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Pedagogical Appropriation of Information and Communication Technologies (ICT) by West African Educators

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Appropriation pédagogique des technologies de l'information et de la communication (TIC) par les éducateurs ouest-africains

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Abstract

This research investigates how and why educators in West Africa, in Mali in particular, pedagogically appropriate information and communication technologies (ICT) and with what effects. Appropriation involves integrating newness into one's very being and mobilizing it strategically to meet contextualized objectives, often in resistance to the status quo. It is assumed that ICT use is shaped by the values and objectives of users as well as by the local and global hierarchies of the milieus in which they are used. Qualitative research methods and interpretive approaches revealed meanings educators give to their reality and experiences. Interviews were conducted with 31 persons: 23 primary through high school teachers, six university professors, and two administrators. As educators digested ICT, it became part and parcel of their beings and everyday lives. As they adapted it to their milieus, they worked as cultural agents, mediating between ICT and society. The professors in particular expressed desires to use ICT to facilitate and enhance African participation in global debates and scholarly production and to transform how Africa and Africans are projected and perceived. Educators harnessed ICT for its transformative possibilities. The changes apparent in student-teacher relations (more interactive) and classrooms (more dialogical) suggest that ICT can be a catalyst for pedagogical change, including in document-poor contexts and ones weighed down by legacies of colonialism. Learning from the perspectives and experiences of educators pioneering the use of ICT in education in Africa can inform educational theory, practice and policy and deepen understandings of the concept of appropriation as a process of cultural change.

Key words: appropriation, pedagogy, technology, ICT, culture, primary and high school education, higher education, West Africa, Mali

Résumé

Cette recherche examine comment et pourquoi les éducateurs en Afrique de l'Ouest, au Mali en particulier, s'approprient pédagogiquement les technologies de l'information et de la communication (TIC) et avec quels effets. L'appropriation consiste à intégrer, personnellement et dans son milieu, la nouveauté et à la mobiliser de façon stratégique pour répondre aux objectifs contextualisés, souvent en résistance au statu quo. Une méthodologie qualitative et des approches interprétatives ont permis de comprendre les significations que les éducateurs donnent à leur réalité et leurs expériences. Trente-et-une personnes ont été interviewées: 23 enseignants du primaire et du secondaire, six professeurs d'université, et deux gestionnaires. Les éducateurs ont assimilé les TIC jusqu'à ce qu'elles deviennent partie intégrante de leur être et de leur vie quotidienne. En adaptant les TIC à leur milieu, ils ont travaillé comme des agents culturels, jouant le rôle d'interface entre les TIC et la société. Les professeurs, en particulier, ont exprimé leur souhait d'utiliser les TIC pour faciliter et renforcer la participation africaine aux débats mondiaux et à la production scientifique, et pour changer la perception présente et future de l'Afrique et des Africains. Les éducateurs ont embrassé les TIC pour les possibilités de transformation qu'elles offrent. Des changements apparaissent dans les rapports entre enseignants et étudiants (plus d'interactivités), dans les salles de classes (plus d'échanges) et les contenus des cours (plus actualisés et diversifiés), suggérant que les TIC peuvent avoir un rôle de catalyseur dans l'évolution des pratiques pédagogiques, y compris dans des contextes où l'accès aux documents est difficile et où l'héritage du colonialisme se fait encore sentir. Les perspectives et les expériences des éducateurs utilisant les TIC dans l'éducation en Afrique peuvent enrichir la théorie, la pratique et la politique éducatives et permettre d'avoir une meilleure compréhension du concept d'appropriation comme processus de changement culturel.

Mots clés : appropriation, pédagogie, technologies, TIC, culture, éducation, école primaire, lycée, enseignement supérieur, Afrique de l'Ouest, Mali

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Acronyms and Abbreviations

ADEA	Association for the Development of Education in Africa / *Association pour le développement de l'éducation en Afrique*
AGETIC	*Agence des technologies de l'information et de la communication* (Mali)
AIMS	African Institute for Mathematical Sciences
AUF	*Agence universitaire de la Francophonie*
AVU / UVA	African Virtual University / *Université virtuelle africaine*
BECTA	British Educational Communications and Technology Agency
CACTIC	*Coordination des associations et clubs TIC* (Mali)
CARET	Center for Applied Research in Educational Technology
CODESRIA	Council for the development of Social Science Research in Africa / *Conseil pour le développement de la recherche en sciences sociales en Afrique*
CRIFPE	*Centre de recherche interuniversitaire sur la formation et la profession enseignante*
CRDI	*Centre de recherches pour le développement international* (see IDRC)
CREM	Resource Center for Media Education
EMIS	Educational Management Information System
ENSup	*Ecole normale supérieure*
ERNWACA	Educational Research Network for West and Central Africa (see ROCARE)
FESP	Faculty of Graduate and Postdoctoral Studies (University of Montreal)
ICT(s)	information and communication technologies (see TIC)
IDRC	International Development Research Center (see CRDI)
IFM	*Instituts de formation de maitres*
ITU	International Telecommunications Union
IWB	interactive whiteboard
MEALN	*Ministère de l'Education, de l'alphabétisation et des langues nationales (Mali)*
NRENs	National research and education networks
NTIC	*nouvelles technologies de l'information et de la communication*
OECD	Organisation for Economic Cooperation and Development

PanAf	Panafrican research agenda on the pedagogical integration of ICT
PhD	*Philosophiae Doctor* (doctor of philosophy)
PISA	Programme for International Student Assessment
PRODEC	*Programme décennal de développement de l'éducation* (Mali)
QDA	qualitative data analysis
ROCARE	*Réseau ouest et centre africain de recherche en éducation* (see ERNWACA)
SAC	*Société africaine de culture*
TechNa	ICT in Education Initiative (Namibia)
TIC(s)	*technologies de l'information et de la communication* (see ICT)
UCAD	Cheikh Anta Diop University of Dakar / *Université Cheikh Anta Diop de Dakar*
UEMOA	*Union économique et monétaire ouest-africaine* (see WAEMU)
UNISA	University of South Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization / *Organisation des Nations unies pour l'éducation, la science et la culture*
USAID	*Agence américaine pour le développement international* / United States Agency for International Development
WACREN	West and Central African Research and Education Network
WAEMU	West African Economic and Monetary Union or in French (see UEMOA)
WSIS	World Summit on the Information Society

Dedicated to Alioune Camara, 1951-2014,
without whom this research would not have been possible.
Alioune Camara was well known for his enthusiastic and efficacious promotion of education in Africa and provided an inspiring example of lifelong learning. Through his work at the International Development Research Center (IDRC), he warmly and innovatively supported and mentored young people, teachers and researchers across the continent.
May his soul rest in peace.

And to teachers, who exercise one of the noblest professions in our world.

Ouvrage dédié à Alioune Camara, 1951-2014,
sans lequel cette recherche n'aurait pas été possible.
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Introduction

Teachers are at the heart of pedagogic activity in schools and universities and even in society in general. During changing times, they play a role in interfacing between innovations and learning processes. With the arrival of computers, internet and other information and communication technologies (ICT) in African schools and universities in the 1990s, teachers began grappling with how to integrate them, or not, into pedagogical practices (ROCARE, 2006). In the absence of national policies on ICT in education, individual teachers and certain schools were at the forefront of experimenting with ICT in teaching and learning, adapting it to their needs and aspirations, and shaping how these innovations would be used in a pedagogical context.

Along with other researchers (i.e. Karsenti & Collin, 2013), we identified the need to better understand the experiences of such pioneering educators in order to inform emerging educational policy and practice and current theory on the integration of ICT in education. We thus undertook research in West Africa to understand, from the perspective of educators, how and why they appropriate ICT and, according to them, changes that ensue in the process. The interpretive analysis is developed from what educators shared with us regarding their use of ICT in teaching and learning and remains to be verified by observation and interviews with learners.

When educators use ICT for pedagogical purposes, they exert their agency and invest their beliefs and values in the appropriation process. They shape ICT and are shaped by it. Appropriation is not mastery (Lund, 2009) of a new technology; it is making newness part and parcel of self and society (Bakhtin, 1981; Hountondji, 2002). The concept of appropriation has been used in social science research to understand how people and organizations engage with new technologies (Jouët, 2000; Lohento, 2003; Olsson, 2008; Phillippi & Peña, 2010). In Europe and North America, it has been used to understand how educators integrate ICT into teaching and learning (Laffey, 2004; Lund, 2009). In Africa, it has been used in studying how Africans borrow from various traditions to blend approaches and propose new cultural options (Nyamnjoh, Durham, & Fokwang, 2002; van Binsbergen, 2004). However, the concept had been little employed within the context of African educational systems. This research thus

offers a unique lens for comprehending the integration of ICT into teaching and learning processes in schools and universities in Africa. Rather than relating to ICT merely as technology tools, we consider them as cultural innovations being mobilized in specific historical, sociocultural and pedagogical contexts. It is in this way that the significance of ICT in African education and its effects on educational and cultural transformation can be better understood.

This theoretical approach accounts for human ingenuity in confronting complexities and contradictions, and for the non-linearity of constantly adapting the new to achieve contextualized needs and aspirations. It encompasses the themes of colonial legacies, learning from cultural encounters, and drawing from past and present to renew culture and create the future, in contexts in which responsibility for the education of youth is a shared one. It draws on African-inspired understandings of appropriation, learning and development. Our research is presented to contribute to literature on how humans shape and are shaped by cultural innovations such as ICT, in interaction with each other in society. It explores how the process involves conversation (Ela, 2006; Hassoun & Wong, 2012), creative combinations (Dei, 2002a, Fonlon, 2010, 2012), border crossing (Akkerman & Bakker, 2011, Giroux, 1992, 2005), socio-constructive teaching and learning (Bruner, 1996; Obanya, 2012a, 2014), and cultural work (Appadurai, 2013; Ki-Zerbo, 2010a&b, Niane, 1974; Wexler, 1981; Zakhartchouk, 2005).

Chapter 1 of this thesis discusses the need for pedagogies that facilitate active, engaged learning and provide opportunities to rethink and remix cultures and identities in a globalizing world. It describes the proliferation of ICT in African societies and classrooms, and suggests that ICT may embody the potential to promote more open and flexible pedagogies. It reviews literature on the effects of ICT on teaching and learning, and concludes by presenting the general research objective of understanding how and why West African educators appropriate ICT, and with what effects.

Chapter 2 presents the concept of appropriation as a lens through which to understand educators' use of ICT. Appropriation involves integrating newness into one's very being and one's culture and mobilizing it strategically to meet contextualized objectives, often in resistance to the status quo (Bakhtin, 1981; Jouët, 2000; Lund, 2009; Michiels & Crowder, 2001; Nyamnjoh, Durham, & Fokwang, 2002; Surman & Reilly, 2003; Toure, 2009). Because

we consider education a socio-constructive process, we also present aspects of socio-constructive educational theory (Bruner, 1996; Obanya, 2012a, 2014; Vygotsky, 1978).

Chapter 3 justifies the use of a qualitative research methodology and interpretive approaches to understand the meaning educators give to their reality and experiences (Bernard, 2006; Karsenti & Savoie-Zajc, 2011; Thomas, 2013; Wertz et al., 2011) and thick description (Geertz, 1973), which is used to analyze and share them. It profiles the 31 interviewees: 23 primary and high school teachers, 6 university professors, and 2 administrators.

Chapter 4 presents the subsequent three chapters, which are the heart of the thesis and in which the research results are presented and discussed. Chapter 5 addresses the first research objective: to understand how and why primary through high school teachers in Mali appropriate ICT in their teaching, and what changes occur during that process. Chapter 6 addresses the second research objective: to explore the ICT appropriation process as teachers interact with others outside the classroom. Chapter 7 addresses the third research objective: to understand why West African university professors pedagogically appropriate ICT.

Finally, in Chapter 8, we review the research results presented in each of the three previous chapters and in relation to the three research objectives. We then conclude with an explanation of changes that are evident at multiple levels (Nasir & Hand, 2006; Rogoff, 1995) – from the classroom, to the community and to the wider world – with the pedagogical appropriation of ICT in the West African contexts in which the research took place. We mention the strengths and limitations of our research process, present recommendations for educational policy reform and practice, and propose ideas for future research.

Through this study, we hope to communicate the innovativeness of the educators we interviewed, their role in the revitalization of education and culture in West Africa, and the intricacy of the unending process of appropriating ICT in teaching and learning.

CHAPTER 1. Problem

Education is life itself.
- John Dewey

Quoiqu'on dise, elle est debout notre Afrique! Elle se lève avec force, portée par le vent de l'aube nouvelle du destin de notre commune espèce. Notre devoir est de tout faire pour être présents à chaque rendez-vous du monde et de ses hommes, à ce départ nouveau qui se prépare de notre commune humanité. La bonne place de l'Afrique y fut toujours présente. De plus en plus, avec le concours de ses fils, elle imposera sa personnalité industrieuse aux autres continents et à leurs peuples!
- Boubou Hama

1.1 Introduction

This dissertation investigates the pedagogical appropriation of information and communication technologies (ICT), mainly computers and internet, by primary and high school teachers in Mali and six professors in Mali and other West African countries. It looks into how these educators use ICT to shape teaching and learning and also how they are shaped by the process. Two central themes of the investigation, therefore, are pedagogical practices and the use of information and communication technologies in education. We consider and relate to both as sociocultural processes. We will begin this chapter by arguing that West African youth need pedagogies that prepare them to confidently embrace their futures and fruitfully transform society and also by suggesting that ICT may have a role to play in the process. We will then, in subsequent sections of this chapter, review how ICT is being introduced into African societies and education systems, with a particular focus on Mali in West Africa, and review literature on the effects of ICT on teaching and learning, before presenting the research questions and objectives.

1.2 What pedagogies for the times?

Pedagogy is learning and teaching in and out of school, a process in which teachers are learners and learners also teach. Pedagogical approaches evolve and respond to historical and sociocultural realities. Rapid changes and innovations within society require new teaching paradigms. Electronic technologies and the proliferation of multiple stories and open forms of interaction have altered the pedagogical context (Giroux, 1994). "There is a pressing need to

reconceptualize and restructure our educational enterprise so as to confront the [...] challenges of this millennium" (Tchombe, 2006, p. 16). The changes and challenges of the millennium require responsive education systems and pedagogies that help make youth capable of "continuous self-improvement" and "the continuous regeneration of Society" (Obanya, 2012a, p. 23). Education should make people more fully human (Bruner, 1996; Fonlon, 2009), as should the use of technology (Fonlon, 2009). Tools of the millennium such as ICT can be used to instill in learners social responsibility, openness to others, autonomy, creativity, critical spirit, and cooperation (Depover, Karsenti, & Komis, 2007; Fonkoua, 2006).

In societies full of multiple narratives, as is the case across Africa due to cultural diversity, centuries of cultural encounters and globalization, new literacies need to include expanded understanding in which learners "experience and define what it means to be cultural producers capable of both reading different texts and producing them, of moving in and out of theoretical discourses but never losing sight of the need to theorize for themselves" (Giroux, 1999, pp. 110-111). Obanya (2012b) calls for all around development and "widening of students' horizons" through learning that promotes culture, creativity, community engagement, and character development and integrates spiritual concerns and entrepreneurial activities (p. 3). Fonlon (2009) insists that students should thirst for knowledge and through university studies learn to "dig to the proximate and the deep-most roots" of problems, to question, doubt, search, and inquire methodically, systematically (p. 86). All this requires understanding how power and authority operate in cultural apparatuses, such as schools and universities. Educators and students need to know how to problematize social issues and understand media production and consumption. They need to know how to dialogue, analyze discourse and assume authority responsibly. They need to know how to realize life and community projects (Organization of Black Communities of the Pacific Coast of Colombia, cited in Escobar, 1995, p. 212).

In a rereading of Paulo Freire, Giroux (2010) referred to pedagogy as "critical cultural practice" and a "project of individual and social transformation" (p. 338). Darder (1991) explained the need for critical pedagogy that accounts for power relations in sociocultural and historical context and opens possibilities for societal transformation:

> *Unlike traditional perspectives of education that claim to be neutral and apolitical, critical pedagogy views all education theory as intimately linked to ideologies shaped by power, politics, history and culture. Given this view, schooling functions as a terrain of ongoing struggle over what will be accepted as legitimate knowledge and culture. In accordance with this notion, a critical pedagogy must seriously address the concept of cultural politics by both legitimizing and challenging cultural experiences that comprise the histories and social realities that in turn comprise the forms and boundaries that give meaning to student lives. (p. 77)*

In contexts in which colonial education has been used to try to shape African identity and in some cases eradicate Africaness in favor of western mindsets, personalities and values, pedagogy should create opportunities to rethink and remix cultures and identities. Destabilizing dominate modes of knowing can be liberating in that it opens spaces for creative restructuring and also diminishes violent forms of translation (Escobar, 1995).

Life and culture do not come in a box, nor are they set in concrete; rather they are in flux. Shaping culture requires the ability to negotiate and renegotiate boundaries and identities, relations and realities, personalities and positionalities. Needed are diverse and perhaps new, or at least blended, pedagogical approaches, inspired from multiple cultural traditions – to inspire and cultivate flexible thinking and praxis. Information and communication technologies (ICT) are purported to hold promise for the development and application of pedagogies that are flexible and adaptable and account for complexity and plurality: "*Les TIC*[1] *offrent les compétences nécessaires dans le vécu de la* complexité*, de la* pluralité *et de la* diversité" (Fonkoua, 2006, p. 233).

African pedagogues and scholars (Fonlon, 2009; Obanya, 2012a, 2012b, 2014; Tchombe, 2006) call for pedagogies that prepare youth to contribute fruitfully to the continuous regeneration of society in a world of change. Critical pedagogues and theorists (Darder, 1991; Freire, 1970/2014; Giroux, 1994, 1999, 2005) do not see schooling as neutral but shaped by history and culture and relationships of authority and power and call for pedagogies that illuminate these relationships – of dominance and subordination, of legitimacy and illegitimacy, of inclusion and exclusion – and empower learners to question and rework them. Schooling needs to problematize media and consumption and their effects, power and its exercise, and the production of goods, services, and ideas, while cultivating intellectual agility and community engagement. Individual and societal itineraries are fluid rather than linear, and

[1] TIC: technologies de l'information et de la communication (TIC in French is the same as ICT in English)

this calls for more open-ended pedagogies, ones that do not merely seek to instill knowledge but to prepare young people to position and project themselves and to shape flexible futures in a world of possibilities and uncertainties. Teaching and learning that enables the pursuit of self-realization and of societal aspirations makes for a richer world in which plurality is encouraged rather than suppressed. As Fonkoua (2006) contends, ICT may be important in the development and application of the pedagogies needed today in Africa and beyond, to prepare youth to contribute fruitfully to the continuous regeneration of society in a world of change. It is with this assumption in mind that we begin this investigation into the pedagogical appropriation of ICT by educators in West Africa.

1.3 Proliferation of ICT in Africa and in education in Africa

In 1996, only five African countries were connected to internet, but five years later almost all 50 plus countries were connected and, with liberalization of the telecommunications sector, there were already 450 internet service providers. An estimated 27% of Africans use internet, compared to 45% worldwide, however penetration rates are estimated to be as high as 40% in Nigeria.[2] ICT use is spreading in Africa, into the everyday lives of urban dwellers, especially of young people. "*Il peut se vérifier de plus en plus que les TIC sont le quotidien des jeunes*" (Fonkoua & Amougou, 2006, p. 176). Meanwhile, access for rural dwellers remains a challenge, as discussed at the annual internet festival in West Africa's Mali in 2014: "*Internet est devenue le quotidien du citadin tandis qu'en milieu rural pour avoir accès à internet, il faut fournir beaucoup d'effort souvent.*"[3] Malian school children are known at times to use lunch money to pay for internet time at cybercafés or cyber centers, and Kenyans are known to sacrifice food to buy minutes for their mobile phones, where, according to a man on the street, "life would definitely come to a stop" without his cell phone.[4] The use of ICT is associated with the "cheetah" generation, characterized as younger, swifter and more entrepreneurial and impatient with poor leadership than the preceding "hippo" generation.[5]

[2] 2014 statistics from www.internetworldstats.com/stats1.htm
[3] Sanogo, F. (2014). *L'AGETIC et son partenaire l'AMISTIC lancent la fête de l'internet 2014*. www.mali-ntic.com/index.php/annonces/54-blogs/general14/879-l-agetic-et-son-partenaire-cactic-lance-la-fete-de-l-internet-2014
[4] See www.pbs.org/newshour/bb/mobile-phone-usage-explodes-africa-spurring-innovation
[5] See 2011 interview with George Ayittey, economist and author of *Africa Unchained* (2006), at www.youtube.com/watch?v=m59po7GlMwc&app=desktop

ICT has changed everyday habits of interacting with others, learning, producing and sharing knowledge, and even ways of being and becoming.

Governments take part in discussions regarding the adaptation of ICT to African needs and look to it to facilitate decentralized governance and developments in other sectors. In landlocked Mali, the government aspires since 2000 to connect its 703 communes to internet. It hosted in its capital city, Bamako, continental meetings: Bamako 2000 on "Internet: Bridges to Development" and Bamako 2002 on what the information society offers to Africa and what Africa brings to the information society (Bamako 2002 Declaration, 2003). Under the leadership of former minister of education Adama Samassékou, Mali played key roles in preparing the 2003 World Summit on the Information Society (WSIS) in Geneva and the 2005 Summit in Tunis. A ministry for communication and information technologies, created in 2002,[6] developed the national ICT policy (République du Mali, 2004) and lobbied for a decree eliminating tariffs on the importation of computer equipment – taxed at 67% – which was passed and operationalized by 2005. A monthly television show, CyberNTIC, reviews initiatives related to the use of ICT in Malian society, and the MaliNTIC website[7] reports on ICT developments in Mali. Mali's Hamadoun Touré, elected as head of the International Telecommunications Union[8] for 2007-2010 and 2011-2014, has met with leaders around the world to promote broadband connectivity in developing countries, gender equality in broadband access, and broadband to transform educational landscapes and empower youth.

With regard to telecommunications training and ICT in education, Dakar, Senegal hosts a telecommunications school,[9] which became a WAEMU[10] regional center of excellence. The African Virtual University (AVU), headquartered in Nairobi, Kenya, used to propose other universities' content through African universities but now works with African academics and pedagogues to develop and offer courses online, from biology and chemistry to education and renewable energy. National research and education networks (NRENs) have been created in countries across the continent to facilitate the interconnection of educational institutions and

[6] and later renamed the Ministry of the digital economy, of information and of communication
[7] See www.mali-ntic.org
[8] The International Telecommunications Union is the United Nations specialized agency for information and communication technologies (ICTs).
[9] See www.esmt.sn
[10] WAEMU: West African Economic and Monetary Union, or, in French, *Union économique et monétaire ouest-africaine* (UEMOA)

the sharing and reduction of internet bandwidth costs. In East and southern Africa, these networks interconnected and allied as the UbuntuNet Alliance, and in West and Central Africa as the West and Central African Research and Education Network (WACREN), which is soon to connect to the pan-European research and education network, GÉANT.[11] Educational Management Information Systems (EMISs) in African countries have adopted web-based tools to share lessons across countries and improve recordkeeping for evidence-based policy and planning, if not yet at decentralized levels such as schools and districts (Yonazi, Kelly, Halewood, & Blackman, 2012). These developments in internetworking, training in ICT, and digital content development by African pedagogues and the increasing interest in and use of ICT in the management of education show how ICT is becoming institutionalized in the education sector.

Computers and internet are making their way into schools and universities in Africa and being lauded and inspected by educators and students as well as parents. It was estimated that 17% of West and Central African teachers using ICT at school were using it to teach their subjects (Karsenti & Tchaméni-Ngamo, 2007). Some teachers make personal decisions to experiment ICT and integrate it into their teaching, whereas others are reluctant and even fearful of learning ICT and of the effect on their subject area (John & La Velle, 2004). Some university professors have made their course materials available online. Students increasingly use computers and internet to access and produce information in relation to their courses, opening up the curriculum to knowledge outside textbooks. Programs such as the Global Teenager Project link students with peers in other countries on and off the continent. Some teachers or schools set up on their own electronic correspondence with schools in other countries (ROCARE, 2006). As a teacher at a high school in Senegal explains, ICT is becoming a part of everyday life and of teaching and learning:

> *L'ordinateur est un média et les élèves l'ont socialisé. Voilà pourquoi on doit même plus parler de nouvelles technologies, ce n'est plus une nouvelle technologie pour les élèves, ça fait partie de leur vécu. On ne peut pas faire l'enseignement, l'apprentissage sans partir du vécu des élèves. (from transcripts of ERNWACA[12] research, for ROCARE, 2006)*

[11] See online interviews with Boubakar Barry, WACREN Chief Executive Officer since October 2013, and minutes of the first WACREN Board meeting in October 2013 via skype: www.wacren.net/content/documents

[12] ERNWACA = Educational Research for West and Central Africa, or, in French, *Réseau oust et centre africain de recherche in éducation* (ROCARE)

Parents are inquisitive, wary, and supportive. Newly literate mothers in Bamako, Mali have been known to use the computer to type poems and proverbs in the commonly spoken Bambara language for their children in preschool. Parents are often willing to contribute funds beyond regular school fees to help finance ICT and seem to think ICT use is related to more easily continuing studies and/or integrating the job market.

School directors, especially those that have traveled abroad, have been a key factor in some schools acquiring computers. Even in schools without computers, however, some teachers, that learned ICT during university studies or on their own, have taken the initiative to use ICT in teaching and learning. They access computers at cybercafés and also send their students to cybercafés to conduct searches on the World Wide Web (Web for short) for information related to their courses. Computers are more abundant in private schools, with one study of 87 schools in ten African countries (Hafkin, 2011) showing an overall computer to student ratio of 1 to 43 in private schools with computers versus 1 to 137 in public schools with computers; the percentage of computers connected to internet was also higher in private schools, at 68%, compared to 47% at public schools. However, all public high schools in Mali (Cissé & Maïga, 2007) and Senegal have a computer lab connected to internet, with all public high school students in Senegal possess email addresses. In Cameroon, 15% to 100% of secondary school students – depending on age, socioeconomic background, level of education, and beliefs – in well connected schools have email addresses, and 50% to 75% go to cybercafés (Tchombe, 2006).

Though computers are increasingly present in and being used in schools, their introduction into teacher training programs, especially in Mali, is limited. Teacher training institutes in Africa are slow to integrate ICT into training of new and in-service teachers (Cossa & Cronje, 2004; Matchinda, 2006). Pedagogical change, however, is on the horizon and thus the need to prepare teachers to enter a virtual world, question and evolve the ways they work, and accompany sociocultural change (Fonkoua, 2006; Fonkoua & Amougou, 2006). Fonkoua (2006), in pleading for the inclusion of *ticelogie* or the science of ICT integration in teacher training programs, argues that discussing didactical challenges related to ICT throughout training constantly draws the attention of educationalists to new roles they will be called to play and new learning methods they will need to employ throughout their careers.

Though quality training in ICT supports teachers in all aspects of teaching (Barry, 2011), including the evolution of their pedagogical styles, making it a reality is a huge challenge. Cissé and Maïga (2006) describe how the 15 teacher training institutes across Mali – where primary school (grades 1 through 9) teachers are trained – seem rather indifferent and impervious to the integration of ICT, even when it is already being used by in-service teachers in some schools in the country.

> *Dans la formation dans des IFM [Instituts de formation de maitres), ces technologies ne sont pas prises en compte alors même qu'on assiste à leur intégration effective dans la majorité des écoles surtout privées et même dans quelques écoles publiques par le biais de coopération (p. 50).*

Mali's *Ecole normale supérieure* (ENSup), created in 1961 and responsible for training high school teachers and pedagogical advisors, has a computer lab with some internet connectivity and provides some training in ICT, but instructors are slow to integrate ICT into their teaching. The school is collaborating, however, with the African Virtual University to begin open and distance education.

The faculty of education at Cheikh Anta Diop University of Dakar (UCAD) uses internet in distance education for the first years of initial teacher training. The University of Education, Winneba, in Ghana, building on its legacy of correspondence education and regional study centers throughout country, has integrated ICT into its distance education programs in areas such as automotive technology, electronics, fashion and textile design, and catering and hospitality. The University of South Africa (UNISA) – where former South African president Nelson Mandela studied while incarcerated during apartheid – is Africa's largest distance education institution, with 350 000 students. With the opening of its division of external studies in the 1940's, it developed correspondence programs, and in the 1970's used radio, audio and video cassettes to further bridge distances between the university and its students; in 2005 it fully integrated open and distance learning using ICT.[13]

In Mali, a University was founded in 1996. Enrolment went from 20 000 to 70 000 students in just 15 years. The first computer lab was inaugurated by the *Agence universitaire de la Francophonie* (AUF) on the main campus in 2000. Faculty at the school of medicine (on a separate campus) use ICT extensively to collaborate with colleagues abroad and advance

[13] See www.unisa.ac.za/140/index.php/unisa-history-timeline

their research agendas (Vittin, 2002). Faculty at the University of Cocody in Abidjan are also exploring the benefits of ICT to diffuse their ideas and develop their career networks, more so than to experiment ICT in their teaching (Bahi, 2006), as is the case for faculty in Ghana (Adika, 2003) and Nigeria (Ahmad & Usman, 2013) and even outside Africa (see Hadagali & Kumbar, 2011, regarding India, and Al-Ansari, 2006, regarding Kuwait).

In addition to the perceived benefits of the integration of ICT in education and research, opportunities for technological and cultural imperialism loom on the horizon (Fonkoua, 2006). The ICT integration process can breed dependency – dependency for example on foreign sources of content and outside expertise. As the learning curve is high, especially during the initial phases of establishing access to internet, and there is limited government support for the integration of ICT, schools can lose important sums of money to external partners not particularly preoccupied with contributing to the conditions for autonomy (ROCARE, 2006). Researchers warn of dependency on foreign experts, especially when certain technical specifications are not released to end users (Tchombe, 2006). Tendencies toward centralization and concentration of control among technicians can disempower school-based personnel trying to use ICT in teaching and learning. In South Africa, central educational authorities, rather than train and trust school staff, technically limited access to school-based computer systems, breeding dependency and ultimately dysfunction when central authorities could not be reached in a timely manner to technically assist.[14] Some partners, like SchoolNet Africa (see SchoolNet Africa, 2004) and WorldLinks, have tried to contribute to training and autonomy after an initial acquisition of computers, and some schools have been successful in replacing computers several years down the road through support from parents and the broader community and by allocating part of the school's recurring budget for maintenance and connectivity.

ICT brings new opportunities and challenges with respect to public-private partnerships, which require policy frameworks and proactive management. Multinational companies like Cisco Systems and Intel partner through African governments with African schools and companies to teach networking and promote their technology products and solutions. Whereas the *Agence universitaire de la Francophonie* (AUF) and the African

[14] 2005 field notes, for ROCARE (2006); see also PanAf Edu newsletters (2007-2011) in the "ICT in Education (PanAf Project)" folder at www.ernwaca.org/biblio/opac_css

Institute for Mathematical Sciences (AIMS) promote the use of open source software in university communities, Microsoft sponsors scholarships, computer training and small business development as part of efforts to penetrate African markets. And Samsung is funding solar-powered mobile internet schools, hoping to reach half a million learners by 2015.[15]

Some schools make special efforts to encourage the use of ICT by their pedagogical staff, but ICT integration into West African education systems more generally is nascent. Namibia, a forerunner in ICT in education, through a highly participatory and intersectorial approach was able to develop and launch in 2007 TechNa, Namibia's ICT in Education Initiative, – a well coordinated approach to the integration of ICT in educational institutions in the country. In Mali, when the education reform, PRODEC,[16] was voted in 1998, ICT was in its infant stages in the country, but government educational authorities recognize the need to adapt the curriculum to account for cultural and technological evolution: "*Le nouveau curriculum sera adapté au développement de l'enfant, à l'évolution du milieu. Il respectera et intégrera les valeurs sociales, morales et culturelles maliennes tout en assurant l'ouverture sur la civilisation universelle et la technologie moderne*" (République du Mali, 2001, p. 25). Though the education sector is prioritized in Mali's national ICT policy (République du Mali, 2004), it takes time, effort and resources to make it a reality. "*Bien que dans la politique nationale sur les TIC l'éducation soit un axe prioritaire, rien n'est entrepris pour que cela devienne réalité*" (Cissé & Maïga, 2006, p. 50).

The Malian government, in collaboration with development partners, orders and receives containers of computers and dispatches them across the country, in the absence of a clear policy for the integration of ICT in teaching and learning and without systematic training for those expected to use the tools in education. One technical school administrator explained that it is easier to get 20 new computers than to get a UPS[17] repaired.[18] The *Agence des technologies de l'information et de la communication* (AGETIC), part of the ministry of communication and information technologies, was mandated to introduce computers and

[15] www.biztechafrica.com/article/samsung-targets-5m-solar-school-project/4425
[16] PRODEC: *Programme décennal de développement de l'éducation*; it is the law put in place, for 1998-2008, to reflect the second reform of the education system in Mali.
[17] UPS: uninterruptible power supply
[18] 2005 field notes, for ROCARE (2006)

internet into selected schools, but educationalists questioned the agency's ability to provide appropriate pedagogical training.

In summary, ICT is increasingly being used in relation to academic activities in primary and secondary schools – particularly in urban areas – and in African universities (Bahi, 2006; Fonkoua, 2006; Essono & Essono, 2006; Fonkoua & Amougou, 2006; Hafkin, 2011; Matchinda, 2006; Mbangwana & Mambeh, 2006; Tchombe, 2006). While computers in schools and universities, in Mali in particular and West Africa in general, is new for some educators and students and less so for others, there is no denying a burgeoning use of ICT for educational purposes. In spite of the all challenges, such as lack of computers in every school and of training in the use of ICT in education for all teachers, some teachers persist in the use of ICT in teaching and learning, and we would like to understand why they do so and how they go about it. The situation has indeed evolved from one of pure experimentation to more systemic integration of ICT, with the emergence of national and regional networks of interconnectivity, national policies and bi-, multi- and international partnerships (Farrell & Isaacs, 2007).

Teachers use ICT in their teaching, including to mobilize opportunities for their students, for example by facilitating student correspondence via internet with peers in others countries. Some professors have put their courses online, university departments have developed distance education programs using internet, and universities and schools are learning how to leverage computer laboratories, cyber centers and cybercafés, Governments, even in the midst of the daily challenges of running education systems, have developed ICT and/or ICT in education policies. In Mali, where not even half of students complete grade 9 so as to be able to continue to high school (République du Mali, 2011),[19] all public high schools have been connected to internet, while ICT makes its way much more slowly into teacher training schools and institutes. Interest in using ICT in teaching and learning varies. ICT is being harnessed in the hopes of making education better for learners and society, while mitigating risks like dependency and cultural imperialism (Toure, Diarra, Karsenti, & Tchaméni-Ngamo, 2008). Educators and education administrators and policymakers are also increasingly aware of the risks of not engaging with ICT. Pioneering teachers, professors, and

[19] See additional statistics on primary and secondary education in Mali in Annex A.

school directors admit they are experimenting with very little guidance and could advance more effectively with documentation on promising practices and more interaction with others.

