different computer, but the computer was also malfunctioning (Field Notes, June 11, 2010). John was disappointed and described the experience in his journal:

> Nick paired me with Daniel but unfortunately Daniel's computer was also having problem with its battery. Some members there were busy preparing for their presentations until it was about to come to an end, [and] that is when Nick tried to connect the computer after your trial and failure. I used the computer with Daniel for a short time and the same problems of the battery resumed and we later depart[ed] (n.d.).

Despite these challenges, once everything was secured, the projector was running uninterrupted and the teacher talked using the slides, the children appeared deeply engaged in the lesson. Their eyes were focused on the front of the classroom and they were keen to respond to questions posed by the teacher. The teachers appeared to be instructing seamlessly, going from verbal instruction to pointing out images on the screen, to writing a word on the chalkboard (Field Notes, June 11, 2010). Thus, the projector and the presentation software were valuable tools to present content in different formats to the class; however, the conditions in which technology like laptops and projectors are used make efficient use difficult, limiting the full potential of these tools for L1 education.

5.3.4 Ownership and Access

Along with enabling infrastructure and connectivity, access is the overriding ingredient necessary to make ICT viable for education in Gulu, according to the findings of this study. The scarcity of computers made them valuable to the point of being fought over, or "specialist and exotic high-status resources" (Prinsloo, 2005, p. 11). As data in this section will show, the teachers reported feeling that other teachers who were not participating in the study were resentful of them and suspicious of ICT, and the participants were thus guarded and protective of the laptops and their role in the study, setting themselves apart from their colleagues. Resentment and jealousy of ICT resources, seen as modern and expensive, has been identified in other cases where computers are provided for the purpose of supporting educators (for instance, Warschauer, 2005).

However, of more consequence was that the APTC wanted to "own" the laptops, as did the teachers and their schools. Suspicions rose between the teachers and the APTC, and the access and ownership issue erupted into a challenging conflict between the teachers and the college that required extensive mediation and compromise. This section describes this conflict, and illustrates well the multiple factors that need to be factored into the design of an ICT intervention to sustain access over the long-term, to coordinate and compromise between different stakeholders, and to maintain technological resources locally, without outside assistance, inevitably unavailable in the long run.

Almost immediately, the laptops used in the training came to be associated by the teachers with wealth and value. Arguments over where the laptops should be kept and who would have access to them (the research participants, or whether students from the college could also use them) began early on (Field Notes, August 16, 2009). Midway through the first training session, the teachers met together discreetly and prepared a letter, which was then delivered to me by Daniel, who was nominated by the others to represent them. The letter outlined the difficulties they faced in getting practice time on the computers without regular access, and they formally asked for their laptops to be transferred to their individual possession:

Lauryn Oates

We are really appreciating the Program so much. We believe we will be able to:

- Plan lessons
- Give exercises
- Train other teachers/Promote computers, literacy among the pupils using local language

- Use projector
- Present our instructional materials and methods used in delivery it to the learners

However, we foresee the following obstacles which will hinder the above mentioned.

Looking at the distance of our work places to the linking centre.

P.TO.

- Restriction by some head teachers/administrators to leave school due to shortage of staff.
- Disappointment by power – irregularity.
- Negative attitude by some teachers we help or we intend to train
- Engagement by of teachers over the weekend and learners
- Activities which need computers
- Enough time for practice
- More so we have our CCT who are very close to us for easy supervision.

Therefore we table our request that the Computers should be given to Participants to allow effective work and Performance.

Thanks,

Participants (August 18, 2009).

The point was reiterated privately by individuals in their journal entries, and there was much anxiety expressed by the teachers as to whether they would continue to be able to access the computers in my absence and after the completion of the study. For instance, Christopher wrote: "I hereby request you that if possible, the laptop[s] be given

to individual teachers to make maximum use of the computer because if you return to Canada we may not have access to it as we have had experience with our coordinator for the past four months" (n.d.). John wrote in his journal, "I wished I had a computer of my own there is even power free of charge at my place of residence or Nick should allow us to borrow the computer for continuous use and mastery to perfect my knowledge of the computer use" (n.d.). In another entry, just before it was his turn to take a laptop and camera out for the night, he wrote, "I will become a computer expert when this evening I'm given a computer and a camera to borrow. When I borrow a computer today and I begin practice with it today, I believe in two weeks time all these problems will become history to me" (n.d.).

Comments made by both sides in their appeals for who should ultimately have possession of the laptops alluded to the pervasiveness of corruption, patronage, and theft in Gulu. Both implored that the other could not be trusted with the devices, which could be sold, stolen, or damaged. The computers were simply too valuable to be left in the care of the accused party. Each side had arguments as to why they would be more responsible caretakers of the computers.

The teachers also claimed often that their colleagues who were not participating in the program were resentful and suspicious reportedly because of their ignorance of computers (Field Notes, August 15, 2009). The teachers often referred to the "negative attitudes" of their colleagues, as in the letter delivered by Daniel. Christopher wrote in his journal that, "other teachers have negative attitudes in using computers as a tool for teaching-learning because of lack of skills to operate and the cost of buying and accessing the training" (n.d.). June wrote in her journal that, "other teachers have negative attitude

in using computers as a learning aides because of lack of skills to operate" (n.d.). She recommended that "more sensitization should be given to DEOs[21], MEOs[22] about the use of computers to a classroom teacher."

As mentioned earlier, when hostilities of the conflict with the LRA began to cease, the APTC reopened in a new location on land donated by the government, about five kilometers from the city centre, down an unpaved rural road. The area is otherwise only residential, with few commercial businesses nearby, and there is no public transportation to the college. The road to the APTC is extremely potholed and during the rainy season, large stretches of the road are almost impassable for vehicles and motorcycles. Many of the teachers use bicycles to travel to the APTC and would often arrive for the training sessions with the red mud of the road staining their pants from passing vehicles and traversing puddles on the road.

The location of the college means its accessibility is limited for those who are not living on or near the campus (students at the college live in dorms on the campus), as the five kilometer trip is time-consuming and hazardous, especially at night, given there is no lighting on the narrow, bumpy road. Since teachers finish work around 4:30pm and night falls by 7:00pm in Gulu, this leaves little time for teachers to travel to the lab and work with the laptops there, and have time to return home before dark. Further, the location of the college was outside the connectivity area for Internet services currently available in the district. To acquire connectivity, the college was told they would be required to pay the costs of installation for cable to reach the campus. Unable to afford this (or unwilling

[21] District Education Office or Officer
[22] Municipal Education Office or Officer

to budget for it) after USAID project funding ended in 2005, the lab's Internet connectivity ended.

As described earlier, the computers were poorly maintained, and began to break down one by one. The college also had no generator, so the lab was unavailable whenever there was a power outage. However, besides privately run Internet cafes, the PTC lab was among few spaces in the district with several computers in a space appropriate for training activities. Further, having the laptops at the college allowed college students to use them when they were not being used by the participants, helping to support the integration of ICT skills into teacher training.

Early on, the participants began complaining about the distance and the difficulty in traveling to the college. June wrote in her journal, "Moving up to Gulu Core PTC is difficult and sometimes we get there when the Lab Technician does not appear hence time is wasted doing nothing" (n.d.). In a focus group, Christopher stated "For me, the way I have seen, what is difficult, is the way we could not access these device[s], like, they should be distributed to all the classes so that the teachers can use them at their own time and then plan in advance with their learners" (Focus Group, June 5, 2010).

The teachers argued that the laptops should instead be placed in their schools, where they could more easily and more often access them. For instance, June wrote in her journal that, "in the future when a project like this is to happen it is better to train the teachers within their schools and the computers be put within that particular school or a nearby place to be reached. [APTC] is too far for a frequent visit."

Participants were keen to devote more time to practicing so that their computer proficiency would improve, and the APTC's location was a fundamental barrier to this in

their view. John wrote in his journal, “I came to learn that with computer, it’s just the matter of constant practice because forgetfulness is the barrier to its learning which can be overcome by constant practice” (n.d.). Willie reiterated in a focus group, “When you take a long time to type on computers, the knowledge comes very slowly, and you take time! We can learn from here very well, but when we go back to our school and here is very far, and we get time to type on the computer, then we will progress” (June 5, 2010).

The college, however, was resistant to the idea of moving the laptops to the teachers’ schools. Nick said he felt this was a risk, and the computers could be too easily stolen, lost or damaged (pers. correspondence, March 2, 2010). After discussions with both the teachers and the college, it was decided in response to the concerns raised by the participants to support the teachers to more easily access the lab by providing them with a transportation stipend for every visit they made to the lab. The stipends were in the amount of US$4 per visit, an amount that would easily cover the cost of taking a motorcycle taxi there and back (a ‘boda boda’) to the college, and the funds were provided through a grant from the study’s sponsoring university, UBC. When a participant arrived at the lab, he or she would sign a voucher and receive a stipend. A record was kept of the payment of stipends through the college, which also allowed me to track the lab attendance of the teachers, and the amount of time per visit.

For a while, the arrangement appeared to work for both parties. The teachers made use of the stipends and came to the lab often, where they worked on their assignments. When the teachers were not in the lab, students at the college had the opportunity to use the new laptops under the supervision of the lab manager. During visits, the teachers periodically discussed with Nick plans for completing their

assignments, and decided among themselves, but with the support and assistance of Nick, to form a committee at each school to support each other in tracking and completing their assignments to produce different types of educational resources with different software applications.

However, after several months of using the transportation stipends to facilitate lab visits at the college, a new problem arose. When I returned to Gulu in June 2010, after six months, I found five of the laptops that had been provided through the study were not in the lab. The printer purchased for the study was also missing. After some investigation, it turned out that the laptops were being borrowed by some of the college faculty. The printer was in the principal's office where it was being used by his secretary. I communicated to Nick that this was not appropriate and reiterated that the laptops and peripherals that had been provided by the study were for the exclusive use of the teacher participants and the students of the college.

Meanwhile, the participants were frustrated that on several occasions some of them had travelled to the college, to find the lab closed and no lab manager on site. For instance, in an interview on June 7, 2010, June reported, "I went to the lab at the college. Sometimes we went and found that the lab technician wasn't there. There was a day we went all the way to the college and we found he was not there, we rang his phone and it was off. We waited and waited and then we left." Other participants had similar reports. Further, some transportation stipends were outstanding to participants from the college.

Within a few days of my complaint, all of the laptops and the printer had been returned to the Lab. I asked the college to agree that the teachers could now sign out the laptops for two days at a time so that they could have the time needed to practice at home

and work on preparing educational resources for their classes. After several days, a meeting was held between Nick, the teachers and myself (June 11, 2010) where the challenges faced over the previous few months were discussed in an attempt to formulate a new arrangement. It was acknowledged that the computers had been kept at the college for their security and so that they could be used by college students, but this was not what was actually happening in practice since faculty had been borrowing the laptops and printer. It was agreed that, from then on, at least one laptop would be placed in each of the three schools, and that committees formed by the study participants in each school would be responsible for the security and maintenance of the computers. The following was noted in the minutes of the meeting:

> Chairmanship of the committee will rotate monthly among the committee members, who are to manage a timetable of 1 hour timeslots for teachers wishing to use the laptops. Only those with ICT training will be permitted to use the laptops unsupervised; and use should always be in an office (the laptop should not be removed from the premises ever), that is locked when no one is present (June 11, 2010).

Since the laptops' anti-virus protection had not been maintained by the college, most of the laptops were infected with viruses, in addition to the USB sticks that the teachers used to store their files. It was therefore also agreed in the meeting that each laptop would be taken to a computer service shop to have an updated anti-virus program installed and to remove the unlicensed expired trial versions, and that Nick would demonstrate to the teachers how to scan their flash drives for viruses to prevent future infection. Two of the laptops also required a re-installation of their operating systems.

Nick would oversee this process, staying in contact with the teachers in order to coordinate these services to the laptops they were using at their schools. A meeting was also arranged to fulfill payment of all outstanding transportation stipends.

It was also agreed that laptops and peripherals should be immediately repaired upon identification of any software or hardware problem. Finally, the minutes noted the decision of the group that,

> Students at the college using the software should be supervised if they have minimal training, so that they do not damage the machines. Under no circumstances are any students or college faculty permitted to remove the laptops or any peripherals such as the printer or scanner from the ICT lab. If it's learned that this is occurring, the laptops will be removed and placed in the schools instead. It should be clearly communicated to faculty that the laptops are for the exclusive use of the teachers in the UBC-sponsored study and of college students learning ICT in the lab. If faculty wish to use the laptops for short periods, they may do so in the lab when students are not using the laptops (June 11, 2010).

Under the politics of the PTC's staff hierarchy and the patronage system that discreetly exists at the college, Nick sought my support in enforcing this decision with a letter to the college administration that made this expectation clear, communicated the consequences of breaching it, and explained the reason why this policy was being introduced. The following is an excerpt from the letter sent to the college principal:

> In 2009, to enhance the training, a private Canadian donor whom I contacted generously contributed funds for the purchase of 12 laptop computers, a printer,

scanner, and projector, all of which were purchased in Uganda. I further contributed CDs and flash disks for each participant, as well as other supplies for the training such as workbooks and pens. The primary purpose of the laptops was for the training of the study participants, and when study participants were not using the laptops, for computer literacy training of education students at the PTC. Thus, the laptops were placed in the ICT lab at the PTC.

However, over time several challenges emerged with this arrangement. Firstly, the teachers found accessing the laptops at the lab difficult because of the long distance to the College from town and the irregular lab hours (teachers sometimes found the lab closed when they arrived). Secondly, when I came to the lab in June 2010, half of the laptops and the printer were missing from the lab. I learned that they had been borrowed by College staff or faculty, which was not the intended purpose for the laptops. Thirdly, the lack of regular, easy access to the computers of the teachers was negatively affecting the development of their computer skills. Finally, since there is no Internet service at the college, it made more sense for the teachers to have easier access to the laptops so that they could more easily transport them to local Internet cafes or other sites with connectivity (December 7, 2010).

Once the arrangement was in place, Nick organized the servicing of the computers as agreed with a local technician. However, the teachers were reluctant to turn over the computers they were using to the technician, fearing that the college would refuse to

return the laptops afterwards. At this time, I had returned to Canada, and received phone calls, text messages and emails from the teachers expressing their concerns; as well as from Nick on behalf of the college, expressing his frustration that he had not been able to collect the computers for repair. For instance, in one email Nick reported that the teachers had yet to come to the technician's shop to have the anti-virus installed:

> But speaking to some few, seems they need everyone to handover together, yesterday most teachers were for workshop organised by UNICEF, none reported at the technician shop. Am following it closely patiently this week to workout this smartly (pers. communication, July 4, 2010).

In response, I wrote a letter for Nick to take with him to the schools of the teachers to confirm that he had my permission to collect the laptops for repair. Soon after, Nick wrote to report that some of the teachers had brought in the laptops for the anti-virus installation:

> The teachers have started responding positively by bringing the laptop to the technician. June brought and taken after the work, she signed as expected. Simon also brought and is being [worked] on. Teachers at Army Primary promised to bring on Friday, am waiting for them at the cafe. The Orphan Boarding School seems to be more negative as I went there several time but both Willie and Joy, they confess [they] need the laptop to use it. Am also inviting everyone again on Friday at the Cafe'. (pers. communication, July 19, 2010)

On the other hand, those teachers who did turn in laptops for repair faced a long delay in getting them back, fueling their suspicion that the college meant to confiscate the

laptops from them permanently. On July 2, 2010 June wrote to Nick, “I'm requesting you to lend me with the Labtop you collected to help me in this music practise. Hoping for you cooperation. Thanks” (sic) to which Nick replied,

> Hello June,
>
> I have not been feeling well---sick of malaria and just arrived yesterday evening from Kampala. As we agreed in the last meeting, some body is work ---installed licensed anti virus to those laptops. LO communicated giving permission to that person to go ahead with that work. I have just handed over that laptop to that man at Prime IT Solution. The work is still incomplete. As soon as it is over, I will lend it to you as the meeting resolved.
>
> I regret the delay, caused by this process. Many thanks for your interest and contribution in this exercise (July 2, 2010).

By August, five of the laptops had been brought to the technician’s and the others were still outstanding. Nick reported,

> The teacher[s] at Army Primary claim they are too busy with pupils doing exams. After the pupils get holiday, they will be free to take the laptops…
>
> For teacher[s] at the Orphan Boarding School, I suggest we pay more patience this holiday 2 weeks, because they were the first to receive this letters, but disobeyed. We shall then revisit what to do next (pers. communication, August 11, 2010)

In September, the problem was ongoing:

At first they mentioned holiday, during holidays I tried to mobilize, they (Albert) said some people had gone to the village therefore we should wait until school starts. Each time that we scheduled a meeting, at first was at Army Boarding School, I had only Kenney who did have a labtop, I gave that letter to reach everybody. The second time was at Main Public School. I met only one teacher also a teacher from Main Public School. When we agree[d] for a meeting, teachers ignore and they don't come. This misunderstanding has also affected/blocked the technician from continuing with his work (Pers. communication, Nick, September 2, 2010).

Meanwhile, I received the following communication from one of the teachers:

Hi, Lauryn it has been a long time to [hear] from you, let hope things are still find from you, sent my regards to all the family members and friend, we are also trying our best to put things right as regarding the program.

I am putting this notice to inform you that there, we are being disturbed about the lab-top we are using, in that, he is saying that, he [Nick] is going to involve the police if we don't return by the end of this month i.e. 31st Aug, 2010 on Wednesday, of which is the dateline.

We would like you to inform us and him so that we sit down and hand over to him as a group, there fore, members are request you clarify it clearly to us because we are tired of the disturbance his is trying to do and we are not pleased with that.

Hoping to here as soon as possible.

thanks

Christopher (August 28, 2010).

The situation was clearly deteriorating, with trust at an all-time low between the college and the participants, with the college resorting to threats of involving the authorities to get compliance from the teachers. I replied to Christopher and also wrote again to all the teachers to clarify why they needed to have the laptops serviced by the technician and to reassure them that the laptops would not be taken by the college (bold in original):

> As you'll remember when we had our meeting together on June 11th in Gulu, we agreed that **all the laptops needed to be taken to a technician in order to have anti-virus software installed on them**. The anti-virus programs currently on the laptops are out of date. If they are not updated, the computers could be destroyed by a virus... Even if they seem to now be working well. Also, Nick is going to install an off-line version of Wikipedia onto each laptop so it is accessible to you without Internet access. The technician will also repair any other problems with the functionality of the laptop. For example, when June and Simon brought their laptops to the technician, some other problems were repaired, like a new hard disk.
>
> So this is to clarify: Nick will collect the laptops from you, or you can bring the laptop to the technician yourself, with Nick's presence, for repair. The repair may take some time, such as 1-3 days. Then you can re-collect the laptops from the

> technician or from Nick. **You are not being asked to return the laptops to the college, but only to bring them to Nick or to the technician he is working with, for anti-virus installation and other repairs.** Only a qualified technician is able to perform the repairs, install the software, etc and this is essential for the life of the computers. When the repairs are completed, you can then continue to use the laptops at your schools, sharing them among the other teachers (bold in original; October 19, 2010).

Besides the tensions between the participants and the college, tensions repeatedly arose between the teachers participating in the study and their colleagues and supervisors at school, in regards to the teachers' access to the computers and cameras. The teachers expressed that they felt their colleagues resented them, were envious, jealous, fearful or would expect the computers or cameras to be shared or to become school property, at which point the teachers would lose their access to more senior staff (Field Notes, June 12, 2010). Because of this perception, the teachers consequently were possessive of the computers and cameras, and anxious over the need to protect the items.

The computers were also generally perceived as holding enormous value, and, accurately, as being something largely out of the reach of a teacher. In the first email she ever wrote, June elatedly wrote of her joy at having learned how to use a computer, comparing it to the status quo: "we teachers in our region does not know anything concerning computer. Others even fear just touching it" (pers. communication, August 18, 2009).

During a focus group, Daniel describes times that he and the other two teachers from his school who were participating in the study would sign out the cameras at the

APTC's ICT lab and bring them to school to take photos, which they then used in their lessons:

> you know, when [we] are taking photos, some teachers also, they think that that one is— that it belongs to the school. So that will bring some rivalry, so they when they will ask you, for example, when the head teacher asked, "where is that camera? Why don't you allow us to keep the camera in the office?" and I said, "no, this one, we have signed for it." Then when the boss is fired that means there is something- eh? (June 5, 2010).

In this comment, Daniel implies that should the camera be put away in the school office, it risks disappearing with a departing or disgruntled staff person. This is a common example of the kind of fears the teachers harboured about using the computers and cameras in front of their colleagues. Willie, who teaches in a different school, described how when he brought the camera to school, the other staff began referring to the camera as belonging to the school: "everyone was talking like, 'where is our camera? How is our camera?'" (Focus Group, June 5, 2010).

As tensions rose between the APTC and the participants, Nick was placed in an awkward position. With the APTC as his employer, formally he had to pursue the interests of the college. He was also perceived as having 'brought in' the computer resources to the college's long-neglected ICT lab, revitalizing it and initiating a partnership with a foreign university, an action that could improve his standing in the college hierarchy. At the same time, he stated that he felt powerless to ask more senior college faculty to not remove the ICT resources from the lab. My "official" letter to the

college would facilitate enforcement of the rule in such a way that would not implicate Nick.

The economic and social value assigned by participants to the computers, sometimes leading to conflict, reflects what others have found in socially marginalized contexts where the conditions of poverty can make ICT resources both volatile and vulnerable. For instance, similar challenges emerge in Prinsloo's findings from two South African contexts, one looking at workers in a shock absorber factory in Cape Town and another in a school in a nearby township (Prinsloo, 2005). At the school, access to computers was "an index of social status" and the computers "a sign whose social indexing function is tied up in larger discourses about wealth and its social display" (2005, p. 8). The findings in Gulu strongly suggest that local perceptions of value and wealth associated with ICT need to be factored into ICT policy and planning to avoid creating divisions within groups, to proactively address suspicion from those not participating, and to be inclusive and transparent to the extent possible.

Newly introduced technology tools will elicit different responses and reactions in environments where poverty is widespread, and accounting for sensitivity to these socioeconomic realities can secure broader buy-in from everyone in the community, trust towards those leading the intervention, and sustainability after the technology tools and skills have been introduced among a particular group.

5.4 Summary of Teaching and Learning Environment Findings

This chapter presented findings that demonstrate that ICT resources do not have any automatic utility, but will react to the kind of environment into which they are placed

or deposited, and how a wide variety of factors must be addressed in preparation for introducing new ICT tools into a given setting.

In this case, the likelihood of teachers actually being able to apply the skills they gain from ICT towards advancing learning outcomes are severely hampered by the surrounding connectivity and infrastructure environments. Interrupted connectivity and unsupportive infrastructural environment often result in *truncated learning*, whereby the synthesis of different skills that might result in overall computer literacy is blocked. This prevents users from consolidating their skills to the point where they can confidently create and use content in ways that strengthen their practice as teachers. Other factors include the under-resourcing of their classrooms and schools, in terms of the kind of environment they teach in, one characterized by student over-crowding, a teacher shortage, and a dearth of textbooks and other print literacy materials.

Findings from this specific teaching and learning environment suggest that ICT will be most effective if it is integrated into a broader teacher training program for local language medium teachers, and is then carried over into a teacher's career so that teachers continue to enjoy access to ICT tools and apply skills gained in their teacher preparation, on a continual basis in their professional lives.

The data suggest that exposure to different technological tools, including both computers and typewriters, in teacher college succeeded in imparting skills; however, there were few mechanisms in place to ensure these skills could be put to use in education settings post-training, unless an individual went to extraordinary measures to find ways of accessing and using computers. Access, post-training, was found to be a key component of sustaining ICT skills and ensuring they are useful to achieving learning

outcomes, however a much neglected aspect of ICT interventions that have occurred in Gulu to date.

For the participants, the practical uses of the Internet to their teaching were limited to what is efficient in the particular connectivity context in which they live. Although they are aware of the vast amounts of information on every topic on-line, they restrict themselves to using the few sites that load relatively quickly, when time and funds are scarce. Unsurprisingly, people will use what they can easily access and easily understand, a condition that must be factored into any ICT4E intervention in Gulu's current connectivity environment.

This study captured a transitional moment in time where the language of instruction policy struggles to find a foothold in the reality of classrooms where teachers have been ill prepared to fully apply the policy. The data shows a situation where teachers struggle to use their native language in the classroom, in a society that over time has come to assign specific roles for Acholi and specific roles for English. Acholi is the language of the community and the language used by illiterate people, while English is the language of education and of the urban elite. The new language policy in education has created tension between these roles, but there is inadequate support to assist teachers in the evolving role of Luo as a classroom language, rather than only a community language, and in breaking down the rigidity of these roles.

The viability of Acholi as a language for education is hampered by a lack of community literacy resources in the local language, and by the lack of standardization of the language in everyday practice across a large, diverse region of speakers. While some, by now old, efforts at standardization exist, in practice, a wide variety of dialects and

spellings are used, with no one quite sure which way is the correct way. This issue added one more challenge on the part of participants in their use of the L1 in generating local language content using computers, among their other reasons for not feeling comfortable using the L1 in creating computer-generated content.