Recommendations from research on the integration of ICT in education in Africa include national policy development and support for access and integration; teacher initiative, involvement and training; development of content; and the proactive management of partnerships beneficial to learners and their communities.[20] Researchers also call for work on the theoretical framework for the integration of ICT in education in Africa so as to advance reflection and support practitioners and policymakers in meaningful integration with widespread impact for educational reform and quality (Tchombe, 2006).

1.4 Effects of ICT use in teaching and learning

Knowing the effects of ICT on teaching and learning can be difficult because ICT is only one element in a learning environment. It is embedded in rather than isolated from the learning process (Newhouse, 2002). It is one of many supports or strategies employed to enhance teaching and learning. The use of ICT in teaching and learning can be as simple as typing a text or downloading maps for a geography class and as complex as graphing statistical relationships on a spreadsheet or working collaboratively across national and linguistic borders to prepare a multimedia presentation. How can such diverse activities have similar outcomes? "And how do you aggregate those outcomes into a measure of impact?" (BECTA, 2002b, p. 3). And how do you know the particular role and contribution of ICT, when similar activities can be conducted using other media? Ultimately, it is not the fact that technology is used in teaching that makes the difference but the *way* in which it is used (Balanskat, Blamire, & Kefala, 2006; BECTA, 2002a, 2002b; Karsenti, 2003a, 2003b).

Despite the difficulties in assessing the effects of ICT in education, in this section we begin with a word about the power of ICT when combined with socio-constructive pedagogies and proceed to review literature on the effects of ICT first on learning and then on teaching. We then mention some of the conditions for ICT to positively affect teaching and learning before saying a few words about the studies reviewed and summarizing.

[20] See, from 2003-2012 PanAf project research in a dozen countries, recommendations for teachers, teacher trainers, school directors and other education administrators, and for policy makers: www.africaict.org/documents.php

1.4.1 ICT for socio-constructivist pedagogies

For Nigerian physicist Abdou Moumouni and American philosopher John Dewey, education is a lifelong process intimately connected with social life and building on values and skills learned in family life (Dewey, 1897, 1956/1990; Moumouni, 1964/1998; Ziniewicz, 1999). Both scholars consider education as a collective, community responsibility. Communication plays a key role in education, whether in proverbs, stories, legends, discussions (Moumouni, 1964/1998) or conversation in public, and education is a means of personal and social growth (Ziniewicz, 1999).

Growing out of these views of education, Newhouse (2002), in conducting a literature review on the impact of ICT on learning and teaching, frames discussions with a socio-constructivist view of education, as theorized by psychologists such as Vygotsky and Bruner. These authors concur that knowledge is constructed from personal sets of meanings as people interact in their milieus, develop explicative frameworks and negotiate future interactions (Newhouse, 2002). Constructivist learning can be characterized by an inquiry method of instruction and activities such as making predictions, more experimentation than pure verification, discussion of ideas with both the teacher and other students, working in small groups, actively observing, inquiring, discussing, applying, and learning by doing (Bruner, 1996). Students spend time developing ideas themselves and constructing new knowledge in relation to prior knowledge. They are active, and the teacher is more of a coach or a facilitator (Depover, Karsenti, & Komis, 2007; Obanya, 2012a, 2014). See also Kanselaar, 2002; Kanselaar, de Jong, Andriessen, & Goodyear, 2000).

Students as well as teachers struggle with such pedagogy. “Students often want the right answer presented to them rather than have to struggle through the elicitation and development activities” (Huffman, Goldberg, & Michlin, 2003, p. 159). Ultimately, however, both teachers and students will say that socio-constructive learning motivates students, helps them think more, and improves learning as witnessed by higher gains in student understanding of concepts, when compared to the use of traditional didactic methods (Huffman et al., 2003). Authors such as Newhouse (2002) argue that use of ICT can help support such learning and keep it learner and community centered. We will consider the effects of ICT on learning and

teaching from a perspective of socio-constructivist pedagogies, in which learning is an ongoing developmental process.

1.4.2 Effects of ICT on learning

In looking at the effects of ICT on learning, we will consider three dimensions: (1) ICT and academic results, (2) ICT and complex cognitive operations, (3) motivation, attitude and interest of students.

1.4.2.1 ICT and academic results

A 1999-2002 study by the British Educational Communications and Technology Agency (BECTA)[21] on ICT impact in 60 schools in the United Kingdom (UK) showed that while there is no direct link between computer use and student attainment, there is evidence that "ICT can exert a positive influence on learning though the amount may vary from subject to subject"; it is the type of use that matters (BECTA, 2002a, p. 4). Findings from 1998-2001 studies of schools in Silicon Valley in the United States of America (USA) and Silicon Glen in Scotland, however, showed no clear and substantial evidence of students increasing their academic achievement as a result of using ICT (Conlon & Simpson, 2003).

The European Schoolnet's[22] ICT Impact Report (Balanskat, Blamire, & Kefala, 2006), which reviewed 17 multi-year impact studies and surveys, showed that pupils, teachers and parents consider ICT to have a positive impact on learning, including higher attainment on national tests, particularly in English, science, and design and technology. The report reviewed the 2006 OECD[23] analysis of the 2003 PISA[24] study of student performance in math, showing an "association between the length of time students have been using computers and their performance" in mathematics; for example students that had used computers for more than five years performed better (Balanskat, Blamire, & Kefala, 2006, p. 27). This finding is not causal but relational.

[21] BECTA was established in 1998 and disbanded in 2011.
[22] The European Schoolnet is a network of 31 European Ministries of Education.
[23] OECD: Organisation for Economic Cooperation and Development
[24] PISA: Programme for International Student Assessment; participating in the 2003 assessment were 41 countries, with Tunisia being the only African country

According to a review[25] by the Center for Applied Research in Educational Technology (CARET, cited in Barrette, 2005) of 706 articles and reports, students' scholastic results can be improved when technology is used to support learning outcomes that will be evaluated and when students are allowed to conceive projects that surpass the content and expectations of standardized testing. Effects are positive when there is possibility for collaboration among students and when technology use is adapted to student capacity and former experience (Barrette, 2005).

Findings from a study of three cohorts of a total of 103 medical students in the UK showed that with internet-based teaching, lecture attendance went down while examination marks went slightly up. The author argued that use of the internet provided more written support than would be possible with distribution of paper copies and allowed students to be more flexible in the use of their time; they were able to obtain equivalent information on the Web if they were unable to attend a lecture (Hammonds, 2003).

This very cursory review of studies shows that ICT use may or may not affect academic results but seems to have no adverse impact on them and can indeed have positive effects on learning. In some cases, students that had been using computers for longer periods of time performed better academically, and among medical students in the UK, those that opted to review professors' online notes rather than attend class did not seem to suffer adversely on their exams. Rather, students had greater flexibility in the use of their time. For a positive effect on academic results, what appears to be more important than the mere use of technology is its use in relation to learning outcomes and student capacity and experience, in ways that entail student initiative and collaboration.

1.4.2.2 ICT and complex cognitive operations

To move educational curricula and testing toward learning objectives that go beyond recognition or recall of information and rather promote the understanding and use of knowledge, Benjamin Bloom, an educational psychologist in the USA, coordinated the development in 1956 of what was called Bloom's Taxonomy of educational objectives. In 2001, the 45-year-old taxonomy was revised by David Krathwohl, who was involved in

[25] financed by the Melinda and Bill Gates Foundation

putting together the original taxonomy, and Lorin Anderson, a student of Bloom's, to account for Bloom's own concerns about the original taxonomy, show how cognitive processes intersect with different types of knowledge, and make it easier for teachers to document and track the teaching and learning of cognitive processes related to chosen instructional tasks (Wilson, 2013). Educators around the world have used the revised taxonomy to analyze the objectives of a course and assess "the extent to which more complex kinds of knowledge and cognitive processes are involved" (Krathwohl, 2002, p. 216).

The revised taxonomy (presented in Figure I) lists cognitive processes or ways of thinking from simpler to more complex ones. For example, recognition and recall are simple whereas creating something new is more complex. While the categories can overlap to some degree and the hierarchy should not be considered rigid, higher cognitive skills like analyzing, evaluating and creating are built upon the lower-level skills like remembering, understanding and applying. Research has shown that ICT can affect the nature and types of activities in which students are involved (Beukes-Amiss & Chiware, 2006) and thus could be used to encourage the higher orders of thinking valued in Bloom's revised taxonomy. Group work using the computer to resolve problems for example helps develop higher level cognitive skills as does student use of communication tools to edit, present and share results of a project (Barrette, 2005).

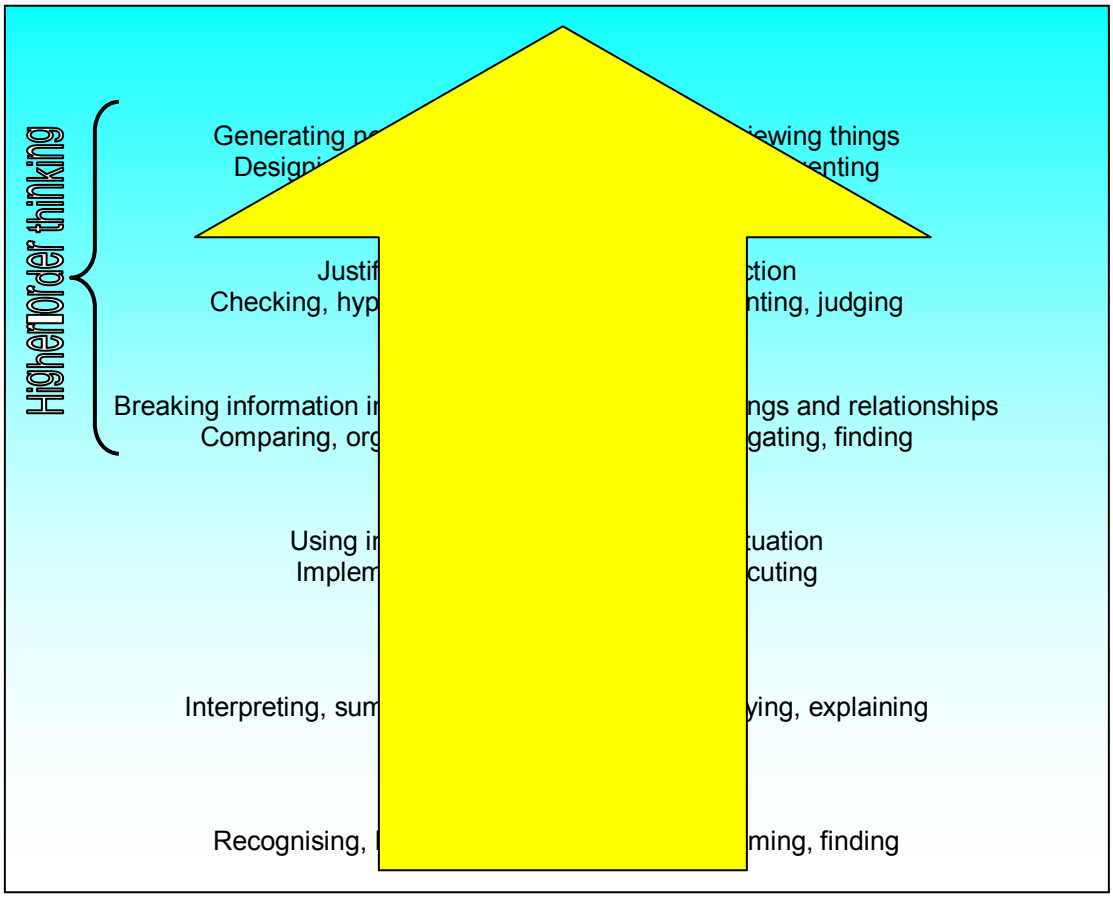

Figure I. Bloom's 1956 Taxonomy of learning objectives revised by Anderson and Krathwohl (2001); presentation adapted from Tarlinton (2003, slide 10)

Teachers can use ICT to help support each level in the taxonomy. For example, information can be stored and displayed on a computer to help with or test remembering. Internet can be used when encouraging understanding of new concepts. Using particular software could allow students to apply understanding to new situations. Students can use the computer to help them organize materials or ideas to foster analysis as well as to evaluate and problem-solve.

> *At the highest taxonomic level is the deep processing that is promoted by the design or construction of integrating projects. Most of the processes represented at the lower taxonomic levels are brought together in the design of projects, for example perceptions are built through sensory input. Such input stored as information for further manipulation should start with understanding and comprehension. In the development of powerful projects, students must explore ideas and resources, and analyze and evaluate information in a final synthesis (Karsenti, Tchombe, Toure, Tchaméni-Ngamo, & Maïga, 2007, in chapter 2 titled "Paradigm shift: From teachability to learnability").*

Part of the potential of ICT in education seems to lie in using it in the development of higher order thinking or complex cognitive operations. This could include integrative and collaborative projects in which students are invited not only to synthesize information but to further interrogate and compare ideas from several sources to understand relationships and generate new ways of perceiving things.

1.4.2.3 Motivation, attitude and interest of students

ICT can be a motivating factor in schools. Students know many things learned outside school and can find school boring. ICT can provide stimuli and motivation for learning. However, if ICT is used in traditional pedagogy in which students are not actively involved in their own learning, ICT is not likely to have motivational effects. For example, some teachers use ICT to deliver a lecture or keep students busy rather than to develop their eagerness for learning (Karsenti, 2003a, 2003b).

In the 36 primary and secondary schools studied by ERNWACA and the University of Montreal in five West and Central African countries, learners' interest and motivation were heightened through the use of ICT. This may make it easier for teachers to encourage the development of higher order thinking as just discussed. "Students were found to be on time for classes, more research-oriented, and faster in learning their subjects when ICT was involved. Students had so much interest in their lessons that they hardly ever missed classes" (Karsenti, Tchombe, Toure, Tchaméni-Ngamo, & Maïga, 2007, in chapter 7 on Ghana). However, in this West and Central African context where computers were introduced in some schools beginning in the late 1990s and early 2000s, there was a certain overconcentration on ICT courses as the following student indicates:

> *Naturally in a school we must have serious ones and non serious ones. Some people are truant but during the period of IT people come to school and I think it really helps because once they come to school, they cannot go back because they know they would be marked present for the first period and absent for subsequent ones, and this will affect them. So they would stay for that day if even they wouldn't come for the rest of the week (Karsenti, Tchombe, Toure, Tchaméni-Ngamo, & Maïga, 2007, in chapter 7 on Ghana).*

Cuthell's (2005) work on teachers' classroom use of interactive whiteboards (IWBs) has shown that being able to click and point and visualize concepts together in the classroom

makes learning fun and contributes to enhanced enjoyment, interest, and motivation and students feeling empowered. The IWB helps to promote a high level of interaction from pupils and provides a catalyst for discussion, analysis and interpretation. "Videos, televisions, and computer multimedia software provide information that can be authentic and challenging in addition to stimulating students' sensorial apparatus through images, color, sound, and movement" (Haddad & Jurich, 2002, p. 34). The European Schoolnet report (Balanskat, Blamire, & Kefala, 2006) shows that "multimedia and interactive content on interactive whiteboards is engaging and motivating, particularly for primary pupils, and that students pay more attention during their lessons"; the motivational effect goes beyond just "attention grabbing" (p. 30).

CARET (cited in Barrette, 2005) found that motivation, attitude and interest is enhanced when problems and tasks are adapted to maximize student experience of success and when technology is used to produce, present, and otherwise share work with peers, teachers and parents. Student use of stimulating and fun applications that build on basic knowledge and skills also improves motivation, attitude and interest (Barrette, 2005). Students in schools pioneering ICT in Cameroon were excited because they were exposed to learning experiences not limited to information assimilation and teaching by telling. Guided inquiry, project-based collaboration, and mentoring relationships were reported to have evoked increased learner motivation (Tchombe, 2006). Karsenti and Larose (2001) list four motivational elements of ICT in university education, as discussed in scientific literature: (a) working with a new medium, (b) more personalized teaching, (c) increased student autonomy, and (d) frequent and rapid feedback (p. 217). As far as differentiated interest and motivation level among girls and boys, research does not show significant differences, except that boys tend to like to play games on computers, whereas girls consider it more as a tool for work and learning (Karsenti, 2003a, 2003b).

Though motivating, an overemphasis on ICT to the detriment of other creative activities is a challenge. If un-channeled or badly channeled, ICT can lead to inertia and passivity or nonproductive, even destructive, time spent in front of the computer screen (Fonkoua, 2006; Ndoye, Dione, & Kane, 2002; Noudogbessi, Azonhe, & Lodjo, 2002). Parents of primary and secondary school students in Cameroon warned that "students should

not be rendered so ICT dependent […] that they put aside their innate creative abilities" (Tchombe, 2006, pp. 37-38).

If the evidence regarding the link between ICT use and scholastic results is mixed, evidence regarding positive effects of ICT on student motivation is not. As a literature review (Beukes-Amiss & Chiware, 2006) published in a Namibian journal on education reports: "There appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning" (p. 41).

1.4.3 Effects of ICT on teaching

Having reviewed literature on the effects of ICT use on learning, we now turn to its effects on teaching. We will focus on relations between ICT and pedagogical shifts. We will also look at how teachers use (or not) internet to teach critical thinking and perspectives and also at the need to use ICT to remain qualified to teach and to shape West African education.

1.4.3.1 ICT and possibilities for pedagogical shifts

As computers have become more available and computer literacy has increased, ICT has gone from being taught to helping teachers teach. This shift has been observed in several West African countries (ROCARE, 2006; Karsenti, Toure, Tchaméni-Ngamo, Villeneuve, 2008). ERNWACA and University of Montreal researchers, based on interviews with school directors, teachers, students and parents in 36 public and private, primary and secondary schools in five West and Central African countries, suggest ICT integration has the potential to contribute to more active teaching and learning pedagogies (ROCARE, 2006). ICT can provide an environment for inquiry-oriented pedagogy that "content-thin textbooks and limited libraries" in Africa could not sustain before (Tchombe, 2006, p. 42).

Some literature however suggests that the use of ICT does not yet fundamentally change teaching practices or roles. "Teachers do not yet exploit the creative potential of ICT and engage students more actively in the production of knowledge" (Balanskat, Blamire, & Kefala, 2006, pp. 40-41). When teachers do use computers and internet for instructional activities, sometimes it is to support more traditional instructional approaches (Mbangwana & Mambeh, 2006; Tchombe, 2006). Despite access to computers for teachers and students, teaching and learning has not significantly changed: "The overwhelming majority of teachers

employed the technology to sustain existing patterns of schooling rather than to innovate" (Conlon & Simpson, 2003, p. 142). Baldwin (1998), citing Green, concurs: Instructional technology "has not radically transformed classrooms or the instructional activities of most [university] faculty" (p. 9). See also Bahi (2006).

Cuthell (2005) researched the use of interactive whiteboards (IWBs) over four years in K-12 classrooms in the UK. Whiteboards allow teachers and students to contribute computer and video content for viewing by the entire class. Cuthell cites Maddux in explaining that educational computer applications are either Type I or Type II. Type I applications simply reinforce existing teacher-learner paradigms, whereas Type II applications of ICT transform teaching and learning. The use of technology affects student learning when the teacher is engaged in a constructivist approach, in which the role of the teacher is no longer to expound while the learner listens but to engage learners (Cuthell, 2005). The potential of the IWB emerges "when the structure of the lessons themselves is examined," when traditional teacher discourse modes are modified (Cuthell, 2005, p. 3). Teachers have effectively used IWBs to facilitate learning and have changed their pedagogical styles in the process – or been changed by the use of the technology. "The interactivity of the boards has made the role of the teacher more interactive" (Cuthell, 2005, p. 3). When young people regularly use computers, they are less likely to find conventional pedagogical approaches appropriate (Cuthell, 2002) – suggesting that student attitudes and behaviors contribute to the ongoing integration of ICT and to shifts in pedagogical styles. "When knowledge is constructed by the students the teacher finds it very difficult to be a gatekeeper" (Cuthell, 2002, p. 25).

Teachers participating in the ERNWACA and University of Montreal study in 36 schools pioneering ICT in five West and Central African countries (Karsenti, Tchombe, Toure, Tchaméni-Ngamo, & Maïga, 2007) claimed that when students are allowed to bring material from the internet to class, they become more active in their own learning, there is more classroom time for discussion, and the teacher is positioned as more of a guide than a lecturer. This certainly suggests the possibility that ICT affects the way a teacher teaches. The European Schoolnet report also suggests the potential of ICT to affect pedagogical styles:

> *The overwhelming body of evidence shows that the majority of teachers have not yet embraced new pedagogical practices. The foundations for more profound changes have been laid, but more time is needed to achieve wider impact on teaching methodologies. [...] ICT is underexploited to create*

learning environments where students are more actively engaged in the creation of knowledge rather than just being passive consumers. (Balanskat, Blamire, & Kefala, 2006, pp. 44 & 49).

Teachers are increasingly using ICT to teach, even if not all teachers do so even when ICT is available. Teachers who use more constructivist approaches to teaching are more likely to be innovative in their use of ICT (Becker, in Conlon & Simpson, 2003; Depover, Karsenti, & Komis, 2007), questioning underlying patterns and structures and transforming the way they teach. Technology seems to have an impact on its users, bringing out more interactive approaches in teachers and making students less likely to accept conventional ways of teaching. There is less time at the blackboard and more room for discussion. It appears that technology, teachers and students are to some degree shaped by each other in fascinating ways that deserve ongoing attention from the research community. For pedagogies to change – toward more socio-constructive ones –, it is not just a matter of using technology but actively engaging learners, however using ICT does seem to be a starting point in a process of pedagogical change.

1.4.3.2 Using internet to teach critical thinking

Using ICT to teach critical thinking is little addressed. Most of the literature considers internet as a support, as content, as a source of documentation to help teach particular disciplines. Little of it talks about internet as a media that should be examined in and of itself. Piette (2003) explains, in reviewing the *Moi, je sais lire entre les lignes* program of the Resource Center for Media Education (CREM) in Canada, that teachers and students rarely take the time to analyze the origin and production of different media, including internet sites, to understand how they are constructed, diffused and consumed and thus understand embedded and subtexted messages. Teachers do not help students understand the effects and impacts of media by identifying the values and viewpoints circulated nor to formulate opinions about the media. Teaching with but not about media, such as internet, deprives learners to some extent of developing a critical perspective (Piette, 2003).

Piette (2003) goes on to explain how teaching about media can help develop transversal competencies, such as critical assessment skills. Learners learn to better use information, to communicate more effectively, and to develop opinions. This kind of teaching

can be considered as a civic activity that engages students in a climate of confidence and an environment of dialogue. Conditions for the success of such teaching include networks of learning, dialogue and peer support (Piette, 2003).

The ARC[26] (2003) inventory of ICT in teaching abstracted a study by Robertson conducted as part of their MA thesis on developing critical thinking skills with the help of new technologies. They found, in researching uses of the Web and electronic forums for learning philosophy, that ICT could support the development of critical thinking skills when students received special training in models of critical thinking. Karsenti (2001) in a study of 600 teacher trainees found that with the use of ICT in training, critical thinking was enhanced among trainees, in part due to enhanced communication via ICT.

1.4.3.3 Remaining qualified to teach and to shape West African education

Teachers unable or unwilling to navigate the technological turn and develop strategies of lifelong learning may become unqualified (Fonkoua, 2006). Baldwin (1998) put it differently: "Technology-resistant faculty are a concern […] In a rapidly changing environment these faculty have the potential to be devalued and marginalized" (p. 17). Researchers (Balanskat, Blamire, & Kefala, 2006; Tchombe, 2006) suggest continuous professional development for teachers – including in the pedagogical use of ICT – as part of a culture of lifelong and peer learning. ICT use has more effects on teaching when teachers are experienced users (Balanskat, Blamire, & Kefala, 2006). "Students of teachers with more than ten hours of training significantly outperformed students whose teachers had five or fewer hours of training" (Valdez et al., 1999, p. 27).

For ICT use to benefit teaching and learning in West Africa, those at the heart of teaching and learning, namely teachers, must be involved. African educational needs and aspirations are best understood and translated into policy and practice by African communities. Will educationalists mediate encounters with ICT? Some of the most powerful actors interested in ICT in education remain "international donors, national governments, some large (mainly international) NGOs and the private sector. The gap between these two groups is often very large" (Wagner, Day, & Sun, 2004, p. 42). Policies and programs, to be

[26] ARC: *Association pour la recherche au collégial*, Quebec, Canada

relevant and implementable, must be imbued with the knowledge, perspectives and experience of teachers. Yet:

> *...many teachers feel alienated from educational technology precisely because the field has become technified, that is, dominated by those with special knowledge and skills […] Technification can be seen as an aspect of the 'digital divide' in which most teachers risk being relegated to the role of mere consumers and deliverers of methods and products designed by an informed elite […] Enough teachers need to be equipped with the appropriate mix of advanced knowledge and skills to ensure that schools have a role in the design as well as the deployment of technology. (Conlon & Simpson, 2003, pp. 148-149, drawing on Spector)*

At the same time that teachers must increasingly learn and use ICT and socio-constructivist teaching methods, some may become overly dependent for information for their teaching activities on ICT trainers and monitors – often not trained teachers and usually not part of public service personnel (Tchombe, 2006). Teachers and professors are thus faced with the challenge of developing confidence in their pedagogical use of ICT and simultaneously nourishing fruitful relationships of mutual learning with peers. To "succeed in a technologically advanced era, professors may need to become more interdependent and mutually supportive" (Baldwin, 1998, p. 17).

Without African participation and collaboration, African content and the infusion of African values, ICT in education could become another form of colonialism, which alienates rather than puts learners in touch with their own and other cultures and links learning to life (African Union, 2014). Fonkoua (2006) refers to the industrialization of long distance training using internet, warns against mere consumption of software and ideas, and calls for teacher involvement and African contributions, which will likely require questioning and upsetting established hierarchies:

> *Cette industrialisation de l'enseignement dans le cadre de la formation à distance par l'Internet doit être accompagnée par la création de nos propres logiciels qui vendent au marché du donner et du recevoir nos ressources particulières. (p. 224)*

While there is the risk that the integration of ICT into education perpetuates or creates new dependency relationships and outward-looking approaches that devalue or minimize teachers and African cultures and values, technology use has also led to some upsetting of hierarchical relationships. For example at Morning Star school in Ghana and other primary and secondary schools in West and Central Africa, students teach teachers technology,

formally or informally, and peer-to-peer configurations in which students learn from each other have become more prevalent and accepted at school (ROCARE, 2006). Reverse forms of mentoring also appear among university faculty, where "younger, more technologically sophisticated junior faculty assist their senior colleagues" (Baldwin, 1998, p. 17). Ultimately however it is not technology that will democratize education and relations between peoples and institutions and revalorize African ways of thinking and doing, but the practice of these values. Remaining qualified to teach and ready to actively shape education in the 21st century involves not just learning and using ICT but also learning to build and navigate horizontal relationships of learning and networks of interdependency, rather than merely top-down relationships of authority.

1.4.4 Conditions for ICT use to affect teaching and learning positively

The success or failure of the use of ICT depends more on "human and contextual factors than on hardware and software" (Valdez et al., cited in BECTA, 2002b, p. 6). A number of factors are important "if ICT is to become embedded in practice and raise standards beyond those teachers or schools that could be described as the innovators or early adopters" (ImpaCT2, 2001, cited in BECTA, 2002b, p. 6). In this section we provide an overview of some of the conditions necessary for ICT use to positively affect teaching and learning.

A condition for the successful integration of ICT in teaching and learning, as in much good teaching, is the definition of clear pedagogical objectives (BECTA, 2002b). In addition, ICT will have the most positive affects in a socio-constructivist learning environment (Cuthell, 2002; Hammonds, 2003), with a continuum of pedagogical activities, in the classroom and beyond the classroom (Barrette, 2005). A supportive institutional environment is important (CARET, cited in Barrette, 2005) in encouraging teachers to define clear pedagogical objectives, deepen socio-constructivist teaching, and engage students in a continuum of pedagogical activities. Support to teachers can include peer forums to discuss their practice in general and the use of ICT in particular and examples of innovative and contextualized applications of technology. "Demonstrations of successful applications may be more useful than dozens of articles and speeches testifying to the benefits of technology" (Baldwin, 1998, p. 16-17).

Of course there can be no use of ICT if there is no access to it. And we have already mentioned the challenges of access to computers and internet in rural areas of West Africa where electricity networks are limited. With the increasing availability of internet via mobile phones, this may change to some extent. Even in urban areas, many teachers and students do not have computers; they use computers at school – if there are computers at school – and at cyber centers or cybercafés.

The European Schoolnet report (Balanskat, Blamire, & Kefala, 2006) refers to a 2003 BECTA study which found that "issuing teachers with their own laptop computer has increased positive attitudes and teachers' confidence in using 'hands-on' experience with ICT for education" (p. 36). A report of OFSTED[27] "highlighted that personal access of teachers to a computer is one of the strongest influences on the success of ICT training and subsequent classroom use" (cited in BECTA, 2002b, p. 6). Similarly, Cameroonian scholars studying the use of ICT in primary and secondary schools and at university explain that teacher possession of a computer is one of the conditions for successful integration of ICT in teaching and learning (Essono & Essono, 2006; Tchombe, 2006). Conlon and Simpson (2003) presented contrary findings, showing little impact on teaching and learning of technology despite the fact that most teachers studied, in Scotland and the USA, had a computer at home and in their classroom, in addition to access to a computer lab or other shared computer facilities. Clearly, access in and of itself is not the only condition necessary for effective integration of ICT in teaching and learning.

Time, in several ways, is a factor in the pedagogical use of ICT. Teachers need time to learn ICT, experiment integrating it into teaching and learning, and evolve constructivist approaches to teaching. The European Schoolnet report (Balanskat, Blamire, & Kefala, 2006) referred to two studies that show that ICT embedded "over a longer period of time has led to more use of ICT by teachers and considerably increased their confidence in using ICT" (p. 48). And it takes time before the effects of the integration of ICT are discernable.

Access to appropriate content is important. Teachers need to be able to access quality materials for each subject at the required level (BECTA, 2002a; James, 2005). Local content and local languages need to play a central role in education (African Union, 2014; Wagner,

[27] OFSTED: Office for Standards in Education, Children's Services and Skills, of the UK government

Day, & Sun, 2004). Policy and practice should be both deep and broad: deep in encouraging autonomy and interdependence rather than dependency and broad in reaching all rather than just a privileged elite already benefiting from relatively positive learning conditions.

1.4.5 Regarding the studies reviewed

Research on ICT is education is quickly evolving, and we have incorporated some more recent studies in the three articles in which the research results are presented. Here, in order to identify the research questions, we reviewed literature on the effects of ICT on teaching and learning in Australia, Canada, China, France, the United Kingdom[28] and some other European countries, the USA,[29] and several African countries including ones in West and Central Africa. Several reports reviewed drew on large-scale comparative studies, such as the Programme for International Student Assessment (PISA) which also includes some Asian and South American countries, for baseline data on the integration of ICT in education systems. Questionnaires are often used in such studies.

Increasingly, however, qualitative case studies provide insight into teaching and learning processes. These employ interviews, classroom observation, and video diaries. The ERNWACA and University of Montreal research (i.e. ROCARE, 2006), conducted in 36 schools in five countries (and later in 100 schools and universities in a dozen African countries; see www.observatoire-tic.org), employed questionnaires to determine levels of student, teacher and school access to ICT and interviews and observations to ascertain how students and teachers are actually using ICT in teaching and learning. The European Schoolnet report calls for making research results available to practitioners in useful ways, i.e. leaflets (Balanskat, Blamire, & Kefala, 2006), as did ERNWACA and University of Montreal researchers. The sharing and discussion of research results can support critical and reflective attitudes among teachers and policymakers as they grapple with ICT and its use in education. Most of the studies reviewed focus on ICT alone when, for a more holistic understanding, ICT could be considered from a wider sociocultural context of pedagogical innovation and reform.

[28] The UK's public body BECTA, which we cited extensively, was disbanded in 2011, in part due to complaints of favoring bigger corporate players in ICT frameworks proposed to schools, which frameworks denied optimum operability and options for flexibility. Source: Wikipedia.

[29] Some studies and reviews were funded or conducted by industry-related organizations, such as the Melinda and Bill Gates Foundation or the Software and Information Industry Association, both USA-based and internationally active, and may to some extent have been influenced by corporate interests for profitability.

1.4.6 Summary of the effects of ICT use in teaching and learning

Some people approach ICT with a great deal of enthusiasm and would like to believe its use can be transformative, for example in personalizing learning, helping teachers and students alike realize their potential, and promoting a shift toward more interactive teaching and learning pedagogies. While the research is unclear or contradictory on certain points, it seems clear that ICT can have beneficial effects on student learning. It is not ICT on its own that makes the difference but the way it is used.

Most of the literature reviewed is in agreement that internet-based learning has not adversely affected student performance. Pupils, teachers and parents consider the effects of ICT use on learning as positive, even if these perceptions need to be confirmed by ongoing studies. Some research shows better performance on exams among regular ICT users, partly because ICT users can access more written materials and be more flexible in the organization of their time. ICT may be used to promote skills such as remembering but more importantly in the development of higher cognitive skills such as analyzing, evaluating and creating. ICT can be used to promote inquiry, interaction and opportunities for discussion and interpretation. Students learn not just in their encounters with ICT but in conversation with their teachers and peers about information they find on the internet and in using ICT to organize and present information to others.

ICT use motivates students and can be used to develop their eagerness for learning. Not only are students more interested in learning with ICT, but its helps them learn more quickly, and students are more involved and take more responsibility for their own learning. The literature reveals debates about whether ICT is used to reinforce existing patterns and hierarchies of learning or to innovate and promote critical thinking and perspectives. It is in general agreement that ICT is underexploited in many situations and benefits teaching and learning most when embedded in a socio-constructive learning environment. The use of ICT seems to enable a move from lecture-based teaching to more dialogue and more student involvement and engagement. None of the literature suggests that teaching and learning would be better without ICT. Indeed, with its growing presence and use, if pedagogues do not harness ICT they could become disqualified to teach and overpowered by technicians and marketers thinking they know best and proposing ill-informed platforms and solutions for

schools and universities. The literature on ICT in education in Africa describes examples of dependency and calls for strategies that promote networking and partnerships that enable African adaptation of ICT and production of appropriate content and approaches.

Among the conditions necessary for the beneficial use of ICT, the most important, above and beyond access to technology which alone is insufficient, is support to teachers in the form of stimulating work environments, training, and opportunities to experiment and reflect on their use of ICT and collaborate and learn from others. Teaching ICT is not sufficient. Teachers need support in creating socio-constructive learning environments, and ICT use may indeed be a powerful catalyst for movement in that direction (Cuthell, 2002; James, 2005; ROCARE, 2006).

Some students and teachers are embracing and experimenting ICT use, while others watch from a distance or simply do not have access to ICT. Its use must be contextually analyzed to inform strategies for its integration in education in specific settings. Use of ICT is shaped by the values and objectives of users in specific contexts as well as by the global hierarchies in which technologies and media and their use evolve. Technology itself is not transformative, but the process of appropriating it just may be.

1.5 Research questions and objectives

In this introductory chapter, we have reflected on the need in the 21st century for active and interactive pedagogies that prepare youth to shape their futures, noted the proliferation of ICT use not only in education in Africa but in society in general, and cited scholarship that points to the promise of ICT in catalyzing and supporting socio-constructive ways of learning and teaching, in accordance with the needs of the times. However, there is little research on how teachers in Africa and West Africa in particular are actually appropriating ICT and why, and thus a need to converse with teachers and document and share their perceptions and experiences. Such exploratory and descriptive research could inform emerging teaching and learning practices as well as the development and implementation of policy. It could contribute to education theory and practice in West Africa and bring perspectives from Africa to bear on theoretical understandings of the pedagogical integration of ICT.

To provide insight into the West African experience with ICT in education, we investigated the formal education system as a continuum, from elementary through higher education, with a particular focus on Mali, where the author lived and worked for seven years. We were particularly interested in the perspectives of teachers, as important pedagogues in the education system, regarding their use of ICT in teaching and learning. Note that we began with two research questions, one regarding teachers and one regarding professors. In answering the first question about how teachers pedagogically appropriate ICT, the importance of their beyond-the-classroom conversations became apparent, and that is why a sub-question specific to that part of the appropriation process was elaborated and one paper dedicated to sharing the results in relation to it. The research questions and objectives are as follows.

Research questions

General research question:

- Assuming that ICT shapes and is shaped by the contexts in which it is used, in West Africa how and why do educators pedagogically appropriate information and communication technologies (ICT) and with what perceived effects?

Specific research questions:

- How and why do primary and high school teachers in Bamako, Mali appropriate ICT in teaching and learning, and what changes, according to the teachers, seem to occur in the process?
- How do teachers' conversations beyond the classroom, about the use of ICT in teaching and learning, contribute to the pedagogical appropriation of ICT?
- Why do university professors in West Africa pedagogically appropriate ICT?

Research objectives

General research objective:

- Understand how and why educators in West Africa pedagogically appropriate ICT and with what perceived effects, assuming that ICT shapes and is shaped by the contexts in which it is used.

Specific research objectives:

- Understand how and why primary and high school teachers in Bamako, Mali appropriate ICT in teaching and learning, and, according to them, what changes seem to occur in the process.
- Understand how teachers' conversations beyond the classroom, about the use of ICT in teaching and learning, contribute to the pedagogical appropriation of ICT.
- Understand why university professors in West Africa pedagogically appropriate ICT.

We will discuss the concept of appropriation in Chapter 2 and the research methodology in Chapter 3. We will introduce the research results in Chapter 4, respond to each of the three research questions in Chapters 5, 6 and 7, and provide a general discussion of the research results and a conclusion in Chapter 8.

CHAPTER 2. Concepts

2.1 Introduction

Assuming that ICT shapes and is shaped by the contexts in which it is used, the research objective is to understand how and why West African educators pedagogically appropriate information and communication technologies (ICT) and with what perceived effects – in teachers and students, in course content and in classrooms and schools. The concept of appropriation serves in the investigation as a lens through which to understand educators' use of technology, while considering education as a socio-constructive process. This chapter begins with an overview of socio-constructivism and goes on to discuss appropriation in relation to the ongoing construction of culture, to technology and to new pedagogical practices.

2.2 Socio-constructivism

The mind, argues Lev Vygotsky (1896-1934), cannot be understood in isolation from surrounding society. The works of Vygotsky – over 180 papers written in the 1920s and 30s but suppressed for half a century by the Soviet Union – made their way into western psychology only in the 1970s and 80s, particularly with the publication of *Mind in Society* (1978) and at a time when people were yearning for a more "socially based and socially relevant psychology" than what cognitive psychology had provided to date (Newman & Holzman, 2014, chapter 1, para. 9). We evoke Vygotsky because of how he anchors understanding of learning and human development in a sociocultural and historical context (Bertrand, 2003; Depover, Karsenti, & Komis, 2007; Nasir, 2009; Nasir & Hand, 2006; Rogoff, 1995; Wertsch, 1985). The mind exists not in a vacuum; it functions in society (Vygotsky, 1978). Bruner (1996), influenced by Vygotsky, explains how education and school learning must be considered "in their situated, cultural context" for "you cannot understand mental activity unless you take into account the cultural setting and its resources" (p. x). Studies of the mind have gone from studying the mind in isolation to understanding it as culturally shaped. Indeed the human mind "could not exist save for culture" (Bruner, 1996, p. 3) – which is elaborated and passed on from one generation to the next.

Constructivism as a theory of knowledge maintains that individuals construct new knowledge in relation to prior knowledge rather than merely acquiring knowledge transmitted by an authority figure. Socio-constructivism or social constructivism puts an accent on the social nature of this process of the construction of knowledge. The constructive of knowledge is collaborative and takes place in interaction with others in specific cultural contexts and communities, which influence the process. Vygotsky went so far as to suggest that "thought develops from society to the individual" (Kanselaar, 2002, p. 2; see also Depover, Karsenti, & Komis, 2007). Not only do people learn in relation to prior knowledge and in interaction, but guidance enhances learning (Vygotsky, 1978), thus the justification for teachers and the organization of collaborative activities to stimulate learning to bring out the potential of individuals and groups, in line with social experience, aspirations and values.

As a vision of learning and human development, constructivism and socio-constructivism shape classroom culture and the fabric of school life and involve rethinking relationships among and between teachers and students, and with the world of ideas (Windschitl, 2010), and even with the communities surrounding schools. Learning becomes more decentralized and more open to diverse perspectives. Learners in one classroom come from different communities and bring different experiences and resources to bear on learning; the "topics you [the teacher] introduce and the resources you use will all reflect this, as will the relationships you set up with parents and carers in the community" (Smidt, 2009, p. 144). The learner is active, and learners "participate in one another's thinking" (Windschitl, 2010, p. 140). They are supported in learning facts but also in interpreting the world in relation to their beliefs and experiences. The learner is called upon and expected to create answers and not merely recognize correct ones (Windschitl, 2010). The teacher is a guide, a facilitator (Obanya, 2012a), a promoter of understanding seeking to "compliment rather than dominate student thinking" (Windschitl, 2010, p. 140). There are various ways of knowing the world, and a socio-constructivist approach would recognize and appreciate the diverse ways in which learners make sense of and develop understandings of new concepts. The process is mediated by community and by culture (Kanselaar, 2002).

2.3 Appropriation

Appropriation is about integrating newness and shaping innovations to make them responsive to strategic objectives in specific contexts, hence the need to appraise how innovations are embedded in and informed, or not, by the aspirations, concerns and needs of local communities. It is important to study appropriation in historical context – for epistemological and scientific as well as political reasons. African societies have been burdened with formal educational systems ill-informed by their own cultures. Many development processes on the African continent since colonialism and structural adjustment are largely outward looking in design and implementation. Theories about the use of technology, largely informed by Western realities, are proposed to Africa with little input from Africans regarding their experiences and perspectives. Studying the process of pedagogically appropriating technology in West Africa can help deepen understandings of appropriation and render theory-building more contextually relevant to African encounters with technologies.

2.3.1 Appropriation as part of the ongoing construction of culture

We begin our exploration of the concept of appropriation with a brief overview of critical theory applied to educational and cultural change processes, because appropriating newness – including the reappropriation of what was known but forgotten – can be considered a part of such processes.

In their study of education, critical theorists include the study of society, power dynamics and cultural change. Such theorists at the Frankfurt School predicted the development of one-dimensional institutional structures that flatten social contradictions, absorbing opposition and permitting in daily life the uncritical acceptance of the status quo. Clichés, stereotypical ideas, and adjustive, instrumental calculation replace thinking, contemplation and critical reflection. Discourse is “sales talk.” Words are “trademarks.” Freedom becomes consumption. Language is used not for elaboration, but as an incantation. “Thought that is socially rooted in momentary conforming adaptation can apprehend, classify and calculate. But it loses the capacity for synthetic construction and the imagination of what is not fact.” (Wexler, 1981, pp. 253-254)

Though this total homogenization of culture has not come about, marketing research and commodity approaches do drive or underpin organizing principles of social life within global capitalism, bringing trends towards uniformization, standardization and flattening. A problem with such conscious or unconscious flattening is that "the cultural traditions which provide a vision of social change, disappear […] There is no traditional culture to progressively appropriate [….] the very dispositions and capacities necessary to appropriate […] recede from reach" (Wexler, 1981, p. 253). The ongoing construction of culture involves absorbing and assimilating elements of former and existing (Hountondji, 2002; Wexler, 1981) and other cultures (Fonlon, 2010, 2012). Meaningful cultural growth and construction of the future involve not only deep-rootedness and rehabilitating the past but also entertaining a free and critical relation with heritage (Fonlon, 2010; Hountondji, 2002).

Native Americans were forced to assimilate at school, if they went to school. It was as if their Indian culture had to be exorcized to make room for a new – western or white – culture. Youth lost touch with the strengths of their culture. This resulted in anxiety, anger, bitterness, self-worthlessness and even self-hatred, leading to anti-social and self-destructive behaviors.[30] Since then, in part through cultural revival movements, Native Americans are reclaiming their beliefs and practices to inform and shape their futures. This positions them to selectively pick and choose ways of doing and thinking from other traditions and to appropriate and blend them into their ever changing culture in creative and strategic ways.

In Africa, Europeans transplanted instructional practices, pedagogy and knowledge systems originating from Europe (Maïga, 2005). And Africans were transplanted from African soil to imported soil. Formal education remains "a journey fuelled by an exogenously induced and internalised sense of inadequacy in Africans, and endowed with the mission of devaluation or annihilation of African creativity, agency and value systems" (Nyamnjoh, 2004, p. 168). "Learning, for a colonial child, became a cerebral activity and not an emotionally felt experience" (wa Thiong'o, 1981, cited in Maïga, 2005, p. 164). Formal schooling was and is to a large extent still disconnected from the life of the community and from its social and geographic realities (Dei, 2002b). However, despite years of colonization and cultural suppression and pressure to learn foreign languages at school, Africans negotiate

[30] Inspired by work of Rev. Dr. Michael Oleksa, who has served as an Orthodox Priest in Alaska for 27 years and taught cross-cultural communication at the University of Alaska. See www.fatheroleksa.org

creatively between European and African and other cultures, appropriating what is new and marrying it with what is known and thus proposing new blends and cultural options. For example, Cameroonian women combine western and African products and tools and ideas of modernity to imagine and create new hairstyles and forms of cultural expression. Perms and curls and plaited extensions coexist as parts of new individual and social identities; what is new is domesticated through its integration into local culture and structures, providing "little hope for a homogenized synthesis" (Nyamnjoh, Durham, & Fokwang, 2002, p. 120).

People draw on heritage to innovate for the future. For example, the genetic wealth of the grain seed heritage in Africa is being looked to with new promise not just for Africa, but for the world (U.S. National Academy of Sciences, cited in Muchie, 2004). Not changing existing cultures threatens their very survival. "New actors, new technologies and new businesses are required to stimulate the innovation and economic performance of […] society. When that fails, crisis sets in" (Muchie, 2004, p. 329). "Renewed creativeness" in all fields is paramount (Hountondji, 2002, p. 218). Ancestral or traditional knowledge has been marginalized and relegated to the periphery when it needs to be opened up and interrogated and selectively integrated; to end extraversion and dependence, there must be a "methodical reappropriation of one's own knowledge and know-how as much as the appropriation of all the available knowledge in the world" (Hountondji, 2002, p. 255).

If the possibility of dialogue and interchange is removed via homogenization and cultural violence, anchored cultural capacity to confront newness creatively and confidently is also removed or at least suppressed. The adaptation or integration of an innovation does not take place in a vacuum. It builds upon a foundation. How could the second story of a house be built if the foundation and first story were ignored or even removed? Yet that is precisely what was attempted with the introduction of European schooling in Africa. Pre-existing educational traditions were completely ignored.

In traditional African education, school and life are one (Moumouni, 1964/1998). Mother and father, and aunt and uncle, fill the role of teacher. The child is the disciple and as such should be obedient. As soon as the child can leave the house, his or her education is the responsibility of all. It is in specific social settings that young people will take part in discussions, listen and observe elders and others as part of their training. As young children they listen in groups to stories, legends and proverbs and enjoy playing different kinds of

games. The entire community thus is responsible, directly or indirectly, for the physical and intellectual development of the child through adolescence and into adulthood. Autonomy grows in contact with others. Through everyday acts of ordinary life young people acquire understanding of society, spirituality, values, customs, traditions, and worldviews and learn reason and judgment. Stories and legends have strong pedagogical value. Practical experience, oral tradition and the spoken word are of paramount importance in an environment where manual activities are constantly combined with intellectual activities. The value accorded to education surpasses that accorded to birth and to fortune, to the point that the quality of being "man" or "woman" or "human" is inseparable from numerous traits related to education. (Moumouni, 1964/1998, p. 18-27)

Education can have a spiritual dimension. African systems of thought stress a holistic view of society and:

> *the need for a harmonious co-existence among nature, culture and society. There is the idea of mutual interdependence among all peoples such that the existence of the individual […]is only meaningful in relation to the community […] There is a form of local spiritual knowing that is connected to the land, to the people, to ancestors, and to a community. (Dei, 2002b, pp. 5-6)*

From this emerges an "education grounded in a culture that enriches the spirit" (Dei, 2002a, p. 351). Struggles are underway to "reclaim spiritual knowing in an increasingly materialistic world and also to take what is valued from Western […] education while at the same time affirming indigenous spiritual roots" (Dei, 2002a, p. 353). The renewal of education thus involves reconnecting with African knowledge, ways of knowing, and worldviews while also integrating elements of Western education and culture – or appropriating and reappropriating traditions from multiple origins.

In the midst of socioeconomic and political crises and social contradictions, mass personal stress occurs "because the social arrangements which might alleviate it" are underdeveloped (Wexler, 1981, p. 257). In the face of such realities, what is the role and response of education? Wexler (1981) suggests that education is a process of cultural mobilization and recognizes the "possibility and need to construct at least the pre-conditions for social change within existing social institutions" (p. 258). He suggests that education is decaying and proposes its reinvigoration via awareness and understanding of social concepts (p. 260). The process of reinvigorating education and culture requires hope, communication

and the capacity to imagine social alternatives (Appadurai, 2013). Questioning existing truths and envisioning possibilities is part of transformative change processes, which requires speaking, writing, imagining, action and embodying (Simon, 1992). New cultural visions become popularly transformative when they are embodied in instrumentally effective, practicable forms of social organization (Wexler, 1981, p. 261).

Wexler (1981) considers education as a space for critical and transformative activity and cultural revitalization and as an alternative to cultural reproduction (Bourdieu & Passeron, 1990). He proposes collective cultural mobilization as a model for understanding and affecting processes of social and educational change. Simon (1992) calls for a pedagogy of possibility, to "wrest tradition from the conformism which [in every era] is about to overpower it" (Benjamin, as cited in Simon, 1992, p. 139, brackets included in original) so as to "enable the articulation of new human possibilities," and for critical pedagogy – "a pedagogy capable of both affirming *and* challenging the immediacy of our everyday experiences" (Simon, 1992, p. 139). Inspired by the social critic Walter Benjamin who advocated that we "brush history against the grain," Simon refers to the power of remembrance to "reveal the present as a revolutionary moment" (Benjamin, as cited in Simon, 1992, pp. 138-139). Remembrance is a source of renewal. It is part of a pedagogy of possibility and can rescue or redeem the past and take "present representations of the world beyond immediate experience so as to dialectically engage that experience and enable the articulation of new human possibilities" (Simon, 1992, p. 139). Memory is a map to the future (Diop, 1960/1974; wa Thiong'o, 2009).

Freire sees education as the practice of freedom and justice, and as a lived process (Smith, 1976). Participation and dialogue are important aspects of the pedagogical process – bringing individuals together to solve common existential problems related to their socio-political conditions. "Education is a cooperative search for the answers to unsolved problems faced by a group people," and "there is no 'expert' who knows the answers and whose job it is to transmit those answers" (Smith, 1976, pp. 3-4). The process should lead to "new roles models" and an "increased sense of personal and racial worth" as well as "new norms, rules, procedures and policies" and the "transformation of a complex system of interrelated realities" (Smith, 1976, pp. 32 & 3). For Freire consciousness is a process of growth and transformation that leads to increased sense of self-worth and peer power in which thought is "scientific and extends […] to the macro-socio-economic sphere where events are placed in a global context"

(Smith, 1976, p. 76). In addition to dialogue, the search for new role models, and the solving of problems, consciousness involves being open to change and to taking risks. "Critical consciousness can fundamentally alter our perceptions of reality and our actions" (hooks, 1994, p. 195).

In this section we have briefly reviewed critical theory applied to cultural change processes and the role critical pedagogy and consciousness plays, especially in contexts of unequal cultural encounters. Culture is constantly changing. The change process happens in part through the appropriation of newness and weaving of it into aspects of existing culture. However when existing culture is suppressed, so are the creative capacities to embrace newness and make it meaningful in the context of everyday life. If education is to be a space for cultural mobilization, according to critical theorists it must be a place of possibility, a place for dialogue and the development of consciousness, and a place of interrogating history, reclaiming cultural strengths and shaping the future. Vision, imagination and hope must be encouraged and nourished.

2.3.2 Understandings of appropriation from communication and media studies

In continuing the discussion of cultural change and revitalization and pedagogies to facilitate it and in trying to develop an understanding of appropriation, in this section we will draw from Mikhail Mikhailovich Bakhtin (1895-1975), a Russian linguist who studied the novel and wrote about appropriating language and making it part of everyday life, and also look at understandings of appropriation that grow out of media studies of the 1970s. These perspectives can help understand how people make technology a part of their everyday lives and adapt it to suit their particular contextualized needs, sometimes in resistance to dominant modes of thinking.

In four essays, Bakhtin (1981) documents "human struggle to accommodate the mysteries of human language" (p. xvi) through a study of the novel. The novel as a literary genre structures itself in a zone of direct contact with developing reality; understanding aspects of the novel can help in understanding aspects of cultural change and innovation and appropriation. The novel grows out of a "very specific rupture in the history of European civilization: its emergence from a socially isolated and culturally deaf semipatriarchal society, and its entrance into international and interlingual contacts and relationships" (Bakhtin, 1981,

p. xxix). Just as the novel was a reflection of rupture and new contacts in Europe, so could internet be the reflection of new possibilities and ways of learning and interrelating.

> *The new cultural and creative consciousness lives in an actively polyglot world. The world became polyglot, once and for all and irreversibly. The period of national languages, coexisting but closed and deaf to each other, comes to an end. Languages throw light on each other: one language can, after all, see itself only in the light of another language. (Bakhtin, 1981, p. 12)*

The polyglot world, for him, is kind of like globalization – which he takes to be the moment when a particular literary genre emerges. The novel is a reflection of new worlds in the making, as the existence and evolution of internet is the reflection of new and old relationships being reordered along old and new lines. These worlds and relationships are full of possibility yet necessitate understanding, engagement and creativity to bring them about in empowering ways. Internet, like the novel, is a reflection of today being rubbed up against tomorrow. "Our era is characterized by an extraordinary complexity and a deepening in our perception of the world; there is an unusual growth in the demands on human discernment […] and the critical faculty. These are features that will shape the further development of the novel as well" (Bakhtin, 1981, p. 40).

Bakhtin (1981) describes how people appropriate words and language – by making them their own. This view can help in understanding how people appropriate technology, imbuing it with their intentions, making it part of their everyday lives, and actively bending it to meet their strategic objectives.

> *Language […] lies on the borderline between oneself and the other. The word in language is half someone else's. It becomes 'one's own' only when the speaker populates it with his own intention, his own accent, when he appropriates the word, adapting it to his own semantic and expressive intention. Prior to this moment of appropriation, the word does not exist in a neutral and impersonal language […] but rather it exists in other people's mouths, in other people's contexts serving other people's intentions: it is from there that one must take the word, and make it one's own […] Expropriating it, forcing it to submit to one's own intentions and accents is a difficult and complicated process. (Bakhtin, 1981, pp. 293-294).*

Just as language can be perceived as lying on the borderline between oneself and the other, so can ICT. Some see the computer and internet as foreign objects that come with foreign ways of thinking and doing. "Typically, innovation tends to be imagined as coming from the outside, from a different domain from one's own, even if in fact that origin is far more continuous with one's own domain" (van Binsbergen, 2004, p. 120). Technology can be

considered as part of a continuum of innovation that is not foreign to any people, as the "scientific and technological treasure today controlled by the North was in fact created over the centuries by the participation of all peoples" (Hountondji, 2002, p. 244). So there is not necessarily the need to reject or distance ICT out of fear of domination but to embrace it in ways that become meaningful and affirming.

In appropriation, as described by Bakhtin (1981) in relation to language, is the idea of taking something from elsewhere and adapting and making it meaningful in specific cultural contexts. Meaning is context-specific for Bakhtin. Individuals and cultures appropriate language when they inflect it by injecting their accents and intentions. Nyamnjoh and Shoro (2011) describe how Africans appropriate European languages by intertwining them into their daily lives and shaping, or deforming, the languages to meet their needs. Individuals and cultures draw on their experiences and visions as well in shaping how ICT is used. They appropriate it by adapting its use to the needs and aspirations of their milieu, in ways that transform the users, ICT, and the milieu. Van Binsbergen (2004) calls the process transformative localization, characterized by cultural mobilization initiated by local actors. The computer is domesticated or localized when its use is imbibed with the users' intentions and culture. Appropriation renders relative the distinction between foreign and what has become domesticated or local and indispensable, for example when Africans in the United States appropriated an "alien tongue" and remade it to "speak beyond the boundaries of conquest and domination"; English was used in a way that ruptured with standard use and was spoken so "white folks could often not understand black speech" (hooks, 1994, pp. 170-171). Thus language become *more* than the oppressor's language. It became a space for alternative cultural production as well as an invitation for mainstream culture to listen and to some extent be transformed.

This idea of understanding how something is taken from elsewhere and integrated into one's being and embedded in one's culture was used also in media studies. In the 1970s, media theory purported that people are controlled by mass media. However, in observing how people interact with the media in their daily lives, researchers like Michiels and Crowder (2001) found that people integrate media within their lives and make sense of it in ways related to their sociocultural and political context. Some interpreted this as a sign that people consciously or unconsciously resist the hegemony of mass media through "simple everyday

practices of ignoring, modifying and appropriating media messages" (Michiels & Crowder, 2001, p. 5). The appropriation of media products is shaped by the synergy between global communication patterns and local conditions. It is a localized phenomenon involving "specific individuals […] situated in particular social-historical contexts […] who draw on the resources available to them […] to make sense of media messages and incorporate them into their lives" (Thompson, as cited in Wolf, 2002, p. 3). In this idea of appropriation is the idea of people making what is appropriated their own by making it serve their needs, not necessarily those for which it may have been intended.

Another trend in media studies was to look at how people use media tools at hand to appropriate not only messages, but the means of media production, for example via graffiti or community radio. Appropriation is about power – power over the content and the tools of communication (Michiels & Crowder, 2001). Civil society organizations in Cameroon in the 1990s appropriated photocopiers and fax machines to stay in touch with the outside world during elections and avoid censorship. "The government was reportedly embarrassed when its delegation touring Europe was preceded everywhere by faxed documents detailing the massive election fraud" (Nyamnjoh, 2005, p. 208). Schools in Mali appropriated technology in the 2010s – in relation to contextualized sociocultural needs – by sending text messages to parents' mobile phones. This personalized approach was much more effective in generating responses and assuring attendance at school events than was the previous system of sending notes – often left in students' book bags – home with students. In a South African university, faculty developed a software to enhance film studies by combining theory and production. To learn and demonstrate their understanding of film narrative and spectatorship, students used the software to construct a film sequence. This was also a way to ensure contextually appropriate learning resources in post-apartheid South Africa (Deacon, Morrison, & Stadler, 2005).

Surman and Reilly (2003) refer to appropriation of technologies as bending and molding them creatively so they can be used more strategically and politically. The gap between "use" and "appropriation" is "doing what is obvious and easy with the technology versus turning the technology to serve your own purposes, ensuring that it reflects your goals and culture" (Surman & Reilly, 2003, p. 25). Organizations must appropriate technology, "molding it to their strategic goals, before its real potential emerges" (Surman & Reilly, 2003,

p. 35). Surman and Reilly claim that in using technology out of the box "activities and approaches are often narrowed by the implied logic of the tool itself. Starting with strategic uses in mind, it is often possible to mold technology to your needs and wishes" (Surman & Reilly, 2003, p. 45). As Hountondji (2002) purports, "The real preoccupation [...] concerns the 'unpacking' of the imported technology and its integration within the host culture" (p. 242-243).

Involving adaptation, creativity, resistance and cultural expression, appropriation of ICT:

> *is a process where communities and groups select and adopt communication tools according to their different needs and then adapt the technologies so that they become rooted in their own social, economic and cultural processes. The process reflects creativity and freedom of expression and, in some cases, resistance to political and cultural dominance by global media markets. (as adapted from Michiels & Crowder, 2001, by Global Knowledge Partnership [GKP], 2002, p. 19)*

Appropriation is a challenging, empowering and ongoing process (Bakhtin, 1981; Surman & Reilly, 2003). Becoming skilled at appropriation is the point, skilled to "mold the technologies as issues and political strategies for change" (Surman & Reilly, 2003, p. 72). "Early appropriation by powerful information producers defines future use, as was the case with radio" (Surman & Reilly, 2003, p. 2). If it is true that early appropriators define future use, this has implications for the appropriation of ICT in education. Appropriation patterns of teachers could be an indication of the pertinence of ICT in education in African contexts as well as promising pathways for its integration. The way technology is used today will "have a significant influence on the technologies that are available to us tomorrow" (Surman & Reilly, 2003, p. 13) and will influence learning and communication paradigms going forward.

Surman and Reilly (2003) borrow a diagram (from Camacho, and from Surman) that shows access, adoption and appropriation as steps on a ladder and explain that the appropriation or strategic use step is important because it is at that level that societies "turn technology to their own ends, creating political and social impact [...] it is also at this level where societies make decisions about how technologies are used and what they are used for" (Surman & Reilly, 2003, p. 10). Access to and adoption of ICT without appropriation could leave ICT users in the role of passively consuming rather than actively producing.

Appropriation is not mastery (Laffey, 2004; Lund, 2009). People could master a technology yet reject and not use it because it is viewed as not belonging to them. Mastery implies control and is instrumental, unidirectional, and manipulative. Thorough technical knowledge of the potentialities of the tool is not necessary for appropriation; users content themselves with learning what is necessary to make the tool useful to them in their context (Jouët, 2000). Appropriation involves relations and is transformative – of people, contexts, tools – and not necessarily without resistance. It takes place in and is informed by the social context.

Appropriation as a lens for looking at ICT use and teacher practice can provide insight into relations and tensions between people and technology as well as changing roles of teachers and learners. Studying appropriation processes can provide nuanced understanding of the "complexities and intricacies of how […] teachers actually incorporate technology in their teaching" (Zhao et al., cited in Lund, 2004, p. 6) and of the transformations going on with the increased use of networked technologies in schools and universities.

2.3.3 Appropriation of technology and of new teaching practices

This section will present research on appropriating new teaching practices while appropriating new technologies as well as the transformative nature of the process. Examples from multiple societies illustrate the tension, in the appropriation process, of extending existing habits and cultures and of changing habits and cultures. Karsenti and Larose (2001) argue for the study not only of the appropriation of technology but also of socio-constructive pedagogies:

> *Afin de mieux préparer les professeurs à vivre les changements de rôles qu'entraine l'intégration pédagogique des TIC pour soutenir des apprentissages collaboratifs, il faudrait étudier l'appropriation et l'application des principes pédagogiques socioconstructivistes par des étudiants et professeurs en situation réelle d'enseignement/apprentissage. (p. 181)*

Training seems to be an important part of supporting the evolution of pedagogical approaches among teachers. Gibbs and Coffey (2004), in studying teacher training programs in 20 universities in eight countries, found that training (60 to 300 hours) can "increase the extent to which teachers adopt a Student Focus." Without the support of training, "teachers may move in the opposite direction and reduce the extent to which they adopt a Student

Focus." This change in the opposite direction is explained because of departmental pressure to "conform to largely teacher-focused conventions (such as didactic lecturing and testing of acquisition of subject content). Change was sometimes frowned upon and taken to imply criticism of more experienced colleagues." The training thus kept "negative influences" of departments in check. Finally, change was not encouraged for the sake of change but in relation to improved student learning. "A Student Focus approach is known to be associated with students taking a deep approach" (attempting to make sense of content) rather than a surface approach (attempting to remember content) (Gibbs & Coffey, 2004, p. 98).

The opportunity for teachers to reflect on their practice is important (Laffey, 2004). Research findings of the British Educational Communications and Technology Agency (BECTA) reveal that "teachers need opportunities for reflective practice to embed innovation and change" and that teachers report a positive impact when "senior managers in school, not just ICT co-ordinators, lead by example" (ImpaCT2, 2001, cited in BECTA, 2002b, p. 6). Both a culture of reflective practice and signals provided by persons in leadership positions play an important role in supporting teachers to learn new technologies and to grow and change professionally.

Aware of the long-term and iterative nature of the adoption and integration of new practices, Ertmer (2000) discusses how scaffolding can support teachers in change processes and build confidence, especially with opportunities for early successes. The idea of support to learning processes via scaffolding was first used by Bruner in the 1960s and grows out of work by Vygotsky on experienced others helping learners to learn. Scaffolding involves recognizing teachers' needs, goals and beliefs, and adding layers of learning in a process of continual refinement and in ways that help teachers move toward their goals. Ertmer stresses the importance for teachers of collaboration, of being able to observe similar others for inspiration, and of concrete ideas for the teacher's grade level and content area. Different types of support and strategies should be available, i.e. one-on-one consultation, just-in-time training, formal classroom training, peer collaboration, observation. There is no one-size-fits-all, however opportunities for reflection and co-reflection on their own and others' experiences is an important part in supporting pedagogical change. Reflection should focus on what learners did or did not do in response to a lesson so as to consider what changes are needed to affect the types of student performance and level of thinking desired.

Andersson (2006) researched how newly qualified teachers in Sweden use ICT. He argued, based on a 2002 anthology of ICT in school learning cultures conducted by Säljö, that the computer as part of classroom dialogue changes children's use of language and that when there are radical changes in the way people communicate, the way they learn also changes. Though ICT influences and challenges traditional ways of teaching, those at the school level must decide the place and role that ICT should have (Andersson, 2006). It is by "questioning, daring to try new ideas and collaborating with others" that teachers "create their own visions of their teaching experience and in such a way function as agents of change" (Andersson, 2006, p. 668). Among the 21 female and male primary and secondary school teachers from three different schools interviewed, one third were deemed experienced ICT users, one third curious users who use the technique to some degree in their teaching, and one third resistant users. The first two thirds of the teachers explained how they had integrated ICT as a tool into their daily work. Changes become apparent in the meetings between more experienced colleagues and the newly qualified when they communicate and collaborate on projects. It was found that sourcing information on the Web helps teachers deepen their ICT competencies and develop the form and content of their teaching.

A study on faculty participation in online learning in higher education in Botswana (Masalela, 2006) showed the benefits of peer interaction and collegiality in learning to teach online courses. Teaching online challenged teachers to engage in student-centered practices. Barriers for non-adopters included lack of knowledge of instructional design, lack of infrastructure and quality assurance, poor management, lack of incentives and large classes. Institutional support measures such as reduced teaching load, other incentives, and technical support were identified as factors that could have a positive effect on the level of participation.

A study on the appropriation of internet spaces, via the creation of school websites, by primary school teachers in France (Audran, 2001) brings to light inconsistences between teacher discourse and practice. Teachers on the one hand talk about the great potential of ICT, yet the websites they create do not reflect important changes in their professional priorities or understanding of their mission. Their websites are an extension of their current practice rather than a way to evolve, deepen or transform it. Their use of internet in the classroom is complimentary to traditional methods of teaching; internet is just one more source of information. However, some pioneering teachers seemed aware of the social and interactive

nature of web spaces and, in a spirit of discovery, reciprocity and learning and in anticipation of a different tomorrow, created highly linked sites and regularly updated them. Through such sites they created networks of relations and benefited from the exchange of information and interactions with virtual peers. The author argued that: "*Internet peut participer d'une évolution de ces options pédagogiques [… et] favoriser une transformation des pratiques et de conceptions par institutionnalisation*" (Audran, 2001, p. 10).

Lund (2004, 2009), like other authors mentioned here, showed how appropriation of newness, specifically of ICT, brings together domains that were separated and in so doing can create or mobilize new spaces for learning and additional pedagogical resources within the cultures in which the process takes place. Inherent in appropriation processes are possibilities not only for the extension of existing habits and cultures but also of their transformation. Lund studied the ICT appropriation processes of three English as a Foreign Language (EFL) teachers at two senior high schools in Norway in 2001 and 2002. Results show that successful appropriation leads to the teacher orchestrating activities across time and space, bringing classroom and non-classroom experience to bear on the subject and learning process. New social spaces for learning, beyond the classroom, develop. Activities and goals may be multiple and may be transformed according to the empowerment and agency exercised. Teachers struggle to find the right balance between overt instruction, intervention, subtle guidance, and learner autonomy. ICT-rich environments may open up space for new, jointly developed scripts for teachers and learners, though teachers may feel somewhat uncertain about how to approach and take part in developing shared scripts and third spaces (Lund, 2009).

Lund (2004) concluded that appropriation processes are:

> *not just about adapting ICT to existing practices but entail an appropriation of technologies that exploit their transformative and future-oriented potential as well. Such processes are molded in the tension between tradition on the one hand and innovation on the other. At both schools [studied], technologies served a fundamentally social role, i.e. they brought individuals into contact with other individuals and with resources produced by learners as well as teachers and external professionals. Thus, teachers' ICT-related expertise needs to be addressed in social and relational terms. (p. 9)*

Appropriation is a complex, multidimensional, ongoing and cyclical process.