One of these other reasons is the perception of the teachers that computers are "planned in English" in the words of one participant, and are unaccommodating for the local language. The examples provided by the participants indicate an overall perception that the computers reject the use of their language, by underlining Luo words as "incorrect" or word processing programs automatically changing Luo words into English words. This reinforced the idea that it was easier to use English when creating content for the classroom using a computer. While the computers used by the participants were indeed planned in English, this study took place at a time when a subtle shift has emerged to better accommodate different languages and scripts through the spreading dominance of Unicode, and the availability of open source software that can be localized into languages other than English. However, the extent to which Ugandan educators can take advantage of these developments remains reliant on several factors, including the need to invest local bilingual computer software engineers or information technologists, to address these developments in IT training taking place in Gulu, and to take advantage of these opportunities within a national policy framework for ICT for education in Uganda.

CHAPTER 6:
ICT4E - Relevance, Value and Sustainability

6.1 Introduction: ICT for Education?

Chapter Five described and considered the environment into which ICT resources are placed in the context of education in Gulu, identifying how local conditions, as well as external factors such as computers being "planned in English" shape and inhibit the role of ICT in teaching and learning, as well as how language contexts shape the ways in which ICT tools are used for teaching and learning. This chapter delves into the *potential* ICT might have, were the many access issues that lie in the way at present to be effectively addressed. There are prominent claims that the potential of ICT for education is overhyped (Toyama, 2011; Cuban, 2001; Robertson, 2003), so this chapter seeks to determine: were ICT more accessible, will there be value in it for teachers? And if so, what might ICT do for educators using L1 as the medium of instruction and for literacy education in Gulu? The answers to these questions will provide further clarity towards the central research question of how ICTs can be effectively used by teachers in Gulu to teach their learners' mother tongue, and ultimately to strengthen pedagogy in this region.

This chapter investigates three themes that emerged from the data: 1 - Identity and Investments; 2 - Content, Format, Mode and Utility; and, 3 - Navigating and Sustaining ICT Competence. The first section of this chapter draws primarily on data that expresses what the teacher participants themselves had to say with regard to the value and potential value of ICT to their teaching, identifying their perceptions of the utility and relevance of digital resources to their practices and lives. The chapter's findings include the four main benefits most commonly identified by participants: (1) belonging, participation and

membership in the information society (the "computer world"); (2) raising one's content knowledge for better teaching and raising the prospects of career mobility; (3) gaining efficiency and managing classrooms in a timely way; and (4) engaging students more effectively through the hands-on, multimodal ways of presenting computer-generated information to learners.

The second section identifies two strategies that emerged as critically important to securing meaningful outcomes from ICT for teacher education interventions. The first is the need to shift the conceptual focus from the machines and onto the *people* using those machines, to ensure that skills and knowledge remain within a community where ICT resources have been placed, and that the hardware and software can serve local needs beyond a short-term project period. The second strategy concerns the role of peer support and collaboration in entrenching and building computer literacy skills among a group of users, suggesting it would be useful to integrate this as a practice into any training interventions. Both of these strategies point to a need to foster local stewardship over technology resources, a notion explored at more length in Chapter Eight.

The issues identified in this chapter lie at the heart of the sustainability of ICT4E initiatives. As one participant stated, bringing the benefits offered by technology to education must begin with teachers. Yet it is not about placing a teacher in front of a computer, but about making both the computer and information literacy skills accessible and relevant to a teacher, in the particular social world that the teacher occupies.

6.2 Identity and Investments

This section presents findings on the teachers' perceptions of the roles, value and uses of ICT tools, notably computers and Internet connectivity, in terms of what

participants reported were the main ways in which they were using or sought to use ICT. There is an emphasis in this section on the potential uses, as much as on the actual uses to which ICT was applied, given the limited access teachers actually had to the Internet, and are likely to face outside of their participation in this study.

The teachers highlighted the capacity for communication as a fundamental advantage of computers; they were eager to be part of the two-way communication "world" that the Internet symbolized for them, wanting to both take and give information to the web. They sought to have an identity on-line, not merely to digest information put there by strangers. Secondly, the participants valued ICT as a way to enhance their subject knowledge and become better teachers, and consequently, potentially pursue career advancement given their upgraded skills. In light of the overcrowded classrooms all the participants contend with in Gulu, ICT was also recognized as a tool to manage large classes, saving time and reducing workload. Finally, ICT "makes learning real" by diversifying the ways in which information can be presented to students. ICT allows for multimodal teaching and learning, integrating the use of image, text, and sound in the classroom.

6.2.1 Agency and Membership in the Information Society

Despite having largely had no previous access to the Internet prior to the study, the participants were nevertheless aware of what the Internet represents, and its significance to influencing change via access to such a vast array of information and knowledge and the ability to communicate with different people, unrestricted by time and space, as the data in this chapter will show. Generally, their statements also indicated a feeling of living outside of this active network of communication, and they recognized

consequences of that exclusion. They held the view that the world is moving forward with or without them and the longer they were offline, the further behind they would be. One participant alluded to an "international way of knowing", a scholarship that was connected and borderless. There was also expression of dissatisfaction with the representation of their country on-line, not in content per se, but in the amount of information about Uganda. Specifically, participants found very brief entries on Wikipedia for topics relating to Ugandan geography, politics, history and resources. One participant capitalized on the chance to respond inherent in Web 2.0, and edited and expanded some of these entries.

The teachers continuously referred to a "computer world", suggesting they viewed computers and the Internet as a kind of exclusive club, a distinctive world of its own that one needed to gain access to. As the teachers gained computer literacy skills, or when they went on-line for the first time, they expressed that they had now entered or were entering this "world". John told me, a year after he went on-line for the first time, "The training has now brought me to world of computers and I am very happy for that. I only wish there could be some opportunity provided to me for continuous use of computers" (Interview, June 10, 2010).

To be outside of the "computer world" is to lag behind. John refers to the practice of knowledge exchange that occurs online, amounting to a network of scholars who are connected across borders and adhere to a modern set of standards for knowledge production and dissemination. His comment implies that it is this standard one should strive to reach:

> When you are not exposed to Internet, say in discussions of people in various aspects of life, you are left behind. Like say games. I used to know about football, but not about rugby or cricket. So I can update myself on these things with the Internet. Then before even going to the Internet, I never knew knowledge for learning, the extent to which the scholars are on there, and the subjects they teach. Like if you go to OER Commons, that one is automatically an international level of learning and teaching (Interview, June 10, 2010).

Some participants believed that while Uganda is behind in the information era society, Gulu in particular is especially cut off from the global advances that had been made in technology-mediated communication. June wrote in her journal that "due to insurgency in the region" and because "many used to [fear] even reaching the region, therefore we are behind to some extent in technologies" (n.d.). John wrote in his journal the following statement, expressing his simultaneous surprise and disappointment at the level of knowledge exchange occurring on-line, a process he feels outside of:

> I visited the OER [sites] and found that I'm really lagging behind the world of education because it is very useful in terms of sharing knowledge internationally and which is very relevant. Actually, I became frustrated since I found myself lagging and didn't know where to begin.

On another occasion, John told me, "I hope it will make me a better teacher through accessing and sharing useful resources on the Internet" (Interview, November 21, 2009).

In August 2009, during one of the teachers' early visits to the Internet café, we held a workshop on the use of email. The workshop's demonstration and assignment were to open an email account using Gmail, the webmail service offered by the Web's

most used search engine, Google. The workshop was held during the day and the connectivity was especially poor. Three teachers had tried repeatedly to register their accounts; however, the slow speed would time out their registration pages causing the data they had entered into the fields to register to be lost. Slower typing skills meant refilling all the fields was time consuming, and the teachers were keen to get their accounts open and to start sending mail. As I assisted one teacher, Albert, to refill each field for the fourth time, he expressed with frustration, "I *want* to be in the world of email!" (Field Notes, August 12, 2009).

Being part of a *world* implies being part of a community, participating in a global conversation that is important to the future of the world. Having email gives one an identity on-line, making one findable, a legitimate participant of the web: "I'm really very happy for the wonderful moment I had with you, training and lifting me from deep down the dark hole to the surface of the world where I'm now easily found internationally" (John, pers. communication, August 20, 2009). Christopher wrote in his journal that email makes "communication and interaction easy" (n.d.). It can allow one to be part of communities beyond the local, unhindered by spatial constraints.

The participants desired to be part of the *two-way* communication of the World Wide Web. Their comments emphasized their desire to both read *and* to write online, to listen and to be heard:

> The most useful part of the Internet is that it updates my knowledge. I am not going to the Internet frequently, but when I do I can use it as a reference. And to some extent, we can't afford it, but it could also be used for entertainment, by enjoying the, well, pictures and other things. Like if you go around to look at the

> types of animals, like birds and fish, it's a sort of refreshment. And when you come to the international way of sharing knowledge with other teachers, worldwide. I never contributed in that, but the way I see it, it is a two way …. We can't afford it, but it could also be for sharing, like a two-way traffic (John, Interview, June 10, 2010).

John's comment alludes to the reality that while it's desirable to be part of a two-way conversation, for now, the communication is in one direction only because access to the Internet remains out of reach for teachers in Gulu. Thus, while there are the ideals espoused by the Web 2.0 movement, they are only that for now: ideals. In their comments, the participants also express a desire to put their country "on the map", to have representation on-line, but for now, Ugandan content is marginal, if growing slightly. Local Ugandan language content remains extremely marginal. In the first orientation session prior to the training, the teachers were asked to share their expectations from the training. One desire was to make websites in Luo, a way of "speaking" to the outside world by representing Acholiland in the "the computer world" but also of speaking to each other within that world (Field Notes, August 17, 2009). Local and global networks could co-exist, with Ugandans as legitimate participants in broader, international conversations taking place.

The participants voraciously consumed entries about their own country on Wikipedia, including entries for Uganda, the LRA, the northern Ugandan conflict, the political system of Uganda, as well as a wide variety of entries on various plants, animals and resources of Uganda (Field Notes, August 19, 2009; Field Notes, November 16, 2009). However, they also sometimes expressed dissatisfaction with the sparse

information they found in the entries, much of which seemed to have been written by outsiders. Wikipedia itself confirms this to be the case:

> As of September 2009, Wikipedia articles cover about half a million places on Earth. However, research conducted by the Oxford Internet Institute has shown that the geographic distribution of articles is highly uneven. Most articles are written about North America, Europe, and East Asia, with very little coverage of large parts of the developing world, including most of Africa (Wikipedia.org, January 9, 2011).

In the following excerpt, Christopher describes how he edited content on Wikipedia related to Ugandan kingdoms and national independence:

> When I was navigating Wikipedia I happened to find one about the history of Uganda, whereby they were talking about the kingdoms and about the independence. I was typing the content, and then other issues, like the Europeans how they came, and how they came into power, and then how they give independence to our country. So I was trying to get that one, and at the same time, I was getting another version from Google. So that one I also got in the other program I told you about [Encarta]. It was also there when I tried to see the issue of Uganda and the Buganda Kingdom. Even, I tried to check the one from.. is it, WikiEducator? Ya. I tried with that, but I was cut off short with the time (Interview, June 9, 2010).

On another occasion, Christopher added an account to a Wikipedia page of a local historical event in Gulu. A Ugandan journalist saw his addition in the encyclopedia,

which is now included in a textbook. This is a remarkable instance of getting a 'voice' within his own country but facilitated by a global network, that of the volunteer content writers on Wikipedia; and also of recording in print what has traditionally been passed down in oral history. Thus, an organization headquartered in San Francisco connected two Ugandans in disparate parts of the country, to record a very local historical account from an isolated region of the country:

> Actually I tried also the one I have on the net, I edited it – about our cultural leader, about Rwot, it's like a Luo king, then his name is Awic. I added that one where they were talking about kingdoms. He was the king of our land, and when the British came, he was collaborating with him. So he was the one who was really important, so he can get the issue of our culture and this region. And he went as far as building a school here, so I added how he helped the missionaries to do their work. I have the issue of how he struggled and did his work. He got sick and died in Kitgum. The thing was not included, so I added it. After I put it, there was a message that… one of the journalists in Uganda saw my name (which was in the brackets). He asked me "where did you get that story?" and I said "I got it from my grandfather, he narrated it because he was a guard to the king so he knew the story." So I tried to write it down because I don't have any record. I was in primary when he told me that story, and I wanted to record it. Now you see it in the curriculum among the kingdoms. I tried to publish it on Wikipedia, but I did not. I just added a summary, not in detail. But for this guy [the journalist], I give it to him in detail, and they decided to publish it in a textbook, to add it to the curriculum (Interview, June 9, 2010).

Feedback from participants suggests a focus on the opportunities of Web 2.0, as opposed to ICT tools that allow for information consumption, but not necessarily for information production, and a desire to participate in a two-way conversation on-line. During the study, we attempted two alternatives to the Internet that would still give the teachers access to information, and specifically, to educational materials: E-Granary, a depository of educational resources derived from the web but available off-line ("the Internet in a box") and an offline version of Wikipedia (WikiTaxi). WikiTaxi captures a copy of Wikipedia at the point that it is downloaded, but in a text-only version, as the inclusion of photos would be beyond the storage capacity of most personal computers. Ultimately neither of these tools allow for the kind of two-way communication that characterizes Web 2.0 and would make the teachers passive recipients of information, without the opportunity to "speak back". These tools serve the purposes of information access offline, but what of reaping the benefits of being online? Warschauer contends that full ICT access goes beyond device ownership and must also include Internet access (2003), the fundamental hub of *belonging* and *membership* in the information society.

The information landscape evolves by the second. Wikipedia was the primary website and information source visited by the teachers, and it is perhaps not a coincidence that Wikipedia's uniqueness is based on its interactive structure: the ability to challenge and evolve content without being an expert, to discuss with others why certain content should appear and why other content should be omitted, and to see new information appear within days, and sometimes within minutes of an event having occurred[23]. Ugandans too want to participate at this level, being both creators and consumers of

[23] For instance, major news events often appear on Wikipedia within 24 hours of when they occurred.

information. Access to computers is not enough. Social inclusion recognizes the power of the new information economy and network society and demands a role within it, something that "can help determine the difference between marginalization and inclusion in this new socioeconomic era" (Warschauer, 2003, p. 12). WikiTaxi is a powerful source of information that significantly enhances what a personal computer can contribute in terms of knowledge development; however, it is not a 'living' entity in the way that online Wikipedia is, as its content is frozen in time and does not allow one to 'speak back'.

Ultimately, the information society is embodied by the Internet, and access to the net is the quest the participants pursued. They were not interested in merely acquiring information, though this was one of the primary objectives mentioned, but in being part of a "world", where decisions are made, information is updated by the minute, and conversations take place that have global implications. This world could be seen to lie along a continuum where one is initiated as a consumer of information, but can eventually become a producer of information, gaining agency in the information world. Membership in a network is the prize, as much as growing one's knowledge. The communications aspect of the web was emphasized by participants, such as being "findable" globally. These findings speak to the notion of making investments (Norton Peirce, 1995; Norton, 2000; Norton, 2001) towards belonging in a sought-after identity, that of membership in a wired, global community with access to the latest knowledge and information.

6.2.2 ICT for Teachers' Knowledge Enhancement

One of the primary values assigned by the participants to ICT was the potential of computers to upgrade their subject knowledge. This was seen as equally or more valuable than the ability to create content in different media; teachers were interested in enhancing what they knew about the subjects they taught, so that this knowledge could be passed on to their pupils, and so that their professionalism as teachers would be augmented. While the participants also liked to browse news websites and get caught up on popular culture issues, such as reading about music and film, they spent the most amount of time online searching for information that falls within the subject of what they teach at school. They were often elated at the breadth of information and the variety of tools they could locate online. The following from Christopher typifies the kind of statements made by the teachers when reacting to what they would find online: "Every time I touched the computer, I could get more and more knowledge" (Interview, November 16, 2009).

John wrote in his journal that he used the Internet as a reference source to update his knowledge, search for new knowledge, and improve the content he teaches to his students, besides using computers to prepare lesson plans and student records more efficiently (n.d.). He visited websites to learn about recent scientific research and used the Internet to "update" his knowledge of biology and the animal kingdom, so the information he relayed to students was more current:

> From the Internet, I was looking at wild animals, fish, different types of fish, and vegetation. So those other information I was looking at the Internet, was helping me discuss with my learners, updating them on what they have in other parts of the world. It comes in terms of stories. When I am outside the class, children

> gather around me and ask me for very many things that they want to be updated [on]. So I tell them about the animals in other parts of the country – like the different kinds of buffalo they have in other types of the world. It comes in the form of stories. I teach science at this school. At the school you have to teach a subject for a year. I just talked about this in class. It helped me to give examples, when I was teaching about animals. It actually updated my knowledge, to help my learners get to know about other things (Interview, June 10, 2010).

He elaborates further, likening a computer to a library, and a means of getting to the "international level" of knowledge and teaching, as opposed to relying only on oneself and books for gaining knowledge:

> If I had a computer with international connections, to make me improve my level, if it is actually to the international level... I want my contribution to be at the international level, to find my standard, to make sure it is good. Then giving detailed explanation would be easier to give to my learners, so it would expand my experience. Because my first time using the Internet, I found myself lagging behind, because I was only using books and my own knowledge. So my experience told me I was really lagging behind…. because my knowledge was not even current. The computer would also help me in making lesson skills and plans; it would also help me for storing information. A computer can be used like a library itself, the way I see it. It can serve as a library because it has even more than a library has. Say you are connected to the Internet, or when you download onto your flash disk and then use your laptop, that would be the best (Interview, June 10, 2010).

In the Internet café, the primary site where participants accessed the Internet, time was of the essence. The connection was slow, pages loaded sluggishly and workshop sessions in the café were usually never more than four hours at a time since the entire café had to be rented out and closed to regular customers in order to hold the sessions for participants. This was an opportunity for the teachers to use the Internet without having to pay for browsing time themselves, since the costs were being covered by the research study's budget. Participants relied heavily on Wikipedia, which would load pages quickly, and come replete with hyperlinks to all related subjects (Field Notes, August 19, 2009; Field Notes, November 16, 2009). The teachers would copy and paste entries in some cases and save them into Microsoft Word documents, so that the information could be read offline later at the Lab. Images were downloaded for use in presentations, and participants recorded notes as they browsed pages. June told me, "There is a lot to be learned from the Internet. Information is only one. Consulting for more information for what you want to teach and sometimes also, for research. Many people are using the Internet for doing research, that is what I see, when I look around a net café, that is what people are doing, research" (Interview, June 7, 2010).

Christopher also found information off-line on his friend's computer, which had an Encarta Kids encyclopedia installed:

> When I was using my computer, or other computers, I happened to get another resource, Encarta Kids, which has many programs, like programs about animals, about sports, about science, about hearts, reading and writing, about people, history, social studies, other games and fun stuff which were there if you want, you go there and go through, you access them, you only type what you want. If

> you say “a boy”, it will give you the results, it will give you, plants, you could access that one. And through that one, we also have Encarta Dictionary. Other words where we don’t know… you go find the words and it give the meaning and the spelling (Interview, June 9, 2009).

The teachers also associated both computer skills and the knowledge that can be gained via ICT with career advancement. John referred to “the GOLDEN CHANCE I've got to get trained in computer knowledge which puts me at a higher standard of my profession” (pers. communication, August 20, 2009). During his participation in the study, John began thinking about further higher education:

> After finishing my first teaching course at the certificate level, I have now gone as far as getting a diploma, specializing in English. So I entered those details about the tenses to help me for my studies for the future. I wanted to take English, double main, like drama, poetry and grammar. I am planning to go for it next year if God wishes. I am now preparing an advance to go and take language for my degree (Interview, June 10, 2010).

Nick believes ICT can be used to expand knowledge within a classroom, supplementing what the teacher knows on a given subject:

> If ICT is introduced correctly in the education system, then probably the teachers will no longer be the only source of knowledge. In traditional settings, the teachers are the only source of knowledge. ICT would make it so that the teacher is still a source of knowledge, but there are alternatives. Like someone can sit in

the classrooms and get more, or more effective knowledge (Interview, June 9, 2010).

However, in Gulu, computers are not likely to make a regular appearance in primary schools anytime in the near future. Computers will not be a direct conduit to knowledge for students, but computers can and did enhance the knowledge of teachers in the subjects they taught, in addition to giving them content that they could bring to their classes and use for teaching. This ultimately benefits the students. This was a role recognized by participants, and indeed may be one of the major contributions ICT can make to education in environments such as Gulu. In Uganda, primary teacher education is normally comprised of only two years of training, in content and pedagogy (plus three school practice periods of eight weeks each thereafter). The potentially positive implications of ICT for enhancing teacher subject knowledge are explored in Chapter Eight.

6.2.3 ICT for Efficiency and Classroom Management

A major value with which the teachers associated ICT was its potential to decrease their workload and make more efficient use of their time, particularly in the context of exceptionally large class sizes. Teachers could prepare lesson plans more rapidly and bring changes to lesson plans more easily on a word processing program on a computer than on a hand-written document. Using a spreadsheet to manage student records would mean a teacher would not need to recreate the document if there was an error as he was preparing it, or when a new set of assessment results was made available. Finally, with respect to managing large numbers of young children in a small classroom,

using a computer to present a lesson helped maintain the class's attention, engaging the learners' interest through the use of multimedia (such as projected images from slides or photo files), a value which will also be described in further detail in the next section, on multimodality.

Christopher wrote in his journal of how "IT has helped to reduce workload of the teacher" (n.d.), and later he added, "ICT has made good time management during teaching-learning and good record-keeping" (n.d.). John remarked in his journal that he had been able to prepare three lesson plans over three hours using Microsoft Word (n.d.). June similarly indicated, "if we are going to have the access to [computers], it will shorten our workload," but specifically noted the need to actually have *regular* access for this tool to serve the teachers (Interview, November 18, 2009).

She further describes the tedious process of preparing documents by hand, which sometimes requires taking time to get assistance from another teacher:

> it will reduce the time. Everyday we have to plan and scheme. Scheming, we have to draw lines using a ruler and a pen. So it's time wasted. Using the computer, it saves time, it's much more easy. You can find objects easily on a computer. Here, you find the teachers don't have the art of drawing, so some teachers call their fellow colleagues to draw for them. Imagine, you call your friend to come and draw for you, that's time wasted. The computer makes it simpler (Interview, November 18, 2009).

Saving time arose as a concern for others as well:

> … for me, it has been easy to make and keep records like class register, recording sheets, pupils' basic information, assessment record, lesson plan, schemes of work, timetable, photographs or picture among other because of this, work is reduced (Christopher, journal, n.d.).

Teachers also reported that when they delivered a lesson using presentation slides screened from a projector, the students were deeply focused on what was before them, and they found it easier to keep large numbers of learners engaged when using the technological resources. June, for instance, wrote in her journal that the slides "make learning real and children are always active in the learning process" (n.d.). Christopher explained the reactions of his learners when he delivered a lesson using a computer, such as with printouts of images downloaded online or using a Power Point slide show:

> even if at times they are not attentive, or used not to concentrate, this time they will concentrate. They will be at attention when you're teaching. Everything you are doing, they need to participate, and much of them are so inquisitive to learn. Even if you don't show them, they will come willingly, you only instruct them, because the resources will be there (Focus Group, June 5, 2010).

However it should briefly be noted here that the first time that a computer and projector are used to deliver a lesson can be a significant distraction to primary school children. During the lessons I observed, in most classrooms the students were preoccupied with the new machine. In particular, since I was filming the lessons, they soon discovered that they appeared on the screen and some proceeded to give performances for the camera, from waving their hands to getting up and dancing during a

lesson. They also liked to put their hands in front of the projection to make shadows. As June wrote in her journal,

> So it happens that the learners were so excited that controlling the class of 110 pupils almost became difficult but at last I have to change my method. I came to realize that majority of the learners have not merely seen a computer that they needed to know. Like opening and closing, then went straight to my lesson (n.d.).

However, once the students were accustomed to the strange new device in the classroom, they were equally attentive to the content presented to them using the machines. During all of the lessons I observed in the participants' classrooms, learners were deeply engaged with the ICT-mediated lessons. They were attentive to the text and images on the slides, and their eyes followed the teachers' pointer across the make-shift screens that had been erected. In all the classes I observed, participation was active as learners raised their hands to respond to questions, volunteered to come to the front of the class, or offered to read the text on the screen (for instance, Field Notes, June 8, June 10, June 11). According to June: "Towards the end, learners were actively participating in the learning process, and it made my work easier. It was a listening and visual lesson. At the end, there was a lot of knowledge that was imparted" (Participant journal, n.d.).