> *Appropriation of concepts or skills is not necessarily something completed. The boundary between comprehension and non-comprehension is often not very clear. Also, complex concepts or skills cannot be appropriated in one way only. (Säljö, translated by Lund, 2004, p. 4)*

The appropriation process will be shaped by pedagogical objectives and also by the contexts in which educators work. The director of a school in Joal, the birthplace of Senghor, Senegal's first President, would send his teachers to a nearby high school where they downloaded course content from the internet. He would then selectively reproduce for classroom use the most pertinent of it using on an old risograph machine.[31] He was thus inviting his pedagogical team to collaborate in the sourcing of didactical materials otherwise unavailable and demonstrating how to harness and combine newer and older technologies in creative ways to meet local needs. The director worked with all his teachers, whether enthusiastic or reluctant about ICT use, and across multiple borders – between elementary and high school, schools with and without internet access, and technologies of different eras. He created an environment and culture conducive to appropriation of newness, whether teachers were excited or wary about ICT.

Drawing on Rogers's (1962/2003) diffusion of innovations model and a 1995 electronic discussion on why faculty use or resist technology, Baldwin (1998) deduces that about 15% of faculty in the USA may be considered early adopters of technology, characterized by a strong technical focus, being visionary, liking to take risks and experiment, favoring revolutionary change, and being largely self-sufficient with regard to technology; other "mainstream" faculty need to be convinced with compelling evidence before adopting technology and may be characterized as being problem and process (not technology) focused, being pragmatic or conservative, and favoring evolutionary change. (pp. 8-9)

Faculty in the USA and also in Cote d'Ivoire have used technology much more in transforming their research and scholarship than in transforming their teaching (respectively, Baldwin, 1998, and Bahi, 2006). "College faculty make up one of the most plugged-in professions in their use of technology for research – and one of the most retrograde in their use of technology for teaching" (Saltrick, as cited in Baldwin, 1998, p. 10). According to these scholars, this is because internet enhanced information sharing is inherent in the scholarly process, whereas the use of ICT in teaching would require "major alterations in the usual work

[31] 2005 field notes, for ROCARE (2006)

patterns associated with teaching" (Baldwin, 1998, p. 11). Faculty can be more flexible in terms of geography and communication as technology "loosens the limitations on an academic career imposed by geography and institutional boundaries [...] Technology has transformed the research and scholarship component of faculty life by easing the process of collegial communication and collaboration" (Baldwin, 1998, pp. 15 & 11).

One might think that early adopters could serve as examples to "mainstreamers," however "having early adopters serve as role models can backfire if novices are put off by their own sense of inadequacy" (Geoghegan and Havice, as cited in Baldwin, 1998, p. 18). "Techies" and "laggards" both need room in higher education, and sceptics can help promote a critical attitude in relation to technology (Baldwin, 1998, pp. 18-19, drawing on Van Dusen).

Taylor (1998) looks at institutional change from the starting part of lone rangers within universities. He says they may represent 10% of staff and play an important part in "leaping" to innovative new practices but that change, to become institutionalized and sustainable, requires stepped appropriation by early adopters (representing another 10% of staff) and another 10% of staff for a total of 30% to represent what some might consider "critical mass." The way to move early adopters and others to change according to Taylor is through (a) *orientation* which includes time to reflect on pre-existing ideas, (b) *adoption* which includes nut-and-bolts training and technical support, (c) *evaluation* which includes the introduction of educational theory as a language for discussion of observations, (d) *innovation* which includes support in the redesign of their adopted practices and a repetition of the three previous steps on the basis of deepened familiarity with flexible learning environments, and (e) *institutionalization* in which staff and manager put in place mechanisms to support new pedagogical practices (Taylor, 1998, p. 276).

Lone ranging is not enough for broader institutional change to take place. Lone rangers produce pockets of isolated activity, which fail to lead to a fundamental rethinking of university culture (Taylor, 1998). Lone rangers often work alone, in a spirit of academic autonomy and are not team players. They are often responsible for autonomous cost centers within the university and might tend toward competition rather than collaboration. And they are practice-focused rather than knowledge-focused, not necessarily documenting and sharing how their innovations make a difference to student learning. Collaboration and partnerships

forged “across what were once separate domains in the institution” are what will contribute to “reinventing of cultures” (Taylor, 1998, p. 273).

Attempting to introduce new pedagogy, i.e. constructivist approaches, and a new technology at the same time can be challenging. It “requires quite an effort on the teachers’ part, both philosophically and technically” (Huffman, Goldman, & Michlin, 2003, p. 166). Considering the complex environments in which teachers work and the internal and external pressures on them, “curriculum development and professional development projects should view success as placing teachers ‘on the road’ to new ideas, not sudden transformation of teaching. Such sudden transformation rarely lasts; it is the slow thoughtful transition that fundamentally alters teaching” (Huffman et al., 2003, p. 152).

Using new technology and adopting new pedagogical approaches should be viewed as a gradual process of implementation and change; change is a process, not an event. Huffman, Goldman, and Michlin (2003) showed that “teachers were able to move towards creating constructivist learning environments in one year” (p. 166). Carey and Dorn (1998) showed that a three-year immersion of adults in an educational program (doctorate in education) using technology is consistently effective in helping technology resistant adults overcome technological illiteracy and subsequently become technology resource persons in their environments; initial training in ICT, peer tutoring, and social contact were key success factors.

ICT is used by educators and students in schools and universities both to extend traditional teaching practices and to transform teaching and learning. The transformation of teaching through the appropriation of technology and socio-constructivist methods is a long term process. Reform processes must be participatory and build in opportunities for teachers to experiment the integration of ICT in their teaching and learning and reflect with others on their practice. It takes time for innovations to become part and parcel of social fabric. Long-term views are required when considering and implementing innovations. Reforms and transformations do not come out of a box like products purchased at the store. Teacher beliefs and contexts must be considered when providing for technology in schools and universities. Teachers and professors, if they opt into particular change processes at all, will take it upon themselves to modify reform efforts to adapt them to their everyday realities. Change is organic, living, and growing. It requires communication and collaboration and constant

reflection and adjustment. Rogers's (1962/2003) theories on the diffusion of innovations are useful in profiling and categorizing technology users, understanding their decision (or not) to adopt an innovation, and predicting patterns of diffusion, whereas theories of appropriation attempt to shed light on the engagement and iterative border-crossing dialogue between users and technologies in the negotiation of change and the construction of socially meaningful newness. The emphasis in Rogers's work is on predictability, whereas appropriation accounts for human spontaneity, power dynamics and social unpredictability when humans engage with technology. Using ICT changes the learning environment, and the ICT appropriation process, shaped by human consciousness, sociality, and ingenuity, mobilizes diverse resources and influences pedagogical change and has the potential to influence wider educational and sociocultural change.

2.3.4 Appropriation: A recapitulation

Appropriation is a dialectical process of cultural transformation. It is not an event or something that is completed, but a process of change (Lund, 2009). It has also been called domestication or transformative localization (van Binsbergen, 2004). It involves investing local culture in things new and making them part and parcel of self and society, of the social fabric. What is new or foreign is absorbed and actively digested (Fonlon, 2010) and becomes part of everyday life. What is new, in the process of creative local usage, loses its foreignness (Nyamnjoh & Shoro, 2011). Through appropriation, new is molded and mixed with old (Fonlon, 2010, 2012; Hountondji, 2002). Tensions between habit and innovation play out. Fresh blends and options are created and proposed (Nyamnjoh, Durham, & Fokwang, 2002). Knowledge and traditions from several sources are combined; different ways of thinking and doing are messily synthesized. The resultant innovations offer cultural enrichment and dynamism (Fonlon, 2012).

The process is personal and social, is embedded in specific sociocultural contexts, and must be understood from relational and cultural points of view (Lund, 2009). Appropriation of ICT takes place when people invest it with their intentions and adapt its use. They creatively shape it and strategically use it to meet their objectives (Michiels & Crowder, 2001; Surman & Reilly, 2003). ICT becomes integrated into the host culture (Hountondji, 2002) as users bring their power, personality and culture to bear on its use. Appropriation involves not passivity but

active human engagement and participation. Appropriators are creators and resisters (Jouët, 2000; Michiels & Crowder, 2001) as much as they are negotiators. Their visions, actions, collaborations and conversations challenge established norms and hierarchies. They question existing truths, envision possibilities, and introduce new courses of action (Simon, 1992). Appropriation requires hope – that change is possible. And the capacity to imagine (Appadurai, 2013) things differently than they are.

Openness to change is as much a part of appropriation processes as is rootedness, for the new cord is attached to the old (African proverb). Rootedness in this case does not imply an obsession with or extension of the past but reappropriating social knowledge and cultural genius to project into the future (Fonlon, 2010; Hountondji, 2002; Muchie, 2004). In African contexts in which cultural genius was partially suppressed and repressed during colonial encounters, this is particularly important. Critical consciousness (Freire, 1970/2014; hooks, 1994; Simon, 1992; Smith, 1976) can promote self-awareness, sense of worth and peer power and can alter perceptions of reality and actions. A critical relation with heritage involves opening and interrogating it (Hountondji, 2002), not to recreate the past but to understand it, draw power from it, and build on its strengths (Wexler, 1981). Memory and remembrance are evoked not in the interest of going back in time but as sources of possibility and renewal in creating the future (Simon, 1992). While appropriation may include a foray into inheritance, it is future-oriented (Lund, 2009; Surman & Reilly, 2003).

Teachers find themselves simultaneously learning ICT, experimenting its use in teaching and learning, and evolving their pedagogical styles (Karsenti & Larose, 2001). The pedagogical appropriation of ICT is both demanding and empowering, and it is continual. Appropriating new teaching methods along with the appropriation of ICT is a process of change carried out through experimentation, reflection (Ertmer, 2000), and social contact (Andersson, 2006; Carey & Dorn, 1998; Taylor, 1998). As teachers pedagogically appropriate ICT and work across borders – of times and technologies, of pedagogies, of knowledge and power –, new social relations and spaces are created (Jouët, 2000). The pedagogical appropriation of ICT leads to transformations in insights, knowledge, skills (Lund, 2009) and practices, and the reinventing of cultures (Taylor, 1998). Teachers become agents of change (Andersson, 2006) as they mold ICT and their milieu to bring about their visions of teaching and society.

Appropriation requires freedom of expression to flourish (Fonlon, 2010, 2012; Michiels & Crowder, 2001). It involves seeking new role models, taking risks, solving problems, and engaging in dialogue (Smith, 1976). In the appropriation of ICT, access to technology is a prerequisite, and the dialogue between users and non-users can contribute to a critical attitude (Baldwin, 1998). Teachers can be inspired by peers that model appropriation and mentor them (Baldwin, 1998; Carey & Dorn, 1998; Ertmer, 2000; Masalela, 2006). Training (BECTA, 2002b; Carey & Dorn, 1998), networks of relations (Audran, 2001) as well as technical and institutional support (Masalela, 2006) nourish the change process, which also requires time (Huffman, Goldman, & Michlin, 2003).

The appropriation process is characterized by uncertainties and tensions between changes and continuities. Change is possible through appropriation because of the cultural mobilization described by Wexler (1981). As teachers and students appropriate ICT in teaching and learning, there are opportunities to evolve pedagogies toward more active ones, with more place for learners and for Africa in the world, as there are risks of extending social hierarchies of privilege that exclude rather than include.

2.4 Concepts in relation to research objective

The concepts of socio-constructivism and of appropriation are used as lenses to understand the use of ICT for teaching and learning by teachers in Mali and university professors in Mali and three other West African countries. The research objective is to understand how and why these educators pedagogically appropriate ICT and, according to them, with what effects. Do they appropriate ICT to better attain pedagogical goals and objectives? for broader social or cultural reasons? Because we assume ICT shapes and is shaped by the milieus in which it is used, the cultural environment of users is of concern. Socio-constructivism as a theory of knowledge allows us to relate to education as a process of learning mediated by culture and community. The concept of appropriation allows us to consider the cultural and historical specificities of the contexts shaping – and being shaped – by the use of ICT. In interviewing educators, their cultures are not considered separately from their classroom practice but as part of what is shaping and being shaped by their teaching and their appropriation of ICT. The conceptual lenses, which take into account the sociocultural

contexts in which appropriation takes place, help to reveal the creative tensions between initiative and passivity, tradition and novelty, continuities and changes.

CHAPTER 3. Methodology

Sadly, the feeling that one has to use the language and methods of experimentalists is a relic of the days when interpretative research was felt to be not quite good enough. (Thomas, 2013, p. 138)

3.1 Introduction

To understand how and why West African educators use ICT in teaching and learning and with what effects, we used a qualitative research methodology, drawing inspiration from ethnographic approaches. The research process was flexible and emergent. In this chapter, we discuss the rationale for this methodology, participants, and the process of data collection and analysis. We conclude with a discussion of the deontological concerns and of the strengths and limits of the methodological approach.

3.2 Why a qualitative research methodology?

To understand and explain a phenomenon in specific contexts, we sought research methods that would allow participants to feel comfortable and natural in their environment. Information was gathered from a small group of educators in the midst of their everyday work environments through semi-structured interviews, informal conversations and observation. Quantitative approaches are useful for large samples to discern certain tendencies, whereas qualitative approaches are richer in explicative power. We tapped that power to explain the pedagogical appropriation of ICT within the complexity and dynamism of the human relations and interactions that define teaching. Savoie-Zajc (2011) addresses the appropriateness of studying teachers in interaction when trying to understand aspects of teaching and learning processes:

> *La nature même de l'éducation est tissée des relations interpersonnelles entre les acteurs du processus d'enseignement/apprentissage. L'éducateur est cette personne qui réussit à établir des liens significatifs et réciproques avec l'apprenant. Comment peut-on alors étudier une réalité interactive autrement qu'en conservant son essence même, soit l'interaction? (pp. 125-126)*

Savoie-Zajc (2011) explains the reasons for qualitative research, first used by anthropologists, which have to do with trying to better understand the meanings people give to their reality and experiences. Qualitative research seeks "to discover meaning and

understanding, rather than to verify truth or predict outcomes" (Myers, 2000, in section on Demands for justification, para. 2). In trying to understand how and why educators appropriate ICT for teaching and learning and with what effects, we needed to understand the meanings that educators attach to their role and to the use of ICT. It would have been possible to obtain insights through questionnaires to hundreds of educators, but the most in-depth information and insights would come from rich qualitative exchange in which educators use their own words to explain their experience and how they negotiate and navigate the changes it brings.

3.2.1 Drawing on interpretive and critical epistemologies

Savoie-Zajc (2011) reviews the three main epistemologies or theories of knowledge underlying education research: positivist, interpretive, and critique. The *positivist* approach reduces reality to certain variables to be studied as objectively as possible to understand causes and effects in certain conditions. The researcher, perceived as neutral, often relies highly on quantitative approaches.

The current research uses the interpretive and critical approaches. The *interpretive* approach takes a holistic position, and seeks to understand the dynamic of a phenomenon in its context. Researchers acknowledge their subjectivity and seek to objectify the data. In a *critical* approach, the knowledge produced helps reveal power structures thereby helping people understand and transform reality. Formal educational systems in Africa during and subsequent to colonialism, as discussed in Chapters 1 and 2, have been highly exteriorized with consequences for learner self-confidence, denigration of culture, and non-relevance of learnings. In such a context of unequal power relations, research methods informed by critical approaches make sense.

3.2.2 A place for subjectivity in the research process

We do not discuss variables, because in the interpretive approach "it is considered artificial to fracture the social world into these categories" (Thomas, 2013, p. 109). Nor do we claim to be objective. To the contrary, "you should use your own interests and understandings to help interpret the expressed views and behavior of others" (Thomas, 2013, p. 109). The social position and outlook of the researchers, sometimes called their positionality, affects

power relations in the research process and the interpretation of data (Thomas, 2013). The positionality brought to bear in this work is as follows.

The researcher grew up in Kansas in the United States and moved to West Africa in 1996, after studying African civilization at the University of Cocody in Abidjan, Cote d'Ivoire ten years earlier. She lived and worked in three different West African countries and travelled to over half of the countries of Africa over the course of her career in Africa. Her views of education were shaped by years of working with African researchers, mainly in West and Central Africa, who share a vision of giving an African face to education in Africa. Over the years, she has been involved in supporting African-led interdisciplinary research on agricultural, environmental, socioeconomic and technological questions and has promoted the discussion of research results and the publication of diverse viewpoints regarding societal questions.

Her background, personal sensitivities and predilections are lenses through which findings were interpreted and put into context, while trying to be "thorough and balanced" rather than objective, as "the centrality of subjectivity" is acknowledged as is the fact that "there is no clear, disinterested knowledge" (Thomas, 2013, p. 109). Feelings, understandings and "powers of reflection" have added insight and depth to the interpretative process (Wertz et al., 2011, p. 160).

3.3 Participants

We wanted to reflect the continuum of the formal education system and thus sought educators from primary school through university. Participants were selected on the basis of their use of ICT in teaching and learning and for being willing to participate in the research. Two administrators were also included for purposes of triangulation and additional insight once we realized the importance of the theme of teachers' beyond-the-classroom conversations about ICT in education. The group was thus obtained, not on a statistical basis, but according to the pertinence of the people invited to participate in the process, in relation to the specific research objectives. Savoie-Zajc (2011) calls this theoretical sampling:

> *un choix conscient et volontaire des répondants par le chercheur. C'est leur compétence perçue comme pertinente en regard de la problématique de recherche qui incite le chercheur à les inviter à participer à la collecte de données. (p. 131)*

Because the researcher was based in Bamako, the capital city of Mali, the primary through high school teachers were recruited in Bamako; the university professors, recruited through regional networks in which the researcher was active, came from Mali and three other West African countries. Participants were recruited initially from a school where the researcher had volunteered and from among education researchers known her. After an initial selection, ongoing conversation with participants and other education researchers led to the addition of other participants. A limited number of interviewees permitted in-depth discussions. Thirty-one persons participated in the study: 23 teachers of primary through high school in Bamako, Mali, six university professors from West Africa, and two administrators in Mali. The group included women (13%) and men (87%), 25 to 55 years of age. Table 1 lists the number of interviewees per category.

Table 1. Number of Interviewees per Category

Interviewees	
Category and sub-category	**Number**
Educators	**29**
Primary school teachers in Mali (grades 1-9)	19
High school teachers in Mali (grades 10-12)	4
West African professors	6
Administrators	**2**
Total	**31**

The 23 teachers worked in six primary through high schools, in Bamako, and the six professors came from the University of Bamako and three other West African universities. The universities were all public whereas only one of the schools was public, the others being private – because we found more experimentation with ICT in teaching and learning in private schools. The schools and universities served socioeconomically privileged and less privileged learners. The following brief descriptions of the schools and universities sketch the environments in which the educators work.

Yéna Issa primary school (grades 1 through 9) in Bamako, the capital of Mali, is in the Bacodjikoroni neighborhood on the right bank of the Niger River. Founded in 1997 as a private school with just a few students and one grade level, it expanded to include all nine levels of primary school. In 2010, the government granted permission to open Yéna Issa high school. The primary school has above average pass rates and a founding director devoted to his teachers and who maintains good communication with parents. Students come from working class families. Annual fees are discreetly waived in part or in full in some cases when families experience financial difficulty. The school has no computer laboratory, however a couple of instructors visit cybercafés to prepare their lessons.

Kalanso is a private school created in 1994 for pre-school through grade 9 in the neighborhood of Djélibougou in Commune 1 of Bamako, on the left bank of the Niger River. The director was trained in Mali, France and the USA and encourages active teaching pedagogies. The school is well resourced and managed, and many of its students are from socioeconomically privileged families. Annual school fees range between US$625 and $675 for girls and US$800 and $875 for boys. It enrolls approximately 750 students, 43% of whom are girls, and 35 teachers, of whom 40% are women. The average class size is 35. Computers were introduced in 1996, and they are used in school administration and in teaching and learning. Computing is taught, and the school has conducted interdisciplinary projects integrating the use of ICT. The computer lab for grades 4 through 9 has about 20 computers connected to internet, and another lab is available for lower grade levels. Teachers use the same labs as students, but some machines are set aside for teacher use. The school library is well endowed with about 2000 books.[32]

Groupe scolaire Mamadou Konaté is a public primary through high school in Bamako on the left bank of the Niger River, in the *quartier du fleuve* neighborhood. Created in the 1930s, it is named for a graduate of William Ponty, a teachers' training college on Gorée Island off the coast of Senegal, who created a teachers' union in West Africa before becoming co-Vice President of the French National Assembly in 1956. Groupe Scolaire Mamadou Konaté was one of 10 school groups selected to house the first government-funded

[32] See www.kalanso.net

cyberspaces for schools in Mali.[33] We developed contacts at the cyberspace thanks to a sociologist conducting research on the use of cybercafés in Bamako.

Complexe scolaire Mali Univers is located in Faladié, a residential neighborhood in Commune 6, one of the larger communes of Bamako, on the right bank of the Niger River. There are three administrations, one for pre-school, one for grades 1 through 6, and a third for middle and high school. A private school that teaches the French and the Malian curricula, it was created in about 2005 in response to concerns of parents in Bamako whose children had started school in France. A computer lab with 40 computers connected to internet is overseen by a monitor who provides some training in ICT to teachers and students, but as of 2008 the school administration had no strategy for using ICT in teaching or learning or plans to maintain the equipment. By 2011, the majority of students were reported to have Facebook accounts.[34]

Lycée Cheikh Anta Diop is a private high school in Commune 5 on the right bank of the Niger River in Bamako. Founded in 1992, it enrolls almost 700 students, employs 30 teachers, and has some computers connected to internet. The process of preparing student transcripts has been computerized since 2008. Some teachers use ICT in their teaching. By 2010, some students were using Facebook, Hi5 more commonly and sometimes Myspace. Some students have access to computers only at school, whereas others also use them at home and/or at cyber centers.[35]

Lycée Kodonso is a private high school in the Djélibougou neighborhood of Commune 1 in Bamako, on the left bank of the Niger River. It enrolls between 500 and 600 students and has a staff of 40 teachers, and a computer lab with about 20 computers connected to internet. The lab monitor trains students in ICT and supports interested teachers. Students that come from the sister school, Kalanso, are already familiar with using ICT for schoolwork, but many incoming students from other schools need to be trained. Students help produce the

[33] See article on 2006 visit by Malian authorities to the cyberspace: www.mali-ntic.org/index.php/toutes-les-ressources/405-tic-et-education-le-projet-cyber-edu-desormais-une-realite-au-mali
see also www.observatoiretic.org/institutions/show/170
[34] See www.observatoiretic.org/institutions/show/199
[35] See www.observatoiretic.org/institutions/show/169 and page 3 of 3 at www.ernwaca.org/panaf/IMG/pdf/PanAf_Visite_Ecole_Mali.pdf

school newsletter, *Kod'News*.[36] It has included an interview with the computer lab monitor, information about computer viruses, and a discussion of pornography on the internet.[37]

The six schools, though only one is public, are diverse. Some are more established and others newer; some are smaller and others larger in terms of student enrollment. Some are only primary or only high schools whereas others include both primary and secondary grade levels and even pre-school. The schools are located in various neighborhoods across Bamako and serve students from diverse family backgrounds. Some of the private schools have relatively affordable annual fees whereas others would be considered costly relative to annual income levels in Bamako. Some schools have libraries whereas others do not. Some have computer laboratories whereas others have no computers at school; some offer teachers opportunities to learn ICT whereas others do not. The level of interest of the school management in ICT also varied from very interested in and supportive of both technological and pedagogical issues, to interested in ICT – partly to please parents and attract students by appearing modern – but not strategizing about its integration, to ignoring pedagogical changes underway with the use of ICT and only minimally if at all supporting teachers wishing to explore its potentialities. All the schools offer the Malian curriculum, and one offers the French curriculum in addition. However none of the schools offers instruction in local languages in the first years of primary school as promoted by the current education reform.

The University of Bamako opened in 1996; enrolment went from 20 000 to 70 000 students by 2011, when it was divided into four different universities, one for social science and management, one for literature and the humanities, one for science and technology, and the fourth for law and politics. There are about 800 instructors. The *Agence universitaire de la Francophonie* provided the first computer lab on campus in 2000 and also provides training for selected students and faculty in open and distance learning. Thanks to our participation and leadership roles in the Educational Research Network for West and Central Africa, we had contacts with instructors at several faculties including humanities (FLASH), science and technology (FAST), and medicine (FMPOS) and also at the institute for applied training and research (ISFRA), founded in 1970, and the teacher training school, *Ecole normale supérieure*, (ENSup), which opened in 1963.

[36] www.kodonso.net/kodonso/kodnews-kodonso-1.html
[37] See www.observatoiretic.org/institutions/show/163

Three of the six faculty interviewed were from universities in other West African countries beyond Mali but had connections with Mali by nationality, secondment, and/or frequent travel for research and lecturing – a sign of some mobility among university professors in West Africa.

3.4 Timeline

The research process took place from 2006 through 2014 and began with acceptance into the PhD program at the University of Montreal and authorization to conduct research in Mali. Data collection took place in West Africa from 2006 through 2009. Data analysis, including feedback from participants, took place from West Africa and North America from 2010 through 2013. The research was written up in North America and West Africa in 2013 and 2014, and the thesis was finalized for submission in 2015. Table 2 presents the major phases of the research process.

Table 2. Time Periods for Major Phases of the Research Process

Time period	Research activity
	Data collection
2006 and 2007	● Interviews with university professors
2008 and 2009	● Interviews with primary through high school teachers and with administrators, and transcription of the interviews
	Data analysis
2010 and 2011	● Development of ICT itineraries for university professors interviewed
2012 and 2013	● Reading and rereading of interview transcripts and development of a synthesis for each
December 2013	● Coding, according to emergent themes, of the syntheses of interviews with primary through high school teachers and with administrators
2011-2013	● Feedback from participants
2013 and 2014	**Writing up of research findings**

3.5 Data collection

In-depth interviews constitute the main source of data. Because we wanted to understand the meanings educators give to their appropriation of ICT, we spent time – at least a total of 50 hours – dialoguing with them and two administrators about their experiences in this regard. We employed a semi-structured approach to the interviews, asking the same set of questions to most participants while also encouraging each participant to describe the

important aspects of his or her ICT appropriation process. We kept a research journal in which we documented the contexts of the data collection and some of our own reflections as the process evolved.

The researcher hired a research assistant, a student in education, to conduct and transcribe five of the interviews, and another research assistant to transcribe the other interviews with teachers. The researcher benefited from the insights and perspectives of the two assistants, each familiar with the local educational system and culture.

Interviews with the six university professors were conducted at their universities, at professional meetings, or in once instance via skype. Interviews with the 23 primary through high school teachers were conducted face-to-face during school visits. Interviews with the two administrators took place in their offices. All interviews were individual except for one, which group interview included seven teachers, two of whom were subsequently interviewed individually.

The interviews with teachers and administrators lasted between 45 and 90 minutes, and with university professors between two and four hours over one or several days. Notes were taken during interviews with the university professors, whereas the teacher interviews were recorded with a digital recorder and then transcribed by a research assistant. Most transcripts were word for word, though a few of the longer ones included some synthesis. The researchers spot checked the accuracy of the audio recordings and the transcripts and verified the audio when parts of transcripts seemed unclear or to hear the tone of voice or verify certain nuances.

3.5.1 Pretest and validation of the semi-structured interview guide

The semi-structured guide used in conducting interviews with educators is attached in Annex B. It was adjusted in interviewing the two administrators. The guide categorizes approximately 24 questions thematically. Because we wanted to understand how and why educators in West Africa pedagogically appropriate ICT and with what effects, we asked about the process of becoming familiar with ICT, about how it was used, about motivations for its use, and about changes that occurred with the use of ICT in teaching and learning.

The guide was tested with two educators in Bamako and shared with two qualitative researchers, before and after the test, for input and validation. Questions evolved with time as issues emerged. For example, as educators talked about how those beyond the classroom

including people who do not use ICT participate in the appropriation process, we began exploring that issue (which became the second specific research objective). The guide includes instructions to the interviewer, as five of the 27 interviews were conducted and transcribed by a research assistant, a student in education at *Ecole normale supérieure* in Bamako.

3.5.2 Triangulation

Triangulation is a way for researchers to explore a phenomenon from multiple perspectives (Baxter & Jack, 2008; Flick, 2007; Savoie-Zajc, 2011), for example by drawing on multiple sources of data, which can also serve to verify data. Though our primary source of data was interviews with educators, we triangulated or compared and contrasted what they said with their résumés, websites and/or the website of their school or university. We also consulted articles and reports available on the Web for complementary information. In some cases, educators shared documents that they or their students had produced, including student evaluations of a course. Because some of the interviews took place in school computer labs, we could observe students and teachers individually and in groups as they used computers in relation to curricular and extracurricular activities to confirm the veracity of the educators' remarks. We had informal discussions with some school directors, which enabled us to triangulate what the teachers said and what we observed in their working environments. We were also able to compare teachers' discourses with the environment described at observatoire-tic.org for some schools. Interviews with administrators were useful in putting into perspective what teachers said about ICT appropriation, especially regarding more systemic appropriation.

3.6 Data analysis

The data analysis drew on various approaches in qualitative research and mainly employs thick description (Geertz, 1973). Thick description means understanding what is shared in context and interpreting it when describing it. "Analysis is a creative process of organizing data so that the analytic scheme will emerge" (Wertz et al., 2011, p. 227).

The first step to begin to organize the data was to read the transcripts to familiarize ourselves with them, an open reading (Wertz et al., 2011). Then we reread, highlighting

segments and making comments using Word's comments feature and asking ourselves as we read: What is going on here?, What is the significance?, What does this mean? Our attitudes in this stage included "empathetic immersion," "dwelling in each moment of the experience," "suspension of belief and employment of intense interest," and "turning from objects to their personal and relational significance" (p. 132). Then we wrote a synthesis of each interview. Interpretative analysis informed the way we grouped text segments into "meaning units" (p. 131) and – for the syntheses of teacher and administrator interviews – provided headings.

We shared the syntheses with participants and with several West African educationalists and researchers for additional insight. As we continued to reread the interview transcripts and syntheses, themes emerged and changed the syntheses. Themes included changes seemingly taking place among teachers and learners and in classrooms and schools, beyond-the-classroom participation in the appropriation process, and desires to use ICT in transformative ways, including to make place for Africa in education and in the world. We had initially intended to focus on ICT at school, but the interviews lead us to consider broader realms – from local communities in which schools are located to the wider world, i.e. beyond Mali and West Africa – in which educators are also active and which shape their appropriation of ICT and inform their motivations for its use.

For the interviews with the 23 primary and high school teachers and two administrators, we used the software QDA[38] Miner to code by theme the syntheses and discussion of each synthesis. Sub-themes ultimately determined the structure of the three chapters in which the results are shared. Sub-themes about changes that appear to occur with the use of ICT in education included changing roles and relations, changing pedagogical styles, changes in course content, and changes in teachers' approaches to professional development. Sub-themes in relation to beyond-the-classroom participation in the appropriation process included conversations with other teachers, conversations with pedagogical advisors, and conversations with parents.

In the interpretive analysis, we used the hermeneutic circle, going "back and forth between parts and whole, and between the whole and its context, in order to achieve a fuller grasp of its meaning" (Wertz et al., 2011, p. 91), as "the whole illuminates the parts" and "the

[38] QDA: qualitative data analysis

parts in turn offer a fuller and more complete picture of the whole" (p. 227). As we read, analyzed, interpreted, and wrote, we consulted the literature on concepts that came up for possible theoretical interpretations and used some of those references to update the initial literature review, creating another hermeneutic circle between the data and the literature.

The interpretive and interactive dynamic of inquiry transformed our understanding of the topic (Wertz et al., 2011). At the outset, we perceived ICT appropriation as a way to improve teaching and learning, without realizing the intentionality of the educators to transform teaching and learning processes and even culture. While realizing that education is a social process, initially we did not fully grasp the degree to which the ICT appropriation process is embedded in the social setting that we studied.

Findings are introduced in a dialogue of discovery, not in a logic of proof (Paillé, in Savoie-Zajc, 2011). We tried to find a "balance between conciseness and richness" (Wertz et al., 2011, p. 93). A strength of the qualitative approach is "the depth to which explorations are conducted and descriptions are written, usually resulting in sufficient details for the reader to grasp the idiosyncrasies of the situation" (Myers, 2000, in section on Qualitative studies and generalizations, para. 6). Some of the scientific discourse through which findings are shared in Chapters 5, 6 and 7 is poetic because educators and administrators used many metaphors when referring to their relationship with ICT and because "knowledge of highly implicit meanings requires creative language" and "some important aspects of human experience are best conveyed with evocative prose" (Wertz et al., 2011, p. 135). "When research analysis is infused with the imaginal and intuitive, science is imbued with a renewed ethical and compassionate dimension" (Wertz et al., 2011, p. 246).

3.7 Deontological considerations

As far as deontological or ethical concerns, implied consent was obtained from participants. In the context of this research, primarily in Mali, where trust depends on knowing each other and members of each other's social circles, formal consent forms were not appropriate. Rather, being known as a person of confidence or being introduced by persons of confidence was important.

Participants were informed of the research objectives and were free to withdraw from the research process at any moment. Because of the nature of the research methodology, which involved the progressive construction of meaning and sharing rather than extracting information, most participants received a paper or email copy of the interview transcript and/or a synthesis for information, verification and any further comments. The anonymity of interviewees has been respected. Pseudonyms are used.

The quality of relations with participants is important. Savoie-Zajc (2011) developed five criteria by which to ensure learning for all involved and to assess the quality of relations with participants. Table 3 lists and describes these criteria and our assessment in relation to them.

Table 3. Assessment of Relational Criteria throughout the Research Process

Relational criteria [a]	Summary definition	Assessment of the quality of relations with research participants
Balance	All voices are heard, not favoring one group over another.	We listened without giving more weight or consideration to perspectives of men or women, those with more or less formal education, more or less experience as a teacher, more or less experience with ICT, more or less reluctance or enthusiasm regarding the use of ICT in teaching and learning, etc.
Ontological authenticity	The study enables participants to enlarge their perceptions about the question studied.	Interviewees appreciated the opportunity to share their experiences and perspectives, and several said sharing in such a way provided them with additional insight into the use of ICT in teaching and learning.
Educational authenticity	Points of views of those involved in the study become objects of learning, going from individual to group views, becoming conscious of one's own view and comparing it with others' views.	As publications grow out of the research process and are shared with participants, they will have more opportunity to compare their experiences and perspectives with those of other participants and with those of the group, and the findings and interpretations will be open to reinterpretation.
Catalytic authenticity	Study results are energizing for the participants.	We cannot attest to what participants did with additional insight into the use of ICT in teaching and learning but imagine participation in this research process was one of many stepping stones in their appropriation of ICT in teaching and learning and the evolution of their pedagogical styles.
Tactical authenticity	Participants move to action, in part through the provision of meaningful conceptual tools.	We shared the findings at one school where several teachers were interviewed; we do not however know the extent to which our development of the concept of appropriation, as a lens through which to understand the use of ICT, educational reform and even cultural change was helpful.

[a] developed by Savoie-Zajc (2011, p. 142)

We tried to ensure that multiple voices were heard without favoring one group over another (balance). Interviewees expressed appreciation for the opportunity to broaden their perceptions of the question studied (ontological authenticity). Participants will receive the research report and have the opportunity to situate their views vis-à-vis those of others (educational authenticity). The study energized the participants (catalytic authenticity) and provided another stepping stone for the development of their pedagogical styles. We do not know how participants were moved to action (tactical authenticity), by reflecting more consciously on their teaching from a socio-constructive perspective or using appropriation as a lens for understanding the use of ICT in teaching and learning.

3.8 Strengths and limits of the methodological approach

The strength of the methodology is the in-depth and contextualized approach and in reliance on participants to help construct meaning throughout the research process. Participants shared about their internal and social worlds, and we dialogued with them and others to make sense of their appropriation of ICT, of the meaning it has in their lives. Given this approach, findings should add to an understanding of human experience in specific educational settings when new cultural tools like ICT become available. Karsenti and Collin (2013) stress the need for empirical studies on the use of ICT in specific pedagogical and sociocultural contexts. Chapters 5 and 6 for example, in which the findings from Malian primary and high school teachers are shared, should reflect certain realities of Malian educational contexts and social aspirations, which may, or may not, be similar to other contexts in Mali and other West African countries.

The number of participants – 29 educators and two administrators – limits the possibility of generalizing. For example, findings from interviews with university professors (in Chapter 7), reflect the experience and perspectives of six professors. They are not generalizable to all university professors in West Africa but do provide insight into the human experience of harnessing technology to pedagogical and other goals in contexts that have been poor in didactical resources and possibilities to participate in scholarly production and debates.

The participants in the study, even as they at times hesitated, were for the most part fairly enthusiastic about ICT and its pedagogical possibilities, or had been encouraged by their school hierarchy to explore ICT and its possibilities in teaching and learning. Most were, to different degrees, fairly open to learning new things and to change. Such sentiments and dispositions are not necessarily shared by all teachers in the teaching corps. The results, analysis and conclusions thus emanate from a select group of teachers. Similar studies of teachers less open to change could provide different results.

We drew primarily on teachers' perspectives to answer the research questions and present the findings. In describing the changes taking place with the use of ICT, we relied on the internal coherence of the narratives of the 29 educators and two administrators interviewed and of the narratives as a group but did not verify the changes described via classroom observations or interviews with learners and their parents. In describing the significance of teachers' beyond-the-classroom conversations about the use of ICT in teaching and learning, we drew on what was related to us by the participants in the study and did not take part in the discussions of teachers with persons, like pedagogical advisors and parents, outside the classroom. Subsequent studies could confirm or infirm or merely deepen the findings presented, about the social shaping of the pedagogical appropriation of ICT, by diversifying the sources of data and thus revealing more complexities and multilayered perspectives.

The researcher knew a couple of the teachers because she had volunteered at their school and most of the professors because she had collaborated with them in one way or another. The intimacy could have influenced the interviewees, as in almost any qualitative research project, to share what they thought the researcher hoped to hear, for example by expressing enthusiasm about ICT in a research project about the use of ICT.

Another limit is the selection of educators in urban centers and the preponderance of teachers from private schools. Some of the findings could be useful in rural settings and in public school settings, but additional studies are required to understand the specificities of the pedagogical appropriation of ICT more generally in urban and rural settings and in public and private schools in West Africa.

CHAPTER 4. Introduction to the three thesis papers in which results are shared

A scholarly papers format, as described by the Faculty of Graduate and Postdoctoral Studies of the University of Montreal (FESP, 2012, pp. 13-14), was selected for this thesis.[39] This format facilitates the sharing of research results by having them published in peer-reviewed journals. Table 4 presents the papers and the journals to which they will be submitted.

Table 4. Journals Selected for Each Thesis Paper

	Paper title and **objective**	**Journal selected for submission**
Paper 1	**Title**: Blacksmiths of Internet in African Classrooms **Objective**: understand how and why primary through high school teachers in Mali appropriate ICT in teaching and learning, and, according to them, what changes occur in the process	***International Journal on E-Learning*** seeks to facilitate the international exchange of information on the current research, development, and practice of e-learning to enhance learning and teaching in corporate, government, healthcare, and higher education. It is a journal of the Association for the Advancement of Computing in Education, based in Chesapeake, Virginia, USA. Articles should not exceed 30 double-spaced pages.
Paper 2	**Title**: Teachers Dialoguing about ICT at the Borders of Transformative Possibilities **Objective**: understand how teachers' conversations beyond the classroom, about the use of ICT in teaching and learning, contribute to the pedagogical appropriation of ICT, as teachers encounter their peers, supervisors, parents and others	***Culture and Dialogue*** promotes research in philosophy and theory that sees dialogue as a fundamental ingredient of culture. Dialogue, in this context, means a mode of relationship that lets cultural formations unfold by bringing together in conversation human beings and, for example, their natural environment, their historical past, traditions, external cultural influences, contemporary trends, other communities, or simply other persons. Linked with UNESCO, the journal is run by the International Research Group for Culture and Dialogue, National University of Ireland, Galway. Members of the Editorial Board are from Africa, Asia, Europe, North and South America, and Oceania. The third volume was published in 2013; two issues have been published each year. Papers should be between 5000 and 10000 words.
Paper 3	**Title**: *Pourquoi les professeurs ouest-africains s'approprient-ils l'internet?* **Objective**: understand why West African professors pedagogically appropriate ICT	***Canadian Journal of African Studies / La Revue canadienne des études africaines*** aims to improve knowledge and awareness of Africa as well as the problems and aspirations of its people, to inform Canadian policy on and in Africa, and to generate public interest in the study and understanding of Africa in Canada. It publishes articles in the areas of anthropology, political economy, history, geography, and development. Many take an interdisciplinary approach. For more visibility on the academic market, the journal is now produced by Taylor and Francis rather

[39] A request to write the thesis in such a format was duly submitted to and approved by the Faculty.

Paper title and **objective**	**Journal selected for submission**
	than at the University of Alberta. One of the three issues per year is thematic. The managing editor is at the University of Toronto. Manuscripts should range in length from 6000 to 10000 words.

Three papers present the research results of a single project that sought (see section 1.5, Research questions and objectives) to understand how and why a select group of Malian teachers and West African professors pedagogically appropriated information and communication technologies (ICT), primarily computers and internet, and the effects, according to the teachers' perceptions, on themselves, their teaching, and their classrooms. We employed a qualitative and interpretive research methodology. The papers reflect the results of interviews conducted from 2006 through 2009 with 23 educators and two administrators in Mali and six professors in Mali and three other West African countries, for a total of 31 persons, as they adopted and adapted ICT in teaching and learning. The papers are bookended by this introduction (Chapter 4) to the results and the general discussion and conclusion (Chapter 8) of the thesis. This chapter introduces the specificity of each of the three papers and their commonalities and complementarities.

Paper 1 (in Chapter 5) seeks to understand how and why a select group of primary through high school teachers in Bamako, Mali were adopting ICT in their teaching and changes, according to the teachers, occurring through the process; paper 2 (in Chapter 6) explores the ICT appropriation process beyond the classroom, as several of these same teachers encounter peers, school and district directors, parents and others outside their classrooms. Paper 3 (in Chapter 7) seeks to understand why selected West African professors, from Mali and three other countries, pedagogically appropriate ICT. All three papers report on the reactions of contemporary educators to formal educational systems undergoing reform but that remain largely shaped by colonial traditions and perspectives, as well as budgetary and material shortfalls. The papers describe the process of becoming familiar with ICT and of experimenting it in teaching and learning and reveal a range of reasons given by educators at all levels for using ICT.

The papers draw on educational theory and on cultural studies. As far as educational theory, they draw on social constructivism (i.e. Vygotsky, 1978; Bruner, 1996; Obanya, 2012a, 2014), in which learning and development is considered as a social activity. As a

complement to educational theory, we draw on cultural studies and African lore to shed light on social behavior and meaning and the cultural context in which education is taking place. We draw on an understanding of culture as the creative force of a people (Ki-Zerbo, 2010a) whose evolution involves initiative, continual restoration and integration of newness (Fonlon, 2010, 2012) and on appropriation theory about how users adapt cultural tools to meet their everyday contextualized needs and objectives (Jouët, 2000; Surman & Reilly, 2003).

Chapter 5 presents the first paper, "Blacksmiths of Internet in African Classrooms," comparing teachers to West African blacksmiths and potters who use metal or clay and fire to shape tools for society. It reports how primary through high school teachers, in their pedagogical use of ICT, move from a tradition of education as transmission to more socio-constructive pedagogies in which they help students be part of multiple cultures and position them to regenerate society, as described by Bruner (1996) and Obanya (2011, 2012a, 2014).

Chapter 6 presents the second paper, "Teachers Dialoguing about ICT at the Borders of Transformative Possibilities," reporting on teachers' conversations and interactions outside the classroom about their experience with ICT. In going beyond the classroom in the pedagogical appropriation of ICT, teachers acted as cultural workers. We compare them to Soumba Ngolo, possessor of the prized *balafon* or xylophone of Sundiata Keita, founder of the Mali Empire. Ngolo used this cultural tool to transmit culture but is also known for his invention of new musical instruments. The paper describes how teachers, having integrated ICT into their personal lives and professional practice, dialogue with different societal actors about how ICT should be appropriated in teaching and learning. They work well beyond their classrooms and schools, across multiple frontiers, in borderlands of transformative possibilities.

Chapter 7 presents the third paper which is titled "*Pourquoi les professeurs ouest-africains s'approprient-ils l'internet?*" and looks at reasons why six university professors pedagogically appropriate ICT. They embrace ICT to recreate positive learning experiences, facilitate African participation in the world, and transform culture. ICT for them is a place and space of confluence and divergence in which and through which pedagogical and cultural changes are envisioned and implemented. Sidi for example speaks about the evolution and imposition of African personality: "*Nous devrons écrire, laisser des traces, rompre un peu avec ce passé […] comme pour défendre notre personnalité, notre culture.*"

ICT is not being introduced into Malian schools and West African universities by virtue of ministerial decrees. Rather, each of the teachers and professors interviewed made a personal decision to use ICT in teaching and learning. ICT offers possibilities to challenge the status quo and evolve school cultures, teaching and learning practices, and relationships between teachers and students. As such it is hastening changes into the culture of education and provoking teachers to reflect on these changes, which are far more sweeping than the mere use of a tool.

CHAPTER 5. **First thesis paper**: Blacksmiths of Internet in African Classrooms

by Kathryn Toure

Abstract
West African blacksmiths observe the world around them closely. Like West African potters, they seek to understand people's habits and aspirations in order to make appropriate vessels and tools. Teachers are Africa's new blacksmiths and potters, encouraging students to use information and communication technologies (ICT) to broaden their connections with the worlds around them and fostering new interactive pedagogies to align with the new technologies. Through interviews carried out with primary and high school teachers in Bamako, Mali, this paper explores how the teachers use ICT to serve their pedagogical objectives and work toward their visions of the world. The teachers describe their experience of appropriating a new technology and the perceived effects of that appropriation on student learning and school culture. It appears that the changes underway enable students to know and express themselves differently, as they break with longstanding pedagogical traditions and colonial legacies.

5.1 Introduction

This paper describes how and why almost two dozen primary and high school teachers in six schools in Bamako, Mali appropriate information and communication technologies (ICT) in teaching and learning and the concomitant changes they perceive in themselves and their students, in their classrooms and in their schools.

5.2 Context

The West African education tradition can be thought of in terms of the history of the land: indigenous populations with their traditions followed by Muslim and European conquests each of which imposed new traditions, all three of which co-exist today (Mazrui, 1986). Indigenous education typically involves an entire community collectively responsible for teaching children to observe the world around them, telling stories to convey history and morality, and solving the problems of everyday life (Moumouni, 1964/1998; Nsamenang, 1992). With Islamic exploration into West Africa beginning in the 1100s, madrassas were introduced for the study of the Koran and other subjects. Later, in the 19th century, as European powers expanded their empires, an education system was aligned with French interests to create a functional local administration: "*L'enseignement visait à produire*

essentiellement le personnel subalterne indigène nécessaire à la bonne marche de l'administration coloniale" (Moumouni, 1964/1998, p. 42). The colonial educational system, which sought to repress rather than foster, to tame rather than inspire (Fonlon, 2010), stagnated and alienated students, as does any educational enterprise that fails to risk examining viewpoints and potentially offending some interests (Bruner, 1996).

The gap created by colonial education between formal schooling and what learners need and want to learn continues to make itself felt in Mali today. The education system is "too hierarchical and ill adapted to the aspirations of parents, students and teachers" (République du Mali, 2003, p. 9, our translation). As Malian schools continue to struggle with outdated pedagogical traditions and the government engages in educational reforms, cyber centers are springing up in many West African cities and towns. In some schools, computers and internet have made their way into administrative offices, computer laboratories, and even some teacher lounges and classrooms. Parents, students, teachers and administrators perceive positively these new technologies: "*Contrairement à de nombreux endroits du monde développé, fonctionnaires et enseignants en Afrique semblent faire bon accueil à la perspective des TICs dans l'éducation*" (Farrell & Isaacs, 2007, p. 30). The computer is not at all out of place at school:

> *Le bien-fondé de l'ordinateur à l'école est reconnu par la majorité des enseignants. Cette position que nous avons relevée dans les attitudes positives des enseignants et dans les représentations sur l'ordinateur à l'école montre que l'ordinateur constitue un enjeu important pour l'éducation. […] La porte est ouverte pour l'intégration de cette innovation. (Kouawo, Karsenti, Gervais, & Lepage, 2013, pp. 230-231)*

The use of computers and internet among teachers began in the 1990s primarily for personal information and communication needs. Some teachers began experimenting with computers in the classroom and integrating them into their pedagogical practices (Karsenti, Toure, & Barry, 2013; Karsenti, Toure, Tchaméni-Ngamo, & Villeneuve, 2008), teaching themselves while inspiring others teachers (Diarra, 2008). Indicative of how teachers embrace ICT to engage in new activities and make new contacts that they feel impact their teaching is the following comment from a woman teacher, let us call her Flower: "*Le fait de visiter*

différents sites sur le net, de participer à des forums pour enseignants et éducateurs me permet d'être en contact avec le monde éducatif et de songer à l'amélioration de ce que j'enseigne."[40]

Livingstone (2012) suggests that ICT may herald a "fundamental transformation" in "relations between pedagogy and society, teacher and pupil, knowledge and participation" (p. 20). Pioneering teachers, such as Flower, are shaping future ICT use (Surman & Reilly, 2003), and those responsible for education systems can learn and benefit from their experiences. Such learning could be timely, because the educational reform process in Mali[41] acknowledges the need to link learning to life to facilitate students' harmonious integration into society, the important role of teachers, and the need for their ongoing professional development (République du Mali, 2003), however policy implementation strategies in the education sector do not elaborate the potential contribution of ICT to those objectives. Teachers may in some ways be like blacksmiths and potters, engaging with new tools and shaping how they should be used to influence their milieu. In this paper, the objective is to understand how and why selected primary through high school teachers in Bamako, Mali appropriate ICT pedagogically and the changes that, according to them, occur in the process. Such evidence from the heart of everyday pedagogic activity can inspire the development and implementation of educational policies, programs, and practices.

5.3 Concepts

In this section we briefly discuss the concept of appropriation as understood in media and cultural studies and then discuss education through the lens of social constructivist theory. It is through the lenses of appropriation and of social constructivism that we hope to shed light on the meanings teachers give to their use of ICT in teaching and learning.

5.3.1 Appropriation

Appropriation, making something one's own, is a concept that grows out of sociology, cultural studies, and communication and media studies in the 1960s, at a time when researchers were studying peoples' challenges to established hierarchies of power and their

[40] From a teacher at a private high school, Lycée Kodonso, in Bamako, in relation to indicator 5.1, on the impact of ICT on teaching, of the 2007-2011 Panafrican Research Agenda on the Pedagogical Integration of ICT; open data from teachers and students in Mali and a dozen other countries is available at www.observatorie-tic.org
[41] known as the Program for the Development of Education (PRODEC), 1998-2008

relations with mass media (Jouët, 2000). The concept is in contrast to determinism, which assumes that technology or media determines behavior. In theories of appropriation, the user is active – shaping and being shaped by media and technology. Use of these cultural artefacts or tools is regarded as a complex and multi-layered activity. Appropriation is a creative process requiring experimentation and reflection, hope and imagination.

Studying appropriation processes provides insight into how people incorporate innovations into their daily lives by straddling old and new and crossing borders. Appropriation involves questioning the status quo, taking risks and renegotiating relations and spaces (Jouët, 2000). The appropriation process is both individual, because it depends on the characteristics of each participant actor, and collective, because it promotes the emergence of new structures (Baillette & Kimble, 2008). An innovation takes root, or is appropriated by individuals and society, as it is used strategically to meet needs and aspirations (Surman & Reilly, 2003).

Appropriating ICT means integrating it into everyday life and shaping its use to meet personal and societal needs. Pedagogically appropriating ICT means integrating ICT into teaching and learning and using it creatively and strategically to meet educational needs. The pedagogical appropriation of ICT can rework boundaries, for example between school and home, and provide openings for the renegotiation of relations, for example between teachers and students. Research on the appropriation of community cyber centers in Latin American contexts (Phillippi & Peña, 2010) has shown how ICT shifts boundaries, providing an opportunity to "get close" to something out of reach; what was "outside my life" becomes part of the daily routine; it is like "a door that opens opportunities to work toward dreams" (pp. 305, 313, 318). An innovation such as ICT is appropriated as it roots in a specific context that also shapes it (Fonlon, 2010).

Appropriation is an organic, multidimensional evolution that blends novelty into tradition. It transforms people and their ways of interacting, their contexts, and their tools in a dialectical process of cultural change. Appropriation involves straddling new and old ways of knowing and doing and shaping newness to fit into – and change – society (Nyamnjoh, Durham & Fokwang, 2002). As such, it requires negotiating tensions, between losing old and introducing new practices, and blending cultural practices associated with local realities and identities with global trends and trajectories (Nyamnjoh, 2013). It requires hope and the

capacity to imagine the future (Appadurai, 2013). For critical pedagogue Paulo Freire, hope was a belief in the possibility of change; it enables educators to "think otherwise […] to act otherwise" and to "think beyond the terrain and territories of the given, making […] individual and social action possible" (Giroux, 2010, p. 338).

5.3.2 Social constructivism

Lev Vygotsky (1896-1934) sets the mind in its context. His *Mind in Society* (1978) became popular as the limits of cognitive psychology were being felt and a more "socially based and socially relevant psychology" was becoming attractive (Newman & Holzman, 2014, chapter 1, para. 9). For Vygotsky, learning is a social construction which takes place through activity and social interaction. He anchors human development and the study of learning in its sociocultural and historical context (Bertrand, 2003; Depover, Karsenti, & Komis, 2007; Nasir, 2009; Rogoff, 1995; Wertsch, 1985). His approach to learning and development can be considered social constructivist. Influenced by Vygotsky, Bruner (1996) explains how education and school learning must be considered "in their situated, cultural context" for "you cannot understand mental activity unless you take into account the cultural setting and its resources" (p. x). Here we review remarks of Bruner (1996) and Obanya[42] (2012a) from socio-constructive perspectives about the purpose of education and learning, schools, and teachers.

Education should be dynamic and responsive to ever changing aspirations of society (Obanya, 2012a, 2014) and aid "young humans in learning to use the tools of meaning making and reality construction, to better adapt to the world in which they find themselves and to help in the process of changing it as required" (Bruner, 1996, p. 20). It is about helping learners tap into the tools of the mind and of the world's cultures. "Getting to know something is an adventure" and others "aid and abet" the learner en route (p. 115) – as in African tales, in which a young person sets off on a quest, going from village to village, seemingly circuitously, yet learning from different encounters along the way. Human learning is best when "given over to constructing meanings rather than receiving them" (p. 84). The objective is not to achieve unanimity but more consciousness. "And more consciousness always implies

[42] Professor Obanya chaired the 2011 Presidential Task Team on Education in Nigeria and in the 1990s directed UNESCO's Regional Bureau for Education in Africa in Dakar (BREDA), Senegal.

more diversity" (p. 97). Learning involves students getting to know themselves and how society functions (Obanya, 2012a).

Schools should empower children to "use the resources and opportunities of the broader culture" (Bruner, 1996, p. xiv). They should enhance cognitive, emotional and imaginative intelligence, as students learn adaptability, problem solving, how to seek knowledge, how to think outside the box and how to apply head-hand-heart (Obanya, 2012a). Schools should be instruments "for awakening potentials and cultivating talent, in order to transform the person as an agent of societal transformation" (p. 8).

In this view teachers should work collaboratively, practice empathy toward learners, and help students discover their talents and strengths, possibilities and potentialities. The teacher is a "guide to understanding, someone who helps you discover on your own" (Bruner 1996, p. xii). The role of teacher is not to dictate or fill empty vessels with knowledge. They must be in touch with the hidden treasures of learners, treasures that are seeking outward manifestation. Effective teachers will operationalize a paradigm shift, from trying to "know all" to "seeking to know how to know," from talker to listener, from purveyor of knowledge to co-seeker of awareness, from conductor to joint organizer of learning, from dictating to encouraging the search for solutions (Obanya, 2012a, pp. 14-15).

To summarize, education and learning are cultural and constructive processes in which the learner is active and in search not just of knowledge but of meaning, identity and models of agency. Culture is a "mediating process in the human response to the world" (Bruner, 1996, p. 164), and schools are important institutions for young people in developing mediation skills. The process is full of inquiry and problem solving as well as narrative making. "Learning in its full complexity involves the creation and negotiation of meaning in a larger culture" (p. 84). And teachers creatively and responsively facilitate the socio-constructive process, which is necessary to put education back in schools (Obanya, 2011) and make schools pertinent for 21st century learners.

5.4 Methodology

To understand how and why teachers pedagogically appropriate ICT and concomitant changes, we selected a methodology that would give the greatest insight into teachers' daily

thoughts and activities, and into what Boullier (in Jouët, 2000) calls the long adjustment between beings and things. This proved to be a qualitative approach, in which teachers were interviewed but used their own words to describe their experience. Qualitative research seeks to better understand the meanings people give to their reality and experiences (Savoie-Zajc, 2011). The process went from data collection to interpretation and sought to understand, from teachers' perspectives, the dynamic of a phenomenon in its context. At the same time, with a critical approach, knowledge produced helps reveal structures of power and domination, thus facilitating understanding of reality and efforts to transform it.

In this section we discuss the profile of the 23 primary and high school teachers in Bamako, Mali selected for interviews, and how the data was collected and analyzed.

5.4.1 Teacher selection and profile

Twenty-three primary and high school teachers were selected to participate in interviews. The teachers were recommended to us by contacts in the education sector and selected because they were experimenting with ICT in teaching and learning. They were from six different private or public schools in Bamako – schools with student bodies from different social strata (i.e. whose families paid no fees at public schools or annual fees at private schools ranging from about US$300 to $900). The schools varied in size from one to several classes per grade level and from several hundred to over a thousand students.

A total of 19 primary school teachers and four high school teachers were interviewed. Six primary teachers taught all except specialized subjects in grades 1 through 6 (first cycle); six other primary school teachers taught math, history and geography, or moral and civic education in grades 7 through 9 (second cycle). Seven teachers taught in grades 1 through 9 of primary school and taught a foreign language or were responsible for cultural or computer lab activities. The four high school teachers taught language, literature or the natural or social sciences. A summary of the number of teachers per grade level and the subjects taught is presented in Table 5.

Table 5. Grade Levels and Subjects Taught by the Teachers Interviewed

Grade level and subjects taught	**Primary school**			**High school**	**Total teachers**
Grade level	**1st cycle**: grades 1 thru 6	**2nd cycle**: grades 7 thru 9	**1st** and **2nd cycles**: grades 1 thru 9	Grades 10 thru 12	
Number of teachers	6	6	7	4	**23**
Subjects	all (except computing, English, and sports)	- math - history/ geography - moral and civic education - etc.	- English - Spanish - cultural animation - computer lab monitor	- natural or physical sciences - geography - history - economics - literature - language	

Of the teachers, 87% were men and 13% women. They ranged in age from 25 to 52 years, with the majority in their 30s or 40s. Each had at least five years of teaching experience, with 10 being the average; the most experienced teacher had 18 years of experience. The teachers had been with their current school between one and 16 years, with six or seven years being the average. Most were not civil servants – with the benefits and stability of a permanent contract from the government – but rather had been hired on the basis of a renewable contract. With respect to training, ten teachers had obtained a master's degree – in English or Spanish, biology or physical science, math or economics, or computing or instructional technology –, but only a quarter had received initial training in pedagogy. They had four to nine courses to prepare each week, taught about 20 hours per week, and had classes of 30 to 45 students.

While there was no attempt to ensure that participants were representative of the at-large corps of teachers in Mali (as described in Annex A), there are some similarities between the two groups. For example, at the national level, as among participants in the study, most elementary teachers (81%) are contractual teachers and most (76%) male. The teaching load of participants is similar to that of teachers at the national level, though the student to teacher ratio (officially of 49 students to 1 teacher in grades one through six at the national level) was somewhat lower among participants, and none of the participants had very large classes of 100 students that can occur in the Malian context.

5.4.2 Data collection

Of the 23 teachers participating in the study, 18 were interviewed for 45 to 90 minutes by the lead researcher or research assistant, whereas the other five participated in a group interview. The interviews took place at the schools where the teachers taught. They were semi-structured in that an interview guide (in Annex B) was used while also allowing participants to develop aspects of the ICT appropriation process deemed particularly important. Interview themes included familiarization with ICT, its use in teaching and learning, changes if any occurring with the use of ICT, and reasons for its use. The interviews were recorded with a digital recorder and transcribed by a research assistant. The data was triangulated with informal observations of students and teachers in computer laboratories and informal discussions with school directors, all of which corroborated what teachers shared with us in interviews, as did teachers' résumés, school websites and other information online, whether media reports or open data[43] from related fieldwork. In sharing the results and discussing them in the next two sections of this paper, we used pseudonyms and in some cases changed small details about teachers to ensure anonymity.

5.4.3 Data analysis

The analysis of the interview data relies mainly on thick description (Geertz, 1973) which involves understanding what is shared in context and interpreting it. "Analysis is a creative process of organizing data so that the analytic scheme will emerge" (Wertz et al., 2011, p. 227). Cultural analysis via thick description has to do with revealing the "informal logic of actual life"; it "starts from a sheer beginning and ends where it manages to get before exhausting its intellectual impulse" (Geertz, 1973, pp. 17, 25). It is not privileged over any other type of analysis but is particular to the context studied (Geertz, 1973).

The first step in data analysis was to read through the transcriptions, on open reading (Wertz et al., 2011). Then we reread, highlighting segments and commenting electronically using Word's comment tool while asking: What is going on here?, What is the significance? We kept in mind ideas like status quo and risk in relation to appropriation processes, and

[43] from www.observatoire-tic.org

aspirations of teachers in relation to their teaching and student learning. The next step was to group segments of text into "meaning units" (p. 131) to produce a synthesis and brief discussion of the interview.

The interpretative synthesis and brief discussion of each interview was shared for feedback with participants reachable via email. We received small corrections and general appreciation, for example: "I read the attachment; I feel so good with it." As we continued to review the interview transcripts and the synthesis and discussion of each interview, we began noting phases in the process of pedagogically appropriating ICT and changes related to us by the teachers. To gain additional insight, we used QDA Miner to code the syntheses and discussions into categories such as familiarization with ICT, use of ICT in relation to pedagogical goals and objectives, and ICT-associated changes. Sub-categories in relation to ICT-associated changes included changes in pedagogical approaches, among students and teachers, in course content, in classrooms and schools, and in teachers' approaches to professional development.

5.5 Results

The teachers interviewed shared how they became familiar with ICT and used it in teaching and learning, as well as changes they considered to be occurring with their use of ICT. The results are presented in this section in relation to these three categories and according to what teachers shared with us. Note that teacher names have been changed to preserve anonymity.

5.5.1 Familiarization with ICT

Teachers began using ICT in relation to personal and professional interests, during their post-secondary studies or after beginning to teach in primary or high school. It gradually, after several months or years, became part of their daily lives. They were first exposed to ICT through personal or professional contacts or during formal training at university, professional development workshops, or private courses. The first encounter with ICT was self-motivated or encouraged by the academic hierarchy. The following examples illustrate these points.

Therese and **Alassane** were introduced to ICT during university training.

- "We studied computing three hours a week and were initiated in Word, Excel, etc. Then at school, we were expected to type materials for lessons." (Therese)
- "I was assigned a project and shown how to surf the Web for information. I had to present the results. Everything started then. I didn't even know what internet was before that." (Alassane)

Nafi and **Jeremiah** started using ICT after becoming teachers.

- Nafi began her teaching career at a school where ICT was present and became immediately interested in learning more.
- Jeremiah, a civil service teacher, received formal training in ICT when asked to manage a computer lab associated with a public school in Bamako. "*De moins zéro en informatique, maintenant je forme aux TIC.*"

For **Issa, Dramane**, and **Abdul**, the first encounter with ICT was outside an academic setting.

- "One day, a friend showed up with his poems well written. I asked how he did it, and he spoke about Word. He brought his portable computer; it was the first time I had seen one." (Issa)
- Dramane started using internet in cybercafés in Cote d'Ivoire, when he was studying there.
- Abdul learned to use the computer himself and took the initiative to sign up for private courses.

Eventually ICT "meshes into the user's real life activities" (Verenikina, 2010, p. 19). Teachers described ICT integrating their being and everyday lives:

Les TIC étaient étranges mais sont devenues intimes. C'est comme le portable, c'est entré dans nos habitudes, on ne peut plus s'en défaire. (Jeremiah)

Je ne peux pas vivre sans la technologie maintenant, c'est carrément lié à ma personne. (Hamidou)

Je ne peux pas faire 48 heures sans toucher à l'ordinateur. C'est le quotidien. Je travaille avec l'ordinateur pour des recherches et à tout moment, en dehors de l'école, à l'école et surtout à la maison. (Abdul)

L'outil informatique est indispensable dans l'enseignement. (Fatoumata)[44]

5.5.2 Use of ICT in relation to pedagogical goals and objectives

The pedagogical appropriation of ICT seems to be driven by teachers' broader pedagogical goals and specific objectives. Teachers' pedagogical goals included desires to help students discover their talents, develop an appreciation of their culture, and prepare for responsible citizenship and leadership. More specific objectives had to do with students learning to speak foreign languages and becoming proficient in mathematical calculations. Table 6 includes examples of teachers' pedagogical goals and objectives as well as related learning activities using ICT.

[44]"ICT was foreign but has become something intimate. It's like the cellphone; it has become a part of our habits, and we can no longer do without it." (Jeremiah)
"I can no longer live without technology; it is linked to me." (Hamidou)
"I cannot go 48 hours without touching a computer. I work with it everywhere, at school, outside school, at home." (Abdul)
"ICT is indispensable for teaching." (Fatoumata)

Table 6. Examples of Learning Activities Using ICT, in Relation to Pedagogical Goals and Objectives

Teacher	Pedagogical goal or objective	Learning activity using ICT
using ICT to **interact with others** – in order to appreciate culture and learn to speak foreign languages		
Hamidou	ensure students learn to speak, and not just write, English	sharing and learning relationships, via internet, with students in other countries
Nafi	help 1st - 7th graders discover themselves through encounters with others	sharing about life in Mali with students in others countries
Abdul	open school to dialogue with others	regular updates to school website
using ICT to **search the Web for information** – in order to learn lifelong learning skills and deepen class discussion		
Dramane	facilitate student's active participation in learning economics	web searches for recent examples of various concepts to present in class
Alassane	prepare students for university and equip them with methods for lifelong learning; update outdated lessons, from before Africa's independence	in small groups students search Web on topics such as *L'aide au Mali*, Malian family code, geography of Russia, Japan or the Americas; teacher evaluates substance of group presentations and quality of interaction with internet
Lassana	nurture in students an understanding and appreciation of African literature	surf Web to learn about Senegalese novelist Mariama Bâ and contribute to class discussion before reading her work
Xavier	prepare students for responsible leadership	discuss, in classroom and courtyard, speeches downloaded from Web of Barack Obama and others
using ICT to **search Web for new teaching methods** – in order to enhance student learning		
Ibrahima	in math, help students perform division more successfully	less reliance on mental subtraction when doing division (a method teacher learned from Web)
using ICT to **produce and share information** – in order to update the curriculum with recent and African content		
Ibrahima	in local geography, fill gaps in 5th grade course	students recorded interviews with elders in nearby neighborhoods, organized the information collected and typed it up for future use
Issa	use culture to make learning more interesting and pertinent	write, type, produce and publish plays related to African history and contemporary social issues

A crosscutting goal was to update the curriculum, which Alassane claimed dated from before Africa's independence. Teachers reported diverse learning activities in line with their pedagogical goals and objectives and ranging from using ICT to interact with others including peers in other countries and thematic research on the Web for class presentations and discussions to collecting information from elders that was recorded and later transcribed and summarized.

5.5.3 ICT-associated changes

Teachers described changes they observed along with their use of ICT in teaching and learning. We present some of these reported changes in relation to pedagogical approaches, students and teachers, course content, classrooms and schools, and teachers' professional development.

5.5.3.1 Changes in pedagogical approaches

Teachers explain how their use of ICT led them to employ more active teaching methods. "*A l'époque, le maitre dispensait les cours, les élèves s'asseyaient pour écouter… maintenant on partage les idées, l'élève ne conçoit pas seulement ce que je dis*" (Ibrahima).[45] Students are active instead of passively consuming the teacher's words. And teachers learn from students.

Certain methods, like corporal punishment, are abandoned, and the focus on dictation, repetition, memorization, lecturing and exams is adjusted. For example, Hamidou is aware of the national program but deviates from it, to obtain his objective of getting students to speak English, yet reviews it with students before exams: "*A la veille des compositions, on prend le programme, on révise rapidement les points saillants.*"[46]

Teaching is facilitated. Physical processes like writing at the board and carrying around documentation are alleviated. "*Je ne fais plus les croquis au tableau; je m'étale plus sur les leçons qu'auparavant, ce qui facilite la compréhension. Maintenant, nous avons le temps de faire des recherches sur le net pour les leçons et on les adapte aux besoins de la classe.*" (Bintou)[47]

[45] "Before, the teacher delivered the course, and students sat to listen… now we share ideas, students don't just take in what I say." (Ibrahima)
[46] "Before exams, we take a look at the official curriculum and review important points." (Hamidou)
[47] "I no longer need to do drawings at the board; we spend more time discussing the lesson, which helps students understand better. We also have time to find material from the Web to adapt lessons to the needs of the class." (Bintou)

5.5.3.2 Changes among students' attitudes, behaviors and performance

According to the teachers, students are motivated by the prospect of using the computer, especially at school, to surf the Web, participate in online contests, and produce documents and presentations. If there is no computer lab at school, students are encouraged to make trips to a cybercafé to seek out information in relation to a course topic. Teachers say students learn better. The student is considered as someone actively engaging in local and global community, rather than as a receptacle for knowledge. Their perspectives and experiences matter. They take initiatives and are more active, vocal, and engaged in their own learning.