6.3 Content, Format, Mode and Utility

6.3.1 Multimodal Texts: From Real Objects to Digital Objects

Gulu's classrooms are filled with the creations of teachers. In all of the public schools I visited between May 2008 and June 2010, students had little to no access to textbooks. Maps, diagrams and other visual aides were not provided by the Ministry of

Education nor by the school administration. Classrooms did indeed have literacy material, however. Visual aides were hand-drawn by teachers and taped to the walls. These mainly featured illustrations that were labeled in English, Acholi, or both, such as a physical setting (shop, school, church, village or town) with the names of people, places and objects labeled; or drawings with labels of body parts, facial expressions, animal specials, place names, letter sounds, or types of professions. Figures 6.1 and 6.2 provide examples of such materials, made by teachers at Gulu Public School.

Figure 6.1: Teachers' Drawings of a Grocery Store Showing Different Food Labels, for Use as Visual Aides in the Classroom (Gulu Public School, 2008).

Figure 6.2: Teachers' Drawings of Community Figures (Gulu Public School, 2008).

In interviews I conducted with teachers from the Main Public School, a primary school in Opit district, and the Orphan Boarding School in 2008, teachers repeatedly

described how they draw people, places, and things on scraps of paper of their own initiative in order to supplement their teaching. In particular, they create bilingual resources for the classroom. They sometimes assist each other in preparing these tools, and sometimes share drawings among each other to increase the variety in the classes. The teachers also translated text from English language textbooks into Luo in order to have literacy material in the local language (Field Notes, May 15, 2008). Participants in the study engage in the same practice, and some of them also described other strategies they have to help learning be less abstract for their learners, including many examples of the use of "real objects" for teaching.

John described "the most valued teaching resources" in his classroom as "real objects, toys and charts" (Interview, November 21, 2009). June gives several examples of real objects that she uses for different subjects:

> …Another one is when you have a real object. Like when you are teaching math, like addition, you bring sticks and straws. We collect them, pile them together and then you use those sticks for adding, and then for subtracting and then for division. And then we use the abacus. They are materials that the government made. They are wood. They are used for placing the place values. You use them then. For other subjects, like science maybe, when you are talking about the flower plants, you let the children go themselves and pick the flowers, bring them in the class and then explain them. Same for the plants, you bring them (Interview, November 18, 2009).

Christopher uses clay and has his students mould objects that are being discussed in the class unit: "for the lower classes, for transport in our community, we have them go

and get some clay and mould a car, boat… then they make it." The clay is used "to make things that they then present to the class and explain how to do this to the other students. We used to have a learning corner where we would display real objects so they could study the actual thing they were learning about, like plants so they could name them and answer questions about them". (Interview, November 16, 2009).

He goes on to describe other items used to make real objects:

> We use grass as well. For making dolls, for teaching about parts of the body. For this, you can use grass, cotton wool, you can use also sponges, or pieces of cloth to make them, then you can bring different colours for different parts. Then you can use flowers to bring out different colours. At times there is not enough colour, so we ask them to bring certain flowers in, and then they can use to rub on things, to draw the colour. We use charcoal as well for drawing when there are no pencils. On a cut box, we give them a task to draw with the charcoal and fill it in with the flowers to paint it (Interview, November 16, 2009).

People from the community who have a skill that can form part of a lesson topic are also invited into the class to demonstrate their skill: "Like if I want to show them how to cook… I don't know how to cook certain food, so we ask someone who knows very well to come and show them. Then they can see themselves how something is cooked and we ask them what they think" (Interview with Christopher, November 16, 2009).

The practice of using real objects to teach is mirrored in what the teachers sought from ICT. Just as they survey their households and communities to find diverse pedagogical tools, what Stein has called "resources for representation" (2008a) to supplement lectures, the teachers surveyed the ICT tools they had access to for

multimodal ways of presenting information to their students. ICT tools, including the computers, printer, scanner, cameras and online access, complemented and expanded multimodality in the classroom, bridging a practice of using "real objects" with a practice of using digital objects. How digital objects were used is explored in the following section.

6.3.2 Seeing is Believing: Teaching With Sight and Sound

An often-cited advantage of ICT-generated content for the classroom, according to participants, was its capacity to teach a topic through diverse modes: text, image, audio, and audio-visual. This capacity was valuable because it "makes learning real" in the words often repeated by the participants, bringing a topic alive with imagery rather than keeping it abstract with a verbal explanation, particularly for something that a learner hasn't seen directly before, like animals that live outside of Uganda. In many ways, this use of ICT by the teachers bridges their existing efforts to diversify learning with real objects, prior to their being introduced to ICT.

Christopher wrote in his journal that it's difficult to teach concepts without visual or audio supplements, and this is the greatest value that computers bring to teaching. He adds, "In the teaching and learning processes, the use of ICT has been so much of great importance in the development and teaching the lesson because of resources at hand which had made my lesson to be real and liked by [all the] pupils" (n.d.). Learning can often be abstract in the absence of textbooks that could provide illustrations, visual aides like picture cards or posters, or picture books in the classroom:

> Because finding some other instructional materials, the learning aids are there in the computer, because the pupils see it visually. Most of these children don't

> really know what they are learning. Like if you say, 'this is an elephant', they have never actually seen an elephant, so this changes the way they are learning, when they can see it (Interview with June, November 18, 2009).

In an interview the following year, June reiterated the point:

> I want instructional materials from a computer. Say for instance the lower classes [P1-P4], when you are teaching, and when you have to refer them… they learn more from the pictures. For instance when you want to teach a subject and you have a projector- that one makes the learning so real. Some of them have not even seen the wild animals we talk of. It makes the learning real when you use computers that way (June 7, 2010).

One teacher, Albert, explains how the main tasks for which he would use the computers were preparing lesson plans, creating Power Point presentations to deliver lessons, and for downloading images from the Internet. He would download and print images of animals, and take them to class to show the students:

> **Albert:** It made learning very interesting, because without that picture the learning would just be abstract. They only think of the name, but they don't even have a view of it.
>
> **LO:** So can you give an example, like, uh, what animal was in the picture?
>
> **Albert:** The giraffe. You know, giraffe, chimpanzee… that was when we were teaching them about the natural game farm, the animal farms, and the gorillas—also these kids have not seen—and when you only mention the name that, like "in the game park, we have gorillas there" they have not even seen any one of them.

> But by using the photos which was downloaded from the Internet, they were at least… the class was very interested to see those pictures.
>
> **LO:** Were they colour photos?
>
> **Albert:** They were in colour.
>
> **LO:** So they reacted differently than they do—so how would you normally teach about giraffes?
>
> **Albert:** Usually you would only explain how it appears or how it looks, and the kind of life that it lives in the environment (Focus group, June 5, 2010).

Christopher explains how he uses images for the different curriculum units:

> You find that this curriculum is built, like from P1, from our school, things in our school, our home, things in our home, our community, things in our community, then the district, sub-counties - you go up to the whole country, region, like that. By that time, the child knows the school, home, the community therefore, the child will be able to go the next class and know more about those items. I've been relating those resources from the Internet I got to these issues. I pick the local one and come and compare them. For us here like animals, we have domestic animals, I show them what we have here, what we don't have here. They say, "oh I've seen this one in a film!" if we don't have it here (Interview, June 9, 2009).

Using computer-generated educational resources in the classroom could supplement Luo language lessons when there was no literacy material to work with in the local language. Christopher wrote in his journal that ICT "made learning-teaching real especially Acholi-Luo and lesson preparation" (n.d.). John found content to supplement

his English subject teaching: "I have downloaded the pictures for reference [shows pictures of farm animals inserted in the lesson plan]. Besides that, I also downloaded some content about the tenses of English, it's there in my flash disk" (Interview, June 10, 2010).

The participants were often focused on finding images, both for their own interest, as well as to download for use in their lessons (Field Notes, November 16, 2009; Field Notes, August 21, 2009). In breaks during workshops, some of the teachers asked me questions about the kinds of animals that live in Canada. Upon arrival at the Internet café, they would look up images of these animals and I would hear exclamations of "oh!" the first time they saw an image of an orca, bear or mountain goat, for instance. I noticed a participant moving from page to page on Wikipedia rapidly and I asked him what he was searching for and he replied that he only wished to view those pages that had images (Field Notes, August 21, 2009). I often saw Christopher looking at medical diagrams, such as an image of the human heart with each part labeled (Field Notes, August 23, 2009). The Internet was to the participants what it is to all people, a vast repository of information that can answer questions one has long been curious about, instantly. Only, the teachers had limited opportunities to have their curiosities satisfied and in a short amount of time, dozens of questions were fielded to Google and Wikipedia, the responses delivered in multimedia format. The inclusion of images, in particular[24] set Internet-derived information apart from most books the teachers had access to.

[24] Because of the low bandwidth and resulting poor connectivity, streaming or downloading video or audio was uncommon; though the teachers often watched videos and listened to music files in the ICT Lab, which had been previously downloaded. The participants most commonly viewed images through the medium of Wikipedia, which loaded faster than other sites.

June, John and Christopher always dedicated time in the Internet café to searching out and downloading images that could be used in their lessons. Christopher reports, "I would try to find more and more materials. There were audio materials, we have also in visual form, others (Interview, November 16, 2009). He printed photos and images from the Internet and also scanned magazines and newspapers: "I printed materials from the Internet, photos, I scanned magazines and brought them, newspapers… it makes teaching easier. You waste less time, you don't have to explain things verbally" (Interview, November 16, 2009). In his journal, he wrote, "WikiEducator has help[ed] me to have resource[s] like pictures and notes for teaching, this is one of the useful tools in the net I've been using" (n.d.). June used Youtube to download video clips of songs she was teaching, describing its uses in her journal,

> Another website I found interesting was Youtube.com which has a lot of pictures that can also be used in the classroom. Children learn a lot when you relate pictures they are seeing. It can be use[d] for refreshment during a free time period in the time-table. Children watch and tell stories after retelling the story. By doing this, skills are being developed (speaking skills, listening skills and writing skills) (n.d.).

Christopher explains how the news spread that he was using some new types of learning aides in class, and some absent students resumed coming to class, their interest piqued by news of the photos and film:

> it is so interesting. I witnessed it when I was teaching, using that one. Though I did not use the computer, I used the photos. They happened to keep the record of that picture in their mind, and in their file. They didn't use to do that, but they

> kept it too well. They asked me to do it more, but I said at the moment I don't have the resources to get more, but you share with your friends. And this one also has encouraged the learners, the others when… you know, they don't have interest in learning, and then other kids heard about this and started coming to school more regularly. At first they used to not come because they had some problem, then they started coming. They said, you have given these photos when I am not around, how do you expect to get? So I have seen they are very happy and interested in the learning. And also that one, I realized it has built a strong relationship between the teachers and the pupil so they are starting to come close to me, whenever they have problems. There was a day I happened to use one of my friend's laptops and gave them a story. It was on a DVD, so that one helps a lot. I gave them a story about other boys when the title of the film is "Lord of the Flies", so the story is so interesting and it was at their level. Because from age 7 to 13, so they were liking it. Every time they were asking me, can I borrow it, that CD? I said, how can you use! First I ask your parents, if you can use and that you should bring it back, to protect that one. And others I have made a copy for them. So their parents appreciated so much. And they were so eager if I have any others, I said, if I have, I will give you (Interview, June 9, 2009).

In the excerpt above, Christopher explains that he felt using the ICT content strengthened his relationship with his students, even prompting them to come to him for assistance with their problems. The use of photos in the classroom drew the interest of students, helping invest them in their own learning. According to Christopher, it was this process that apparently made them perceive their teacher differently, as someone to

confide in and seek the assistance of. In this case, the teacher's position seemed to be enhanced by his application of new learning objects in the classroom.

Using a projector and laptop also makes it possible to adjust material as the lesson is proceeding: "if it's somehow too technical for them to understand, I can bring it down to their level. I can change it as I am going…. We put little words for them in the pictures. The computer makes that process easier" (Christopher, Interview, June 9, 2009). As they delivered lessons using a projector, I also observed two teachers pause to correct a spelling mistake in the file before continuing with the lesson (Field Notes, June 8, 2010).

The following section describes two examples of how teachers mixed modes in computer-generated educational resources.

6.3.3 Diversifying Modes: ICT-supported Resource Creation

The first sample provided is a lesson plan prepared by June (see Appendix I), who teaches music. In the lesson, June focused on the use of rhythm in the local song, "Mr. Hyena the Cat," and she included a mix of image, symbols and text for a unit on "Singing and Beats". June used both narrative text as well as a table format to organize her lesson, then had the musical notes written to teach students the rhythm of the song as well as the musical symbols. She also used five photographs taken of the pages of a storybook, which is the narrative used in the song. The lesson itself used various modes of teaching, instructing students to first listen to the song, "clap to the rhythm of the song," to sing, to recite the poem found in the song, to "match the French rhythm names to the staff rhythm symbols," then to listen to a recording of the song. June wrote out the different methods she would use to teach and listed the activities of the lesson. She also listed the required

resources and references, and pointed out the life skills and values the lesson aims to impart. Her table allows her to divide up the timing of the lesson for each phase, with separate columns for the teacher's activities and the pupils' activities. After the table, she included a section to write her assessment of the lesson afterwards, followed by notes she needed to deliver the lesson, including the rhythm names and symbols:

French rhythm names

ta - te	ta - te	ta - te	taa
ta - te	ta - te	ta - te	taa
ta - te	ta - te	ta - te	taa
ta - te	ta - te	ta - te	ta

Staff rhythm symbols

♫ ♪

d . r : m . r : d . r : m

m . r : m . r : m . r : r

m . r : m . r : d . r : m

r . m : r . d : r . d : d

Sol-fa notes and the song

d . r : m . r : d . r : m
Mis-ter Hye-na and the Cat

m . r : m . r : m . r : r
Had a plan to climb a hill

m . r : m . r : d . r : m
When the Hye-na saw the meat

r . m : r . d : r . d : d

I feel sick he lied to cat.

June included slides she planned to show the students, which illustrate the story of Mr. Hyena and the Cat. During the actual lesson, she displayed the slides from a Word document, also using the computer's speakers to play the song, and to display the notes with the projector. In June's lesson plan, all of the material she planned to work with to deliver the lesson including her presentation material was found within the document. This seems to have been facilitated by the application's capacity to include text in different formats, symbols, and image.

The majority of the time, the participants used only their own photographs in their educational resources, as opposed to photos they had downloaded off the Internet. Photos were often of objects in the local environment that they used to illustrate a unit such as photos of livestock, a house, fruit, or people. However, in many cases, the teachers took photos of other visual educational resources such as diagrams or the illustrations in books, and then mixed these photos in with the text in both their lesson plans and in the slides that were presented to their students. June does this above with the hyena story, and another teacher, Davis, uses photos of classroom posters showing the different food groups for a slide in his Power Point presentation on vitamins. While Davis could just as easily use the actual posters in his lesson, by inserting the photo of the posters into his slide, he can present the visual information together with the text for an integrated lesson.

Figure 6.3: Vitamins Presentation Slide

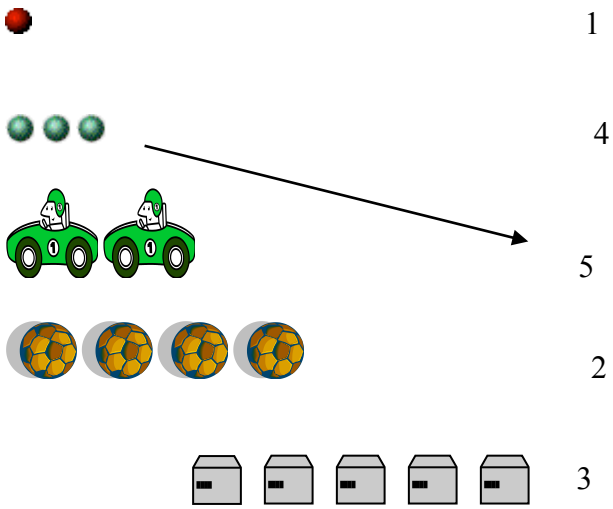
In this example, Albert uses a photo of the long-horned cattle to illustrate a historical fact included in a lesson on the Bunyoro Kitara kingdom of Uganda. Albert had taken the photo in town earlier in the week.

Figure 6.4: Long Horn Cattle Presentation Slide

Christopher's more advanced computer skills and faster typing allowed him to prepare documents more rapidly than other participants. He tended to prepare all of his lesson plans in two language versions, one in English and one in Luo (see, for example, Appendix J). He also used graphics and symbols in his lesson plans. Like all the teachers, he preferred using a table format to organize the information. Christopher's competence with functional computer skills may be contributing to an enhanced pedagogical ability

too, as he deftly incorporates different forms of material (image, text) into his lessons, bringing out richer content as a result. The following excerpt from Christopher's bilingual math lesson plan shows an example of his use of graphics and symbols:

KIT ME PWONYO NE

TIC PA LAPWONY	TIC PA LUTINO
Lapwonyu ki lutino woto ki lutino woko gin coko jami ma pat pat. Nyutu ki lutino kit me keto jami idul. Nyutu ki lutino kit me telo tol, labole  	Lutino lubu kor lapwony kun gin coko jami ma pat pat. Keto jami idul Telo tol kit ma lapwony mito.

The lesson plans and presentation slides show the teachers' quickly acquired use of the option to include non-textual modes, and demonstrate their desire to communicate information (even to themselves, in the case of the lesson plans) using mixed modes. The teachers were able to enrich the content of their lessons by using mixed modes of expression. These samples were drawn from amongst the first assignments the teachers worked on, when they were still becoming familiar with the software applications they were using. It is thus significant that their practice was automatically to integrate non-text modes. The software they used, and the hardware used to present their lessons (LCD projector and laptop) facilitated the presentation of multimodal content, bridging non-ICT

supported teaching practices (as in the illustrated, bilingual posters that teachers prepare for their classrooms) with the ICT supported practices. These examples point to one way in which ICTs can be used effectively by primary teachers in bilingual classrooms.

It has been argued that teachers are better able to make use of technology in their profession when their ICT skill development is focused on subject-specific training, rather than learning computer literacy as a stand-alone skill and leaving teachers to determine how it might be used towards teaching and learning (Hughes, 2005). The participants in this study did not take long to recognize benefits of ICT specific to their teaching practice. This is likely derived from the fact that their training and exposure to ICT has mainly been in the context of the study's workshops, which were largely oriented around applying computer literacy skills to teaching and learning tasks. For instance, when participants learned to use the Microsoft spreadsheet software program, Excel, they learned as they created a template and graphs for student assessment results. The basics of Internet research were learned by searching for educational resources that could be used in the classroom.

6.4 Navigating and Sustaining ICT Competence

This thematic section examines two main findings drawn from the data: the difference made by structuring ICT training programs to invest in the end-users, as opposed to the physical inputs of programs; and the role of peer support in teachers' ICT learning.

6.4.1 Focus on Machines Vs. Focus on People

The record of ICT interventions in Gulu and Uganda to date reveal a tendency for the central focus of a project to be on the provision or placement of machines, rather than

on the skills to use those machines in locally meaningful ways. For instance, this study found both traces of a past intervention (a USAID-funded computer lab at the College) that tell something of where sustainability failed in that instance as well as findings from the intervention that took place as part of this study, which reveal that the participants themselves emphasize skills and access, over the mere presence of technology tools. Taken together, there is a strong suggestion that for ICT to be effective, the focus of the investment must be on *people*, and not exclusively on the technology. The outcomes sought must be about the skills, competencies and confidence of the end-users of ICT, and not about procurement or infrastructure alone. Procurement and infrastructure are important, but they are secondary to the people using them, as it is people, not machines, who will ultimately determine the impact that ICT makes and whether it is useful to advancing learning outcomes and relevant to the needs of local communities.

Project concepts that focus more on the provision of technology, rather than on building up local human capital in technology have little to show today, despite a history of various ICT interventions in the region. Referring to USAID's Connect-ED project at the APTC and eight other colleges a few years prior, Nick describes the problem:

> the Government hasn't recruited trainers to manage those labs. So it's like they need to find someone to recruit and keep that person. But there are delays in pay, poor standards in paying… the college will say, "this is the amount we have", but it may be below so maybe a good rate, but you have to be there. At times it's not like it's even paid monthly as it was agreed. It can take six or seven months to be paid at times. So that one forces somebody to look for alternatives for income because you cannot depend on that resource for your income. So that affects the

> computer labs. When it comes to training, it's really, really difficult. You have to shift your role from trainer to counselor. They really want to learn, but there aren't enough resources, so they struggle, so you have to work with them, to teach them how to share and explain that this is the situation. But they really complain a lot, very, very bitterly. I really find it very difficult (Interview, June 9, 2010).

In the course of the study, the need for ICT interventions to leave behind them local skills at the project site was evident many times over. An illustrative example is the challenge of computer viruses and the capacity of the teachers to address this problem. As new computer users, the concept of a virus infecting a computer was new and strange to most participants. A great deal of time was spent throughout the training component of the study explaining what a virus is, how it works to harm a computer, how to identify a virus, and how to remove it. However, viruses consistently infected the laptops, mainly via teachers sharing USB sticks among each other and with different laptops. The viruses were invisible files, but resulted in programs slowing down or shutting off, and as the virus infection worsened, the operating system malfunctioned and finally imploded. When computer users cannot identify or effectively address a computer virus infection, the machine quickly becomes unusable.

Navigating the world of anti-virus software is time-consuming, demands access to a range of information such as independent consumer reviews and product websites, and requires familiarity with a range of technical terms. Understanding what a computer virus is and how it works to corrupt files and damage a computer requires a conceptual understanding of a computer's design and internal functions, something that new computer users are unlikely to fully grasp early on. There is a substantial industry of anti-

virus products, some of which have free versions and some of which do not, the latter of which would generally exceed the average monthly salary of a teacher. Finding and selecting an anti-virus product demands familiarity with the web and some computer savvy.

The study participants were aware of viruses and had some understanding of how they worked, but they could not easily recognize the signs of a virus infection other than to realize that a machine was not functioning as it should and something was wrong. The college had not been renewing the anti-virus software, and it subsequently expired on the laptops (Field Notes, June 6, 2010). When most of the laptops and USB sticks were diagnosed as having many viruses each, it was agreed Nick would install new anti-virus software in all of the machines to protect them and would explain how the software worked to the participants (Field Notes, June 12, 2010).

Two challenges were faced with this plan. Firstly, as described in Chapter Five, many of the teachers at this time were suspicious that the college meant to confiscate the laptops and that if they turned them in for the anti-virus, they would not be able to access them again. Secondly, Nick was the only person the participants had contact with who had the skills and ability to remove viruses from a computer and to install anti-virus software; and his many roles and busy schedule made it difficult for those participants who were willing to take their computers in to access him. Because Nick is the only person employed at the college's ICT lab, when he is not present at the lab, the lab is locked up and closed so that college students cannot access it. Further, Nick was based at the college, while the teachers were based in the town, and this required coordination and travel planning to meet. Finally, Nick supplements his income from the college with other

jobs and contracts he takes on in addition to his full-time role at the college. Outside of his hours in the lab, he is often occupied with other work. All of this made it challenging for participants to reach him. John remarked at one point in his journal, "Nick told me that he found a lot of complication with the computer I was to borrow, and that it may not be repaired soon because of his busy schedule" (n.d.).

In the classroom setting, when the participants were training in the ICT workshops that formed part of this study, two or more people were on hand to assist them to learn how to carry out tasks. However, with limited practice time outside of the workshops, the participants were reliant on Nick to assist them to trouble-shoot any major mechanical or software programs that arose. Beyond the short-term, this would be insufficient to maintain the laptops. Sustainability of both the physical hardware, software and of skills in ICT requires shared stewardship over resources, whereby the end-users are taught more than how to use programs useful for their profession (such as a word processor or presentation software), but become proficient in protecting and maintaining ICT tools, and in understanding what makes a particular piece of technology such as a projector, a printer, a flash drive or a computer "healthy" or "unhealthy". Stewardship over technological resources must be integrated into the sites of use, as advocated by the teachers:

> The value is that we are now living in the world of technologies. Whether the other schools which are now teaching computers as a subject, in some primary schools which are well off and have the money to buy the computers, but here, there is no school which has computers as a subject. So the problem is the

> computer. First we have to begin with the teachers, and then the pupils (Interview with June, June 7, 2010).

June refers to the computer as a "problem", which can be solved by a computer literate teacher capable of unlocking the potential of the machine. In other words, the computer is useless without the person. Nick also recognized the need for the kind of skills that he possesses, to be spread among the teachers actually using the computers:

> Proper Operational Guidelines (policies) has to be developed to ensure use and protection/safety of equipments. This can be shared with College Admin, Head teachers of participating teachers and the teachers. This is useful for now and tomorrow too (pers. communication, June 13, 2010).

Further, feedback from Nick gives an idea of the level of skill required to effectively use off-line substitutes that can capture and make available some of the information contained on the Internet, providing some degree of information access for unconnected computers. In the case of E-Granary, the "Internet-in-a-box" tool mentioned earlier, once set-up, navigation was fairly intuitive, functioning similarly to a web browser. However, the installation process was complicated, time-consuming, and had to be repeated every time the program was opened. The process confounded Nick, a trained IT specialist, who relied on a manual and numerous communications back and forth with the help desk at the headquarters of e-Granary in Iowa. Below, he summarizes some of the difficulties he faced with e-Granary:

1. Most importantly, the main challenge exist[s] at the installation stage, apart from making fresh installation each time you use, the system doesn't run on itself

(autorun). You need to browse a file name autostart.bat It demands you cause it to run (execute).

2. Others include:

- Music file and videos demands for internet connection, no string available.
- Graphics are not displayed for other websites.
- Apart from link to external source; that require real internet connection-text displayed "change proxy/demands internet".

(Pers. communication, Nick, January 20, 2010)

In the case of WikiTaxi (off-line Wikipedia), the download and launch process is also complex, requiring a file sharing system and personal computer with a large storage capacity drive:

> I downloaded Offline Version of Wikipedia, the file extension is .tar which is not executable. This file is invalid. I need to try it on file-sharing system, please could you try it out and send to me as attachment? There is another site with 2GB which our connectivity can not support
> (pers. communication, Nick, August 11, 2010).

All technology requires an investment in human capital to be relevant to the objectives of end-users. All of the challenges described in the above examples need not terminate the potential of ICT resources, but those resources will not manage to yield results for very long when local capacity to resolve hardware and software problems doesn't exist.

6.4.2 Peer Support and Collaboration

While more advanced tasks, such as removing computer viruses, necessitated contact with an IT specialist like Nick, for many other tasks the teachers turned to each other for assistance. Peer collaboration played an important role in skill development, and was a valuable strategy both in and outside of the training workshops and ICT lab.

At their schools, the teachers continued to work together, trouble-shooting, and organizing collectively to ensure their assignments would be completed. One of the focal participants in particular, Christopher, took on a teaching and support role to many of his colleagues, who turned to him in the lab or net café for explanations of how to complete a task, as well as at school when teachers had borrowed the laptops to work on presentations or lesson plans (Field Notes, August 21, 2009; November 15, 2009). Christopher explains, "Where you are green about it, you consult," adding, "At times, I consult others. I might get something but not understand the content, like those who experience the profession. We normally share ideas, here and there" (Interview, June 9, 2009). In his journal, Christopher acknowledges this role, describing himself as having become a "peer leader by assisting my fellow teachers using ICT" (n.d.).

The teachers were a small group and over the period that they participated in the study and attended workshops together, they grew close and sought support from within their group. The teachers in each of the three schools were united together by their shared experience in computer literacy, and they continued to rely on each other post-training. Describing his difficulty in using the spell check feature of Microsoft Word, John explains how another teacher from the study, Willie, assisted him: "Willie was helping me with that one [spell check], but he was having the same problem" (Interview, June 10,

2010). In his journal, John wrote, “I’m to go and see how others operate computer and I learn by seeing in most cases” (n.d.). In another journal entry, John expresses his appreciation for Willie’s assistance with making a presentation: “Yesterday evening (9:00pm – 10:00pm) Willie help[ed] me with his computer and I was able to make my lesson on the power point. It was a short moment but I thank him for devoting his time and computer to make me make my lesson” (n.d.).

The teachers also shared content, swapping photos and other files using their flash drives. In the absence of an Internet connection, they had a social network among themselves to share information:

> At times I moved to other people, where they had the pictures, like on their computer or on their flash and we meet and we display, and then I say, “can I have this one here?” and they say, “yes you are free to have” or they tell you where you can find what you are looking for, and you go, or make an appointment. Like audios… like I like getting riddles for them. So you get a tape recorder and go record and then record a CD. So they listen to it. You can do this with local stories (Interview with Christopher, June 9, 2009).

In the months in which I was absent from Gulu, the teachers continued to meet, sometimes with Nick at the ICT lab at the APTC, and would formulate plans to complete their assignments, or agree on an approach in the lessons they were preparing on the laptops. On December 3, 2009, Nick sent me the following update by email:

The following have been agreed.

1. The pending assignment to be done in group. We need to share the knowledge and skills.
2. Representatives from each participating school were selected by their members. Below is summery.

- Davis-Army Primary
- Christopher-Main Public
- Bernard-Orphan Boarding School.

They suggested to work and produce material under thematic curriculum. This is testing a strategy. Other alternative are available.

Strategy for work-select them and participants make lesson plan, Notes and learning material.

Selected learning area includes>English,Mathematics,Literacy I^II PE. Each participant develop the mention resources on theme one, week two (OUR SCHOOL). Another main point was borrowing a camera for use outside the lab. A participant can borrow a camera and share with member in the same school up to a period of one week.

I asked them to bring back all the cameras so that we engraved codes on them including the labtops and other equipments, what codes do you suggest? [sic].

Others have also found peer collaboration to be important strategies for the effective application of ICT resources into teachers' learning. Hughes (2005) has proposed the establishment of collaborative, subject-specific "inquiry groups" of teachers for professional development, after finding that "predominantly informal learning experiences" played a significant role in facilitating the access and use of technology

among her teacher participants, with informal guidance being a deciding factor for technology's relevance to teaching practice (p. 295). Warschauer (2003) points out that "most people rely on their social networks to offer support and assistance" in navigating the numerous decisions that need to be made in accessing ICT, like how and where to find a computer or Internet connection, and in gaining the skills needed to use these tools (p. 156). The potential role of pedagogical practices that integrate peer support into ICT training initiatives for educators is discussed further in Chapter Seven.

6.5 Discussion and Summary

Toyama (2011) notes that "the history of electronic technologies in schools is fraught with failures" and that "computers are no exception, and rigorous studies show that it is incredibly difficult to have positive educational impact with computers. Technology at best only amplifies the pedagogical capacity of educational systems; it can make good schools better, but it makes bad schools worse" (p. 1). In his highly critical assessment of the uses of technology in schools to date, he refers to a cycle of new technologies repeatedly introduced into schools that go through the phases of "hype, investment, poor integration, and lack of educational outcomes" (Toyama, 2011, p. 1). Others who offer a more hopeful analysis still point to the poor track record to date. Mishra and Koehler (2006) argue that part of the problem "has been a tendency to only look at the technology and not how it is used. Merely introducing technology to the educational process is not enough" (p. 1018).

The findings presented in this chapter echo the role of poor integration as a culprit in blocking many efforts to introduce ICT into education from sustaining long-term change in learning outcomes. Computers on their own do not have any intrinsic

resourcefulness (Prinsloo, 2005). Integration demands attention to a wide array of issues that have been identified in these pages so far: bridging exposure to ICT in teacher preparation to ICT in teacher careers, addressing connectivity and infrastructure issues, ensuring access, and nurturing the development of local technology stewards within sites of use. Nick captures a similar point in the following comment:

> My thinking is that if these teachers are trained well, if they are provided with important skills, if these teachers are equipped with proper strategies of teaching, they would make an impact all over the country. Using ICT for teacher training, its an area that covers a lot of research to get the best practices and it can change the tide of the education system *(*Interview, June 9, 2010).

Most importantly, however, is the suggestion emerging from the findings that the design of ICT interventions must have the creation of human capital as its end goal, and see digital resources as tools in the hands of people, who are the units of transformation. This supports the notion that ICT4E's utility depends on a highly localized methodology in order to yield results. Like the need to study ICT as placed resources (Prinsloo, 2005), practical ICT interventions must also be implemented as placed resources, in a way that will be centred around the people who use the ICT tools and their capacity to continue to make use of those tools beyond the bounds of a particular project or short-term initiative. In Warschauer's review of ICT interventions which failed and some which succeeded, one which stood out as a successful example did so because "much greater effort and money were spent on developing awareness, planning and implementing effective training, and setting up processes for sustainable change rather than merely on purchase of equipment" (2003, p. 4).

Computer literacy is one social practice that weaves into many others: the practice of teaching, of learning, of creating content, of consuming content, of communicating locally, and communicating globally. Together, these processes contribute to how the teachers experience the world and what meaning they make of it. Ultimately, ICT access needs to be about a holistic process that gets the right combination of supporting people, devices, connectivity, skills development, and stewardship over technological resources and how they are used.

The desire of educators to be part of the "computer world" and the opportunity for interactions that entails must also be recognized: "in order to engage in practice, we must be alive in a world where we can act and interact" (Wenger, 1998, p. 51). Indeed, the Internet is a powerful tool in growing social capital (Lin, 2001), something that the participants seemed inherently aware of. Yet without a concerted effort on skills building, relevant content, stewardship over technology, sustained access, and a robust plan that will assist ICT initiatives to find permanent roots in their target communities, such as among local language primary teachers in a rural area, many projects will continue to fail to have any lasting positive impact for their end-users.

CHAPTER 7:
Theoretical and Practical Implications

7.1 Introduction

The question guiding this study asks under what conditions can ICTs be effectively used by teachers in post-conflict Gulu (northern Uganda), and how might it be used to strengthen the teaching practice of local language medium teachers in this region? Key themes that have emerged from the findings provide some useful guidance in response to this question, that can serve both the design of educator-focused ICT initiatives in Africa and add to the body of theory informing our understanding of how ICT intersects in the lives of teachers and learners, and what meanings it has for pedagogical practice in multilingual contexts such as northern Uganda's. Drawing from the themes identified in Chapters Five and Six, this chapter is organized according to their corresponding theoretical constructs, which are summarized as follows:

- The communicative power of the Internet was a compelling draw for participants, who desired the opportunity to participate in the information society as both listeners and speakers, suggesting that stop-gap measures that replicate some of the capacities of the Internet (access to information), such as e-Granary, are ultimately inferior to 'the real thing' that provides the opportunity to interact with, and to be heard by others;
- The participants were found to benefit from relying on each other, making a case for the integration of informal learning and peer support opportunities in the design of ICT for education interventions;

- The teachers were focused on ICT, and the Internet in particular, as a means of content knowledge enhancement, but also as a tool for classroom management and administrative efficiency;
- Sustaining digital literacy learning among educators is determined in great part by the design of ICT interventions in terms of whether they emphasize people or machines as the unit of change;
- There is a need for local stewardship over technology to increase the long-term sustainability of technology introduced into new groups of users;
- In particular, participants valued the different representations of information they could find online to diversify how they teach their students, an extension of existing 'offline' pedagogical practices whereby teachers use "real objects" to illustrate ideas and concepts when teaching;
- The connectivity and infrastructure environment in Gulu was found to be a fundamental barrier to the mobilization of ICT resources for education, and results in a truncated learning experience for both teachers and students.

In this chapter, these inferences drawn from the data will be explored in more detail, through analysis that will link the study's findings to their theoretical implications, and draw links to the broader bodies of research investigating digital literacies and their relevance to teacher education for the multilingual classroom in Africa.

7.2 ICT, the Information Society and Teacher Identity

Manual Castells, perhaps the most widely read scholar of the network society, has claimed that the "the first historical steps of informational societies seem to characterize them by the pre-eminence of identity as their organizing principle" (2000, p. 22). For

language survival, the linguist David Crystal also places the emphasis on identity as pivotal:

> People tend to underestimate the role of identity when they express anxieties about language injury and death. Language is a major means (some would say the chief means) of showing where we belong, and of distinguishing one social group from another and all over the world we can see evidence of linguistic divergence rather than convergence (Crystal, 2003, p. 22).

This section highlights a number of ways that identity figures into the social practices of teachers using ICT resources. It points to a need in ICT learning for teachers for the design of strategies that will speak to the situated experience of learners and their personal aspirations, examining the idea of imagined identities and investments (Norton, 2000) as they apply to in-service primary teachers gaining computer literacy skills. It further emphasizes the stated desire of the study participants to participate as full and active participants in the "computer world," investing in their own individual stores of information but also getting the chance to shape the sources of that information with their own local perspectives and experiences. Constraints against the realization of the participants' imagined futures are also discussed in order to understand how possibilities are limited by structural boundaries and by the experience of truncated learning.

7.2.1 The Imagined Community of the Computer World

The study's data highlighted the participants' understanding of ICT as a doorway into an international network, and possession of computers as a necessary accessory to joining this network. This network is the site in which modern learning takes place and

where vast, global repositories of information can be found, shaping knowledge and its dissemination. It is also where people communicate across borders, influencing public opinion and even impacting decision-making locally, nationally and internationally. Entry into this club matters, in the view of participants. The participants did not want to be bystanders gazing through the windows; they wanted to be on the inside. They sought to have an identity on-line, not merely to digest information put there by strangers. The participants also recognized their present exclusion from this network, and sometimes ventured towards speculation at the consequences of that exclusion such as being isolated or falling behind the evolution of scholarly knowledge.

These findings are consistent with Norton's (2000; 2001) notion of imagined identities, described in Chapter Two. At present, the participants sit on the periphery of participation in the 'computer world' that they seek to be a part of, but their ideas of what it might look like to be at the centre of that world are well developed. John, for instance, imagines an international community of scholars exchanging knowledge according to a high standard, an exchange that he could participate in and use to upgrade his subject knowledge, when he says that to not be exposed to the Internet and the discussions taking place online, means "you are left behind." With the Internet, he can update himself on what is happening in the world. The Internet has "knowledge for learning", and it is online that you will find the "international level of learning and teaching" (Interview, June 10, 2010). Christopher wants to document local history and other information about where he comes from by writing a book about Gulu and by writing content on Wikipedia pages about Uganda, where readers from other parts of Uganda and from the rest of the world can read it. Other participants associated the Internet with individuals using email

to communicate, thus giving them an identity online and making them findable within a global network[25]. As Kanno and Norton (2003) highlight, the fact that "investment in such imagined communities strongly influences identity construction and engagement in learning" (p. 247) has important implications for pedagogy. In ICT learning for teachers, it calls for the design of strategies that will speak to the situated experience of learners and to their personal aspirations.

Being part of a *world*, a metaphor often used by participants, implies being part of a community, participating in a global conversation that is important to the future of the world. Having email gives one an identity on-line, making one reachable and 'findable' by having an address, a legitimate participant of the web, who can speak and be spoken to within the virtual universe. John referred to learning how to use computers in the course of the training as "lifting me from deep down the dark hole to the surface of the world where I'm now easily found internationally" (pers. communication, August 20, 2009). In this vein, the participants were often focused on the opportunities that would fall within the category of Web 2.0, where they would have the opportunity to interact online. For example, Wikipedia was the primary website and information source visited by the teachers, a site the uniqueness of which is based on its interactive structure: the ability to challenge and evolve content without being an expert, to discuss with others why certain content should appear and why other content should be omitted (as captured on the Discussion pages of Wikipedia), and to see new information appear within days, and sometimes minutes of an event having occurred. As Castells (2000) points out, "new

[25] Following the end of their participation in the workshops, two of the study participants opened Facebook accounts, consistent with the growing trend of Facebook use among Ugandans. There were 436,300 Facebook users in Uganda as at July 31, 2012, accounting for 1.31% of the population (SocialBakers.com, 2012).

information technologies are not simply tools to be applied, but processes to be developed. Users and doers may become the same" (p. 31).

The emphasis on having the capacity to communicate speaks to the notion of agency in a computer user as manifested in the ability to be an active participant in the information age. The world metaphor is accurate, as others have contended that our world is indeed now a digital one (Negroponte, 1995). The Internet is a site in which global conversations take place, about everything from environmental policy to governance to the enforcement of human rights law and much more, mediated within a forum assumed to be open and accessible. It's a means of accessing the latest information on issues that profoundly affect our futures, but it is also a means of speaking to and on these issues, whether it's to post a comment on a public forum, to publish a letter to the editor on a news site, to email a political representative, or to mobilize a grassroots network to lobby for policy reform. The web is a microcosm of more local policy shaping forums wherein language is a gatekeeper. When one does not speak the languages used in decision-making spaces, one's language is marginalized, and in turn, speakers of languages that are marginalized "will not have access to government services, programmes, knowledge and information. They often do not understand the policies, the objectives and the procedures of development and therefore cannot meaningfully participate" (Muthwii & Kioko, 2003, p. 105).

Thousands of networks and communities of practice exist online, sometimes merely sharing information or offering support, and sometimes working to effect collective change. These interactive communications are shaping the kind of world we live in. To be locked out of the information society is to be denied the right to participate

in these dialogues, and in some cases, in decision-making of some consequence, locally and globally. As Kellner (2002) points out, "computer culture enables individuals to actively participate in the production of culture" (p. 161) and further, ICT today mediates a much amplified opportunity for democratic participation:

> Put in historical perspective, it is now possible to see modern education as preparation for industrial civilization and minimal citizenship in a passive representative democracy. The demands of the new global economy, culture and polity require a more informed, participatory and active citizenship, and thus increased roles and challenges for education (p. 155).

The communications aspect of the web was emphasized by participants, but the frustrations presented by Gulu's connectivity environment often boiled over as participants came up against barriers to participating in this communication, as when Albert exclaimed in exasperation in the Internet café in Gulu his vehement desire to "be in the world of email" (Field Notes, August 12, 2009), a world that was at that moment being denied to him. Constraints erected against the realization of one's imagined future may alter the process of imagination itself, limiting possibilities to the confines of the structural boundaries that come with a system that imposes low expectations on its subjects. In this case, the infrastructure environment in Gulu has seen little infusion of government resources directly or of incentives to the private sector to expand and improve ICT services locally nor within the education system particularly. Participants' aspirations to be part of the world of digital information flows were curbed by the structural constraints around them, as they expressed a lack of faith in their school

administrators, the education authorities, the Internet cafés, or the teachers' college to improve the functionality of the local ICT resources. For instance, Nick commented on the slowness of the Internet in Gulu and the expense this entails in the time required to upload documents or browse sites (Interview, June 9, 2010), while June (Interview, June, November 18, 2009) and Christopher (journal entry, n.d.) both pointed out the costs of internet use charges in the local net cafes as prohibitive for teachers. As long as the situation remained unchanged, they recognized their participation as marginal.

When one's presence is marginal or if one's community is absent altogether from the network then others are determining how the community is represented online, if it is represented at all. Christopher discovered this when he read pages related to northern Uganda on Wikipedia, which were often sparse, and it ultimately motivated him to add his own information to the content that was there. His contention that this representation of his community matters was quickly validated when a short time later he was contacted by a journalist in Kampala inquiring about his additions to the page's content (Interview, June 9, 2010). Through a simple gesture of content creation and within a short period, he was influencing another person's understanding of the place he came from, and what is more, influencing a journalist who had the power to communicate this information to others. On another occasion, Christopher stated his desire to equip his learners with the capacity to be good citizens and to advance forward as a society through a better understanding of the place they came from: "I want to write books about my country, about my district. My ambition is that the pupils I'm teaching, that I can teach them to be good citizens, so they can be self-reliant and serve their nation, and to have a better community" (Interview, November 16, 2009). In Christopher's view, access to

information about one's community helps determine that community's capacity to shape its future for the better.

In this vein, the absence of Luo as a language in the "computer world" is not so much a barrier to Ugandan use of ICT as it is an implicit message that Luo is not a relevant language or a language compatible with ICT. This is consistent with other findings from Africa suggesting that "attitudes and views significantly contribute to the socio-psychological processes that ultimately determine whether people accept a language and strive to possess it, or whether on the other hand, it just 'puts them off'" (Muthwii & Kioko, 2003, p. 100). The participants did not want to write in Luo in Microsoft applications because the Spell Check tool underlined most words and tried to change them to English words with similar spellings, a symbolic message that their language was not the "right" language. The participants were discovering a digitalized world in which their mother tongue did not have a place:

> There was another one, Learning Essentials for Students, which is under Microsoft Office. So that one is also, you don't use Internet, you just download it on to the computer. It has other programs like Student Papers and Reports, Presentations: How to Present; I happened to get that one. There is also Charts and Diagrams. We have Research and Brainstorming. We have features like Organizational Tools, Language Arts in the social studies. Unfortunately our local language is not inside that one (Interview with Christopher, June 9, 2009).

Disappointment at the absence of Luo in computer applications does not mean that the teachers cannot or will not use applications that function only in English. The

participants were all fluent in English, had received instruction in English at their teacher colleges, and most of them had spent most of their careers instructing their learners in English. They were also very capable of using computers and computer applications in English, but the new demand placed on them by the Ministry of Education was to instruct their learners in Luo. These learners will go on to learn in English at school after completing the lower primary classes (P1-P3), and they will be members of a community where English will co-exist with the local language. For the two languages to reinforce each other and to each serve their speakers in their learning and in their future aspirations, it's worth considering whether ICT tools that can function in both languages might better serve a bilingual education system, as well as allow teachers to represent themselves in the "computer world" with due recognition (and use of) their full linguistic and cultural repertoire. As Muthwii and Kioko (2003) point out, "the choice of language used in a situation depends on what language or its variety makes speakers feel comfortable or uncomfortable, secure, confident or threatened, able or not able to follow and participate in conversations and interactions" (p. 104).

So long as ICT resources appear to be tools that are only usable in English, the polarization that makes English "for school" and Luo "for community" will be reinforced. Unilingual use of ICT may thus have limited applicability to aiding the transition to L1 instruction policy in primary education; while what Lee and Norton (2009) have called a linguistic hybridity framework may prove to have more relevance in a multilingual education environment like Gulu, if use of the local language is legitimated in such a way as to mutually support English learning as well.

Besides aspirations towards belonging in a global network of ICT users, identity is also manifested in aspirations towards local career advancement and professional development. Another way in which ICT came to be viewed by the participants as a means towards negotiating agency and identity was in its capacity to enhance their expertise as educators, providing opportunities for increased recognition and prestige. Participants valued ICT as a way to raise their subject knowledge and become better teachers. This would have several advantages: teachers could become more trusted by their students for their expertise and more confident teachers, they could be part of an international community of professional, skilled educators, and they could move ahead in their careers with upgraded skills, earning reward and recognition.

Participants used their time on the Internet for energetic online searches and downloads of material related to the curriculum. Reading up in more detail on topics they teach would allow more in-depth instruction in the classroom: "The most useful part of the Internet is that it updates my knowledge" (Interview with John, June 10, 2010). Downloads of files to use in their teaching such as photos and diagrams would enhance the lesson and further demonstrate their up-to-date knowledge on the topic. Enhanced expertise could also potentially lead to career advancement, as well as to being recognized as an educator according to an international (and presumably, higher) standard, as in John's reference to an "international way of sharing knowledge" (Interview, June 10, 2010), that includes both contributing to and taking from a foundation of knowledge. Christopher felt using ICT content strengthened his relationship with his students, even prompting them to come to him for assistance with their problems. The use of photos in the classroom drew the interest of learners, helping

invest them in their own learning. According to Christopher, it was this process that apparently made them perceive their teacher differently, as someone to confide in and seek the assistance of, and the teacher's position was enhanced by his application of new learning objects in the classroom. Christopher had also expressed his admiration for people who could comfortably navigate the complexities of computers, and stated his own desire to be proficient in ICT: "If a computer is broken, they can just fix it. Once also I would like to be a very good technician, I need to be like all round, if I can do something, that is what I hope*"* (Interview, November 16, 2009).

Unsurprisingly, there are different motivations for different teachers, and in most cases, there were multiple reasons for accessing or wishing to access computers. These reasons draw on different investments individuals may have in different imagined communities, which are ultimately investments in their own identity and in acquiring the cultural capital considered necessary to achieve an aspired-to identity (Norton & Gao, 2008). Some teachers perceived computers and the Internet as a means of making friends internationally, getting the latest updates on popular culture such as downloading hits from Ugandan music groups, or simply as a means of entertainment. For others, computers were more often recognized as a tool for increasing efficiency: a way to more quickly prepare lesson plans or maintain student records. And for others yet, computers were recognized as a career enhancement tool, both in providing a new skill (computer proficiency) that could improve employability but also as a way to capitalize on opportunities, such as being able to type a professional job application letter or apply online for overseas study opportunities. During and after the study formally concluded, many of the teachers would email me, asking for help finding information they sought to

realize a personal goal. Christopher was looking for overseas study opportunities and scholarships, and June wanted to acquire a fruit dehydrating machine to start a small business selling dried fruits, a consumer good that was not available in Gulu and which in her view, represented a potentially lucrative market. They used email to communicate their requests for information and the information they were directed to was usually a website. Contact with a foreigner by email became a form of access to a projected identity, as a bridge to information that was available only via ICT.

7.2.2 Identity vis-à-vis ICT as Economic Resources

Finally, ICT resources were also generally associated with high economic status because of their rarity in Gulu and because of participants' awareness of the costs of these resources. Local perceptions of the economic value placed on computers in an environment where such resources are scarce can result in divisions within groups, as they did when both the teachers' college and the participants sought to possess the laptops and disagreed over their intended use. In addition, the teachers had reported suspicion on the part of their colleagues who were not participating in the study and the feeling that their school administrators were unsupportive of their learning ICT. This situation parallels what others have found in situations where there are differences in technology use between two different groups (such as the students and teachers in a school), which lead to differing perceptions of value that ultimately serves as a hindrance to the effective integration and use of technology in literacy pedagogy (Cammack, 2003). In effect, the participants in their newfound unity and protectionism were constructing an image of how they perceived their future selves to be within their communities, as people knowledgeable about ICT and with privileged access to ICT resources.