Students are not there to swallow what teachers say. Awakened and alert, they question and verify what they hear in class. Students construct and share representations of their culture. They co-write with Issa who said, "When we workshopped a play on HIV/AIDS, they found the title, the characters and the places." He said they even transform what he says sometimes and improve it.

Teachers explained how students find and bring content into the classroom for discussion, contributing to classroom and school cultures of exploration and dialogue, and becoming co-producers of their own learning and development.

5.5.3.3 Changes among teachers

Just as students are motivated by the possibility of integrating ICT into learning, teachers are motivated and energized by its use. "*Ça me pousse à travailler plus*" (Hawa).[48] Teachers gain in efficiency: "*Auparavant, après les compositions, il fallait chaque fois trouver un temps pour venir dans la salle de professeur pour faire les relevés et les calculs de note, maintenant avec les logiciels on calcule tout facilement.*" (Oumou)[49]

Teachers realize they do not need to be the ultimate possessor of knowledge. They also realize the need to continue to learn. They become less transmitters of knowledge and more like guides, accompanying students on a voyage and teaching methods for learning as they go. As they adapt and deepen their practice, they invite students to become more active.

[48] "ICT pushes me to work more." (Hawa)
[49] "Now we can use software to calculate grades after exams, making things much easier." (Oumou)

5.5.3.4 Changes in course content

Courses are enriched and updated by teachers and students alike with information gathered from the Web and from other sources and synthesized. Lessons in geography, on Japan or Russia for example, are enriched. Maps are more available and do not need to be drawn on the blackboard. "*Dans la salle informatique, je peux dire aux élèves, sortez-moi la carte de l'Afrique. On peut comparer les différentes cartes.*" (Dramane)[50]

Students become familiar with online databases with population and demographic statistics. A youtube video of a young person addressing the issue of pollution at a United Nations conference can inspire young Malians to voice their opinions on global issues. Lessons in economics go beyond textbooks to integrate the 2008 financial crisis. History lessons on Ancient Egypt, World War II or the French Revolution draw on images from the Web, which could not all fit into textbooks but help make history come alive.

Foreign language courses also go beyond the dialogues proposed in textbooks to virtual dialogues with peers in other countries. And students' discourse is not scripted but constructed, often in dialogue and interaction with classmates. Online grammatical and mathematical exercises are also accessed. Teachers say explanations are less abstract and more concrete when they can show images, for example of insects for biology class. Content is sourced from the Web even on topics related to Africa, for example on African novelists, the Panafrican Women's Organization, the African Union, development aid in Mali, and the marriage code in Mali.

5.5.3.5 Changes in the classroom

According to the descriptions shared by teachers, it seems as if the classroom space becomes more fluid. Teachers are not always at the blackboard; they may wonder throughout the classroom. Students are not always sitting in rows; they may work in groups. It is not just the teacher's words that matter.

Classrooms are filled with more dialogue, more student initiative and participation, and more of a critical spirit. Lassana saw how a computer in the classroom helped open the space to new content and more dialogue; students learned they could take initiatives in the classroom

[50] "In the computer lab, I can ask the students to pull up a map of Africa, and we can compare different maps." (Dramane)

and transform the teacher into a guide. Dramane among others promotes a critical spirit, encouraging students to build a case and challenge him in class.

5.5.3.6 Changes in the school

School life transcends boundaries – between the school and surrounding communities, between Mali and other countries. The school is more open to the world and the world to the school. School teams produce websites that project school life into new spaces.

New relationships of collaboration develop at the school, for example between teachers and the computer lab monitor that supports teachers across subjects and grade levels: "*Le chargé de l'informatique essaye de me débloquer; quand il répond à mes questions, ça me pousse chaque jour à m'améliorer*" (Ibrahima).[51] Such transdisciplinary encounters allow for the association of different competencies. As one or several teachers begin to integrate ICT into their teaching, new dialogues, about ICT and pedagogical changes, enter the school space, via informal discussion and reflection and discussion, including in pedagogical committees.

Computer labs are established in schools or near schools and become spaces where users learn in contact with one another. Abdul monitors the work of all students in the lab via a software and also sits right next to a student to mentor him. Such guidance can be more informal, responsive and intimate than in a traditional classroom setting.

5.5.3.7 Changes in teachers' approaches to professional development

Internet becomes a companion for teachers not only in working toward their pedagogical goals and objectives with learners but also in their own professional development. Nafi reads, on the e-pals website, about topics such as fearless education (McLester, 2013) and empowering students to transform schools. Hamidou is drawn to information on positive behavior support. Via resources on the Web, Ibrahima learns news ways of teaching math.

Xavier reaches out to virtual contacts to learn that not everyone in Africa uses the same textbook in teaching English: "*J'ai écrit à un ami au Bénin pour lui demander* English for Africa. *Il se trouve qu'il ne l'utilise pas, et moi je croyais qu'on utilisait ce livre partout en*

[51] "The lab monitor answers my questions, which pushes me to continually improve myself." (Ibrahima)

Afrique." (Xavier)[52] Issa exchanges youtube videos and other pedagogical resources with educators in other countries.

Alassane, teaching at three schools that have neither computers nor cultures of ICT integration, is nourished by members of the university internet club in Mali, who continue to communicate, including via an electronic discussion list, even after graduating and beginning their professional lives. Jeremiah is nourished on a daily basis by encounters and learning relationships among users of the computer lab he manages.

5.6 Discussion

Consistent with the three-part research objective, we discuss changes that seem to occur as ICT is pedagogically appropriated, why teachers appropriate ICT, and how. The discussion emanates from interviews with 23 primary and high school teachers in Bamako, Mali, but through naturalistic generalization (Myers, 2000; Stake, 1995; Stake & Trumbull, 1982), teachers elsewhere, in and outside Africa, may relate to some of the experiences and sentiments described.

5.6.1 Pedagogical shifts and changes in roles and relations, classrooms and schools

With ICT there is a pedagogical shift. Many of the teachers interviewed seemed to realize they can no longer teach using the methods their teachers used. They describe swapping lecture and dictation for methods that engage students more actively. They seem to use ICT to make learning more participatory, proactive, and collaborative, and "given over to constructing meanings rather than receiving them" (Bruner, 1996, p. 84). Rather than focusing on knowledge acquisition, it seems they teach students methods for lifelong learning. They adapt their teaching and attempt to render school learning more dynamic and responsive to needs they perceive around them.

ICT becomes a companion for teachers in deepening their teaching. The teachers interviewed interact with other teachers via internet and search the Web for ideas to nourish their pedagogical styles. A computer lab, whether at the school or outside the school, becomes

[52] "I wrote to a friend in Benin to ask about *English for Africa*. As it turns out, he doesn't use it, and I thought that textbook was used everywhere in Africa." (Xavier)

a sub-community in interaction (Bruner, 1996) and can promote transversal thinking[53] and interdisciplinary collaboration, as appropriation processes are prone to do (Jouët, 2000). It is as if a line joins separate areas, allowing for new perceptions, new conversations. The lab becomes a community of learning and of practice, a place of networking – with nearby neighbors or ones across the world. Something faraway is brought closer (Phillippi & Peña, 2010).

Not only did we discern pedagogical shifts underway but also shifting roles and relations, which according to Jouët (2000) are often renegotiated in appropriation processes. Teachers described becoming guides that "aid and abet" learners (Bruner, 1996, p. 115) rather than seeking to know all (Depover, Karsenti, & Komis, 2007; Obanya, 2012a). Just as the use of a tool, such as a language, changes people and the way they relate to the world (Vygotsky, 1978), teacher appropriation of ICT appears to change roles and relations at school: teachers become learners and students become more active. Power is shared rather than merely possessed by the teachers. Teachers and students alike learn to negotiate the horizontality of formerly highly hierarchized relations. For Lassana, a computer in the classroom, where the tradition is that students copy from blackboards and listen to teachers whom they do not question, subtly changes dynamics: "The students manipulate the computer and ask me many questions about many things."

In putting students in touch with "resources and opportunities of the broader culture," teachers and students turn classrooms into places of inquiry and mind-using (Bruner, 1996, p. xiv). There seems to be more time and space for communication and expression, rather than just listening to the teacher. More diversity of perspectives, as called for by Bruner (1996), and more room for dialogue in classrooms contribute to questioning and constructing understandings of the world rather than passively imbibing what is in textbooks. What is taught seems broader and deeper in scope, extending the content of textbooks – which, when available, can be expensive for families and may be already out of date or irrelevant to local and national concerns. The proliferation of content from the Web in the classroom seems to open it up to other sources of knowledge as well, for example from elders in the community.

[53] See http://advancedmediaissues.wordpress.com/2012/04/23/transversal-thinking

School culture can be refreshed and reinvigorated by contact with other cultures and renewed contact with Malian cultures. As students are engaged in representing themselves and directly mediating their culture with others via internet, for example in the classrooms of Hamidou and of Nafi, they are engaged in a process of discovery, negotiation, and construction of identity, of creating and contesting their roles and responsibilities in the world.

The adoption of ICT in teaching and learning shifts relations with self, others and with knowledge. Classroom and school spaces evolve toward more openness and fluidity. Rather than focusing on transmitting knowledge, the shift is toward learning to learn. These changes appear to reflect the type of education described by Bruner (1996) and Obanya (2012a, 2014), which helps young people make meaning of their lives and adapt to and shape the world.

5.6.2 Harnessing ICT for its transformative possibilities

Why are the teachers using ICT? In short, because they desire change. The teachers interviewed shared how they leverage ICT creatively and strategically in resistance to the status quo, in relation to a societal vision, or merely to comply with school expectations. They use ICT to further their pedagogical goals and objectives, and also to remain qualified to teach (Fonkoua, 2006). Teachers appropriate ICT pedagogically as a way of adapting to and bringing about change in a world where "change is the norm" (Bruner, 1996, p. 15).

Some teachers express dissatisfaction with their training, the monotony of teaching, or the curriculum based on outdated textbooks and find that ICT enables them to teach differently, to approach student learning and the curriculum differently. The deficit context – of outdated and often unavailable textbooks and of antiquated teaching styles – motivates change (Do-Nascimento, 2005), and ICT becomes an ally in bringing it about. Teachers and their students gain in nimbleness (Nyamnjoh, 2013). Together they infuse new flexibilities into learning and negotiate changing times. ICT becomes an ally in changing the status quo – for example toward less hierarchal relations, more dynamic teaching and learning and content, and new ways of sharing information and culture. In their use of ICT, teachers are awakening potentialities in themselves, their students, and their culture. They contribute "to the continuous regeneration of Society" (Obanya, 2012a, p. 23) by creating learning materials, engaging learners in the process and putting learners in touch with their own and other

cultures. Blacksmiths work with metals, shaping it to meet societal needs. Teachers use internet to shape their visions of a different tomorrow.

For some teachers, motivation is internal. For example, Issa can no longer imagine being a cultural animator without ICT. Nafi and Hamidou can no longer imagine teaching a foreign language without the possibility of dialoguing with native speakers in other countries. Dramane and Alassane could never return to the days of teaching economics and geography without up-to-date information from the Web accessed and synthesized directly by students.

For other teachers, the motivation to experiment ICT in teaching and learning is more external. Lassana advances with reluctance and ambivalence. Invited by the school hierarchy and encouraged by peers to experiment ICT, lest he become impertinent or lose the respect of his colleagues, he accepts a computer in the classroom and is astounded at what happens – students know what to do with it and ask him questions, sidelining him as the guide. Like Lassana, Theresa was hesitant. A university-trained mathematics teacher, she advanced by respecting the rules and would not necessarily innovate on her own. When instructed by the school hierarchy however to begin typing her lessons, she complied. Otherwise she does not actively engage with ICT in her teaching yet nonetheless yearns to learn internetworking skills to facilitate contact with others and stay abreast of developments in her field and profession. The dialogue between more and less enthusiastic users can contribute to a critical attitude vis-à-vis technology in education (Baldwin, 1998).

Whether ICT is enthusiastically or reluctantly embraced, a desire to change is at the core of the motivation – a desire to change what is taught and how, or merely change oneself by complying with new school practices to remain respected, pertinent and qualified to teach.

5.6.3 Exciting, ambiguous, and bumpy journey

Having discussed changes that appear to accompany the use of ICT in teaching and learning, and that teachers embrace ICT for its transformative possibilities, we turn to how teachers appropriate it in an exciting, ambiguous and bumpy journey.

Teachers become familiar with ICT through relations in or out of school. They begin to appropriate it when they actively engage with it to meet their objectives (Surman & Reilly, 2003). As ICT is digested (Fonlon, 2010) or transformed, the user is transformed and transforms his or her context in small ways – contributing perhaps to a gradual metamorphosis

of culture (Fonlon, 2010). The teachers interviewed described how ICT becomes part of classroom and school life around them. The interviews with them suggest that as ICT is introduced and appropriated into a community, parts of the community are intermingled with ICT and vice versa until ICT becomes a part of daily life of not only individuals but the community (Baillette & Kimble, 2008).

It is the process of actively engaging with ICT and experimenting and reflecting on its use in teaching and learning that creates change. Teachers report using their agency (van Binsbergen, 2004) to bend and shape technologies and adapt them to local conditions, while confronting established norms, to work toward their pedagogical goals and objectives. They reported adapting ICT – for example by visualizing period photos to make history come alive or reading online about the African Union, which is poorly covered in textbooks preoccupied by colonial histories.

The teachers interviewed share certain characteristics, which they model to their students and that feed into their pedagogical appropriation of ICT. They are open and curious and love to learn. They are collaborative and enjoy sharing and contact with others. They respect and consider their students; they observe them, listen to them and learn from them. They take initiatives and at times calculated risks (Bruner, 1996) in doing things differently from how they were taught or the norm in their environment. They consider the future to which they are contributing. They are attracted to mobility and to mobilizing resources for their students' development. They are not afraid of change. Indeed they desire change yet realize the process takes effort and creativity and can be a struggle. They persevere with determination and ingeniousness even through difficulties. They renegotiate their own relationship with authority, relinquishing and holding onto theirs as teacher. Even as they strategically embrace ICT and are renewed, they are sometimes bewildered in the process.

While teachers express excitement about the changes that ICT use brings, subtle tensions arise in the face of something new and unknown, between the comfort of familiarity and the uneasiness of novelty, between preservation and transformation of traditional practices, between the linearity of classical teaching and the fluidity of more dialogical learning. Even as teachers encourage and see the arrival of new content in the classrooms, they are very aware of the weight of the national curriculum and high-stakes exams. Even as they co-construct more dialogical spaces, they are aware that the activity to some extent

undermines established hierarchies. They are excited and anxious, and the road can be arduous. Yet, they persevere through ambiguities with hope (Giroux, 2010) that imagined (Appadurai, 2013) changes are possible.

Some of the teachers described the use of ICT at school in terms of travel, of crossing borders, between times and spaces. Getting to know something is an adventure (Bruner, 1996). Nafi, when she prepares her students for transatlantic learning and cultural encounters, reminded us of *masa* or king Abubakari II giving up his throne of power in the Mali Empire of the 14th century in a quest for knowledge. He prepared companions and a fleet of boats to traverse the Atlantic, in search of its other shore. "*Ils partaient non pour la conquête de nouveaux territoires, mais à la rencontre de l'autre […] Avec Abubakari II, les explorations transocéaniques trouvent leur objet dans la curiosité de celui que veut changer d'horizon*" (Diawara, 2010, pp. 15-16). Abdul, in the computer lab, is like a stationmaster, helping passengers onto the right train; some take the express whereas others would do best on the local, depending on destinations. Teachers, as they appropriate ICT, are interested in material conditions and the psychological and spiritual preparation for mediated encounters with knowledge and culture – that prepare students to apply head-hand-heart (Obanya, 2012a).

Appropriation is not revolution. It involves straddling worlds and ways of knowing, throwing some things out, re-embracing others, and melding new and old creatively and strategically (Nyamnjoh, Durham, & Fokwang, 2002). It involves both breaks with and extensions of what exists. For example teachers reported leaving behind lecture methods while discovering the challenges of navigating a potentially more chaotic classroom space. Locally available knowledge may be revalorized as it is interrogated and integrated. Continuity is part of change, as related in an African proverb about attaching the new cord to the old. Jeremiah tries to demystify computers for students and teachers at a government-financed school-based cyber center but keeps his chalk and blackboard at home just in case. While there is preoccupation with creating the future, contact with the past does not disappear. Rather engagement with the past can become more active and engaged. Teachers know they are navigating uncharted waters and advance prudently, observing and reading signs around them as they go.

5.7 Conclusion

This paper describes, according to a group of 23 primary and high school teachers in Bamako, Mali, how and why they began to use and strategically adapt ICT in their classrooms. It describes tensions, anxieties and ambiguities they experience as well as continuities and changes they perceive when they actively engage with ICT to achieve pedagogical goals (Surman & Reilly, 2003). The appropriation process seemed to some extent to be a catalyst for the type of active and socio-constructive education and learning described by Bruner (1996) and Obanya (2012a, 2014). The teachers took risks, challenged the status quo, crossed borders, and worked with students and others to engage in new encounters and to synthesize information in new ways. They are like blacksmiths and potters, envisioning the future and tentatively shaping the way technology is integrated into learning in some classrooms and schools in Bamako.

The challenge of creating favorable environments and conditions for the pedagogical appropriation of ICT remains, otherwise the benefits of its use, such as accessing information and knowledge to update the curriculum, evolving pedagogical approaches, dialoguing with others around the world, and projecting one's culture into the world, could be restricted to and shaped by circles of privilege. We recommend studies on the pedagogical appropriation of ICT outside the circles of privilege of city dwellers, including in peri-urban and rural settings.

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CHAPTER 6. Second thesis paper: Teachers Dialoguing about ICT at the Borders of Transformative Possibilities

by Kathryn Toure

Abstract
One of the worst repercussions of colonialism in Africa was the wresting of cultural initiative from Africans. This led to education systems modeled after colonial mindsets and aspirations. African teachers however are taking initiative back into their hands, and tools they are using include the computer and internet and other information and communication technologies (ICT). Drawing on a series of interviews with Malian primary through high school teachers and two administrators, this paper discusses the pedagogical appropriation of ICT by teachers and the significance of their beyond-the-classroom conversations about the use of ICT in education. It argues that as teachers appropriate ICT in teaching and learning, they dialogue with people beyond their classrooms to inform and shape the use of ICT in education in their context. They work as cultural change agents to (re)connect with African culture and community and with other traditions, across generational, hierarchical and cultural frontiers, in borderlands of transformative possibilities.

6.1 Introduction

Formal education systems in Africa were put in place initially to train Africans for the colonial administration. African cultural initiative and imagination were suppressed (Fonlon, 2012; Nyamnjoh, 2004; SAC, 1965) as French schools in West Africa sought to make the Blackman as "French as thoroughly as possible" (Fonlon, 2012, p. 87) and serve European needs and interests as much as possible. During this "long and traumatic history of cultural and educational capture by alien forces" (Pence & Nsamenang, 2008, p. 33), learners experienced – and continue to experience – alienation and dualism. Schools continue to be "at variance with local and national realities" (Nsamenang, 1992, p. 161).

In this context of disconnect between schools and their milieu, African scholars (Dei, 2002a&b; Fonlon, 2012; SAC, 1965) call for a renewal of school culture, one in which pedagogy is informed by African peoples. The reshaping of school culture should be carried on from within, to create a "new, rich, harmonized and dynamic culture" (Fonlon, 2012, p. 91), and involve experimentation: "The creation of a culture [… is] a process in self-education: We learn to do by doing" (Fonlon, 2012, p. 93). It involves working creatively and strategically at the borders where different cultures and ways of thinking co-mingle to challenge prevailing notions, redefine identities and remap relations (Giroux, 2005).

Reappropriating cultural genius is important, because there is a reconquest of power in uncovering local forms of expression and practices of knowledge (Devisch, 2011). Researchers (ERNWACA, 2002) and Malian educational policy (République du Mali, 2003) call for the integration of societal values into the curriculum and into pedagogical approaches through social dialogue and teacher involvement in the process. Such dialogue, about how education could be, is part of wresting back the responsibility and initiative for educational and cultural development – and is part of a centuries-long African renaissance (wa Thiong'o, 2009).

In the 21st century, ongoing renewal of school culture will not take place outside the context of the knowledge society and the information and communication technologies (ICT) on which it relies and which are increasingly used in schools in West Africa (Karsenti, Collin, & Harper-Merrett, 2011; Mikre, 2011). The African Union (2014) encourages the integration of ICT into teaching and learning, in line with African priorities and values, to participate in cultural industries and the knowledge economy and to "disseminate and promote African cultures across the world" (p. 18). However, there are fears that technological companies will infest African school systems, offloading hardware and software for cash, often obtained via loans, and promote a culture of consumption of material goods and once again of ready-made foreign ideas. Fonlon (1960s/2012) warned that slavery and colonialism are marked by refinement, "wear a smile" and "come bearing aid" (p. 181). Cheikh Anta Diop (1960/1974) warned compatriots to be wary of aid and to recognize the importance of Africa's internal markets – some of the most important in the world.

What do teachers, and those around them, think about the pertinence, or not, of using ICT in education in Africa? How are they negotiating the introduction of computers and internet into learning and everyday life? This paper explores the importance of discussions Malian teachers reported having about ICT in education with their peers and supervisors, with the parents of their students, and with others in the communities surrounding their schools. Such beyond-the-classroom dialogue has received little attention in studies on ICT in education. We argue that ICT can be a catalyst for the renewal of school culture, to the degree that these new tools and the changes they bring become the object of public curiosity and contestation, and that many of the teachers we interviewed are actively facilitating social

dialogue about ICT and its place in education. In so doing they are involved in challenging established hierarchies, rethinking knowledge and school, and proposing new options.

6.2 Concepts

In this section we propose the concepts of appropriation and of culture as lenses through which to understand teacher dialogue about the pedagogical appropriation of ICT.

6.2.1 Appropriation

The concept of appropriation has been used in sociology, anthropology, communication and media and cultural studies and in art where the term refers to artists borrowing and recontextualizing others' work in theirs. According to Jouët (2000), in twenty years of studies on the use of new communication tools, researchers found that people adapt them to meet their personal, professional and social objectives (also Surman & Reilly, 2003). Appropriation involves an extension of what exists as well as resistance to it and can lead to the upsetting of established norms and hierarchies and the creation of new options (also Nyamnjoh, Durham, & Fokwang, 2002). Usage is a social construct, and the user is not afraid to be different and is even accorded a certain social distinction as a pioneer. Studying the appropriation of ICT is not the study of users and products but of social and cultural practices. It is the reconstitution of the use of computers and internet within a particular social setting that conveys their social significance. (Jouët, 2000, pp. 499-505, 514)

6.2.2 Culture and cultural renewal through appropriation

Cultures is "fluid, continuously interpreted and revised in transmission, internally contested," and sometimes best sustained through change (Akkerman & Bakker, 2011, p. 86). Culture is not "monolithic or unchanging" but a "shifting sphere of multiple and heterogeneous borders where different histories, languages, experiences, and voices intermingle amid diverse relations of power and privilege" (Giroux, 2005, p. 24). Culture is a space of "agreed-on meanings" as well as "difference and contestation" and is constantly being "imposed, invented, reworked and transformed" (Gupta & Ferguson, 1997, p. 5).

Bakhtin insisted that "meaning can come into existence only when two or more voices come into contact" (Wertsch, 1991, p. 52).

Philosophers Hassoun and Wong (2012) view culture as a "living, changing thing" (p. 86) and conceive of culture as conversation and as sustained through conversations. This conception acknowledges the internal contestation, diversity and fluidity of culture, as well as the agency and participation of a culture's members in transmitting, interpreting and revising their culture. "The plural voices in a conversation bring […] the possibility of change, especially when the voices are disagreeing" and challenging each other (p. 77). The conversational model of culture "points to the possibility of belonging to more than one culture, just as one can participate in more than one conversation" (p. 77). It also "allows for different modes of conversation" (p. 77). Conversations change over time: "Some voices can fall silent; voices that have been dominant can become recessive, and vice versa; new voices can enter and change the character of conversations" (p. 77). Sometimes people may note "that they have rudely broken up a conversation" and apologize "to those hurt by the interruption" (p. 88).

Continuous conversations at borders are particularly likely to contribute to cultural transformation; by borders we mean places where different social worlds intersect (Akkerman & Bakker, 2011). Such boundaries as conceptualized in educational theory are considered as a challenge and as a resource for learning and developing new understanding and practices (Akkerman & Bakker, 2011). Boundaries are ambiguous in that they both separate and connect different ways of thinking, being and doing, and those that work at boundaries are also ambiguous in that they can be both ostracized and accepted. Insufficient continuous "work at the boundary could explain the lack of […] lasting transformations" (Akkerman & Bakker, 2011, p. 149). Transformations take place through "dialogue between multiple perspectives and parties" (p. 150). Dialogue at the boundary does not mean "moving from initial diversity […] to homogeneity and unity"; in dialogue, diversity is maintained and contributes to the "something new […] generated in the interchange" (p. 152). Transformation begins with confrontation that disrupts "the current flow of work" (p. 147). In dialogue, tensions and conflicts can "be made productive for transformation of the systems" (p. 146), because dialogue includes seeds of change.

Ela (2006) describes some of the dialogical learning processes needed at borders to construct new and meaningful knowledge systems in Africa, which should feed into schools and education systems:

> *Just as those that possess indigenous knowledge need to learn about other knowledge and about new tools for forging into the prevailing world of science and technology, the young need to return to old people and their wisdom to reconnect with their scientific memory. (p. 400, our translation)*

Ela evokes various intersecting social realms – worlds of different kinds of knowledge and ways of knowing, worlds of young and old people, worlds of working with different cultural tools toward different aspirations – and the need for people to interact across these worlds and their ideas in the interest of continual cultural renovation. Culture is to be preserved, contested and constructed.

Cultures are sometimes presented as frozen in time or adverse to change, whereas Malian lore, through the story of Soumba Ngolo, demonstrates how culture is both transmitted and changed. According to tradition, Soumba Ngolo was the first possessor of the Soso-Bala, a big *balafon*, like a xylophone (Niane, 1974), which was a great treasure of Sundiata, founder of the Mandika Empire in the 13th century. With this musical instrument – or cultural tool – Soumba Ngolo preserved history and tradition for posterity and transmitted it, especially at rituals associated with the death of a chief. At the same time that Soumba Ngolo was a guardian of culture, he was also an innovator, as he is attributed with the invention of musical instruments such as the *signbin*, the *dan* and the *siramon*. This story goes to show how rootedness and openness are both part of the appropriation of newness and of the transmission and renewal of culture. The transmission and renewal of culture are not in opposition.

Cultural renewal is not a matter of refusing the advancement of time or of contemplating an idealistic past (Niane, 1974) but of appropriating what is new and helpful, of reappropriating African culture and values (Hountondji, 2002), and, through imagination and continuous effort on a daily basis (Appadurai, 2013), of making something new (Nyamnjoh, Durham, & Fokwang, 2002; wa Thiong'o, 2009) and attuned to the needs of the times.

6.2.3 Conceptual summary in relation to the research objective

The use of ICT is a social construct, and its appropriation can contribute to the transformation of culture. Culture is transmitted, and it is also revised through individual

agency and dialogue across the boundaries of various social worlds. Through the consideration of pluralistic viewpoints, often stimulated by new cultural tools, newness is created and integrated into social and cultural practices. ICT brings together various social worlds in new ways and is thus worthy of investigation in this regard. In light of this understanding of culture as diverse and dynamic and of appropriation of newness as a means of cultural renewal, we suggest that ICT is an opportunity, in the Malian school context, to dialogue fruitfully across boundaries in the interest of collective rethinking and reworking of school culture. And teachers play an important role in the process to the extent they go there where people are and talk with them: *[ce] qui permet de renouveler les approches […,] de susciter l'imagination à partir des questionnements des gens ordinaires*" (Ela, 2006, p. 402). We will explore, based on what teachers shared with us, how their interactions with others about ICT in education are part of the process of its cultural and pedagogical appropriation.

6.3 Methodology

To shed light on how teachers interact with persons outside the classroom as part of pedagogically appropriating ICT, we opted for a qualitative methodology with an interpretive approach (Savoie-Zajc, 2011) using thick description (Geertz, 1973). Interpretive research is "interested in people and the way that they interrelate – what they think and how they form ideas about the world" (Thomas, 2013, p. 108). This approach allows "those researched to explain their actions in their own words" and the context of their ICT decisions (Haddon, 2000, pp. 313-314).

The number of participants is intentionally limited and by no means representative of all teachers in Mali. We do not seek "outright transference" of findings "to groups not investigated" but possibilities of comparability and translatability (LeCompte & Goetz, 1982, p. 34), to help understand similar phenomena in similar or dissimilar settings, or, more likely, of naturalistic generalization (Myers, 2000; Stake, 1995; Stake & Trumbull, 1982), as some readers "gain insight by reflecting on the details and descriptions presented" and others "find descriptions that resonate with their own experiences" (Melrose, 2009).

6.3.1 Participants

We interviewed a total of 25 persons: 23 primary through high school teachers, known by their peers to be using ICT in teaching and learning, as well as two administrators. We heard about these persons through colleagues in the education sector. For insight into the appropriation process, we wanted to learn from those that had already begun integrating ICT into teaching and learning.

As for the two administrators, they were involved with ICT in the education sector: one responsible for supervising pedagogical advisors covering 300 public and private schools and one working in the ministry of communication and new information technologies. The 23 teachers came from five private schools and one public school in Bamako, Mali's capital. There were 19 primary school (years 1 through 9) teachers and four high school (years 10 through 12) teachers. They taught a variety of subjects, from language and literature to math and the natural and social sciences. The teachers come from Bamako, Gao, Koulikoro, Mopti, Ségou and Sikasso and were between 25 and 52 years of ages; 13% are women and 87% are men. The majority had obtained a master's degree, and a quarter had received initial training in pedagogy; each had between five and 18 years of teaching experience, with 10 being the average.

6.3.2 Data collection

Twenty of the 25 interviewees participated in interviews of about 45 to 90 minutes, and the other five, all teachers, participated in a group interview. The teachers shared about the process of appropriating ICT for pedagogical purposes, whereas the two administrators shared about the appropriation of ICT, or not, by the scholastic system. These viewpoints from teachers and administrators are complementary. The interviews were conducted in Bamako in 2008 and 2009 and were semi-structured by themes and questions to stimulate discussion while allowing for issues related to the appropriation process to come up freely. Interview themes at the outset included the process of becoming familiar with ICT, using ICT in teaching and learning, changes that occurred with the use of ICT, motivation for using ICT, and attitudes toward change; eventually the topic of engaging with persons outside the classroom about the use of ICT in education emerged.

The interviews were taped and subsequently transcribed. In 2013, when possible we shared the interview synthesis with the participant for correction and integrated minor comments. Participants expressed appreciation for the accurateness and insight. As Geertz (1973) explains, "What we call our data are really our own constructions of other people's constructions of what they and their compatriots are up to" (p. 9).

6.3.3 Data analysis

The analysis of the interviews uses thick description (Geertz, 1973), which involves understanding what is shared in its cultural context and interpreting it when describing it. Participants "lead us into understanding" (Geertz, 1973, p. 20), and we offer an account of that understanding. The first step was to read through the transcripts to familiarize ourselves with them, an open reading (Wertz et al., 2011). We reread, highlighting segments and making comments as we asked ourselves: What is going on here?, What is the significance?, What does this mean? Then with the phenomenon of pedagogically appropriating ICT in teaching and learning in mind, we divided the transcript into "meaning units" (p. 131), in relation to the internal coherence of the narrative, and then grouped the units and organized them under thematic headings, beginning to reveal as we worked themes and layers of meaning. Having organized the data, the next step of the analysis was to think more deeply about each group of meaning units in relation to the phenomenon being studied and in relation to other units. We wrote our raw reflections, insights, spontaneous questions and uncertainties. The writing evolved into a narrative for each participant and a brief discussion of it. The aim of the brief discussion was to grasp and express the meaning in context of the process of pedagogically appropriating ICT, make significant themes in the teachers' narratives emerge and learn how the research questions were answered in the narrative.[55] One of the themes that began to emerge after the preparation of several individual narratives and accompanying brief discussions was the use of ICT to cross borders.

[55] In this analytical approach, borrowed from phenomenological inquiry, individual experiences are the point of entry. Understanding in readers is sought, including at the emotional level, by presenting contextualized human experiences. See how such methods of have been used for example to study the experience of being gay (Rodgers, 2013).

When interviewing teachers about their pedagogical appropriation of ICT, we expected to hear about becoming familiar with ICT and using it in teaching and learning[56]. We were surprised to hear teachers talk about conversations with people outside the classroom about the use of ICT in education, which theme became the focus of this paper. We did not participate in those conversations, which took place in the course of teachers' everyday professional lives, but rather heard one teacher after another, without us necessarily prompting them to do so, mention such conversations when talking to us about the process of pedagogically appropriating ICT. We used QDA Miner to code the narratives and their brief discussions by sub-themes related to the concepts retained for the study including "dialogue with peers about the use of ICT in education" and "dialogue with pedagogical advisors about the use of ICT in education" as well as "synthesizing information from several sources," "intergenerational dialogues" and "dialogues across the scholastic hierarchy." In presenting the findings, we tried to find a "balance between conciseness and richness" (Wertz et al., 2011, p. 93). To preserve anonymity, we use pseudonyms when attributing comments to participants.

6.4 Results

This section provides an overview of the conversations teachers reported having with people in their milieu as they appropriated ICT in teaching and learning, and related comments from two administrators (Lamine, Mohamed). The overview includes descriptive commentary – the beginning of analysis – and quotes, which we translated from French into English. It is organized by the actor about whom the interviewee was speaking: other teachers, school or district directors, pedagogical advisors, parents, and people living in the communities around the schools. We draw mainly from interviews with seven teachers (Alassane, Dramane, Hamidou, Ibrahima, Issa, Jeremiah, Xavier) that focused on these conversations; some teachers did not focus on conversations outside the classroom.[57]

[56] We addressed becoming familiar with ICT and using it in teaching and learning in the first thesis paper (Chapter 5).

[57] Nafi emphasized instead the relationship of her students with peers abroad. A major theme of the group interview was the complementarity between books and internet. The interviews of Lassana and Therese also had main themes other than beyond-the-classroom conversations. The five interviews conducted by our research assistant were shorter and more structured than the ones we conducted and did not explore themes that arose more spontaneously, such as beyond-the-classroom conversations about the use of ICT in education.