ICT tools are indeed economically valuable as well as scarce in northern Uganda and this state of affairs is likely to remain so for the foreseeable future. ICT need not and cannot be artificially stripped of its perceived value, but the lesson to be drawn is simply that newly introduced technology tools will elicit differing responses and reactions in environments where poverty is widespread, than from better resourced environments, and accounting for sensitivity to these socioeconomic realities can secure broader adoption from stakeholders, trust towards those leading the intervention, and sustainability after the technology tools and skills have been introduced among a particular group. In particular, understanding the investments that a given group of learners may have in learning and/or possessing ICT resources can illuminate how those resources will be perceived and used in particularized ways. As Prinsloo (2005) points out, "ICTs inserted in a particular setting to bring about certain results encounter situated social practices that do not necessarily result in these resources being used in a way that promotes social development and participation, as conceived by the implementers" (p. 12).

In this study, a multitude of factors lay at the heart of how digital literacy skills were acquired and to what ends they were used by the participants. Only by understanding the particular and varied investments participants had in their pursuit of digital literacy would it be possible to determine how they drew meaning from their experience with ICT, and how this meaning could be harnessed to serve learning objectives in multilingual primary classrooms.

7.2.3 Social Practice and Peer Support

Leu, Kinzer, Coiro and Cammack (2004) have argued that "the new technologies of literacy allow us to take advantage of the intellectual capital that resides in others, enabling us to collaboratively construct solutions to important problems by drawing from the expertise that lies outside ourselves*"* (2004). Similarly, Brown and Duguid (2000) point out that "lateral ties are as significant in cyberspace as in the old world" (p. 113). This study found that as the participants learned to navigate their way around the 'computer world,' they relied as much on each other as they did on the trainers. Wenger's (1998) notion of communities of practice serves as a useful lens through which to view the participants' relationships with each other in the context of the ICT training experience. A community of practice in Wenger's meaning is a group of people learning collectively, whether intentionally or unintentionally, in a domain of endeavour, such as a work place, school, training program, or any kind of institution where shared practice is taking place. The learning of those belonging to a community of practice is impacted by the *interactive* nature of people practicing something collectively.

In the current study, participants worked together of their own accord during training demonstrations and lectures, during open/free time for practice or browsing, and outside of the training when they worked on assignments, practiced their typing or sought to overcome something they didn't understand. In particular, participants who worked together at the same schools would meet at their school to assist each other. Peer support also facilitated communication between a foreigner (myself) and the participants. For instance, I sometimes observed participants "translating" my Canadian English into Ugandan English for other participants during training sessions.

These social practices were extensions of normal peer interactions in some ways, and also because the teachers were working with ICT in inherently social environments: in their classrooms, net cafes, at the college lab, and elsewhere. What they made of their newfound skills played out in the space between themselves and others as they translated their learning into the learning of others. As Leu et al (2004) suggest, "it is simply impossible for one person to know all the new literacies and teach these directly to others. Each of us, however, will know something unique and useful to others."

The contentions of Hughes (2005) and Warschauer (2003) echo Wenger's (1998) theory of communities of practice, which posits that learning is a fundamentally social act; learning simply cannot take place without the involvement of others, whether direct or indirect, implicitly or explicitly. For the participants, they were united in their shared pursuit of computer literacy, creating a community of practice among themselves, based on their shared practice of meaning making. In this case, conversation was a critical means of mentorship and support, what Wenger describes as a powerful form of communication that interweaves reification and participation (Wenger, 1998). Conversation facilitates stories and storytelling among groups, which in turn facilitates a shared framework of interpretation (Brown & Duguid, 2000), something fundamental to learning.

The participants' strategies of peer support can be viewed through the lens of Wenger's community of practice theory (1998), in that such strategies:

1) provide resolutions to institutionally generated conflicts such as contradictions between measure and work;

2) support a communal memory that allows individuals to do their work without needing to know everything;

3) help newcomers join the community by participating in its practice;

4) generate specific perspectives and terms to enable accomplishing what needs to be done;

5) make the practice habitable by creating an atmosphere in which the monotonous and meaningless aspects of the job are woven into the rituals, customs, stories, events, dramas, and rhythms of community life (p. 46).

Others have also found peer collaboration to be important strategies for the effective application of ICT resources into teachers' learning. Hughes has proposed the establishment of collaborative, subject-specific "inquiry groups" of teachers for professional development, after finding that "predominantly informal learning experiences" played a significant role in facilitating the access and use of technology among her teacher participants, with informal guidance being a deciding factor for technology's relevance to teaching practice (2005, p. 295). Warschauer points out that "most people rely on their social networks to offer support and assistance" in navigating the numerous decisions that need to be made in accessing ICT, like how and where to find a computer or Internet connection, and in gaining the skills needed to use these tools (2003, p. 156). In the context of Gulu, these social support practices were especially useful, where participants faced numerous challenges related to their ICT use, from handling the suspicion and lack of support from colleagues outside of the study to mobilizing resources to access the Internet, or traveling together to the lab located at a

distance from the community core, examples provided in the data presented in Chapters Five and Six.

The integral role of peer collaboration in serving as scaffolding for ICT learning attests to the argument that digital literacy skills are strongly situated by social practice in their distinctive contexts (Prinsloo, 2005). In this case, peer assistance offered a training input that was a valuable component of the learning experience, alongside the availability of machines, though an economic value could not be assigned to the contributions of peer support. Viewing the teachers' negotiation of their ICT learning in close interconnection with their colleagues supports the notion that the new literacies are social practices (Street, 2003) as much as they are about gaining technical navigation skills around hardware and software. The value added to ICT learning by peer support presents an important opportunity to curriculum designers thinking about strategies to reinforce and sustain digital literacies among teachers in ICT training initiatives, such as ensuring that design builds in entry points to formalize opportunities for peer leaning. This idea is taken up further in Chapter Eight.

It is indeed the emphasis on hope that makes it worth finding ways to capitalize on imagined communities and imagined identities. As Kanno and Norton point out, "the notion of imagined communities provides a theoretical framework for the exploration of creativity, hope, and desire in identity construction" and this is what makes it an exciting framework. Similarly, Castells (2000), in his exhaustive survey of the modern shift towards a networked society, notes well the "liberating power of identity" (p. 4).

7.3 Machine-Centric ICT Intervention

This study took place in the aftermath of a previous attempt to introduce ICT into teacher education in Gulu, the USAID-funded ICT Lab at the teachers' college described in Chapter Six. Like other ICT interventions to date in Uganda, the Connect-ED project exemplifies the tendency for the central focus of a project to be on the provision of machines, rather than on the skills to use those machines in locally meaningful ways. ICT4E interventions typically seek as their outputs the provision of laptops or desktop PCs, or another physical object of technology. The computer is the central output, with the focus of many projects being to procure computers for African classrooms, telecentres, training labs or other sites. This approach stems from an assumption that the digital divide is merely a problem of the absence of digital objects. The remedial approach implies that if those objects are provided, everything else will fall into place, with the presence of computers logically leading to positive outcomes. Yet this logic "overemphasizes the importance of the physical presence of computers and connectivity to the exclusion of other factors that allow people to use ICT for meaningful ends" (Prinsloo, 2005, p. 15). It further ignores that technology practices are socially grounded (Gee, 1996; New London Group, 2000) rather than technologically determined since humans are the driving force of how digital resources are used. As Luke (2000) points out, "a computer is meaningless without programs, programmers, and users" (p. 75). The fixation on investing primarily in computers and other physical inputs of ICT use is nevertheless a problem that "occur[s] again and again in technology projects around the world, which too often focus on providing hardware and software and pay insufficient attention to the human and social systems that must also change for technology to make a

difference" (Warschauer, 2003, p. 6). Computers are part of the equation of yielding anticipated outcomes in ICT4E, but how (and for how long, and how often) they are used by *people* has far more importance in assessing their utility for raising learning outcomes and sustaining digital literacies among educators.

The study found that ICT skills and access to computers had value for teachers when certain fundamental conditions were met, which relate to the social practices imbedded in the community of computer users. Firstly, the applications were demonstrated in the context of teaching practice, making their relevance evident from the beginning and facilitating teachers' creative exploration of how to best use ICT resources to support their teaching practice. For example, participants learned to use a word processing program by preparing a lesson plan or using digital images by preparing a photo essay for presentation to their pupils. This ensured the participants discovered and determined the applicability of ICT skills to their pedagogical practice. This suggests the necessity of a training curriculum oriented at teachers specifically, an approach that was also taken by the Connect-ED project when it was active.

However, the next condition is that teachers require ongoing access to the hardware and to connectivity if ICT is to enhance their teaching beyond the short-term, an enabling environment requiring long-term planning, policy change and collaboration with various levels of stakeholders. In environments like northern Uganda, there is little existing infrastructure to support computer use, a larger problem that must be strategically addressed by local and national authorities to yield any viable results locally. Further, other pre-existing conditions of the education environment impact the likelihood of successful integration of ICT into teaching enhancement, such as the under-resourcing

of schools, resulting in student over-crowding, a teacher shortage, and the absence of textbooks and other print literacy materials. It is an environment where policies designed by the government in Kampala are often impossible to realize locally when few resources have been allocated towards ensuring policy implementation. Teachers' use of computers will not solve any of these deeper problems affecting the education sector and indeed, these problems will thwart the potential contributions of ICT to contribute to learning.

Besides these broader environmental factors, the findings suggest that the unit of focus must transition from machines to the people using them. As Jarboe (2001) notes, "it is not simply a question of technological deployment. The end purpose is not to narrow some gap, but to ensure that everyone has access to the expanded opportunities" (p. 1). Because it is human beings who operate digital resources and determine their validity, the experience, skills, needs and perceptions of those end-users must be integrated into ICT planning, but also the relationships *between* humans must be accounted for in planning.

Without investing in the people who will determine how and why ICT resources are used, the manifestation of opportunities will be an interrupted process, a result I call truncated learning. In the case of the Connect-ED project, those student teachers who attended the college when the project was active (such as Christopher) retained the basic skills for specific applications even years after the project ended, such as typing or opening and formatting a word processing document. However, Christopher was unable to apply these skills to his teaching practice on an ongoing basis due to the lack of access to computers. Even in the course of the study when he had ongoing access to computers, the challenging connectivity environment at the net cafes constantly stalled the process of acquiring information that he could use in his teaching practice. While he had absorbed a

new skill, his ability to use this skill towards transformative ends was rendered static, stored away for some theoretical future use. Presumably, this was not the anticipated outcome of the Connect-ED project.

As Prinsloo (2005) articulates, technological practices are unlikely to become embedded in a given setting when the machines and networks of practices are disrupted. Examples of truncated learning can be identified throughout the study's findings. When the LCD projector was used in the participants' classrooms as described in Chapter Five, troubleshooting problems rooted in the lack of an enabling environment for that particular ICT resource (lack of electricity, lack of generator fuel, and the classroom building) took up so much time and demanded so many resources that it eroded the limited classroom time for the learners. In that case, it can easily be argued that not only is technology ineffective when it's not accessible regularly, but that it can put learners and teachers at a further disadvantage, hindering rather than helping. This is reiterated by Kellner (2002), who notes, "without proper resources, pedagogy and educational practices, technology might be an obstacle or burden to genuine learning and will probably increase rather than overcome existing divisions of power, cultural capital, and wealth" (p. 156).

Thus, disrupted opportunities for teacher learning and access to ICT combined with interrupted connectivity and an unsupportive infrastructural environment result in a truncated learning process. The synthesis of different skills and experiences that might result in sustained digital literacies towards a pedagogical purpose is blocked, as well as the application of those skills towards productive ends in terms of knowledge development. Users are prevented from consolidating their skills to the point where they

could confidently create and use content in ways that strengthen their practice as teachers and build on their own subject knowledge.

These circumstances risk further entrenching the state of information marginalization characteristic of the digital divide, the very problem that most ICT4E projects seek to rectify. Streamlining ICT-enhanced learning from the acquisition of skills to the enhancement of knowledge to the improvement of pupil learning outcomes will demand making the end-user the unit of transformation. It would further involve tailoring programs to be responsive to specific groups of end-users, and taking a long-term view as to the human capital among a community of practice that will be available to sustain and maintain technological resources. A user-centred focus could also address the deterioration of ICT resources once a given limited-term project concludes.

Without local stewardship over ICT resources, most initiatives will simply be self-defeating beyond a short-term period. However, if ICT4E projects are conceptualized to invest in people, besides equipment and connectivity, there can be local human capital in place to effectively troubleshoot problems that arise and to preserve the functionality of ICT resources, and even to innovate in the maintenance and application of ICT resources (such as downloading FOSS applications to replace corrupted software). Skills and knowledge can then remain within a community where ICT resources have been placed, and hardware and software can serve local needs beyond a short-term project period. As Castells (2000) points out: "The closer the relationship between the sites of innovation, production and use of new technologies, the faster the transformation of societies, and the greater the positive feedback from social conditions on the general conditions for social improvement" (p. 36). Innovation as it relates to ICT use can

encompass actions as diverse as invention and experimentation that leads to the development of new applications, to the creative adaption of ICT resources to distinctive contexts (such as localization), to small acts of innovation that make technology tools more relevant to local users, such as the following example given by Leu et al (2003):

> Consider a person who wishes to send a specially designed and formatted message via e-mail, but she has an e-mail program containing very limited design and format tools. This person might think to use a word processor with more powerful design tools to compose the message, knowing that she could then paste the formatted message into the e-mail message window. Thus, a word processor can be transformed into a tool for composing e-mail messages, a purpose for which it was not designed, but a function it fills admirably. This potential only comes to life when a person envisions a new function for a technology and enacts this envisionment. In essence, we can say that she envisioned how to repurpose a technology for a new and different function. Envisionments such as this happen regularly as individuals encounter new problems and seek solutions in new and creative uses of existing technologies. They contribute to the deictic nature of literacy.

Further, by focusing on the identities, aspirations and needs of a particular group of teachers, and recognizing the challenges they face in their sites of use, ICT4E programs stand a better chance of meaningful adoption because end-users will recognize the relevance and the possibilities relative to their particular situation. Perhaps of more immediate concern, is that decision-makers will recognize relevance and value, and thus

be more willing to invest in and sustain access to ICT resources. End-users must see points of entry for new technological tools into their everyday lives, given the notion that "technology is society, and society cannot be understood or represented without its technological tools" (Castells, 2000, p. 5).

Warschauer (2003) succinctly captures why it's worth addressing these many factors of social practice in the planning and execution of ICT4E interventions:

> We may work to distribute computer equipment, but again as one step towards a larger purpose of helping people participate fully in the information economy and network society. That participation requires not only physical access to computers and connectivity, but also access to the requisite skills and knowledge, content and language, and community and social support to be able to use ICT for meaningful ends. The tasks are large, but so is the challenge: reducing marginalization, poverty, and inequality and enhancing economic and social inclusion for all (p. 216).

7.4 Finding Local Roots: Multimodality, Digital Literacy

This section examines the convergence of the concepts of multimodality and digital literacy/literacies, examining the link between 'offline' pedagogical practice and ICT-supported pedagogical practice, which challenges some of the current thinking that emphasizes the contrast between digital literacies and other literacies rather than the similarities.

Analysis of the rise of digital literacies often emphasize differences rather than commonalities with print literacy, pointing to the new skills required to read and draw

meaning from a vastly new way of interpreting and disseminating information (Lankshear & Snyder, 2000; Luke, 2000; Snyder, 2002). Leu et al (2004) have argued that theoretical perspectives drawn from other contexts (such as print-based literacy practices) and applied to ICT and digital communication are limited because "they fail to place the Internet and other ICTs at the center of their perspective." In particular, the emphasis on image in online communications is supposedly novel and demands new interpretive skills: "contemporary texts are more likely to privilege the image in ways which are new, but also in ways which provoke debate" (Abbott, 2002 p. 32). Yet, digital literacy skills draw heavily from other literacy practices, and educators may apply ICT-based pedagogical practices that closely mirror non-ICT teaching methods, including in the use of visual aides, live demonstrations and other multimodal tools. This was the case in Gulu, where in the absence of ICT resources, the teachers in the study used a variety of "real objects," as they termed them, to bring learning alive in the classroom, from the use of clay to moulding objects that were being discussed in a lesson, to live demonstrations as when Christopher invited a chef to show his cooking skills, to images that the teachers draw themselves to serve as visual aides in the classroom. This strategy, using materials at hand, served as the offline equivalent of hypertext, something the teacher could summon within a lesson to give a new angle to a lesson, complementing other teaching methods (such as lecturing or reading), and then put away to return to the main lesson.

The integration of 'real objects' into classroom lessons draws on multiple literacies, just as the process of finding, vetting and using information derived from the Internet does, and many of these literacies overlap: decoding images, actions, sound and text. The practice of using real objects to teach is mirrored in what the teachers sought

from ICT. Just as they survey their households and communities to find diverse pedagogical tools, what Stein (2008a) has called resources for representation, to supplement lectures, the teachers surveyed the ICT tools they had access to for multimodal ways of presenting information to their students. ICT tools, including the computers, printer, scanner, cameras and online access, complemented and expanded multimodality in the classroom, bridging a practice of using real objects with a practice of using digital objects. In fact, the most often-cited advantage of ICT-generated content for the classroom, according to participants, was its capacity to teach a topic through diverse modes: text, image, audio, and audio-visual. This capacity was valuable because it "makes learning real" in the words often repeated by the participants, bringing a topic alive with imagery rather than keeping it abstract with a verbal or textual explanation, particularly for something that a learner has not seen directly before, like animals only found outside of Uganda.

In many ways, this use of ICT on the part of the teachers bridges their existing efforts to diversify learning with real objects. The participants recognized this use quickly in their experience using ICT resources and rapidly identified ways of finding images, sound, symbols and video to use in lessons. This function was recognized explicitly by participants as well. Their use of multimodal resources drawn from ICT tools was creative, and seemed to emerge naturally within the scope of their computer skills learning. In other words, at the same time that the participants learned mechanical ICT navigation skills (like transferring data), they were simultaneously innovating ways of using different forms of data to represent the lessons they wished to impart to their learners. This innovation is similar to what Stein (2008b) found in the multimodal

resources in learners' communities, which she argued could serve as rich educational resources in the classroom. While Stein's findings were drawn from grade school children, the basic premise is still applicable to educators as learners of ICT in that the teachers were making use of non-linguistic representational resources.

These strategies were not at odds with the ways in which they normally teach (without digital resources), but rather, paralleled them significantly, a finding supported by other recent research from Uganda (Andema, 2009). However, many scholars of the multiliteracies schools imply that digital literacy competencies are fundamentally different from non-digital literacies:

> Meaning-making from the multiple linguistic, audio, and symbolic visual graphics of hypertext means that the cyberspace navigator must draw on a range of knowledges about traditional and newly blended genres or representational conventions, cultural and symbolic codes, as well as linguistically coded and software-driven meanings. Moreover, the lateral connectedness of hypertext information, which users access by clicking on buttons or hotlinks, immerses navigators in an intertextual and multimodal universe of visual, audio, symbolic and linguistic meaning systems. In hypertext navigation, reading, writing, and communicating are not linear or unimodal (that is, exclusive language- and print-based), but demand a multimodal reading of laterally connected, multi-embedded and further hotlinked information resources variously coded in animation, symbols, print text, photos, movie clips, or three-dimensional and manoeuvrable graphics (Luke, 2000, p. 73).

While the presentation of information is certainly different and does require new skills to competently navigate, arguments such as Luke's cited above deny the ties that these new skills have with non-digital literacies and the existing cognitive resource banks that teachers can draw from when they find themselves facing a computer screen for the first time. Social practices that they applied in their teaching are expanded and enriched to absorb new sets of tools presented by a new medium, in a process reminiscent of the funds of knowledge that Moll and Greenberg (1990) argued should be validated and built upon to enhance the learning experiences of learners from linguistic minorities. Funds of knowledge mobilize the intellectual resources of the L1 and are "the essential cultural practices and bodies of knowledge and information that households use to survive, to get ahead, or to thrive" (p. 321).

In the participants' view, ICT was a means of *enhancing* teaching, building further on the curriculum and enriching the content of lessons. This echoes Internet use by teachers in other parts of the world. For instance, a 1998 study in the US (from when Internet access was in its early stages in the education sector) found that 68% of teachers surveyed used the Internet to find resources for their lessons, though not surprisingly the use was higher among those with regular Internet access (home and/or work access). Ninety percent of the teachers surveyed considered Internet resources "valuable or essential", and critically, access to the Internet made it more likely that the teachers perceived the Internet as a resource in their teaching (Becker, 1999). Further, familiarity with navigating the multimodal landscape of the Internet which integrates the visual and the written is considered a core component of digital literacy: differential access to these skills and knowledge will be one important divider between the 'interacting' and the

‘interacted’ in tomorrow’s economy and society (Warschauer, 2003, p. 27). The importance of these skills is further supported by Kellner (2002), who proposes expanding the term “computer literacy” to include “a broader concept of information and multimedia literacy” (p. 161): computer literacy thus also

> involves the ability to discover and access information and intensified abilities to read, to scan tests, and computer databases and websites, and to access information and images in a variety of forms, ranging from graphics, to visual images, to audio and video materials, to good old print media. The downloading, and organizing digitized verbal, imagistic, and audio and video material that are the new building blocks of multimedia culture (p. 162).

From this perspective, the study participants were successfully taking up digital literacy, and doing it in a way that was compatible with, and reminiscent of their existing pedagogical practices that make use of multimodal resources. It may ultimately be more useful towards understanding the ways in which teachers use ICT resources meaningfully to examine the assets they bring forward from the ‘offline world’ and how these assets serve them in the online world, rather than focusing primarily on the clashes between these two sets of literacies.

7.5 Intersecting Language, Technology, Pedagogy and Content

The previous section discussed participants’ use of multimodalities in integrating ICT-derived resources into their teaching and how this use was bridged with practices applied in the non-ICT classroom. This section examines the theoretical implications of how participants used ICT-derived content in the classroom and in upgrading their own subject-area knowledge, and the relationship between pedagogy, content, and the medium

of ICT. It further identifies possibilities for multilingual content resources arising from the integration of pedagogical, subject knowledge and digital competencies.

7.5.1 ICT As a Medium to Teacher Content Knowledge

Kellner (2002) points to the "limitations to pedagogy and educational proposals based primarily on technology without adequate emphasis on pedagogy, and on teacher and student empowerment" (p. 156). The findings of this study support this argument, making a compelling case for the close integration of pedagogical design, language and access to quality content in the use of ICT for teacher development purposes. This is particularly so in Gulu where teacher education for the primary level is limited by both the short training period and by lack of resources, and where teaching primary school, according to participants, is not considered a high status profession.

Computers enhanced teachers' access to information and helped them build upon their knowledge bases in the subjects they taught, in addition to giving them specific pieces of content (earlier referred to as 'digital objects') that they could bring to their classes and use for teaching. In the view of participants, increasing their access to information about subjects they were teaching their learners was one of the major contributions ICT could make to the overall learning process, in that it could expand the knowledge base they bring to their classrooms, a result that is also supported by the literature. For instance, Hughes (2005) has argued that teachers are better able to make use of technology in their profession when their ICT skill development is focused on subject-specific training, rather than learning computer literacy as a stand-alone skill and leaving teachers to determine how it might be used towards teaching and learning. In her own study on the role of teacher knowledge in technology-integrated pedagogy, Hughes

found that "the more content-specific the example, the more likely the teacher will see value and learn it" (2005, p. 296), and that the potential power of the technology was largely determined by the way that the teacher perceived its value vis-à-vis education.

This value added by ICT resources may be particularly relevant to teacher development in Uganda where primary teacher education is normally comprised of only two years of training, in content and pedagogy (plus three school practice periods of eight weeks each thereafter).[26] The average age of a primary teacher college entrant is only 17 years, because teachers are encouraged to apply immediately after passing their 0 Level examinations (the minimum requirement for college entrance): "A Level is considered an *additional* qualification because this background is perceived to be far removed from the immediate needs of a primary school. It is believed that A Level leavers cannot be interested in primary teacher training, otherwise they would have applied to join a college with the minimum qualification" (emphasis in original, TPA, 2010). This reflects statements made by the teachers during focus groups that imply that one becomes a primary teacher after one has failed at something else, or did not get the exam results necessary for another field of study, an assumption also mentioned at one point by the college's principal. Several of the participants told me it was not their original plan to teach; it was simply the discipline they were eligible for and teacher college was more affordable than other schools. While in rural areas a teacher is considered an educated, urban person; teaching is nevertheless not a high status (nor high-earning) profession. Thus, the typical primary teacher graduate is 19 years old when they begin their first year of teaching and is expected to be able to teach all subjects on the primary school

[26] Covering the following subjects: Professional Studies, Mathematics, Language, Science, Social Studies and Cultural Studies.

curriculum. In reality, this is usually not the case: “many stakeholders feel that two years is inadequate for effective exposure to the theoretical content of all the subjects taught and involvement in the practicum”, and there is a consensus among many ordinary Ugandans that the quality of teachers and teaching in primary schools is inadequate (TPA, 2010).

This consensus is supported by the research. Teacher subject knowledge has been shown to have a strong correlation to student achievement (Eide, Goldhaber & Brewer 2004; Hanushek & Rivkin, 2006; Wayne & Youngs, 2003) and one US-based literature review that surveyed the findings of 92 studies asserted that teacher subject knowledge was found to have greater impact on learning outcomes of students than did the pedagogical skills of a teacher (Allen, 2003). However, ongoing access to knowledge sources during a teacher’s career is also critically important: “expertise in teaching is dependent on flexible access to highly organized systems of knowledge,” according to Mishra and Koehler (2006, p. 1019). Further, sustainability in terms of broader social development objectives ultimately relies on competencies in accessing, vetting and using content rather than merely on technical skills that might be defined as having competency in *services* (typing, emailing, printing, faxing, etcetera). This is a finding confirmed from another inquiry into ICT sustainability in Uganda, which emphasized quality content as that which ultimately serves broader development goals, empowers end-users, and promotes literacy (Prah, 2003).

The educational psychologist Lee S. Shulman argued in the 1980s for *pedagogical content knowledge* in teachers (and for assessment exams to measure for this), in effect, the ability of a teacher to have deep knowledge of a subject, of how that

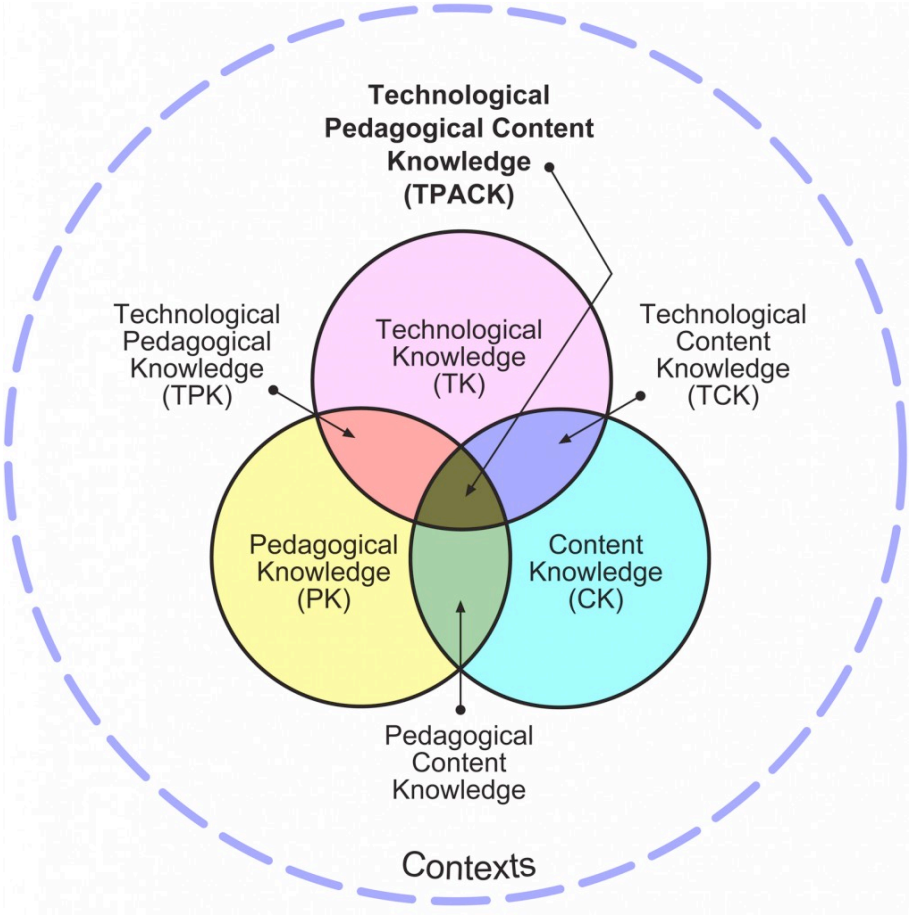
subject fits within broader bodies of knowledge and its significance to knowledge, and the best representations of that subject for effective teaching: "the teacher need not only understand *that* something is so; the teacher must further understand *why* it is so, on what grounds its warrants can be asserted, and under what circumstances our belief in its justification can be weakened and even denied" (Shulman, 1986, p.9). Shulman contended that teacher preparation has transitioned since the 19th century when it was focused primarily on content and to a lesser extent on pedagogy to being overly focused on pedagogy by the end of the 20th century and inadequately focused on teachers' subject knowledge, a criticism supported by others later (Ball & McDiarmid, 1990; Mishra & Koehler, 2006). The implications are that "pedagogical prices are paid when the teacher's subject matter competence is itself compromised by deficiencies of prior education or ability" (Shulman, 1986, p. 8).

In the absence of reform of the teacher education system in Uganda, access to the Internet can serve as a source of subject information for both in-service and pre-service teachers. The Internet is particularly amenable to this task because it can offer both the raw information that can feed a teacher's knowledge of a particular topic, as well as tools that can be used to teach that topic, meeting Shulman's (1986) criteria for the need to blend the capacities of teachers to know and to teach. This blending comes from being able to identify appropriate representations, cases or methods to teach something, and being grounded in a sufficient foundation of knowledge on the topic to be taught.

Shulman's ideas have more recently been expanded to account for the introduction of technology into education and teacher preparation, in a theoretical framework called Technological Pedagogical Content Knowledge (TPACK). TPACK

argues for a blending of content knowledge, pedagogy knowledge and technology knowledge (Shulman had proposed blending content knowledge, pedagogy knowledge and curricular knowledge), for the effective integration of technology into teacher preparation and teaching, capitalizing on the intersections between these three areas of knowledge, and the new knowledge that arises from their use together, or from where they overlap: "A teacher capable of negotiating these relationships represents a form of expertise different from, and greater than, the knowledge of a disciplinary expert (say a mathematician or a historian), a technology expert (a computer scientist) and a pedagogical expert (an experienced educator)" (tpack.org, 2011). This blending was clearly visible in the study participants, as they simultaneously learned digital literacy skills, downloaded digital objects for use in lessons, and used those same digital objects as well as supplementary information to expand their own knowledge of the given topic. The multiliteracies literature also often argues for the integration of skill sets given the value of critical assessment skills in vetting information to the ability of mechanically navigating one's way around the information highway: "the dynamics of lateral and cross-linked information of hypertext requires and generates a cognitive orientation akin to what is often termed lateral thinking- the very skills educators aim to instill in students" (Luke, 2000, p. 73).

Figure 7.1: Technological Pedagogical Content Knowledge



Source: http://tpack.org/, 2012, with permission

7.5.2 Possibilities for Multilingual Education: Integrative Training

The TPACK framework is also poised to facilitate multilingual content development in that the acquisition of digital literacy skills can be directly applied to content creation in non-dominant languages *as the skills are being learned*, and as an educator learns to navigate the multimodal resources available online. For instance, as Christopher advanced his computer skills and increased his typing speed, he was preparing documents rapidly and he tended to prepare all of his lesson plans in two language versions, one in English and one in Luo. He also used graphics and symbols in

his lesson plans. Like all the participants, he preferred using a table format to organize the information categorically. Through the TPACK lens, Christopher's ability to use both English and Luo in his lesson plans was supported by his technical competencies integrated with his content training.

Yet at the same time, most of the participants expressed frustration with trying to use computers to prepare content in Acholi.. Put off by the idea that the computers were created in English for use in English, the participants also brought to their computer learning experience their own histories and uses of bilingualism..Bamgbose's (2000) work suggests that the participants' experiences of an abrupt shift in language roles without the requisite resources to realize the new roles would contribute to speakers devaluing their mother tongue, or at least, dismissing its value for accessing social and economic opportunities in a globalized context.

Further, the participants came from communities where there was a clear delineation on the uses of English and Acholi. The mother tongue is reserved more for use in the community outside of the school/workplace context, while English is the language of education and for professionals. This view is consistent with other findings from Africa, such as Muthwii and Kioko's (2003) observation that "parents overwhelmingly do not favour instruction of their children in indigenous African languages, even in the lower primary classes," (p. 104), or with another study from Uganda which found that English along with Luganda as a lingua franca (but not a local mother tongue) were typically used for reading and writing (Tembe & Norton, 2011) and that English is associated with opportunity for upward mobility and global citizenship (Tembe & Norton, 2008). Further, parents commonly want their children to be taught

English early on in their education (Bergmann, 1996). These local views persist despite the advantages to English learning that come with the integration of local language instruction (Cummins 1981; Klaus 2003; Mehrotra, 1998; Obondo, 2007; and Williams, 1996), though parents and other community stakeholders may be unaware of the scholarly evidence attesting to this (Tembe & Norton, 2008). Parents and learners, meanwhile, are investing in potential future membership in imagined communities where their children will be able to communicate in an international language and presumably access the opportunities attached to that ability, including higher education and more lucrative career prospects. Similarly, the teachers may find their ability to imagine an identity as globally connected professional educators through the medium of a local language if their previous experience (in this case, their initial interactions with computers) has shown them obstructions to using that language for the intended purpose, a finding paralleled by Tembe and Norton's (2011) research in rural Uganda:

> The community from the rural school preferred the use of Luganda to teach reading and writing, arguing that this was the language that had been used in the past and that they were now accustomed to. When many participants were growing up, there was no orthography available for Lunyole while the only reading materials that were available were in Luganda. Some participants therefore struggled to conceive of Lunyole as a medium of instruction (p. 16).

How, then, might ICT be used to support more effective implementation of the L1 instruction policy? Firstly, since it is teachers who will interpret the policy in the classroom, the focus of ICT amenability to effective L1 instruction should be teacher-

centric. In other words, it is teachers who must be empowered to use ICT resources in ways that will support the language goals of the classroom.

Secondly, ICT resources should be usable in both languages used in the classroom. For this to happen, the applications used to create content should be functional in the L1; and teachers should be equipped to confidently create L1 educational resources. For these two conditions to be realized, two tools demonstrate particular promise, and some evidence to date of their potential contributions through nascent efforts already taking place in Africa.

The first tool is free and open source software (FOSS), applications wherein anyone can use as well as adapt the software's original source code without paying any licensing or other costs. The ability to change the software's source code facilitates language localization in re-creations or adaptations of the software, meaning that an individual can create a software tool completely functional in a local language using the foundation of software developed by someone else. This has been successfully done for a variety of applications (word processing, web browsers, email, among others) in other African languages, including in Swahili. The purpose of localization is "to make sure that computer users can interact with software in their native language" (e-Learning Africa, 2011). Some of the conditions that best facilitate access to and development of localized FOSS for African languages are discussed in Chapter Eight.

The second tool is the approach taken to content creation by the methods underlying the OER movement, which are particularly responsive to many of the issues raised by the participants. The OER movement is founded upon the principles of Web 2.0, and works on the basis of educators downloading and using resources from OER

repositories, but also uploading and adding their own resources, or adapting and expanding the resources of others and then making those adapted resources available. OER sites[27] are fundamentally interactive forums, progeny of Web 2.0, where one gains from the ideas and resources of others, while also having their own ideas heard and sharing their own tools and resources with a global network of educators. Given the desire of the teachers to participate in the connected online world, OERs fulfill a dual purpose of enhancing the knowledge and resources of teachers, while giving them access to global conversations and the collective shaping of knowledge and pedagogical practice. OERs allow for adaptation to suit local contexts, giving space to teachers to add cultural nuance like using local folk stories or adding familiar imagery. They can also allow for linguistic representation, in that resources that are adapted to or created in a local language can be shared with the world as well as shared locally with other teachers. Finally, OERs are accessible in terms of cost because they are free and do not require any licenses for use.

These two tools show promise in supporting the opportunity of learners (in this case, teachers) to take control of their learning in a way that honours their identity, through the creation of multilingual content (Chow & Cummins, 2003; Cummins & Early, 2011). But for these rich opportunities to translate into tangible strategies to support more effective implementation of the L1 instruction policy, the *educational* value of ICT tools must be thoroughly integrated into the computer literacy training a teacher undergoes, and emphasized as part of the core digital literacies for teacher development. In practice this might include ICT modules in teacher education programs focused on

[27] Well known OER websites include Curriki.org, Oercommons.org, and MIT's OpenCourseWare, among others. UNESCO and WikiEducator serve as key forums for planning and discussion related to the OER movement.

FOSS and on OER tools and an understanding of the OER movement. It would also need to be complemented by steps addressing the other challenges identified in this study as barriers, such as the need for local stewardship over ICT resources, ongoing access opportunities and connectivity infrastructure, among others.

7.5.3 In the Shadow of Technological Predecessors

Mishra and Koehler (2006) contended that "developing theory for educational technology is difficult because it requires a detailed understanding of complex relationships that are contextually bound" (p. 1018). Of note is that both Christopher and June, who had a greater degree of comfort using computers than other participants, had previously used typewriters in their capacity as teachers. I would posit that a typewriter can impart foundational skills that are useful to gaining computer literacy, particularly since the slow pace of typing was cited as a blockade for many participants who were focused more on decoding the keyboard than on using the keyboard to produce something useful to their teaching. Understanding the context in which a teacher has been exposed to computers, and to other technological tools and 'small computers' (like cell phones or calculators) is important to explaining why some skills come more easily for some than for others, and the ways in which ICT learning happens among Gulu's diverse teacher population. Andema (2009) captures a similar point in his research, stating that ICT training in teacher education programs in Uganda is

> devoid of local knowledge and local experiences. The trainees in these programs are assumed to have no digital literacies when they enroll for ICT training courses and programs despite the fact that these people have mobile phones, TV sets, VCD and DVD players, radios, cameras, and recorders in their houses. Their daily

> interactions with these tools are rarely recognized and integrated into the training programs they receive. The trainers make little effort to incorporate people's daily experiences with locally available digital tools, which constitute their literacy practices in real life (p. 13).

Localized study can help explain how ICT tools work (or do not work) in specific settings (Prinsloo, 2005; Warschauer, 2003), taking into account historical access to other technological tools and the context of that access (such as whether it was integrated into teaching tasks). Of practical value is the opportunity to link existing social practices around technology into ICT training curricula, creating bridges to teachers' previous experience rather than emphasizing their roles as novice ICT learners.

7.5.4 A Marriage of Technology, Content, Multilingualism and Pedagogy

A response to the research question of how ICTs can be effectively used by teachers to teach the L1 and to strengthen pedagogy, is to create the conditions for the Internet to serve as a source of content knowledge for teachers to be a complement to a high quality, more extensive teacher preparation phase in which substantial time is devoted to the development of teacher subject knowledge. A strong foundation in the subjects that a teacher will end up teaching is a critical asset for educators, as teachers use their prior knowledge on which to build new knowledge (Borko & Putnam, 1995; Bransford & Schwartz, 1999). The Internet might best be used as a source of knowledge to teachers well integrated into teacher education, and then into teaching practice and ongoing professional development. For educators who have already completed their teacher training, in-service digital literacy training oriented at accessing subject

information and finding appropriate teaching tools for subjects represents interesting possibilities, provided that teachers can enjoy regular and reliable access to the Internet, which is, unfortunately, not currently the case in Gulu.

Considering Gulu's lack of printed literacy materials, in Luo in particular but also in English, the Internet holds particular potential for serving as a source of knowledge to educators in an isolated region like Gulu. Yet, this value is not necessarily automatically enacted; technological tools need to be introduced within a pedagogical and subject knowledge framework. ICT should not be an alternate reality, but rather, directly integrated into the everyday lives and needs of teachers (Warschauer, 2003). Hughes has found that teachers "who learn about technology from a content perspective may be more likely to use it to support content learning, whereas teachers who learn it as a skill may have greater difficulty using the technology for educative purposes" (2005, p. 280). In particular, teachers with less educational preparation will benefit most from content-specific technology training. The TPACK framework thus provides both a useful analytical lens and design model for ICT4E interventions in environments like Gulu's, and it served as an appropriate model for this study in light of the ways in which the participants blended the development of their digital literacy skills, acquired resources to enhance their lessons, and sought to raise their own knowledge of subjects taught in the curriculum.

7.6 Contributions to the Literature

This study has sought to contribute towards a relevant conceptual framework as well as practical findings on ways in which ICT can be used to support mother tongue education, through teacher education. These findings are drawn from an educational

environment with few traditional print literacy resources to support literacy learning outcomes in primary schools and where there has been little support forthcoming from the government to effectively transition teachers to the L1 instruction policy for primary education. The study uses a range of data drawn from a bounded case, that of teachers' experiences in learning and practicing digital literacies in a bilingual context. Analysis of the findings from this case of situated learning was used to understand what did and did not support the development of digital literacies among the participants.

Practically, the findings can inform the design of strategies to integrate ICT into teacher education in multilingual education environments. The study highlights the problems inherent in focusing too heavily on the machinery of technology at the cost of the people who will be the end-users, and the need for building local stewardship over ICT resources. Most importantly, the study sheds light on the lack of ICT localization at precisely a time when localization tools are widely available, cost-effective and adaptable for almost any language. Language localization facilitated by the increasing availability of free and open source software (FOSS) may help to make computers more relevant and meaningful to the lives of Gulu teachers, allowing them to consume content produced by others in other locales while also producing content for the consumption of others, in other words, to be able to speak to the world.

The data identify a need for the design of strategies in the use of ICT for pedagogy that will speak to the situated experience of learners and to their personal aspirations, or imagined communities. The study's theoretical implications suggest that end-users of ICT resources must see points of entry for new technological tools into their everyday lives; and in the context of Gulu, this must include opportunities for

multilingual content production if ICT is to support L1 instruction. The data supports a case for localized study to help explain how ICT tools work (or do not work) in specific settings taking into account historical access to other technological tools, and the context of that access (such as whether it was integrated into teaching tasks).

My study places emphasis on the teacher as the transformative unit in determining the realization of language and pedagogical goals in the classroom, and makes a case for the need to support teachers of multilingual classrooms by making applications for the creation of content functional in those languages used in the school. For theory, the study raises important questions about the relationship between identity and teachers' use of ICT resources in multilingual education settings, drawing from the participants' emphasis on their desire to participate as both contributors and users of what the Internet offers. It also sought to build an understanding of how the language used in computing impacts the application of ICT resources in teaching practice in a context where English co-exists with an African indigenous language.

The study also builds on the concerns raised by others (Abbott, 2002; Jarboe, 2001; Prinsloo, 2005; Warschauer, 2003) over machine-centric ICT4E initiatives. It identifies and analyzes the problem of *truncated learning*, wherein the synthesis of different skills and experiences that might result in digital literacy is blocked. However, I also find significant parallels between digital and non-digital literacy practices of the participants as they pertain to their teaching practice (such as in how 'digital objects' mirror the use of 'real objects' in teaching); and these findings dispute some of the assertions made by theorists of multiliteracies (see for instance, Lankshear & Snyder,

2000; Luke, 2000; Snyder, 2002) who emphasize differences over similarities between the literacies needed for the online and offline worlds.

The current study identifies possibilities for multilingual content resources arising from the integration of pedagogical, subject knowledge and digital competencies. It examines the potential value added by ICT resources to teachers' subject knowledge, drawing from Shulman's (1986) ideas on the relationships between content knowledge, pedagogy knowledge and curriculum knowledge as they have expanded more recently into a theoretical framework called Technological Pedagogical Content Knowledge (TPACK). This framework applied to my findings in that it provides possibilities for the effective integration of technology into teacher preparation and ongoing professional development, and specifically in its capacity to facilitate educators' multilingual content development in tandem with the acquisition of digital literacy skills. This directly responds to the question of how ICT can be used to support more language teaching in Gulu.

It is my hope that locally, the research process has left in place new strategies and ways of thinking about mother tongue literacy and teaching, and its purposes for learners as well as their broader communities. I also hope that the study's process and results will prove to be relevant to the development of the PTC's programming in ICT for pre-service teachers.

7.7 Summary and Conclusion

In Gulu, observation of pedagogical practices already in use in the absence of ICT resources revealed how digital literacy skills drew heavily from other literacy practices and helped explain how and why participants used multimodal resources when they were

confronted with ICT-mediated information. Awareness of how the ICT-supported teaching practice was mirroring pre-existing strategies the teachers relied on showed that the teachers brought forward a bank of tools that they could deploy in learning how to make use of ICT resources for their teaching. The teachers held multiple investments in their use of ICT resources from seeking career mobility to connecting with strangers outside their own locale. They also had investments in *possessing* ICT resources, united together as a unique group that was acquiring skills that were uncommon in their broader professional and personal communities and having access to resources that were scarce and valuable. These findings also identified possibilities for multilingual content resources arising from the integration of pedagogical, subject knowledge and digital competencies, and in particular, examined the potential value added by ICT resources to teachers' subject knowledge.

This chapter dissected some of the theoretical and practical implications of the study's findings. A common thread throughout many of the inferences is the case for the *integration* of several specific literacies into computer literacy training aimed at supporting primary teachers in Gulu. These literacies include the ability to find multimodal representations of information, to identify resources that will enhance their subject knowledge and academic competencies, and to use software in a way conducive to content creation in L1 or in English. The implications also point to the value of making computer literacy training responsive to local identities, as well as recognizing the histories and experiences that teachers bring with them to the ICT lab such as their previous exposure to other technological tools, the context and era of their teacher training, the perceptions of the local language and of English in their communities, and

their own reasons for wanting to participate in the information society.

Wenger (1998) calls for theory and design that recognizes the inherent links between the social world and the process of learning, arguing that "those who can understand the informal yet structured, experiential yet social, character of learning – and can translate their insight into designs in the service of learning – will be the architects of our tomorrow" (p. 255). While there are numerous and significant hurdles to making ICT accessible and useful to Ugandan educators, nothing less should be the goal, if the purpose is to reduce marginalization and make learning and teaching a process of empowerment.

CHAPTER 8:
Recommendations

8.1 Introduction

As a study examining the experiences of teachers this project benefitted from the opportunity to not only observe the situated social practice of a group of educators interacting with ICT resources but to guide the methods used to develop digital literacy skills among the participants. The study thus served as a rich laboratory facilitating insights into prospective curricular design features that could shape future ICT training initiatives for teachers in multilingual contexts in the developing world. The recommendations that follow may serve practitioners who are planning the design of ICT training initiatives for educators who work in multilingual primary classroom settings including primary teachers' colleges, teacher professional development programs, non-governmental organizations and other institutions considering the use of ICT within their teacher education curricula. This chapter identifies five groupings of recommendations organized within the following categories, which derive from the study's five thematic areas: the need for emphasis on multilingual content creation; supporting the development of local language software programs; nurturing local stewardship over ICT resources; creating viable ICT learning environments for educators; and capitalizing on peer support opportunities. The final section of this chapter reflects on priorities for ongoing research needs based on the results of this study.

8.2 Emphasize Multilingual Content Creation

To date, the local language instruction policy has only been implemented in Ugandan primary schools for 10 languages out of some 50, and is not used in urban areas.

As highlighted, what emerges from the study data (Chapter 5) is a disconnect between policy and practice, whereby teachers struggle to use their native language in the classroom, in a society that has come to assign certain roles for the local language and certain roles for English. English has become the language for education, and is used for text-based communication, while Luo is the language for use in the community, used largely for oral communication. The mere declaration of a policy change does not on its own change entrenched attitudes and language practices. The new policy has created tension between these traditional roles, yet there is inadequate support to assist teachers in the evolving role of Luo as a "classroom language", rather than only serving as a "community language" in the early primary years. The experience of this study was that the initial enthusiasm for the opportunity to gain computer literacy for the purpose of creating learning materials in the local language dissipated when the participants were confronted with the time constraints from the time it demanded to think, plan and write in Luo, a language they had not traditionally used in an education or work context.

Local language compatibility for educational goals must also be a communications goal within the ongoing implementation of the mother tongue instruction policy. The policy to date has mainly been implemented in rural areas, causing resentment and suspicion on the part of parents who believe that urban children are getting more exposure to English and will consequently have greater educational credentials. These challenges suggest that for the policy to achieve its intended outcomes in schools, a priority issue must be to build consensus about the value of the change among stakeholders, which would include communicating to parents, local leaders and others the evidence that primary instruction in the mother tongue will also support

English language learning, rather than excluding children from being able to communicate in English.

In addition, the Ugandan Ministry of Education and Sport should move to address the lack of local language literacy materials available to teachers and schools. According to the Uganda Multilingual Education Network (MLEN), a coalition of organizations and individuals working to promote the cause of local languages, where the L1 instruction policy has been introduced, it has not been backed by proper materials or training for teachers (pers. communication from MLEN, Nov. 15, 2010). Tembe and Norton (2011) also point out, drawing from their research in another region of Uganda, "exacerbating the challenge of deciding which language constitutes the most dominant 'local language' in any given area was the acute shortage of funding and human resources to support materials development and teacher education" (p. 4). To address the lack of materials, MLEN is recommending that the Ministry of Education and Sport establish a working relationship with the Local Language Boards (formerly District Language Boards) and establish a National Local Language Committee to supervise the implementation of local language policy in education.