6.4.1 Teacher conversations with, or about, other teachers regarding ICT in education

According to what we heard from teachers, they engage in dialogues of mutual support and complicity with other teachers about the use of ICT in education. Pedagogical committees become platforms for the discussion and resolution of challenges. Computer labs become learning centers, in some cases communities of practice. The peer learning in these committees and labs is more informal and relationship-based than in formal training, and often less theoretical and more directly related to specific pedagogical challenges of the moment.

Teachers also express impatience and frustration with peers and put social pressure on their corps to evolve itself by embracing the transformative possibilities of ICT. They sense that masses rather than handfuls of teachers would be needed for the scholastic system to feel the changes they have been able to bring about in their pedagogical styles and the quality and pertinence of teaching and learning. Examples of the conversations of complicity and those of frustration and impatience are shared in Table 7.

Table 7. Dialogue with, or about, Other Teachers regarding ICT in education

Dialogues of mutual support and complicity regarding pedagogical approaches deemed useful and important
- Hamidou's school initiated pedagogical committees by subject before ICT was ever introduced in the school. With support from the school director, ICT became a subject of reflection and discussion within them. The committees thus became a source of support for teachers for learning and experimenting ICT and persisting through difficulties. - Teachers dialogue, collaborate and learn from each other via computer laboratories. Lab monitors assist teachers with technical questions and guide students in relation to teachers' pedagogical objectives. Jeremiah taught until he was asked to learn ICT and manage a lab; he learns about the pedagogical uses of ICT from teachers that visit the lab.
Dialogues of frustration and impatience with peers slower to embrace change
- Teachers discuss the inevitability of working with ICT to improve pedagogical spaces: "We have no choice… we need ICT to do our work well" (Alassane). "Teachers should go beyond the course, expand the field of analysis, of vision. You cannot be in a field these days without meeting people who will bring you around to it" (Dramane). According to Mohamed at the ICT ministry, certain teachers innovate with ICT, but the experiences remain informal. "Why not give these teachers computers and space to share their reflections on the pedagogical use of ICT?" (Mohamed) - Alassane may be exaggerating when he claims some teachers have lesson plans dating back to 1950, but he expresses a frustration with teachers using a colonial-inspired curriculum. Teachers express impatience with peers "caught in a rut," who do not "muster the courage" (Hamidou) to move beyond their comfort zone, to learn how to browse, to update their courses.

6.4.2 Teacher conversations with, or about, school and district directors regarding the use of ICT in education

Teachers talked about putting themselves in the shoes of school and Academy (or district) directors and dialoguing with them regarding ICT and the changes they envision in the school system. Examples of these conversations are in Table 8. Jeremiah made very practical suggestions to the Academy director. Having seen the pedagogical appropriation of ICT in action, as well as obstacles to it, he feels a responsibility to go beyond the lab he manages and contribute to more systematic appropriation of ICT. Mohamed, from his viewpoint in the ministry of communication and new information technologies, called for vision and innovation at all levels of the education system.

Table 8. Dialogue with School and District Directors about ICT in Education

Engaging with school directors
Issa brings his school director along as he integrates ICT and culture into learning. After exploring areas of resistance with colleagues, he returns to the director with arguments, i.e. regarding why phrases in local languages belong in plays he, with his students and using ICT, writes or adapts, produces, and publishes. "I returned to the director and explained how there are books in Bambara, thus it is interesting to learn in a local language."
Xavier however was unable to persuade his director about new pedagogical approaches his use of ICT implies, for example putting students into groups. "The director does not understand why I do that. Schools directors can help us if they listen to us."
None of the three schools where Alassane teaches has computers; he says if he were a director, he would ensure "at least a small computer lab connected to internet," adding that partnerships with students, parents and authorities could make it a reality.
Mohamed of the Ministry explained how many directors ignore the venue of ICT and their pedagogical and transformational possibilities.
Advising the Academy director
Understanding the importance of school directors understanding ICT, Jeremiah met with the Academy director to suggest he require directors' annual reports be typewritten – as a way to get them to learn and use ICT.

6.4.3 Conversations with, or about, pedagogical advisors regarding the use of ICT in education

Having less access to ICT and little opportunity to experiment its use in teaching and learning, pedagogical advisors, when in the field to evaluate teacher performance, end up, according to what teachers shared with us, learning from teachers appropriating ICT. A supervisor of advisors, Lamine, explained how he requested from the Ministry computers for advisors. He also expressed frustration about dependency in the place of development from "within" (Fonlon, 2012, p. 96) that internet access could help facilitate. Table 9 presents

examples of teacher dialogue with or about pedagogical advisors, previously known as inspectors, regarding the use of ICT in education.

Table 9. Dialogue with Pedagogical Advisors about ICT in Education

Seeing the pedagogical appropriation of ICT in action
When an advisor asked if what is on internet is credible, Alassane said he replied, "Some is; some is not. You have to know how to navigate… know what you want and how to obtain it." He goes on to explain: "Even if advisors are not against internet, it is difficult to change habits. Any pedagogical practice, before being accepted, has opponents, but with time even they realize the benefits."
Pedagogical advisors "are not adverse to these approaches that go beyond the textbook" (Ibrahima).
Hamidou's students correspond with students in the Middle East and North America, and also participate in online competitions with youth in other African countries. An advisor, surprised to find Hamidou's students speaking English so well, noticed Hamidou was not using the approved textbook, which the advisor said was not a problem, but he did ask the director for a copy of the materials Hamidou used. Yet he asked no questions of Hamidou, which surprised Hamidou. He just assured him his class was perfect.
Expressing frustration with ongoing dependency
"Only yesterday we received science suitcases from an association in France, containing objects to help in teaching about the human body and the earth. Now if an advisor had a computer, they could do research to prepare lessons." (Lamine, a supervisor of advisors)

6.4.4 Teacher conversations with, or about, parents regarding the use of ICT in education

Teachers insist the implications of ICT be discussed with parents. Parents both guide and are inspired by their children: "When a child likes something, they also stimulate the interest of their parents" (Issa). Parents are not too old to learn nor too proud to learn from the younger generation. Alassane's father, also a teacher, asked his son to "introduce him to internet." Table 10 has examples of teachers' thoughts about connecting with parents and about dialogues with parents regarding pedagogical styles and course content. When approached by parents about new pedagogical approaches – whether encouraging more dialogue in class or teaching mathematics in a new way – teachers reassure parents. The silence of parents about new course content in local geography is interpreted as approval, including of the way it was developed – in conversation with local people in the know.

Table 10. Dialogue with Parents about ICT in Education

Connecting with parents
"As long as we do not explain things, parents do not know the impact or importance of ICT in education" (Alassane). Students and their parents must be involved (Mohamed).
Making parents feel comfortable rather than intimidated at school is partly why Issa insists on phrases in Bambara or Fulani or another language of Mali in school plays. Plays all in French can be hard to understand, "but as soon as there is some Bambara, everyone laughs. It is as if we meet up, and the play can continue."
Dialoguing about pedagogical styles
"All you do is play in class," Hamidou heard some parents say, which "can discourage a teacher, who could drop new methods and return to what parents want: writing. One has to work prudently, because parents want to see the grade. If you disregard the curriculum completely, and a child fails exams, you are partly responsible and will be interrogated by parents. But we teachers said, 'Once you decide, you should go forward.' Now parents appreciate the way we work. I heard a parent at a meeting exclaim, 'My daughter of only five years old, can you believe it, can already speak English.' That is the work of a colleague that interned with me."
Ibrahima introduced new ways of teaching division, learned via the Web. Finding it more appropriate for the grade level he teaches, he taught students to write the results of subtractions, rather than relying on mental calculations. When challenged by parents, he reassured them.
Dialoguing about course content
Fifth grade local geography involves the study of the topography and hydrography of nearby neighborhoods. "Because documentation on this was lacking, we went with students into neighborhoods to conduct interviews. People shared with us the names of waterways, such as the Molobalini, Banconi, and Woyowoyanko, the meanings of which refer to the history and environment of the area. Students typed up the information. Many parents received the document produced, and there was no negative reaction, no contradictions saying we had misunderstood things, which means, sincerely, the work was well done." (Ibrahima)

6.4.5 Conversations with, or about, people in the communities surrounding schools

Table 11 has examples of how teachers described synthesizing information from several sources, including elders, and attitudes in their cultural context toward change. When dialogues about ICT and the construction of knowledge extend beyond the school, others learn as well and can participate in (re)shaping schooling. People in the community gain more insight into school learning, into innovations such as ICT as well. "Malians should accept change when necessary, when beneficial, but we need to discuss it and what can be obtained from it" (Lamine).

Table 11. Dialogue with People Living in the Communities around the Schools

Synthesizing information from several sources
Alassane explains how "it is up to us to adapt ICT to our concepts, to our socioeconomic reality. We are working on it. I compare what is on the Web with what is in books and with what older people say, because they have a lot of knowledge. Rather than simply relying on what is in books and on the internet, when we also ask older people what they know, we learn more. One always has to verify information, synthesize it."
Alassane explained how the instructor of his younger siblings asked students to research the history of the Bacodjikoroni neighborhood in Bamako. "When they came to ask for help, I told them I did not know much but would search the Web, and I indicated who in the neighborhood they should go see. When they returned, we wrote a synthesis of what they learned with people in the neighborhood and what I found on the Web."

Issa shares proverbs on the school website, "because of the wisdom in them. I find the proverbs on the Web too universalized, however. That is why I am recording ones shared by elders – to publish and share them."
In the local geography project, described in the previous table, where content is developed in an inquiry-based and participatory way, Ibrahima explains: "It is not knowledge simply transmitted by the teacher but knowledge collectively gathered and put together. There is that of the students, of people in the community, and also of the teacher. The joy for students to be in contact with people from the community was really extreme."
Culturally embedded attitudes toward newness and change
"Here in Africa, we say even if you do not like something, you should still listen; when you do, you can develop an opinion. We do not reject ICT, we welcome it. It brings many things, and we in turn can contribute. Like our *griots*, the Web gathers and shares information. We consult many people to find a solution to a problem, so also should we consult the Web. We need to encourage the positive sides of it." (Ibrahima)
"Life changes, the world changes. Your children have demands. You are obliged to have a TV and at some point other means of informing yourself. Not using internet in teaching is like telling a parent the future of his child is not to go to school. I think we need to adapt over time. The African is obliged to adapt. But if you are in a village, this is more difficult." (Dramane)
Xavier sees change happening across generations, from the time of his grandparents. "For 150 CFA francs, one can access a great deal of information, rather than having to share one book." With ICT, he exposes students to what he hopes will inspire them to be responsible citizens. "For the moment, things seem not to change, but with time, perhaps…"
Lamine talks about traveling in a car on a tarmacked road for the first time when he left his village to go to high school. And now children are traveling information highways. "Young people are going to become more intelligent than we were in our day."

This overview of teacher conversations about ICT shows that teachers are dialoging with various social actors, whether peers or supervisors or parents of their students. Let us turn now to a discussion of the significance of these conversations, in which teachers both influence views and are influenced.

6.5 Discussion

According to what we heard from teachers, they do not appropriate ICT in the classroom independently of others' views and perspectives; they engage others as they shape how ICT is used at school, because they live and work in an environment where children belong to the community and their education is of concern to all. They are educated according to the following societal belief and practice: "*Chaque personne [apporte] sa pierre à l'édifice social en ayant son mot à dire sur l'éducation où le comportement des autres.*"[58][59] The teachers' conversations and interactions with others are discussed in relation to two themes:

[58] From a story about Sanounbereni, a child whose parents tried to make his education their personal affair: www.kalanso.net/index.php?option=com_content&view=article&id=91:sanounbereni&catid=93&Itemid=560

[59] Article nine of the 13th century *Charte du Mandé* (commonly called the Charter of the Mandé people, the Manden Charter proclaimed in Kurukan Fuga, or the Constitution of the Mali Empire) stipulates how education is the concern of all.

(a) collectively exploring the potentialities of ICT in education, and (b) teachers as border pedagogues and cultural workers.

6.5.1 Collectively exploring the potentialities of ICT in education

The teachers who were interviewed consider the use of ICT in education as inevitable. And with its use, changes are already evident – in the creation of new spaces (i.e. computer labs) and professions (i.e. lab monitors), as well as in learning and teaching (more collaborative, more active). Even if some teachers do not have time today – to learn to use a computer, to go to a cybercafé – in time they will have no choice but to learn and use ICT, regardless of their fields: "You cannot be in a field these days without meeting people who will bring you around to it" (Dramane). ICT is becoming a part of the daily landscape of learning and of the teaching profession. Its appropriation is a process of experimentation and perseverance – similar to how Fonlon (2012) referred to the creation of culture: "We learn to do by doing" (p. 93). But also of social dialogue; whether out of enthusiasm for ICT or frustration with reticent peers, teachers are discussing the pertinence of innovations like computers and internet, and through those discussions shaping the way they are used and how education is reshaped in the process.

The supervisor of pedagogical advisors, Lamine, comments how he travelled in a car on a tarred road for the first time when he left his village to go to high school. Now primary and high school students in Bamako are learning as part of their formal education to negotiate information highways. "Young people are going to become more intelligent than we were in our day," he added, with a mixture of delight and fear. There is little chance of removing computers and internet from cities and schools and returning to learning without them. There is instead the challenge of continuing to shape how ICT is used and making it more widely available, especially when many primary schools in Mali do not even have access to electricity.

The teachers' conversations indicate a desire to "expand the field of analysis, of vision," to "go beyond" what is given or inherited (Dramane). Jouët (2000) mentions how the appropriation of something new, like ICT, involves the extension of what already exists as well as resistance to and the upsetting of established norms and hierarchies. ICT use provides an opening. It disrupts the flow of routines (Akkerman & Bakker, 2011) and introduces new

information and concepts. In engaging with it and conversing about it, teachers and others look anew at learning and relations with knowledge and culture, and relations of power – in the classroom and beyond.

Alassane learns more by opening up to those in the community, as well as to internet, without throwing books out the window. He and his younger siblings ask "older people what they know" and consult documentation available on the Web regarding the history of a neighborhood in Bamako and synthesize what they gather. Forging new and meaningful knowledge systems in Africa depends on such conversations between those possessing indigenous knowledge and those manipulating new tools (Ela, 2006). The young need to connect with and consult old people (Ela, 2006) to reconnect with their wisdom and memory (wa Thiong'o, 2009) and cultural genius (Devisch, 2011). Evident in the teacher conversations is a fusion of knowledge across generations, languages (i.e. Bambara, French, English), worldviews and cultures. As Fonlon (2012) explained, reshaping school and revitalizing culture involves "integration of the best elements" of multiple approaches and cultures (p. 90). Can this happen without ICT? Certainly. But the use of ICT brings multiple social worlds into more intimate contact with each other, which becomes an occasion for rethinking sources of knowledge and ways of knowing. Ibrahima compares internet to an African *griot* and insists that the two sources of knowledge are complimentary.

Web searches are not integrated into teaching and learning processes to the exclusion of other ways of gathering information. Issa documents proverbs shared by elders for the school website, plays and an upcoming publication. It makes sense to "consult many people to find a solution to a problem," says Ibrahima who guided students in conversing with elders about local geography. Ibrahima is surprised to see the "joy for [students] to be in contact with people from the community." In this way, "students are no longer confined to the classroom. The classroom is an adjunct to the community rather than the reverse" (Boggs, 1970/2011, in section Toward a new system, para. 6), and popular knowledge is admitted into schools. Parents' unspoken agreement with the participatory and inquiry-based approach used to study neighborhood geography and reclaim social knowledge (wa Thiong'o, 2009) is not ignored. Their silence is interpreted as acquiescence and recognition of a job well done. Conceiving of culture as conversation "allows for different modes of conversation" (Hassoun & Wong, 2012, p. 77), such as, in the Malian context, silence as part of communication.

Also taken seriously are parents' concerns about "singing in [English] class" rather than seriously preparing for written exams and concerns about teaching some arithmetic operations in new ways, learned through pedagogical resources on the Web; teachers take their time to explain the new approaches and reassure parents. Differing opinions and tensions such as these can "be made productive for transformation of the systems" (Akkerman & Bakker, 2011, p. 146) in that teachers consider the perspectives of parents and reflect on and explain the rationale for their pedagogical practices. In engaging in conversation, teachers and parents are together in deciding what is and is not appropriate in education. When intellectuals go to everyday people such as parents and sit with them to discuss and solicit their imagination, it can contribute to the renewal of approaches (Ela, 2006). In the context studied, ICT use is a pathway for exploring the pertinence of new possibilities for accessing information and constructing knowledge. The pedagogical appropriation of ICT is not just about trendy student-centered learning, but about community learning, and community participation in teaching. ICT is a catalyst for educational change, and conversations about its use accompany and shape the use of ICT and the changes it brings.

Teachers are not using ICT to flee their cultures but to enter into them in creative and challenging ways and free up the curriculum to grow more relevant for their students and communities. In appropriating ICT they may seek information and contacts in faraway places, but they also reach into nearby communities – perhaps in new ways – and synthesize information and ideas to make something new (Akkerman & Bakker, 2011; Nyamnjoh, Durham, & Fokwang, 2002; wa Thiong'o, 2009). They simultaneously value rootedness in African culture and openness to other cultures. Teachers and students employ a plethora of languages and technologies to tap into different and co-existing ecosystems of information and knowledge. In going beyond their inherited present they are adding to it. And parents and others seem to be keeping watch, asking questions, and oftentimes nodding in approval.

6.5.2 Teachers as border pedagogues and cultural workers

Teachers are working in several borderlands or frontier spaces that appear or become more pronounced with the use of ICT in education. ICT use brings together different worlds, the borders of which separate and connect them. When teachers and students go into the community with digital recorders and cameras and notepads to learn local geography and type

up the findings, the world of school is connected with its milieu and youth with elders. When pedagogical advisors ask teachers about internet and teachers meet their supervisors to discuss the practicalities and possibilities of ICT, the world of teaching is brought into contact with the world of management. Malian students and teachers are in contact with other cultures and worldviews when they surf the internet and virtually dialogue with peers in other countries. The borders between these separate and connected worlds can be conceived of as opportunities or resources (Akkerman & Bakker, 2011) for pedagogical and cultural renewal through the fruitful confrontation and consideration of various viewpoints.

Some teachers bend and blend the boundary between teaching and other functions in the school system, such as advising and directing. Seeing the pedagogical possibilities of ICT exposed before his eyes in a computer lab, where teachers from different schools, grade levels and subjects come to work, alone or with their students, Jeremiah feels a responsibility to discuss them with his hierarchy. He proceeds to engage, among others, a pedagogical advisor and an Academy Director, making very practical and actionable recommendations. Pedagogical advisors may be open, pessimistic or even opposed to change. Harmonious views are not to be expected (Akkerman & Bakker, 2011; Hassoun & Wong, 2012) when something like ICT comes and upsets the status quo. It exposes work needed – at the borders of knowledge and power. Not only do advisors, and school directors for that matter, have less opportunity to pedagogically appropriate ICT than do teachers, but having moved up the hierarchical ladder, they may be fearful of changes to their position, to their power. Having to listen to and learn from teachers is a necessity but one not easily integrated. And such sentiments need to be considered for wider ICT appropriation.

Teachers took the initiate to reach out in their school and beyond, in efforts to sensitive supervisors to the pedagogical possibilities of ICT and how to go about its appropriation, but where are the spaces for the scholastic system to regularly listen to and learn from the practice of teachers such as those interviewed? Are the different parts of the school system talking – across its borders – to each other? In the same way that parents need to guide and learn from their children about the use of ICT –, the system needs to guide, support and learn from teachers and needs mechanisms to do so. To go beyond what he calls the informal nature of teacher appropriation of ICT, Mohamed, from one of the Malian ministries, calls for champions, partnerships with young people parents, and spaces to bring innovators together.

At the same time, day to day pressures can crowd out attention to newness and to the shaping of change, even when they are knocking at the door.

It is not easy for the education system to work across borders and in so doing free up creative energies especially when, as Mohamed explains, there is little budget for innovation and personnel are engaged in the daily activities of running the system. However, in under resourced settings, further resources could be lost if teachers are not supported in working borders as resources for the evolution of the education system. Their initiatives can provide inspiration and guidance, but insufficient continuous "work at the boundary" could lead to transformations that are not lasting (Akkerman & Bakker, 2011, p. 149). Are the conversations about ICT use taking place – as they are opportunities to catalyze change? Or are they being suppressed or merely ignored, leaving (or preferring) the system stuck in a rut of reproduction?

In turning various borders into opportunities to learn and reflect and change teaching and learning, teachers are border pedagogues and cultural workers in their appropriation of ICT. A cultural worker is concerned by the integrity of the total community (Holmes, 2014). They cross borders and exercise their authority to facilitate critical reflection and create conditions favorable for self and social formation (Giroux, 1992, 2005). When teachers dialogue with those around them about ICT, they are not confining themselves to their classrooms but going into communities "with their resources and possibilities" to help create "borderlands for dialogue" about the construction of tomorrow (Giroux, 2005, p. 135). They are encouraging reflection and the social shaping of both ICT and education. Their use of ICT brings local and global trends into contact, and conversations about what to value inform the ways in which elements from these different realms should be combined fruitfully. To renew school culture, "African values should be […] charged with new dynamism; […] the examination and choice of the foreign elements to be grafted thereon should be done by Africans" (Fonlon, 2012, p. 92). Through their use of ICT, teachers bring the world to Mali and Malian culture to bear on its appropriation. Attuning to various perspectives on the use of ICT is part of guiding and being guided in pedagogical practice and the shaping of school culture.

Teachers appropriating ICT make borders – between different kinds of information, knowledge, power, worldviews, technologies – more accessible to others. Through their

initiative, in thought, action, and dialogue, they bring borders closer. They are not afraid of diversity or to be different (Jouët, 2000). They bring what might be considered foreign or new closer to the realm of everyday life, for inspection and perhaps integration. At the same time that teachers are transmitters of culture, like Soumba Ngolo they are also facilitating processes of change and innovation through their use and discussion of ICT.

6.6 Conclusion

The pedagogical appropriation of ICT in the context studied, according to the teachers interviewed, is a social and dialogical process involving teachers and their students, school administrators, pedagogical advisors, parents and other community members. Teachers' conversations with, or about, their peers (other teachers) regarding ICT reveal on the one hand complicity with teachers already appropriating ICT and on the other frustration with teachers caught in a rut or unwilling to leave their comfort zone. Conversations with pedagogical advisors become opportunities for advisors to learn about ICT in education. With a spirit of concern for the evolution of the school system, some teachers put themselves in the shoes of school and district directors and engage them in dialogue about ICT. Teachers explained listening to the concerns of parents and reassuring them about new teaching methods and more active pedagogies that come with the appropriation of ICT. Teachers reported guiding students in gathering and blending information from the internet and from members of their local communities; knowledge is thus collectively produced and not just received. Students and teachers are adapting ICT to Malian contexts, in concert with those around them.

The concept of culture as conversation (Hassoun & Wong, 2012) was employed in this paper to provide insight into culture as fluid and open-ended and the creation of culture as a participatory process fraught with differing opinions, challenges and confrontations, as well as complicity. Teachers' conversations in Bamako about the use of ICT in education are part of the process of involving various social actors in deciding how ICT will be used and how school culture might be renewed. "Activities become widespread only if the culture also supports them […] It matters what tools are available to a culture, but it matters more what that culture chooses to do with those tools" (Jenkins, 2009, p. 4). Part of change is stimulating conversation and movement across borders. Stopping change could involve trying to limit

movements across borders, whether physical, generational, socioeconomic, linguistic or technology-related, but could result in isolation and stagnation. Working the borders of compliance and contestation, of continuity and change, can breathe new life into and lubricate a sclerotized system.

Some of the Malian teachers interviewed are pointing to possible pathways for revitalizing pedagogy and culture in participatory ways. They are working across generations and across the scholastic hierarchy, opening the school in numerous small ways to nearby communities and the wider world. They are questioning power relationships between students and teachers, and exploring expectations of dependency and desires for autonomy and interdependence. Their contact and interaction with newness and participation in social discourse about it make them artisans of cultural renewal.

To further understand the importance and role of social dialogue in the pedagogical appropriation of ICT in West Africa, future studies could include analysis of interviews not only with teachers but also with those with whom they interact and dialogue about the use of ICT in teaching and learning, including learners as they too participate in the social shaping of ICT. In addition, because this study investigated primarily the use of the computer and internet, future research could look into the use of mobile devices and social media, which have been introduced into some schools. Tuning into the conversations and social dialogue about the pedagogical appropriation of these innovations – in urban, peri-urban and rural settings – and considering the borders they introduce and the value of working them could provide rich insights into emerging educational and societal trends.

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CHAPTER 7. Third thesis paper: *Pourquoi les professeurs ouest-africains s'approprient-ils l'internet?*

par Kathryn Toure

Résumé
Pourquoi des professeurs de l'enseignement supérieur en Afrique de l'Ouest s'approprient-ils les technologies de l'information et de la communication (TIC)? Cette question est abordée à travers une interprétation socioculturelle d'itinéraires de six professeurs. Les résultats montrent l'intégration active et progressive des TIC dans la pratique pédagogique, entre autres, par la mise en ligne des cours à distance et l'interaction à distance avec les étudiants. Ils mettent aussi en lumière des aspirations plus profondes comme la participation africaine au monde scientifique et la transformation des relations humaines et de la culture. Dans le processus d'appropriation, les professeurs sont amenés à remettre en question leurs approches pédagogiques, à franchir des frontières entre différents univers de traditions et connaissances et à proposer de nouvelles approches d'apprentissage, de production des savoirs et de construction de l'identité africaine. Ces résultats contextualisés viennent en complément de ceux sur l'utilisation des TIC à l'université. Ils peuvent enrichir les pratiques éducatives des enseignants dans ce domaine, ainsi que les politiques.

7.1 Introduction

La société africaine a été déstabilisée par l'éducation coloniale qui a mené à une aliénation profonde, une glorification de l'oppresseur et un avilissement de la culture africaine (Moumouni, 1964/1998). L'école coloniale a essayé d'effacer la personnalité africaine. Une façon de penser et de voir le monde a été imposée et les jeunes devaient jeter leur africanité par la fenêtre pour porter d'autres habits (voir Alessandri, 2004). Des processus d'adaptation et de rééquilibration sont toujours en cours.

Venant également de l'extérieur pour la plupart, les théories relatives à l'intégration pédagogique des technologies de l'information et de la communication (TIC) doivent être abordées avec précaution. Pour mieux comprendre l'intégration de ces technologies dans les pays africains, il est important d'étudier leur appropriation du point de vue des utilisateurs africains, et ce, en prenant en compte les spécificités culturelles. En étudiant l'utilisation des TIC dans les universités ivoiriennes, Bahi (2006) conclut que l'individualisme et le carriérisme du monde scientifique occidental dominent plutôt qu'un esprit de développement collaboratif. A la différence des études focalisées surtout sur l'accès à et l'usage d'internet et recommandant l'accès amélioré et la formation (Adika, 2003; Ahmad & Usman, 2013; Al-Ansari, 2006; Hadagali & Kumbar, 2011), une étude dans une douzaine d'universités en

Afrique de l'Est (Anthony et Muliaro, 2008) s'est intéressée aussi à la nécessité des initiatives TIC d'être imprégnées des aspirations des utilisateurs de ces innovations. Dans le cas contraire, l'éducation continuera à diviser et aliéner plutôt que de faciliter le plein épanouissement de la personnalité africaine (voir SAC, 1965).

L'objectif de ce texte est de comprendre pourquoi des enseignants du supérieur en Afrique de l'Ouest s'approprient les TIC, en particulier l'ordinateur et l'internet, dans leur enseignement. Nous partons du postulat qu'en adaptant les TIC aux défis et aux opportunités de leur contexte et en y investissant leurs valeurs et expériences, les enseignants font évoluer leur pédagogie et proposent de nouvelles façons d'interagir avec soi et les autres. Après cette introduction, nous aborderons les concepts de la culture et de l'appropriation. Puis nous justifierons l'utilisation d'une méthodologie qualitative et présenterons et discuterons les résultats de la recherche avant de conclure.

7.2 Concepts de culture et d'appropriation des technologies

Nous utiliserons les concepts de culture et d'appropriation afin de comprendre l'emploi des nouvelles technologies par des professeurs de l'Afrique de l'Ouest. La mobilisation de ces concepts sert, en investiguant l'utilisation d'une innovation, à comprendre les expériences et aspirations des professeurs en prenant en compte leur contexte socioculturel et historique. La culture est la vie créatrice du peuple qui transforme le milieu naturel et social (Ki-Zerbo, 2010a). Elle est organique et vivante; elle se développe et subit des changements qui équivalent parfois à une véritable métamorphose (Fonlon, 2010). La culture ne prospère pas dans un environnement stérile ou coercitif, elle nécessite plutôt la liberté et le contact fructueux (Fonlon, 2010, 2012). L'historien burkinabè, Joseph Ki-Zerbo, a enseigné qu'il ne faut pas « dormir sur la natte des autres », c'est à dire qu'il faut s'enraciner et entrer en contact avec l'autre en toute connaissance de soi.

> *Le développement et […] un passage « de soi à soi-même à un niveau supérieur » par rejet ou assimilation organique et historique d'éléments internes et externes dans la mesure où on ne peut pas s'enfermer sur soi, mais s'ouvrir à partir d'une véritable connaissance de soi. (Ki-Zerbo, 2010b, p. 22)*

Zakhartchouk (2005) exprime cette idée d'enracinement et d'ouverture afin de faire évoluer sa culture en disant qu'il faut en même temps l'assumer et s'en arracher. Est-ce que ce n'est pas

en étant bien enraciné, bien implanté qu'on peut grandir, s'ouvrir sur le monde et offrir ses fruits?

Le processus culturel est un processus créatif d'appropriation constante. Quand un individu ou un peuple s'approprie une langue, il l'adapte à sa culture et aux idées à exprimer. Les langues coloniales sont domestiquées par l'usage créatif local (Nyamnjoh et Shoro, 2011). La langue est soumise à des approches, des perceptions et des objectifs différents de ceux de ses concepteurs. Celui qui utilise la langue l'investit de ses intentions (Bakhtin, 1981). Les Africains créolisent leur héritage linguistique en mélangeant les langues africaines et les langues européennes. Celui qui approprie les TIC les investit aussi de ses intentions.

Le processus d'appropriation s'effectue au niveau de l'individu et de la société. Il est caractérisé par un questionnement du statu quo et même par la résistance à la domination culturelle, mais aussi par une réappropriation des connaissances sociales et du génie culturel afin d'imaginer des alternatives sociales et se projeter dans l'avenir. Il faut absorber puis « digérer les nouvelles acquisitions culturelles pour qu'elles deviennent partie intégrante de la substance de son être » (Fonlon, 2010, p. 81). En combinant de façon intuitive, créative et stratégique ce qui existe avec ce qui est nouveau, de nouvelles options culturelles sont proposées. La synthèse des traditions de plusieurs sources peut dynamiser et enrichir la culture. (voir Appadurai, 2013; Baillette et Kimble, 2008; Devisch, 2011; Ela, 2006; Fonlon, 2010, 2012; Jouët, 2000; Hountondji, 2002; Lund, 2009; Michiels et Crowder, 2001; Muchie 2004; Nyamnjoh, Durham et Fokwang, 2002)

La technologie – soit les langues, soit les TIC – fait partie de la culture et doit favoriser l'humanisation; elle peut construire ou blesser selon son utilisation (Fonlon, 2010). De la même façon qu'un individu ou un peuple le fait avec une langue, il peut s'approprier les TIC. En les adaptant au milieu, leur utilisation est contextualisée en même temps qu'elles transforment les utilisateurs, leurs habitudes et leur environnement. Elles deviennent partie prenante d'une personne, d'un peuple. L'appropriation n'est pas la maîtrise de la technologie (Jouët, 2000; Lund, 2009) mais son utilisation créative et stratégique qui permet d'atteindre les objectifs des utilisateurs (Michiels et Crowder, 2001; Surman et Reilly, 2003).

Les enseignants s'approprient les TIC quand ils adaptent leur utilisation aux défis particuliers de leur contexte, afin de résoudre des questions stratégiques (Surman et Reilly, 2003). Ils y investissement activement leurs intentions, leur personnalité et leur culture. Le

processus peut remettre en question les rôles et relations entre enseignants et étudiants, amener l'enseignant à coordonner des activités à travers l'espace et le temps, amener des changements dans les perceptions, connaissances et compétences (Lund, 2009) et contribuer à une réinvention de la culture (Taylor, 1998). Le processus d'appropriation est coloré par le milieu socioculturel, politique et économique en même temps qu'il influe sur le milieu.

Afin d'enrichir le patrimoine culturel africain avec des réalisations durables, il faut encourager le génie; il doit y avoir restauration, de soi et de l'histoire, mais aussi intégration de la nouveauté (Fonlon, 2010). En précisant pourquoi les professeurs ouest-africains interviewés s'approprient des technologies, un va-et-vient créatif et dynamique se dégagera entre restauration et intégration, entre le passé, le présent et le futur, entre ce qui existe et ce qui est nouveau.

7.3 Méthodologie

Pour comprendre pourquoi les professeurs ouest-africains s'approprient les technologies, une méthodologie qualitative avec une approche interprétative a été utilisée, ce qui permet d'apprécier leurs orientations et choix pédagogiques. Un tel travail demande au chercheur – et au lecteur – d'aligner sa perception sociale, culturelle et politique avec celle des personnes interrogées et observées (Gupta et Ferguson, 1997). L'approche interprétative diffère de l'utilisation des enquêtes dans la recherche quantitative. Elle n'est pas contre la théorie, ni les généralisations, mais elle prend en compte les complexités de la vie – dans l'étude présente de l'enseignant, du système éducatif, et de l'environnement dans lequel l'enseignant et le système évoluent. Les généralisations ont un sens par rapport aux spécificités du contexte (Geertz, 1973). Dans l'approche interprétative on ne recherche pas un échantillonnage représentatif de la population générale mais plutôt une participation qui donnera des réponses à la question de recherche (Savoie-Zajc, 2011).

Notre étude porte sur six enseignants d'université, identifiés à travers notre réseau personnel et professionnel, utilisant depuis plusieurs années les TIC dans l'enseignement. Il s'agit de femmes et d'hommes, de francophones et d'anglophones, de musulmans et de chrétiens qui enseignaient les humanités, les sciences humaines, ou les sciences naturelles dans quatre différents pays ouest-africains. Ils avaient entre 40 et 55 ans lorsque nous avons

conduit des entretiens semi-structurés avec eux dans lesquels nous avons abordé des thèmes comme la familiarisation aux TIC, l'utilisation des TIC, les comportements face aux TIC, et la motivation pour leur utilisation dans l'enseignement. Les entretiens ont été conduits en face à face (avec une exception, par skype), pendant deux à quatre heures chacun, et en s'inspirant des approches ethnographiques et des récits de vie[60], entretiens de type biographique (Pilote et Garneau, 2011). Nous avons pris des notes pendant ces échanges qui ont duré entre deux et quatre heures. Nous avons recoupé certaines informations en consultant les curriculum vitae des professeurs, leurs sites internet et quelques matériaux pédagogiques.