Further to this, this study's findings strongly support the argument that teachers can serve as the best placed resources to create rich local language materials, when they are supported to access, assess and adapt web-based educational resources and to use ICT-based applications for materials development. If teachers have a foundation in digital literacy skills, they can bring to the computer screen funds of knowledge (Moll & Greenberg, 1990) derived from their existing pedagogical practices, such as the ability to aptly integrate multimodal resources into lessons, as discussed in Chapter 8. This can

serve education in Uganda by creating a pool of resources that can be shared by different teachers across classrooms and communities. It can further add Ugandan representation to global repositories of educational resources, contributing Ugandan perspectives and cultural capital to the shaping of educational content and including Ugandan voices in online communities of educators. This would be an important step forward in improving the equity of the web and its relevance to speakers of other languages. However, to date

> computer training programs in developing countries like Uganda largely tend to focus on teaching the trainees to simply access already existing information on the Internet or to carry out basic word processing functions. Hardly any mention is made of the skills needed to generate new knowledge and to upload it onto the Net for the rest of the global world to consume (Andema, Kendrick & Norton, 2010, p. 451).

Therefore, ICT training curricula for teachers should be oriented around promoting the digital literacies necessary for multilingual content creation. This might include authentic learning assignments wherein as part of their training, teachers create 'real' resources for use in their classroom that can be critiqued and improved upon within the scope of their training, and then deployed in classrooms. Digital literacy skills around multilingual content creation should include being able to upload and share one's resources with others, as well as effectively adapt and reuse the resources of others. However, one enabling condition necessary to support teachers' multilingual content development in the context of Gulu will be to better support versatile use of Luo for the classroom and the community. This would include explicit emphasis on the synthesis of

language and digital literacy skills to support more seamless use of the local language in diverse settings, making Luo relevant and validated in both the community and at school.

Uganda has a large and organized Diaspora community who could potentially serve a greater role in the creation of Ugandan local language content online. Indeed, some Diaspora organizations have already begun modest endeavours[28]. In terms of Luo speakers in the Ugandan Diaspora, the Acholi Diaspora Association based in Toronto at one time had an online multilingual Forum with Yahoo Groups, though it's unclear whether the group, with only five members, is still active. Acholi Online is an active online portal "on and about Acholi people" (Acholi Online website, 2012), though which operates in English only. The New Vision Company, the Government-owned English daily newspaper, also owns several local language newspapers, including the Luo-language Rupiny, which has an online version (http://www.rupiny.co.ug/) that allows Luo speakers abroad to read news out of northern Uganda. Those embarking on the creation of Luo language materials for education might take advantage of digital communications to engage the organized Diaspora community to assist in Luo content creation.

A key vehicle to the realization of these recommendations is the development and use of localized software. Another is the methodology of the open educational resource movement and the potential it offers to supporting teachers' increased access to learning materials. These two opportunities are taken up in the following sections.

[28] For example, Twegaite, an organization with six chapters in the United States, and one chapter in Uganda, representing the Busoga cultural group (speakers of the Lusoga language), include a page on their website introducing basic expressions in their language. The North America Masaba Cultural Association (NAMCA) promotes the Masaba language, among other objectives. They have initiated an interactive website, in the hopes of bringing together the "largest online Masaba community in the world" (NAMBA website, 2012).

8.2.1 Spurring Software Localization

The research participants perceived that the computers they were using, despite having been purchased in Gulu, were "planned in English" and were unaccommodating for Luo. The examples provided by the participants suggest that the participants saw the computers as 'rejecting' the use of their language, by underlining Luo words as "incorrect" or word processing programs automatically changing Luo words into English words. This reinforced the idea that it was easier to use English when creating content for the classroom using a computer, and that computers were fundamentally foreign, produced elsewhere by English speakers for English speakers.

As highlighted in the previous chapter, social transformation arising from new technologies is accelerated when sites of innovation around new technologies are close to their sites of production and use (Castells, 2000). This implies the problematic nature of depositing tools produced elsewhere into sites of use, when there is minimal or no local input into the development or adaptation of technologies. Just as 'parachuting in' computer hardware into a site of use, without adequate attention paid to the social practices that will underly that use, is often ineffective, so is importing software developed in contexts far removed from a site of use. For instance, Tushabe, Baryamureeba, Bagyenda, Ogwang and Jehopio (2008) reviewed several studies that found that up to 68% of software acquired by government institutions in developing countries "remained either unused or unsuccessfully utilized" (p. 1). Their own study, focused on Uganda, found that while only 12% of customized software in organizations is locally developed (59% is imported and 29% is freeware / open source[29]), locally and internationally developed products had similar performance and satisfaction levels. Their

[29] 27% said that they use pirated software.

respondents specifically cited the lack of user participation as a problem in local software development processes. Tushabe et al further point to the problem that local software developers lack the capacity to move innovative ideas into usable products that meet local needs, leading to a lack of "locally designed and socially relevant products" (2008, p. 1). Similarly, Duncombe and Heeks' (2001) study found that local software development in developing countries, in addition to low cost efficiency and poor quality, did not respond to local demands. Products tended to cater largely to sectors like finance management or the military, rather than to students and teachers for example, and thus had little penetration beyond specialized institutions.

Such findings suggest the need to nurture the development of local production enterprises through, for example, government incentives and an enabling environment (like reliable and affordable connectivity infrastructures) and to better connect such enterprises to the needs of a broader range of the population—like teachers. Such nurturing is also facilitated by advanced training opportunities, exposure to open source platforms, capacity and publicity support to local developers, and as Tushabe et al (2008) recommend, making software development a multidisciplinary undertaking involves a wide array of expertise ranging from visual artists, social scientists, software engineers and others depending on the intended audience. This is particularly important in that education was not even listed as a topic in use or under development in Uganda currently, though school management software was expected to increasingly be in demand (Tushabe et al, 2008).

Part of local software development needs is innovation in language technologies for African languages, to increase both the ability to access online repositories as well as

to create and contribute content openly and freely in local languages. While there are interesting developments in the field of machine translation, applications remain fraught with challenges and translations imperfect if sufficiently comprehensible (De Pauw, Wagacha & de Schryver, 2008). De Pauw et al further point to the slowness and expense of using manually compiled rules to build language applications and tools. Muchemi (2008), in the same volume, points to the incompatibility of natural language and database access in African contexts.

Interoperability is often pointed to as a culprit across all of the open movements (FOSS, open access, OERs), and an example for Africa is the compatibility of keyboard keys for languages other than English, particularly when there is a lack of coordination and standardization among commercial or other development efforts to create fonts in local languages with non-Latin scripts. On the other hand, the very presence of the various systems represent an important emerging effort to develop strategies to make it possible to communicate electronically in non-Latin scripts and shows motivation is present within the software development industry. These efforts range from transliteration, to the use of added accents or symbols (extended Latin scripts) when typing to indicate a character not found in the standard Latin alphabet, to the use of image files (like jpg. extension files) to display characters. The emerging adoption of Unicode across applications and systems is especially promising because despite these technical challenges, most African languages are relatively simple to code and many use extended Latin scripts[30], suggesting that the creation of open source operating systems in African

[30] Osborn (2001) groups Africa's languages into three categories: those that use more or less the characters of the Latin alphabet; those that use more or less the Latin alphabet, but with some additional characters which simply adapt Latin characters (extended Latin scripts); and those which use a non-Latin script; the

mother tongues is feasible from a technical point of view. While computers and the Internet do indeed have their origins in the English language, as the teachers surmised, with the American Standard Code for Information Interchange (ASCII) being the original character encoding scheme used for computer-based communication, that is changing. ASCII continued to be the dominant scheme until 2007, when UTF-8, based on Unicode, emerged to become the dominant character encoding on the web (half of all web pages currently use UTF-8). UTF-8 differs from ASCII in that it can represent characters from other scripts beyond the Latin alphabet, including 109,000 individual characters within 93 scripts, accounting for most written languages in the world today.

The rapid and successful spread of Unicode is extremely significant for multilingual environments such as Uganda's. Already, there is open source software that can be freely downloaded and translated into Ugandan languages. Open source software packages that include all the usual programs such as word processors, spreadsheets, presentation software, email, and Internet browsing have recently been translated into Luganda and Runyakitara, by a team of Ugandans based in Kampala with sophisticated proficiency in programming and other IT skills (Lindo, Mugabi & Lunghabo, 2005), representing a first foray into indigenous Ugandan language software production, that will likely provide useful lessons for efforts in other Ugandan languages. In particular, local language operating systems in open source format would serve as a platform for expanding access by reducing software costs, and stimulating more local development, and consequently, more local OER creation and sharing.

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latter two of which currently present important accessibility challenges and which demand a considerable investment of resources, skill and time to place electronic communication for education in closer reach.

However, the extent to which Ugandan educators can take advantage of these developments remains dependent on several factors. Firstly, software localization is truly about the 'local', meaning that software translation would need to be undertaken by local bilingual computer software engineers, or at least, individuals with some advanced information technology training, in addition to proficiency in the local language. Gulu University, the only public university in the northern region, has an IT program in its Science Faculty; however, the program is run in English and does not address language localization (pers. communication, Nick, January 3, 2011). Therefore, language localization software skills would need to be integrated into IT training curricula; and this would require robust policy from the government. End-users of the software also need to be trained in the open-source, local language versions of the programs if they are produced. In other words, any ICT training that teachers receive at teachers' colleges or in later professional development experiences should include a focus on the local language tools that can be used for teaching and learning.

While ICT has been identified as a development priority by the Ugandan Government, and a National Information and Technology Agency established, the translation of policy into results has been disappointing to date. Efforts to encourage the spread of ICT infrastructure in rural areas are hampered by language barriers, since all the computers procured and distributed throughout Uganda come with English hardware and software (Lindo, Mugabi & Lunghabo, 2005) and no governmental initiative has been taken yet to localize software for non-English speakers. A small community of web-savvy, urban Ugandans have initiated localization efforts on their own for two widely spoken indigenous languages; however, government support is needed to scale up efforts

and to enhance the existing national ICT policy to be better integrated with the language of instruction policy in the education sector. Most importantly, localization efforts must emphasize local skill development and IT capacity from within a language framework.

There has never been a more enabling time to create computer programs in non-English languages. The World Wide Web now accommodates non-Latin scripts, and many email programs can use different language settings. The open source movement is firmly established and an open source version of every major type of software exists at no cost. This means that developing countries do not have to wait for commercial software producers to recognize market potential before creating language versions viable in those countries (the reason why Finnish is included in Microsoft applications, but not Hausa, for example). Thus, the 'inputs' are there; what is left is the need for an enabling policy environment that supports computer literacy and advanced IT skills; as well as policy with an emphasis on advancing the use of local languages through a variety of avenues, including using the tools made available by the information society. Then, it is up to Ugandans to initiate localization experiments, so that all computers will no longer be "planned in English", and like so many Ugandans, computers too can be bilingual.

8.2.2 At the Juncture of Global and Local: OERs

The OER movement is centred around the notion of extending the 'public commons', and embraces principles of openness, free use, and expanding knowledge globally. UNESCO defines OER as "any type of educational materials that are in the public domain or introduced with an open license. The nature of these open materials means that anyone can legally and freely copy, use, adapt and re-share them. OERs range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio,

video and animation" (UNESCO website, 2012). The underlying principles of the global OER movement—free, open (generally unrestricted licensing), adaptable—hold promise to a community of educators in an environment like Gulu, where printed educational material is limited, and where the finite resources of the education sector and the limited personal resources of teachers make paying fees for licensed material unrealistic. Indeed, the rhetoric of the OER movement is one that emphasizes inclusiveness, access, and the irrelevance of borders.

Yet while the OER movement is indeed generous in the sheer quantity of resources freely offered in numerous sophisticated online OER collections, there is remarkably little language diversity in the main OER collections (Oates, 2009). Most collections are exclusively in English, though some have smaller collections emerging in other European languages and to a lesser extent, in Asian languages. The scholarly literature on OERs and their application in the developing world makes much of the potential that OERs offer education in developing countries (for instance, Geith & Vignare 2008), but there has been little examination of how to make space for multilingualism of non-European languages specifically; and in the discourse on access there has been little discussion around language diversity, translation, or multilingualism within the OER movement, despite the discussion of other access issues[31]. Even OER initiatives designed specifically for use in Africa are largely unilingual. Merlot Africa and OER Africa, for instance, function in English only and TESSA (Teacher Education in Sub-Saharan Africa) has inactive language options on its homepage for Xhosa, Arabic, Swahili, French and English, and no OERs in languages other than English were found on the site as of mid-

[31] For instance, the Cape Town Open Education Declaration specifically mentions, "whenever possible, [OERs] should also be available in formats that are accessible to people with disabilities and people who do not yet have access to the Internet" (Cape Town Declaration official website, 2011).

2011 (TESSA website). While acknowledging that these initiatives are still nascent, it is significant that language has not yet figured as a central theme at a time when there is a shift towards mother tongue instruction on the continent (Obondo, 2007).

While "global" repositories of OERs have not yet undertaken robust efforts to promote African language content collections, there are nevertheless national and regional efforts from within Africa. These include, for example, the Kumasi Project (a Swahili online dictionary), or Aluka, an online collection of scholarly resources from and about Africa that currently functions in English, French, Spanish and Portuguese (though as an archive, documents are in their original language once identified which include eight colonial languages spoken or once spoken in Africa). These projects may offer valuable lessons learned and potential models that can be replicated elsewhere.

Creating collections of African language OERs will require the collaboration of different types of expertise. For instance, Osborn points out that, "there is little collaboration between linguists and ICT technicians in Africa" (2006, p. 90). Initiatives that can mobilize, from the planning and design stages onwards, synergies between information technology professionals, educators, curriculum design experts, linguists (such as those working on standardization efforts) and policy-makers will ensure better overall usability by addressing the needs and concerns of different spheres of accessibility such as technical navigability, visual appeal, content relevance and being responsive to the needs of teachers. Catalyzing the potential of OERs for African teachers of multilingual classrooms will also demand better regulatory environments and more support and will on the part of senior policy-makers. The African Virtual University (AVU) which has undertaken some advocacy and sensitization efforts on OERs for

Africa found a need for awareness of OERs within education institutions, non-existence of a common policy and licensing structure for OERs, and a need for quality assurance processes to be the key challenges to moving OERs forward in Africa. The AVU also found that the state of technical infrastructure in Africa was a major impediment to the spread of OERs (UNESCO Wiki, 2009).

The possibilities of OER for African education have already been well articulated. For instance, OER Africa states that its purpose is *"*to ensure that the power of OER is harnessed by Africans for Africans by building collaborative networks across the continent" (OER Africa website, 2011). Bissell and Boyle (2007), of the major OER collection ccLearn, have concluded that "most people who create OER sites have a sense of who they expect their users to be and what needs those users have. This is all to the good, if it is not to the exclusion of those users whose needs—or innovations—we have totally failed to imagine" (p. 9). On that advice, it is perhaps time for OER advocates to imagine the needs, and the potential contributions, of the many thousands of teachers instructing in African mother tongues within multilingual communities, and the tremendous potential the OER movement holds for them.

8.3 Stewardship Over ICT Resources

This study's findings point to the need for sustainability of the physical hardware and software of computers, as well as to the skills that can lead to shared stewardship over ICT resources, whereby the end-users are taught more than how to use programs useful for their profession (such as a word processor or presentation software), but also how become proficient in protecting and maintaining ICT tools (Chapter 6). This includes

understanding what makes a particular piece of technology such as a projector, a printer, a flash drive or a computer "healthy" or "unhealthy," to draw on an analogy we often used during the training sessions throughout the study. Stewardship over technological resources must be integrated into the sites of use. This is another step towards bringing sites of innovation, production and use closer together (Castell, 2000), as the maintenance and protection of ICT resources cuts across these three areas.

All technology requires an investment in human capital to be relevant to the objectives of end-users. The challenges unearthed in the findings around the break-down and misuse of ICT resources at the teachers' college and among the teachers (and innumerable other examples from ICT projects around the developing world) need not terminate the potential of ICT resources, but those resources will not manage to yield results for very long when local capacity to resolve hardware and software problems is limited. Beyond the technical skills needed to preserve ICT tools that have been introduced to a given site, an overriding *culture of stewardship* over technological resources needs to be cultivated at the local level whereby there is a collective commitment to maintain and preserve ICT resources so that they can continue to serve as accessories to broader education goals.

While foreign aid agencies, which are often the instigators and very often the donors of ICT projects in Africa, should be accountable for their projects' sustainability, at the same time, it is not the sole responsibility of external agencies to create an enabling environment for ICT to serve education objectives in a meaningful way. Strong national policy needs to be driven to realization by a committed and well-resourced Ugandan agency that will collaborate closely with teacher colleges, schools and district education

departments, and other community stakeholders like IT departments in universities. Throughout the world, the education field and teacher training in particular have been characterized by poor planning in how ICT is integrated into training and curriculum (Warschauer, 2003, p. 32). This has also been the case in Gulu so far.

To be effective in advancing learning outcomes, ICT needs to be accessible in all phases of a teacher's career, from the training years and into work life. Teacher training institutions need to retain local capacity to manage and maintain ICT tools, and equally importantly, should have some level of commitment internally to the role of ICT in education so that the benefits of ICT can outlast short-term, externally funded donor projects. Digital resources need to find fertile ground in the environment where they are placed, one that has been suitably prepared to receive technology tools and apply them in ways that are meaningful to local learning needs and will serve education in a holistic way. In the long run, reliable and affordable power and the provision of broadband from reliable, accountable ISPs will make computers far more viable for a far greater number of people. The conditions for an enabling environment are discussed in the following section.

8.4 Creating Viable Learning Environments for ICT

The habit to date of approaching ICT for educators in Gulu and Uganda (and beyond) as projects of limited time periods that are focused primarily on the acquisition of physical goods (such as computers) and sometimes connectivity (though often without a business plan for how connectivity can be sustained after a project's budget is closed) has meant that a culture of valuing ICT among diverse stakeholders often fails to take

root. Short-term projects that leave little in the way of strategies for building relevant local human capital and particularly of stewardship planning may fail to engage power holders in the long-term support of ICT programs for teachers. Local administrators may refuse to prioritize support for ICT when its potential benefits are poorly understood at the grassroots level (Chapter 6). This was the case in Gulu, where the PTC had traditionally marginalized the ICT program on campus. The computer lab, equipped with only seven computers for 500 students, was poorly maintained, under-staffed, and consequently, not well used. Recent principals were distrustful of ICT, according to faculty; however, by 2009, there was a new principal who was reportedly more open to strengthening the ICT support facilities at the college. However, the ICT lab typically received minimal financial support and the college claimed it did not have any budget line for ICT (though there was some skepticism and suspicion about this claim from some on the campus). Thus, while Uganda has a national ICT for education policy, it appears that there is insufficient political will to support and monitor the implementation process, as well as a lack of coordination that fails to drive policy forward (such as between Ministry of Education and Sport ICT departmental officials with college principals). The result is a piecemeal introduction of ICT, where NGOs and development agencies work on some sites and not on others, and often for a limited period. ICT is nowhere near being integrated into the school system but is cropping up, rather, on a project-by-project basis where ties between projects are often limited, including the documentation and sharing of lessons learned.

In addition to the resources needed to properly introduce policy, the reliability of power, infrastructure and connectivity must be addressed for any long-term viability of

the Internet in Gulu. For instance, the classroom observation data from teachers' use of projectors and computers to deliver lessons illustrated the significant challenges, and drain on classroom time, in trying to use ICT resources in a poor infrastructure environment. Despite these challenges, once everything was secured, the projector was running uninterrupted and the teacher talked using the slides, the children appeared to be engaged in the lesson. Their eyes were focused on the front of the classroom and they were keen to respond to questions posed by the teacher. The teachers appeared to be instructing seamlessly, going from verbal instruction to pointing out images on the screen, to writing a word on the chalkboard. Thus, the projector and the presentation software served as tools to present content in different formats to the class; however, the conditions in which technology like laptops and projectors are used make efficient use difficult, limiting the full potential of these tools for L1 medium education. Electrification and broadband access in this region are two infrastructure issues that must be addressed before computers can be seriously discussed as valuable, relevant tools for educators in Gulu, and indeed in Africa at large. A 2001 study found that, besides affordability, the greatest barriers to more equal ICT access were the inequities in broadband access, in addition to linguistic, content, and skill deficits (DiMaggio & Hargittai, 2001). These are needs that extend beyond the capacity of the Ministry of Education and Sport, and fall within the mandate of other government ministries (such as the Uganda Communications Commission and the Ministry of Works, Housing and Communication), who must collaborate with the private sector to seriously address the ongoing acute lack of reliable electrification and broadband.

In the meantime, however, websites purportedly aimed at African audiences (given that the connectivity situation in Gulu is fairly typical of the continent at large) can take steps to make their content more accessible to people in poor connectivity environments. These steps include reducing the megabytes of page size through steps such as limiting the number of advertisements that appear on pages, avoiding inefficient coding, avoiding large images, too many images and high resolution photos, limiting complicated fonts, avoiding the use of plug-ins like Flash, animation, roll-over effects or other functions that require high data transfer capacity. Using particular file formats and types of file compressions can raise the speed of loading time. Alternate versions of websites can be recreated in mobile or low-bandwidth versions. Wikipedia was the preferred site among the teachers because it meets all of these criteria, and because it is friendly to new Internet users in its presentation and intuitive means of organizing information. Despite its simple presentation of content, it is rich in information through the use of hyperlinks that led participants on an endless path of discovering new content, that included both text and image, as well as small audio files on some pages.

There are significant challenges to making ICT tools relevant and useful for improving the quality of education in post-war Gulu and to supporting teachers to play a role in preserving and advancing the local language. But there are no shortcuts. While important intermediate means of accessing information do exist amidst an environment that puts Internet access out of reach for most people, ultimately, those means are inferior to an environment where Internet access and the requisite hardware are accessible to all, but especially to educators. In the long run, the only sustainable output will be an investment in infrastructure at a national level that will support broader, affordable, and

reliable access for Ugandans, including in isolated, rural regions like Gulu. Africa does not present an environment inherently at odds with connectivity. The lack of connectivity infrastructure is profoundly a problem of government will, policy and resources, and these are hurdles that must be overcome sooner rather than later if ICT is to help Uganda meet its education benchmarks for its 2015 Millennium Development Goals.

8.5 Educators and ICT in the Social World

In the course of this study, participants were found to benefit greatly from relying on each other. Peer assistance was an evident asset in the development of participants' digital literacies, taking place in both the labs and internet cafes when all participants were together, but also outside of formal training sessions, when participants working at the same schools collaborated together to troubleshoot problems, understand how programs and specific features worked, and get assignments completed (Chapter 6). While more advanced tasks, such as removing computer viruses, necessitated contact with an IT specialist like Nick, for many other tasks the teachers turned to each other for assistance. Peer collaboration played an important role in skill development, and was a valuable strategy both in and outside of the training workshops and ICT lab.

The findings make a case for the explicit integration space for informal learning and peer support opportunities in the design of ICT for education interventions. This might take the form of building in ample open practice time into training agendas where participants have the chance to work with each other, or pairing teachers together during training. It can also be facilitated by noting groups of participants that come from the same work places, and encouraging collaborative practice such as assigning group projects or establishing professional groups at each school or work site. For instance,

drawing on her research, Hughes has proposed the establishment of collaborative, subject-specific "inquiry groups" of teachers for professional development, after finding that "predominantly informal learning experiences" (2005, p.295) played a significant role in facilitating the access and use of technology among her teacher participants, with informal guidance being a deciding factor for technology's relevance to teaching practice. Leu et al (2004) counsel that "effective learning experiences will be increasingly dependent on social learning strategies and the ability of a teacher to orchestrate literacy learning opportunities between and among students who know different new literacies. This will distribute knowledge about literacy throughout the classroom, especially as students move above the stages of foundational literacy." Instructors can also leverage the advanced learning of some participants. ICT learners who become comfortable earlier in applying digital literacy skills can be asked to support the trainers as peer leaders, to assist other learners. Particularly if a trainer is not a local community member, this can facilitate effective communication.

8.6 Suggested Directions for Future Research

This section highlights several questions that arose from the study leading to opportunities for future investigation, including more examination of applied localization efforts in multilingual contexts, infrastructure issues limiting ICT4E, the need for data from conflict and recently post-conflict research sites, and assessments of the online use of OER resources and communities.

This research used as its site of study an active ICT learning experience, and was able to manipulate and question this experience within the framework of a training curriculum and delivery undertaken by the researcher. A similar methodology that

included the use of localized software programs in African contexts could yield much needed guidance on how locally developed African language applications derived from open source platforms are best applied in ICT education for teachers. In general, there is a lack of research on the use of, and possibilities presented to educators teaching at any level by localized software programs such as operating systems, word processors, email or web browsing, though there are a few existing models of such applications that can be used for this purpose, including from Uganda. Any research effort that can provide data allowing for a better understanding of the potential of multidisciplinary ICT planning would be valuable, such as what might arise from collaborations between educational design experts, software engineers, and linguists as one example of diverse professional backgrounds that could combine different areas of knowledge to create software responsive to the needs of teachers instructing in local languages.

This study identified weaknesses in the implementation of various policies that impact on ICT4E, including the national ICT policy of Uganda and the mother tongue instruction policy for the primary levels, such as the lack of reliable power in rural areas and low bandwidth access. Further research examining infrastructure needs and opportunities vis-à-vis policy and planning for ICT coverage and access would be useful.

Data from post-conflict and conflict societies on ICT4E in general is needed, given the often unique experiences of educators in such settings and the ways in which war impacts the education sector in distinctive ways. It is further needed because there is a powerful relationship between the role of education and conflict prevention (or manifestation), and ICT4E may represent new strategies to strengthen curricula and teacher education to serve peacebuilding purposes.

Finally, this research project brought into relief the untapped potential of the OER movement to supporting teacher content knowledge and giving teachers access to diverse, adaptable resources for their classrooms, needs that are particularly acute in Gulu, where primary teacher education lasts only two years, where the average incumbent teacher is 19 years old, and where the L1 instruction policy has seen minimal investment of government resources. The potential of OERs is also manifested in its emphasis on reuse and sharing, in an equitable process of producing and consuming resources across global communities of practitioners. This focus is a potential platform to give voice to educators in unique contexts like post-conflict Gulu, to share their views, ideas and cultural resources with the world. However, it is largely unrealized in Uganda, and there is a lack of data demonstrating specific impacts or identifying ways of circumventing and dismantling the barriers that still stand in the way of access to OER collections and online OER communities to teachers in the developing world. It is hoped that this study may contribute in some small way towards opening the doors to more scholarship and more practical innovation to explore these possibilities.

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Appendix A: ConnectED Computer Skills Learning Objectives

- State the difference between computer hardware and software
- Turn on a computer and computer monitor
- Recognize CD-rom disks and USB sticks
- Name basic computer system parts
- Logon to a computer network using a user name and password
- Use a mouse
- Use a keyboard
- Open a computer application using an icon
- Open a program using the START menu
- Know where to find the time and date on a computer
- Shut down a computer
- Save a document to the desktop
- Send a document to the printer
- Send and receive email
- Use the internet to research topics

Appendix B: Interview Questionnaire #1 for Focal Participants (November 2009)

I. Personal Information & Professional Background

1. Name:
2. Age:
3. Place of employment:
4. Year started teaching:
5. College where trained:
6. Any additional training or education:

7. Teaching levels:

II. Computer Experience

8. Describe any previous experience using personal computers.

9. What are your perceptions or thoughts towards personal computers? (language, fears, hopes, etc)

10. What are your expectations around how access to a personal computer will affect your teaching?

III. Classroom Context

11. Do your students have textbooks? If so, how many per child?

12. What other types of literacy materials do you have to work with in your classroom?

13. Can you describe the physical environment of your classroom?

14. In that environment, what are your most valued teaching resources?

IV. Biographical Information

15. Please share some background information about your life and experiences that you feel comfortable sharing.

Appendix C: Instructions for Participant Journals

Instructions for Journals

Why am I being asked to keep a journal?

As a participant in the Computer Literacy for Mother Tongue Study, it is our goal to learn from your personal experience in becoming a computer user and in using computers and other digital tools to produce open educational resource materials. We want to understand in what ways you are using the computer skills you have gained in your teaching practice and specifically, in the creation of educational materials.

What kinds of things should I write about?

You can write about anything that you feel is relevant to the research question: *how can ICTs be effectively used by teachers to produce educational content in the mother tongue?* Examples include:

- Your ideas, plans, sketches, or brainstorming about how you presently do, hope to, or can use the various computer programs to create materials.
- Responses of your students to the ICT-generated materials: did the materials support the curriculum? Did they encourage active learning? Were they useful for a particular exercise? Did they make your work easier? Did the students respond to the subject material differently when the ICT-generated materials were used in the classroom? Did the appearance of the classroom change? Were there responses from parents, school administrators, colleagues or others?
- Challenges you face in any aspect of the process and ways that you mitigated those challenges.
- Information about the school and community environment where you teach and how this impacts your use of ICTs.
- Highlights for you: which materials (and programs used to create them) were especially effective? Why?
- The role of language: was it easy to produce the materials in Acholi? Why or why not? How did the students respond to the materials in Acholi?
- Your experience using and adapting OERs, and uploading OERs to the Internet.

How often should I write in my journal?

Please try to write in your journal after each time that you create a new OER, and/or after you introduce it into your classroom. You should have a minimum of 10 journal entries by March 2010. You are welcome to write more than this.

Who will read my journal entries?

- Lauryn Oates and her doctoral research committee in Canada: Dr. Bonny Norton, Dr. Maureen Kendrick and Dr. Margaret Early
- [redacted]

Your journals will not be shared with others outside of the individuals named above, without your permission.

Can I keep my journal?

You will be provided with a new journal for this task. In March, you will have the option to hand over the journal, or the completed pages to Lauryn, or if you prefer to keep your journal, we can make a photocopy of the completed pages.

If I have questions, what should I do?

Please email Lauryn at Lauryn.oates@gmail.com or call [redacted] at 0782-161870.

Appendix D: Interview Questionnaire #2 – Focal Participant

Name:

Date:

Location:

1. Have you been using your ERs in your classrooms?
2. Have they changed the way you teach a lesson? How?
3. You prepared your lesson plans and other ERs in English. Did you teach the lesson in Acholi or English?
4. Why did you prepare the materials in English?
5. Which language do you feel more comfortable writing in? Teaching in?
6. Do Acholi and English have different roles? When do you use one and not the other, and why?
7. Are you comfortable writing on a computer in Acholi?
8. How did you choose the content that went into your ERs?
9. Did you use the online information to enhance the lesson, and/or your own knowledge on the topic?
10. Did you change the format of the ER when you used the computer, compared to how you might have organized the information by hand?
11. What is your perception of content you saw on the internet about Uganda?
12. Does it fairly represent your country?
13. Do you use the Internet for reading/learning, or/and for writing/speaking?
14. What is the value of the Internet?
15. What do you want from computers as a teacher?
16. What do you want from the internet as a teacher?
17. What can the Internet be used for in Gulu?
18. Which websites do you use the most (for teaching) and why?
19. Which websites have you visited but were not found to be useful, and why?

Appendix E: Interview Questionnaire for PTC ICT Lab Manager

Name:

Date:

Location:

1. What is the reason that computers take so long to repair in the Lab?

2. Can you describe the resourcing situation in the ICT Lab?

3. How does communication work between the PTC and the MoE?

4. What is your own assessment of the training efficacy? What was missing? What was especially useful?

5. In your experience, what do teachers struggle to understand the most? Why do you think they struggle with these skills?

6. What do you see as the key barriers to Gulu teachers' participation in the OER movement?

7. What do you see as the greatest potential for the internet, OER movement, and information society for Gulu's teachers?

8. Are Gulu's teachers part of the information society? Are they included?

10. What can be done about the access and affordability challenges?

11. What would you want to communicate to Canadian education researchers as research priorities for education, language or literacy in Gulu as it relates to ICT?

Appendix F: Focus Group Questionnaire

Focus Group #1 - Questions

1. Have you been using your ERs in your classrooms?

2. Have they changed the way you teach a lesson? How?

3. Most of you prepared your lesson plans and other ERs in English. Did you teach the lesson in Acholi or English?

4. Why did you prepare the materials in English?

5. Which language do you feel more comfortable writing in? Teaching in?

6. Do Acholi and English have different roles? When do you use one and not the other, and why?

7. Are you comfortable writing on a computer in Acholi?

Focus Group #2 - Questions

8. How did you choose the content that went into your ERs?

9. Did you use the online information to enhance the lesson, and/or your own knowledge on the topic?

10. Did you change the format of the ER when you used the computer, compared to how you might have organized the information by hand?

11. What is your perception of content you saw on the internet about Uganda?

12. Does it fairly represent your country?

13. Do you use the internet for reading/learning, or/and for writing/speaking?

14. What is the value of the internet?

Focus Group #3 - Questions

15. What do you want from computers as a teacher?

16. What do you want from the internet as a teacher?

17. What can the internet be used for in Gulu?

18. Which websites do you use the most (for teaching) and why?

19. Which websites have you visited but were not found to be useful, and why?

Appendix G: Repeating Ideas

- Expressing identity through computers
- ICT changing my identity / getting expertise
- Typing experience / typing speed
- Challenge of finding ways to learn computers or to teach with computers
- Un/availability of print resources
- Spelling errors in ERs
- Computers used to find information on Uganda
- Condition of technology and connectivity / preferred programs due to speed
- Peer assistance in ICT
- Sharing ICT resources
- Conflict interrupting goals / sacrifice / increased family obligations
- Connectivity / access / affordability and poverty
- Mixed modes or formats of learning resources
- "Making learning real"
- L1 / language issues
- Language standardization
- Language use: computers for English
- Ownership of technological resources / conflict over laptops
- Distrust of trainer, GPTC
- The "computer world" / being behind in technology / missing out on ICT / lagging
- Computers for saving time in lesson preparation
- Computers for making large class size easier
- Computers for making learning more interesting / relevant for students
- Computers for upgrading subject knowledge

- Computers for career advancement
- Spell-check underlying Luo words
- Sustainability of ICT programs in Uganda / technology maintenance challenges
- Lack of local competence in ICT or ICT training
- Government will/leadership towards education, and/or ICT
- E-Granary feasibility

- Language use divisions: community / school

Appendix H: Analysis Synthesis Process

#	Data Type	Data Excerpt	Repeating Ideas / Categories	Themes	Theoretical Constructs
		⇒	⇒	⇒	

	i. Repeating Ideas	ii. Themes	iii. Theoretical Constructs
1	• Un/availability of print resources • Spelling errors in ERs • L1 / language issues • Language standardization • Language use: computers for English • Spell-check underlying Luo words • Language use divisions: community / school	**<u>Language, Literacy and Educational Materials</u>** Scarcity of educational material Use of English in ERs despite L1 policy, Language of teacher preparation Computers and Internet created for English speakers Value for effort to promote L1	Disconnect between producers of content aimed at audiences in developing countries, and the actual audiences / Lack of feasibility for connectivity environments / the African market left out of planning and policy Value for L1 teaching and learning does not match up with practical application; language use not transferable between community and school 'Imported' tools combined with language divisions prevent L1 content creation
2	• Challenge of finding ways to learn computers or to teach with computers • Condition of technology and connectivity / preferred programs due to speed • Connectivity / access / affordability and poverty • Distrust of trainer, GPTC • Sustainability of ICT programs in Uganda / technology maintenance challenges • Government will/leadership towards education, and/or ICT • Ownership of technological resources / conflict over laptops	**<u>Environment into Which ICT is Placed</u>** Interrupted process of accessing information Resourcefulness, access requires motivation of time and resources Practical uses of internet limited to what is efficient in this connectivity context Incompetence, lack of will, lack of funds, or poor implementation from government	Success from taking initiative (individual) or using creative means to get access to ICT resources Truncated learning (learning process not linear: interruptions due to connectivity environment Lack of power and connectivity infrastructure impeding access & learning Political commitments to education / corruption and patronage in PTC, government
3	• Expressing identity through computers • ICT changing my identity / getting expertise • Computers used to find information on Uganda	**<u>Identity and Investments</u>** Concern with knowledge about Uganda, representation of Uganda to the world Having a voice in the world	Tapping into a global repository for local purposes Local representation for global recognition and participation; desire to

	i. Repeating Ideas	ii. Themes	iii. Theoretical Constructs
	• Conflict interrupting goals / sacrifice / increased family obligations • Ownership of technological resources • The "computer world" / being behind in technology / missing out on ICT / lagging • Computers for career advancement	Getting recognition in a global community Expressions of inclusion / exclusion in a global interconnected community Explicit recognition of significance and/or power of information society Association of ICT to wealth, development, upward mobility, recognition	belong to, and to act in a global, wired community ICT users with/without agency; Role of information producer imbedded in role of information consumer; Wanting a voice in the world Diverse investments in gaining digital literacy and ownership of ICT resources, economic, social, political motivations
4	• Computers for saving time in lesson preparation • Computers for making large class size easier • Computers for making learning more interesting / relevant for students • Computers for upgrading subject knowledge • Mixed modes or formats of learning resources • "Making learning real" • Real objects • Integrating local representations	**<u>Content, Format, Mode and Utility</u>** Errors and weaknesses transfer from print to screen Use of internet or computers for teachers' knowledge enhancement Teachers' use of diverse modes (audio, visual, text, motion) Teachers' value of ICT's ability to facilitate diverse modes ICT and classroom management	Using diverse teaching formats / different materials and forms a carry-over from offline teaching strategies Participants use online content that they can easily access and easily understand Computers facilitate better teaching through multimodality Teachers transfer offline multimodal pedagogical practices to ICT-mediated pedagogical practice
5	• Typing experience / typing speed • Lack of local competence in ICT or ICT training • E-Granary feasibility • Peer assistance in ICT • Sharing ICT resources	**<u>Navigating and Sustaining ICT Competence</u>** Impact of early exposure to ICT on ability or comfort level Linking old and new technologies Protection and maintenance of ICT resources Trend of machine-focused investments in ICT training/interventions Social nature of ICT learning	Impact of technology exposure context Machines 'dropped' into an environment do not have lasting impact, ignore social and environmental context Need for stewardship over technology Sustainability of both *skills* and *resources /* investments in people vs. machines / decisive role of social capital in ICT learning Peer dependency and collaborative practice

i. Repeating Ideas	ii. Themes	iii. Theoretical Constructs
		interwoven into learning experience in this context

Appendix I: June's Music Lesson Plan

LESSON PLAN FOR CAPE 1(MDD) TERM TWO

DATE	SCHOOL	CLASS	NO.OF PUPILS	TIME
10/06/2010	GULU PUBLIC P/S	P.4		9:50am-10:30am

ASPECTS: SINGING, LISTENING, READING AND WRITING
TOPICS: SINGING AND BEATS (RHYTHM)
CONTENT: Rhythm in song "Mr. Hyena the Cat"
COMPETENCIES: -Clap to the rhythm of the song.
Sings to French rhythm name of the song.
Sings the song to sol-fa.
Recites the poem of the set song Mr. Hyena and the Cat.
Sings the song Mr. Hyena and the Cat.
Match the French rhythm names to the staff rhythm symbols.
Listens to the recorded piece of Mr. Hyena and the Cat hen sings after.
METHODS Rote methods
Problem solving
Guided discovery
ACTIVITIES: -Clapping to the rhythm
Singing to French rhythm name of the song.
Singing the song to sol-fa.
Reciting the poem of the set song Mr. Hyena and the Cat.
Singing the song Mr. Hyena and the Cat.
Matching the French rhythm names to the staff rhythm symbols.
Listening to the recorded piece of the song and singing after.
RESOURCES: Word card, recorded piece being played.
LIFE SKILLS AND VALUES: -Creative thinking, Critical analysis, self esteem.
Reference: CREATIVE ARTS CAPE 1 SYLLABUS Primary 4 page 12.

LESSON PRESENTATION

TIME	PHASE	TEACHER'S ACTIVITIES	PUPIL'S ACIVITIES
05 mins	INTRODUCTORY	The teacher shall begin by singing the P.4 Term one song.	Pupils sing term one song "Stand up and clap clap."
25 mins	EXPERIENCING	-The teacher will demonstrate clapping according to the rhythm -The teacher instructs the learners to clap to the rhythm. -Allow the pupils to sing the French rhythm of what they are clapping. -Sing the song to sol-fa notes -Recites the poem of the song while they listens attentively. -Sings the song several time while they listen. -She allows them to sing together with her and withdraws slowly	-Pupils listen attentively while he teacher claps. -Pupils clap according to rhythm. -Sings the French rhythm of what they are clapping. -Sing to sol-fa notes. -Listen attentively to how the teacher is reciting. -Listen attentively to how the teacher is singing

		leaving them to sing alone and correct where there is mistake. -Allow Pupils to match French rhythm names to staff rhythm symbols.	-Sings together with the teacher and correct themselves as told by the teacher. -Pupils match the French rhythm names to staff rhythm symbols.
5 mins	SHARING	-The teacher will play the recorded piece of the song of P.4 term Two while they listen and then sings after they are instructed.	-Listen attentively to the recorded piece and sing following the rhythm of the song.
5 mins	EVALUATION	-The teacher will give simple exercise for pupils to write the staff rhythm to the sol-fa notes.	-Pupils write in their exercise books.

STRENGTH:
……
……
WEAKNESS:
……
……
WAY FORWARD:
……
……

LESSONS NOTES

French rhythm names

ta - te ta - te ta - te taa

ta - te ta - te ta - te taa

ta - te ta - te ta - te taa

ta - te ta - te ta - te ta

Staff rhythm symbols
♫ ♪

d . r : m . r : d . r : m

m . r : m . r : m . r : r

m . r : m . r : d . r : m

r . m : r . d : r . d : d

Sol-fa notes and the song

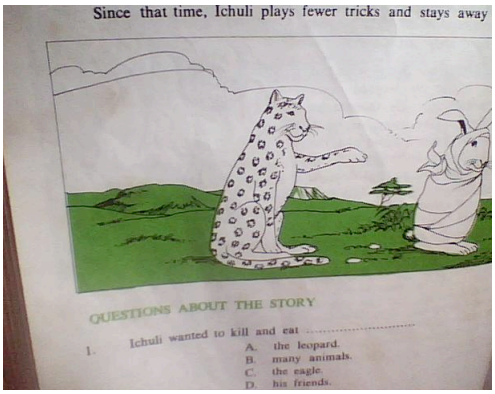
d . r : m . r : d . r : m
Mis-ter Hye-na and the Cat

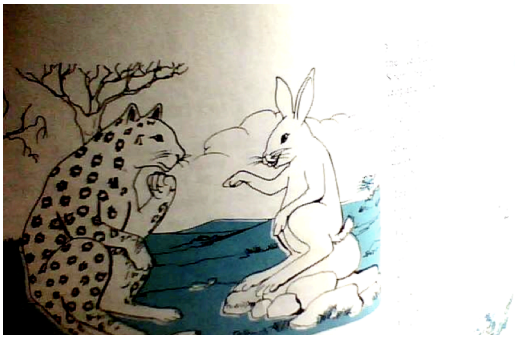
m . r : m . r : m . r : r
Had a plan to climb a hill

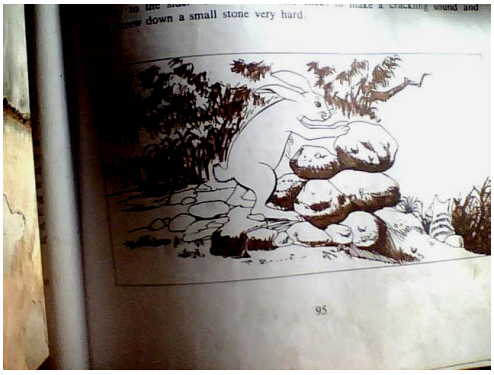
m . r : m . r : d . r : m
When the Hye-na saw the meat

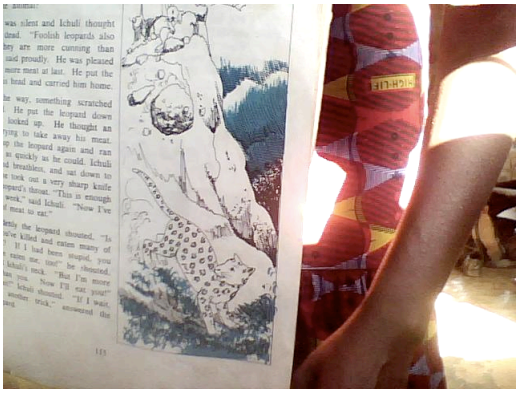
r . m : r . d : r . d : d
I feel sick he lied to cat.

[Note: the image sizes have been reduced. In the original, there was one image per page, and each page was projected onto the screen for the students]









was silent and Ichuli thought
ihead. "Foolish leopards also
hey are more cunning than
said proudly. He was pleased
more meat at last. He put the
s head and carried him home.

he way, something scratched
He put the leopard down
looked up. He thought an
ying to take away his meat.
p the leopard again and ran
as quickly as he could. Ichuli
d breathless, and sat down to
e took out a very sharp knife
opard's throat. "This is enough
week," said Ichuli. "Now I've
f meat to eat."

ddly the leopard shouted, "As
've killed and eaten many of
If I had been stupid, you
eaten me, too!" he shouted,
Ichuli's neck. "But I'm more
than you. Now I'll eat your
Ichuli shouted. "If I were
another trick," answered the
ing.

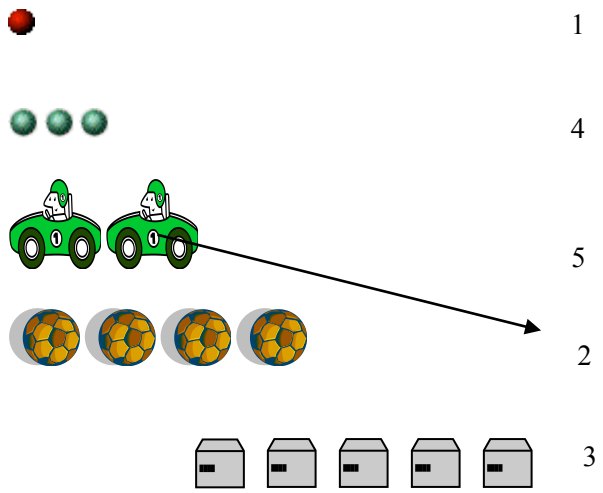
Appendix J: Bilingual Math Lesson Plan

03(a) LESSON PLAN - MATHEMATICS

DATE: 24TH MAR, 2010
CLASS: P.1
TIME: 40 MINUTES
NUMBER OF PUPILS: 50
SCHOOL: GULU PUBLIC SCHOOL
THEME: OUR HOME
SUB – THEME: DIFFERENT WORK DONE IN OUR SCHOOL

LEARNIING COMPETENCE	METHOD
Should be able to: Put objects in groups Count numbers from one to five (1 – 5) Compare objects with the numbers Match object with numbers correctly	Demonstrations Explanation

LESSON PROCEDURE

TEACHER'S ACTIVITY	LEARNER'S ACTIVITY
The teacher walks with the learners to collect difference items like balls, pens, books e.t.c. The teacher demonstrates how to put things in their groups. The teacher shows or demonstrates how to match object to numbers, for example  	Learners follow the teacher while they collect the objects Learners put objects in their different groups Learners match objects with their numbers in their exercise books.

TEACHING/LEARNING AIDS: Learners' collection.
REFERENCE: NPSCU Page 97

WEAKNESS: ……
STRENGTH: ……
WAYFORWARD: ……

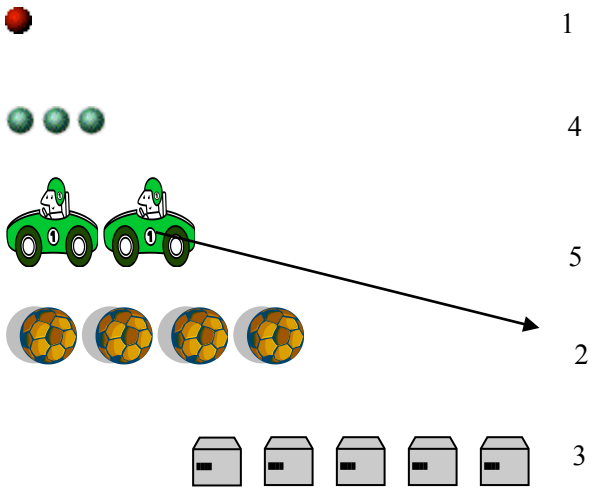
03 (b)LESSON PLAN IN LOCAL LANGUAGE(LUO)

MATHEMATICS (CURA)

NINO DWE: 24/3/2010
KILACL: P.2
CAWA: DAKIA 30
WEL LUTINO: 50
GANG KWAN: GULU PUBLIC SCHOOL
DUL MADIT: GANG KWAN WA
DUL MATIDI: TIC MA PAT PAT MA IGANG KWAN WA

TIC MA LATIN ROMO TIMO	YO ME PWONY
Keto jami I dul Kwano 1 – 5 Poro cal ki coc Coko jami	Tito Nyutu

KIT ME PWONYO NE

TIC PA LAPWONY	TIC PA LUTINO
Lapwonyu ki lutino woto ki lutino woko gin coko jami ma pat pat. Nyutu ki lutino kit me keto jami idul. Nyutu ki lutino kit me telo tol, labole  	Lutino lubu kor lapwony kun gin coko jami ma pat pat. Keto jami idul Telo tol kit ma lapwony mito.

JAMI PWONY: Jami ma lutino ocko

KANONGO NGEC: NPSCU pot kara tac 97

KAMATIME MABER: Keto jami idul.
KAMAMYERO AYUBA: Telo tol
NGO MA MYERO ATIMA: Tim one tyen ma pol mite.