Pour débuter l'interprétation des données, nous avons développé pour chaque professeur un « itinéraire TIC » qui relate sa rencontre et son interaction avec les TIC. Nous l'avons partagé avec chaque personne concernée, par courriel, en 2011 pour apporter des corrections, insérer des commentaires et ajouter des informations complémentaires. Alors, comme Pelckmans (2009) dans sa recherche sur l'utilisation du téléphone mobile au Mali, nous avons effectué un travail de terrain même lorsque nous étions géographiquement éloignés. L'interprétation des données ne recherche pas une loi générale, mais la signification de ce qui se dit (Geertz, 1973); il s'agit d'identifier les thèmes qui ressortent et de les lier à l'approche conceptuelle. Nous avons organisé la discussion sur les résultats autour de deux de ces thèmes : (a) intérêt pour les TIC et découverte de leur possibilités pédagogiques et, (b) aspirations profondes pour leur utilisation. Dans la présentation des résultats et dans la discussion, les noms des professeurs et certains détails de leurs itinéraires ont été modifiés afin de respecter l'anonymat.

7.4 Résultats

Les résultats de recherche sont présentés dans cette section sous forme de six itinéraires TIC dans lesquels la personnalité professionnelle de chaque professeur transparaît. L'approche vise à permettre au lecteur d'entrer dans le vécu des professeurs et de mieux comprendre leur utilisation des TIC de leur point de vue. Deux des six itinéraires sont en

[60] Les récits de vie, plus utilisés en histoire, ont été institutionnalisés en sociologie à partir des années 1920 par des chercheurs comme Robert Park de l'Université de Chicago et suite aux évènements de mai 1968 en France par un groupe de chercheurs autour de Daniel Bertaux (Sanseau, 2005).

anglais; chacun comporte une synthèse, en français, de la conception des TIC du professeur. Les itinéraires sont discutés dans la section subséquente.

Itinéraire TIC de Sidi

Sidi commence son expérience avec le calcul informatique au milieu des années 1980. « En France, j'ai continué. Il y avait un laboratoire avec des ordinateurs et quelqu'un qui faisait les calculs pour les autres profs. Mais moi, j'ai pu utiliser l'ordinateur directement. Les gens étaient étonnés de voir que j'utilisais l'ordinateur et que je venais d'Afrique. J'ai toujours aimé travailler avec l'ordinateur. Au départ c'était dur ».

N'étant pas en mesure de s'offrir un ordinateur, il a acheté une calculatrice de poche programmable. « J'ai fini en 10 ou 12 minutes ce que les autres faisaient en deux heures de temps. J'entrais avec la machine lors des examens. Les gens pensaient que ce n'était qu'une machine à calculer ».

C'est en 2005-2006 qu'il a mis un cours en ligne. Le processus l'a obligé à mieux le structurer, en indiquant des objectifs spécifiques et en fournissant d'emblée les exercices et les autoévaluations en même temps que le contenu. Cela prend beaucoup de préparation et de travail pour mettre un cours en ligne, mais une fois fait, cela facilite la vie de l'enseignant – et aussi de l'apprenant. Le processus d'apprentissage, qui était chronologique et rigide, devient modulable et flexible. « La documentation est facile, et pour eux, et pour moi. Ils peuvent accéder à l'ensemble d'un programme dès le début. C'est appréciable. Normalement, l'étudiant ne pouvait pas connaître la dernière leçon avant la première. Les évaluations et le contenu sont présentés en même temps. Chaque cours est accompagné d'objectifs précis. Les TIC t'obligent à mieux structurer. Ils t'obligent à préparer ». Les étudiants ont beaucoup plus de liberté dans la poursuite de leur apprentissage. « Même pour un seul cours – que l'étudiant a intégralement devant lui –, la prise de notes n'est pas fidèle. Après la prise de notes, l'étudiant peut aller à quelque chose de construit, quelque chose qui reste. Le cours en ligne devient une deuxième présence du prof auprès de ses étudiants ». De plus, « les perturbations sur le campus n'impactent pas un cours en ligne ».

Ainsi l'enseignant se sent moins fatigué et plus léger. « Ce que je transportais régulièrement dans mon sac, je ne l'ai plus ».

Les étudiants ont deux types de réactions face aux cours en ligne, selon Sidi. Certains les ont appréciés alors que d'autres ont eu peur et ont résisté. « Comprenant la nécessité de faire face au refus, j'ai rassemblé les deux types d'étudiants dans des petits groupes de travail ».

En théorie, ayant créé une plateforme d'apprentissage et un espace de collaboration, l'enseignant devrait avoir plus de temps – pour faire de la recherche et écrire. « Sur l'ordinateur tu peux ouvrir plusieurs thèmes. Tu ouvres, tu notes, tu oublies. Tu peux travailler sur beaucoup de choses en même temps, faire progresser plusieurs projets en même temps, pour capitaliser tes connaissances ». C'est comme si le disque dur devenait une extension du cerveau.

« Ne pas être à l'origine de la technologie n'est pas gênant. Mais il est désagréable de ne pas utiliser les nouvelles possibilités ». Sidi insiste sur le fait que même si les forces derrière les innovations technologiques ne viennent pas de l'Afrique, les Africains ne peuvent pas les ignorer. « Elles conduisent à une certaine 'industrialisation' de l'enseignement.

Personne ne pourra l'arrêter ». Les enseignants en Afrique doivent suivre et aussi bâtir leur chemin. Ils doivent sérieusement apprendre et s'approprier les TIC afin d'être doublement « présents » pour leurs étudiants. Mais aussi pour participer aux débats et à la construction des savoirs sur le continent et dans le monde.

« Maintenant, le défi est de transformer l'information en savoir. L'intérêt est vu par tous par rapport à l'ancien système. Mais l'accès à internet est difficile. Et tout le monde n'a pas les compétences technologiques ». Il faudrait investir beaucoup plus dans les enseignants – pour les former et aussi les « transformer ». Sinon « les étudiants du continent continueront à consommer le plaisir et les loisirs et deviendront culturellement pauvres plutôt que d'entrer dans la société du savoir. L'enjeu est de ne pas être analphabète dans une telle société, autrement tu seras laissé de côté. Nous devrons agir… Pour se positionner en TIC il faut des compétences en TIC. Pour être présents nous devrons avoir les compétences de produire du numérique ». Il estime que seulement 3 sur 100 formateurs d'enseignants dans son pays utilisent les TIC dans leurs enseignements. « Il y a des solutions aux résistances, par exemple, pour insérer les TIC dans la formation initiale. Mais comment transformer les professeurs déjà en service? »

« Nous, nous n'étions pas au centre de l'information. C'était le maître et seulement le maître. Il y avait une autre conception de la connaissance. Nous devrons produire nos connaissances, ne pas nous comporter comme nos parents. Nous devrons écrire, laisser des traces, rompre un peu avec ce passé. La tendance nous oblige à être présents sur ce terrain, comme pour défendre notre personnalité, notre culture ».

Synthèse de sa conception des TIC : Selon Sidi, les TIC sont un raccourci pour se mettre au même niveau que (ou devancer) les autres. Tout comme il se sentait un peu malin quand les gens en France le regardaient – lui, un Africain – manipuler un ordinateur, il voudrait que les Africains utilisent de façon stratégique les TIC pour apprendre et produire des connaissances. Il semble convaincu que cette action peut transformer positivement la société et aussi contribuer quelque part à un réalignement des relations de pouvoir. Cette appropriation des TIC passe par une rupture avec le passé afin de « se lancer sur la scène des innovations », rénover et défendre la culture africaine.

Itinéraire TIC de Kadijatou

Kadijatou a grandi dans une grande famille. « J'étais parmi les aînés. On devrait apporter une aide dans l'éducation des frères et sœurs. On devrait être en mesure de soulever les défis. Les enseignants, ainsi que ma famille, m'ont toujours poussée et m'ont fait comprendre que je pouvais très bien faire. En retour, je voulais aider aussi. Donc j'utilise mes études pour régler des problèmes… à l'université, dans ma vie, dans les vies de mes étudiants, dans la société ».

Elle a appris l'utilisation de l'ordinateur avec deux autres étudiants aux États-Unis vers la fin des années 1980. « J'ai même fait un petit boulot avec l'ordinateur » pour gagner de l'argent. « Mais au retour au pays, pas d'ordinateur ». Elle a dû se battre pour que l'administration de son université puisse acquérir un ordinateur dans les années 1990. « Pour la première fois, nous avons pu faire une centaine de lettres – et sans erreur – dans une seule journée. Mes superviseurs étaient étonnés ».

Kadijatou a ensuite enseigné. Elle était surprise de voir que « pour les cours magistraux, le niveau des étudiants ne leur permettait pas de prendre de bonnes notes. A cause

de toutes ces difficultés, j'étais obligée d'écrire mon cours au tableau. Mais mon bras s'ankylosait. Vers 2005, j'ai dit à mes étudiants de créer des adresses courriel. J'ai commencé à leur envoyer les cours. Plus besoin d'écrire au tableau! ». Elle a aussi découvert le Web et a « créé un site sur la littérature. Mon site aidait les étudiants à naviguer ».

Avec les TIC, « on a pu finir le programme en juin, même quand l'année scolaire a débuté en retard – en janvier! ». Et Kadijatou a commencé à encadrer des étudiantes habitant en dehors de la capitale qui trouvaient contraignant de faire le trajet jusqu'à la ville en raison de leurs responsabilités de parents.

Elle était frustrée de voir qu'au « niveau du secondaire, les élèves utilisaient plus l'ordinateur qu'au supérieur ». Mais « seulement ceux qui ont étudié à la capitale utilisaient l'ordinateur, pas les autres ».

Elle n'enseigne pas seulement sa matière, « mais aussi les thèmes qui sont des défis nationaux et les compétences qu'il faudra en plus des connaissances théoriques ». En fait, pour elle, les « TIC poussent les étudiants à faire de la recherche et les aident à entrer dans le monde scientifique ». Mais pas seulement cela. « Si un étudiant sort sans utiliser l'ordi, il ne peut pas trouver un travail ». Elle cite avec fierté l'exemple de plusieurs étudiants qui, en suivant ces conseils, ont obtenu des emplois chez eux. Elle encourage ses étudiants à élargir leurs connaissances, à poser des questions, à réfléchir et à être ouverts, flexibles et pratiques.

Consciente de la valeur des TIC dans l'apprentissage, elle a convaincu le doyen d'ouvrir un laboratoire informatique. Kadijatou affirme : « les TIC m'ont ouvert de nouveaux horizons dans l'enseignement parce que j'étais ouverte à apprendre des autres et à étudier comment eux ils règlent leurs problèmes ».

Synthèse de sa conception des TIC : Kadijatou n'hésite pas à apprendre des autres et à adapter les nouvelles connaissances à son milieu. Ayant découvert les TIC à l'étranger, au retour au pays elle plaide pour leur introduction dans l'administration et l'enseignement à l'université. Les nouvelles pratiques avec les TIC l'aident à faire ce qu'elle ne pouvait pas faire auparavant : s'économiser physiquement, finir le programme même lors des grèves sur le campus, suivre des étudiants qui sont en dehors de la capitale. Pour elle, les TIC sont pratiques. Elles l'aident à préparer les jeunes à obtenir du travail et aussi à apporter leur contribution à la nation et au monde scientifique. La vision de Kadijatou d'arrimer dans l'enseignement et l'apprentissage les connaissances pratiques et théoriques informe sa façon de s'approprier les TIC.

Itinéraire TIC de Bakri

Bakri a été confronté à l'informatique pour la première fois dans les années 1980, dans son pays d'origine, grâce à son université et des partenariats universitaires étrangers (avec la France) et la coopération au développement dans l'enseignement supérieur (à travers l'USAID[61]). Comme il a été un des premiers à s'intéresser à une salle informatique nouvellement installée dans l'école de formation des enseignants, il est devenu responsable de formation en TIC. Les années 2000 et 2001 ont été une période de changements majeurs avec la mise à disposition d'internet au campus francophone numérique et aussi, via l'université de Strasbourg, la formation à distance dans l'utilisation des TIC dans l'enseignement.

[61] USAID : Agence américaine pour le développement international / United States Agency for International Development

Son utilisation d'internet dans l'enseignement lui permet de finaliser le programme avec ses étudiants, même quand l'année scolaire est interrompue pour une raison ou une autre. Avec internet, alors, le processus éducatif se poursuit, malgré les distances entre lui et ses étudiants, entre son université et une université partenaire en France. La virtualité est introduite dans l'enseignement et l'apprentissage à l'université. L'accès à internet lui a donné également la possibilité d'aller au-delà des livres : « Je télécharge des ressources et je les imprime, et les étudiants les reproduisent. Je peux aussi envoyer mes étudiants consulter des sources particulières ». Il a également créé pour eux un site internet qui fournit par exemple des sources sur l'utilisation des statistiques.

Bakri souligne comment le maniement d'internet rend les étudiants plus actifs dans leur quête de connaissances, et moins peureux vis-à-vis des enseignants. Non seulement ils posent des questions, mais ils collaborent plus facilement entre eux. En fait, il semble frustré de voir que les étudiants assimilent plus rapidement les avantages offerts par les TIC que les enseignants. Il mentionne l'existence de clubs internet pour les étudiants dans différentes facultés sur le campus, alors que rien de semblable n'est initié par les professeurs. Ce n'est qu'en 2010 et 2011 qu'un réseau d'enseignants utilisant internet dans l'enseignement est initié, et ceci par l'UNESCO[62]. En même temps, il déplore le fait qu'il n'y ait pas de soutien matériel plus systématique pour les élèves travaillant de façon novatrice avec les TIC, par exemple dans le développement de logiciels pour effectuer des calculs mathématiques complexes. Et l'accès généralisé aux TIC sur le campus demeure un véritable défi.

Il suggère de revoir ce qui a été appris mais oublié, et d'en sélectionner ce qu'il faudra combiner avec de nouvelles connaissances provenant de diverses sources. « La connaissance ne provient pas d'un seul peuple. Il faut prendre dans chaque invention, en l'occurrence internet, l'aspect positif et ce, en tenant compte des valeurs sociétales. De façon traditionnelle, nous allons vers les autres. Depuis toujours, nous aimons échanger, apprendre avec les autres, avoir le point de vue des autres. Les parents envoient leurs fils à Mopti, par exemple, pour apprendre le Coran auprès d'un guide religieux. » Lui, il a voyagé à Paris pour apprendre les sciences naturelles dans un environnement collaboratif. La collaboration, explique-t-il, « fait partie de la société africaine ».

Synthèse de sa conception des TIC : Bakri s'implique rapidement dans les projets collaboratifs intégrant les TIC. Il est impatient et voudrait que l'esprit d'innovation soit renforcé. Il pense que l'intégration des TIC dans l'enseignement et l'apprentissage aidera à restaurer les éléments positifs des enseignements traditionnels perdus dans l'urbanisation. Cela suggère un véritable dialogue et une construction entre ce qui est appris chez soi et ce qui vient d'ailleurs, entre le village et la ville, entre les générations et les cultures.

ICT itinerary of Isadora

"Oh, I started using ICT a long time ago. I am essentially a communicative being. Communication is what characterizes me.

"I studied in Europe in the late 1980s, about the same time internet was coming up. We used it to communicate within the university, but not outside. We would even telephone people over the computer – we call that 'chat' now." Isadora explains how she used the

[62] UNESCO : Organisation des Nations unies pour l'éducation, la science et la culture / United Nations Educational, Scientific and Cultural Organization

computer to type her thesis and also to write stories and make history. “When you write a good story that’s published, isn’t that making history?”

Her use of ICT changes gradually, as her knowledge changes. “Now I can move around three computers: one desktop, one laptop, and one notebook – copying materials from one to the other, including audio recordings that are part of my research. Some frustrations have increased, others dimensioned. Some of the greatest frustrations are around access. Availability is not synonymous with affordability.

“For me, ICT is a set of relationships that hooks me up with others. Cell phones for example are ways to reach out to people, to make yourself available, an enabling technology. And I use skype to reach out to people with something useful for what I’m studying. I use ICT in relation to other things. I never use them just for themselves. ICT facilitates relationships and encounters, enables connections, disconnections, junctions, disjunctions. It’s a crossroads. ICT is never autonomous, or all powerful. Never stands alone. It’s embedded in social relationships.”

You said ICT allows us to cross boundaries? “Yes, social boundaries, and physical boundaries. Boundaries between magic and reality. Between poverties and riches. The poor experience the world of the rich. And poverty enters and agitates rich bedrooms.

“ICT allows us to redefine relationships in all sorts of ways. And we do not necessarily get better results, but we can sometimes get closer. I use ICT in learning and exchange of information, and in relationships of learning. With students, we have used internet to look up Bob Marley’s lyrics, in studying what it means to be an African, in trying to understand who lays claim to Africa, attributes of geography, attributes of sociability…

“With ICT, we tame time and space. We do from a distance what ordinarily we couldn’t. We can benefit from something that would have taken time to get to us. Before you could mail me a letter with a photo, and it might takes months to get to me. With skype we consume instantly. I’ve given lectures from Africa, with students in Europe or North America asking questions. If you want to illustrate Lady Gaga and her craziness in a lecture, you go to youtube, click, and she appears in the classroom.”

What are the dangers of using ICT in the classroom? “That’s a silly question. I do not see ICT as a set of negatives and positives but as complexity.”

Do you wish ICT had been invented in Africa? Do you feel you’re using the colonizers’ tools? “ICTs are independent neutral technologies harnessed differently by different peoples. Don’t you know that Silicon Valley is peopled by Asians and that the West outsources? I would say we are using the tools of the colonized. Technology does not belong to the West. It’s a global ecumen – different religions dialoguing together.

“ICTs are merely dimensions of what has always been. Virtual space is an intimate and intricate dimension of reality. Growing up, certain things we experienced were explained as witchcraft. Now I know better. They had to do with technology. Yes, ICT is like modern witchcraft. With ICT, virtuality is ever more present.”

Synthèse de sa conception des TIC : Pour Isadora, l’utilisation des TIC facilite la mobilité et la connectivité et permet de franchir les frontières, y compris entre les individus, et avec plus de rapidité. Il se sert de l’ordinateur et de l’internet d’abord au sein de l’université et aussi pour faire sa thèse. Grâce aux TIC, il écrit et partage l’Histoire et des histoires, des réflexions sur les perspectives africaines. Et il peut être présent – même dans une salle de classe aux États-Unis – sans monter dans un avion. Le contenu sur internet entre dans la salle de classe,

par exemple par YouTube, et enrichit les discussions. Le téléphone mobile et skype facilitent la communication et les relations. Dans son rapport avec les TIC et dans la mobilisation de ses réseaux pour la recherche et l'apprentissage, l'oral est aussi important que l'écrit. On peut dire qu'avec les TIC le relationnel est virtuel et intensifié, l'Afrique est plus connectée au monde et plus présente dans le monde.

Itinéraire TIC de Kannou

Kannou tire parti des circonstances de la vie. Les TIC ont été pour lui une occasion favorable. Il les a investies personnellement et financièrement pour se perfectionner (en prenant des cours d'informatique en cabinet privé et à travers l'UNESCO et l'AUF[63]). Son initiation à l'utilisation des TIC a visé, dans un premier temps, l'amélioration de la qualité de ses productions écrites (mémoires et rapports mieux écrits et avec moins de fautes d'orthographe) et à être plus autonome par rapport aux prestations d'un secrétaire.

En second lieu, le recours aux TIC a influencé son approche pédagogique. Il a commencé à percevoir l'apprentissage non pas comme une accumulation, mais comme un processus de construction de connaissances – « les étudiants accompagnés par un enseignant sont actifs dans leur processus d'apprentissage ». Il a encouragé tous ses étudiants à l'université à acquérir un ordinateur. Pour ce faire, il est allé jusqu'à leur négocier des facilités de paiements auprès d'un fournisseur. Il voulait que ses étudiants expérimentent, lors de leurs apprentissages, l'autonomie et la proactivité qui ont caractérisé les siens. Il a mis ses cours en ligne et a échangé avec les étudiants par courriel. Le processus pédagogique est ainsi allé au-delà de la salle de classe.

Il explique comment il combine deux approches thérapeutiques et pédagogiques : ce qu'il a appris de sa grand-mère (guérisseuse traditionnelle d'une grande autorité) et ce que lui a enseigné l'école (la non-directivité de Carl Rogers[64] par exemple). Il compare son enseignement à sa pratique clinique hospitalière qu'il poursuit à côté de l'enseignement et qui attache du prix à l'écoute. « Il n'y a pas de solutions toutes faites. Le médecin en adoptant la posture d'un accompagnateur chemine avec le patient pour essayer de trouver une solution appropriée et acceptable pour tous ». Cette approche de recherche de solutions et d'accompagnement nous informe sur sa façon de s'approprier les TIC dans l'enseignement.

Synthèse de sa conception des TIC : L'utilisation des TIC par Kannou et l'incitation de ses étudiants à faire de même sont liés à une profonde soif de savoirs, de construction de connaissances, de promotion professionnelle, de réalisation et de reconnaissance. Kannou semble transmettre à travers son enseignement et son utilisation des TIC des valeurs qui lui ont été inculquées par son éducation. Par exemple, il a appris qu' « il ne faut pas tomber dans les considérations trop matérielles ». Il faut résoudre les problèmes et surmonter les difficultés. Il faut aussi la persévérance et le dialogue. J'ai été impressionnée par la manière dont Kannou prend soin de son ordinateur qui est rangé dans un sac très ordonné. J'imagine qu'il doit être aussi sacré pour lui que les outils de travail de sa grand-mère, une guérisseuse.

ICT itinerary of Aaron

[63] AUF : Agence universitaire de la Francophonie

[64] Carol Rogers (1902-1987) était un psychologue humaniste nord-américain. Dans la psychologie clinique et la relation d'aide (counseling), il utilisait l'approche centrée sur la personne, qui « met l'accent sur la qualité de la relation entre le thérapeute et le patient (écoute empathique, authenticité et non-jugement) » (Wikipédia).

Before Aaron started using a computer in teaching in 2003, he used other media in teaching. "We used local materials to produce flip charts, insect boxes, books of leaves, flannel graphs, etc. We used to produce a lot of it." Aaron ended up with oodles of materials occupying the teachers' rooms of the two universities where he teaches.

"When the computer came, I switched over." He bought his own computer when at a conference abroad but finally was able to use and manage a computer lab installed at the university. "I showed students how to search the internet. I continued teaching the instructional design course but modernized it. We began stocking the lessons produced in yahoo groups, and later in google groups and on moodle.org. The advantage is that students who will be teachers tomorrow have access not only to their own modules but also those developed by friends. My students produced modules for example for biology that include units on photosynthesis, respiration, osmosis, locomotion, etc. The process produced good course materials because many people contributed. Teachers can download, modify, add and subtract to what has been created. A group of teachers can create open educational resources for a course they all teach to avoid unnecessary duplication."

Students would send their assignments to the yahoo group email address, and Aaron would receive per day almost a couple hundred messages needing validation before they could be posted. "Sometimes students don't call me teacher but moderator, because the person who runs a yahoo group is a moderator."

In a measurement and evaluation course, Aaron teaches student teachers to use the computer to develop multiple choice questions. He asks them to design 40 multiple choice questions on specific topics in relation to say a biology course. In the student work he shared with me, topics included plant and animal nutrition and reproduction. "Once they do it, they post it. Then they have multiple choice questions that can be revised and updated at any time."

In a course on cooperative learning, "I stress a lot on micro-teaching.[65] I bring a video camera. I hire it. Students pay about 100 CFA francs each. We distribute real class topics, like the geography of a certain country. Then students form groups and arrange when to meet. They create their own yahoo group and build up their topics. When they present their work, we videotape them, for the micro-teaching session. We review their pedagogical practices. See what they did well on so they can keep on, and where they need to improve, etc." Micro-teaching is made easier; and the storage capacity of internet and CDs can be handier than having to store materials in teachers' rooms.

In addition to a computer, Aaron also bought himself an overhead projector. "People asked if the university is paying for it. I say no. But it's what I need. Without it, the work I want done won't get done. You have to do all to acquire certain things yourself." It was not obvious to find a video projector readily available for class time, so Aaron would turn the slides of a PowerPoint presentation he prepared for a class into transparencies, which he projected using the overhead projector.

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[65] Le micro-enseignement est la simulation de la pratique de l'enseignement. L'objectif est de donner aux enseignants la confiance, le soutien et la rétroaction en leur faisant essayer entre amis ou collègues une courte tranche de ce qu'ils comptent faire avec leurs élèves. Source : http://isites.harvard.edu/fs/html/icb.topic58474/microteaching.html
Voir aussi Crahay, M. (1979). Un essai de micro-enseignement : une perspective fonctionnelle. *Revue française de pédagogie*, n° 48, p. 21-34.

A student evaluates Aaron's course as follows: "The knowledge I gained from your classes is being applied when I want to know something which I cannot find in a book. I go to search it in internet. I also communicate using yahoo messenger."

Aaron said he noticed how interested student teachers are in internet. He insists that when students use media, they understand better and faster and retain better. Media is easy to use, "but it takes time to plan." Notes prepared using a computer can be uploaded to a digital platform so students may easily access them. Notes can be revised year after year. He explains that those not using technologies have not been trained. "You won't fall into something that you don't know."

It does not bother Aaron at all that internet comes from elsewhere "because even the books and pens we use come from outside. The cars we drive too, and no one cares. We are lucky these teaching tools are available nowadays to facilitate the teaching enterprise" and, he adds, that bandwidth is increasing and prices in many cyber cafés are affordable. Now even the text messaging and voice mail features of the mobile phone can help with learning beyond the classroom. "The important thing is to create and access our learning materials easily, and upload them in such a way that they are also used by outsiders."

Synthèse de sa conception des TIC : Aaron est vraiment à l'aise avec la technologie, et il est convaincu que leur utilisation dans l'enseignement approfondit la compréhension de la matière. Il intègre, progressivement et aisément, les nouvelles technologies – y compris le téléphone mobile – dans son enseignement, et cela a fait évolué son rôle vers celui d'un modérateur. Quand cela est justifié par le contexte, il valorise aussi les « anciennes » technologies, en utilisant un rétroprojecteur par exemple. La participation – des étudiants et de l'enseignant – dans le financement de ces technologies est importante pour lui, sachant que le soutien du système éducatif peut tarder. Le partage aussi est essentiel: Aaron s'intéresse à l'ouverture de l'enseignement et de l'apprentissage, à travers la mise en commun de leçons et de contenus sur internet. On sent qu'il serait fier de voir l'expertise et la créativité des enseignants africains mieux partagées et consultées.

7.5 Discussion

Nous discuterons les résultats de l'investigation qualitative en deux volets : (a) comment les professeurs se sont intéressés aux TIC et ce que leur utilisation a changé dans leur enseignement, puis (b) pourquoi ils s'approprient les TIC dans leur enseignement.

7.5.1 Attraction aux TIC et découverte de leurs possibilités pédagogiques

Les professeurs expliquent comment ils ont découvert l'ordinateur, de façon générale, au milieu des années 1980 et l'internet à partir de 2000, juste quelques années après leur commercialisation de masse. Ils sont partis à la recherche des connaissances, en voyageant en Europe ou en Amérique du Nord ou grâce aux partenariats étrangers avec leurs universités en Afrique. Cette recherche de nouveaux horizons commence au foyer familial – souvent au

village – et passe par l'école et de multiples autres étapes avant la découverte de l'ordinateur au sein de l'université. Ils profitent de voyages à l'étranger pour acheter un ordinateur qui devient aussi important pour eux que la *daba* ou la houe au paysan dans son champ.

Tous les professeurs ont exprimé leur appréciation du nouveau type de mobilité offert par les TIC. Le monde des connaissances est soudainement plus vaste et accessible, en même temps que les enseignants se rapprochent de leurs collègues, qu'ils soient près ou loin, à travers l'utilisation des TIC. La virtualité entre en scène. Pour Isadora, la mythologie et la science, l'ésotérique et le réel coexistent. Dans un tel environnement, embrasser la virtualité se fait sans problème. Et pour Aaron qui est déjà technologiquement branché, les TIC ne sont qu'une continuation d'un domaine qu'il connaît bien.

Après l'intérêt initial pour les TIC, avec leur utilisation, la façon d'enseigner et d'apprendre semble changer. L'apprentissage n'est plus perçu comme une accumulation des connaissances mais un processus de construction (Kannou). Celui-ci devient moins linéaire et plus flexible (Sidi) et les façons d'interagir avec les apprenants changent et se diversifient. L'apprenant dépend moins du professeur parce que le cours est mis en ligne et qu'il peut le parcourir en entier; il peut même avoir accès à l'évaluation finale en tout temps (Sidi). L'apprenant devient plus actif, participatif, collaboratif et moins peureux (Bakri). Il apprend qu'il doit aller à la rencontre des connaissances et bâtir de celles-ci. L'enseignant devient plus le modérateur (Aaron) d'un processus d'apprentissage qu'un livreur de connaissances. Comme l'a attesté Barry (2011) dans une étude portant sur 87 écoles africaines, le professeur n'est « pas la seule source de savoir face aux étudiants » (p. 13).

Le contenu des cours va au-delà des livres (Bakri) sur lesquels le système éducatif repose tant – quand ils sont disponibles. Kannou est tout à fait à l'aise avec différents types de connaissances – celles de sa grand-mère et celles apprises à l'école – et il les combine utilement, maintenant, avec celles auxquelles il accède par internet. Les connexions et interconnexions – entre personnes, avec les connaissances – se multiplient, enrichissent l'apprentissage et facilitent la construction des savoirs. Les cours sont modernisés et rendus partageables (Aaron). En ce qui concerne Isadora, elle accède à la culture populaire africaine et internationale pratiquement en temps réel et en format audiovisuel pour alimenter les cours. Les enseignants ne se confinent plus aux livres et ne dépendent plus de la disponibilité de films dans une bibliothèque. Avec un plus vaste accès aux ressources pédagogiques, le

professeur a plus de choix en ce qui concerne le contenu des cours. Et les étudiants peuvent être mis dans des « situations d'apprentissage réalistes variées et multiples » (Barry, 2011, p. 14).

Le rapport pédagogique va au-delà de la salle de classe. Les enseignants commencent à communiquer avec leurs étudiants par courriel. Les apprenants ressentent la présence et le soutien du professeur même en dehors de l'amphithéâtre. Sidi explique qu'à travers la virtualité, il peut être doublement présent pour les étudiants. Isadora mentionne aussi cette joie de se rendre disponible sans se déplacer. Trois professeurs ont constaté, grâce au travail à distance, qu'ils ont pu terminer le programme scolaire avec leurs étudiants, malgré les grèves qui perturbent les campus universitaires en Afrique de l'Ouest et du Centre chaque année (Nyamnjoh, Konings et Nkwi, 2012).

Le tableau 12 fait la liste des changements que les professeurs ont décrits avec l'intégration des TIC dans leur enseignement.

Tableau 12. Changements dans l'enseignement et l'apprentissage avec les TIC

L'apprentissage devient un processus de co-construction
apprentissage modulaire et flexible, moins linéaire (Sidi)
étudiants plus libres et connaissant le parcours dès le début (Sidi)
apprenant plus actif, participatif, collaboratif et moins peureux (Bakri)
l'apprentissage n'est plus perçu comme une accumulation des connaissances mais un processus de construction (Kannou)
l'enseignant devient plus un modérateur (Aaron)
Changements dans les cours
changement dans la façon de préparer les cours (Sidi)
possibilité d'aller au-delà des livres (Bakri)
modernisation des cours (Aaron)
intégration de la culture populaire africaine et internationale dans la salle de classe (Isadora)
Rapport pédagogique à distance
être en contact avec les étudiants en dehors de la capitale (Kadijatou)
terminer le programme, même lors de grèves (Kadijatou)
court-circuiter les perturbations du campus (Sidi)
terminer le programme même quand l'année scolaire est interrompue (Bakri)
se rendre disponible sans se déplacer (Isadora)
grâce à la virtualité, être doublement présent pour les étudiants (Sidi)
apprentissage au-delà de la salle de classe au début par les courriels échangés (Kannou)
Gain d'efficience et de temps pour l'enseignement
enseignant moins fatigué, plus léger (Sidi)
préserver le bras, i.e. pas besoin d'écrire au tableau (Kadijatou)
plus de temps pour la recherche (Sidi)
facilitation des entretiens de terrain pour la recherche (Isadora)

Ces professeurs qui ont décidé d'expérimenter les TIC n'ont pas hésité à partir à la recherche de nouveaux horizons. Ils étaient curieux, ambitieux et motivés par des besoins particuliers – à communiquer, à calculer, à être plus autonomes, plus présents, plus proches, plus en contact avec les autres. Selon eux, les TIC ont facilité leur enseignement et même changé leur façon d'enseigner. Les enseignants sont devenus plus efficients, comme ceux cités dans l'étude de Bahi (2006) en Côte d'Ivoire et dans l'étude du ROCARE et de l'Université de Montréal (Karsenti, Collin et Harper-Merrett, 2011) dans 10 pays africains. Les professeurs en ont gagné une certaine maîtrise de la distance et du temps, ce qui n'est pas surprenant (Dahmani, 2004). Les six enseignants ont commencé à adapter l'utilisation des TIC aux besoins pédagogiques. L'appropriation des technologies débute quand l'utilisation répond aux besoins spécifiques de l'utilisateur et est le reflet de ses objectifs et de sa culture; c'est dans cette adaptation – ou harmonisation – de la technologie aux besoins et désirs que son potentiel réel émerge (Surman et Reilly, 2003).

7.5.2 Être présent dans le monde scientifique et transformer la culture

Pourquoi les professeurs décident-ils de persister dans l'utilisation des TIC dans leur enseignement? Quelques réponses à cette question sont apportées dans le tableau 13 ci-dessous. Elles révèlent trois aspirations : reproduire une expérience d'apprentissage, faciliter la participation africaine au monde, surtout des savoirs, et transformer les relations et la culture. Nous parlerons d'abord du désir de reproduire une expérience d'apprentissage. Sidi et Bakri ont bénéficié de séjours de découverte et d'apprentissage à l'étranger, et ils essaient de recréer l'esprit et la richesse de ces rencontres pour leurs étudiants dans l'utilisation d'internet. Kannou voudrait que ses étudiants expérimentent la même autonomie qui a caractérisé ses apprentissages, et il insiste ainsi pour que chaque étudiant obtienne un ordinateur.

En plus de cette volonté de recréer des expériences pédagogiques positives, cinq professeurs sont soucieux de la participation africaine au monde à travers l'occupation de l'espace culturel, politique et scientifique. Ils insistent sur la création des connaissances et la participation aux débats de société. Isadora parle du désir de *faire l'Histoire*. Cette ambition nécessite la prise en compte de l'écrit, mais aussi de l'oralité. Sidi explique qu'il ne faut pas se fier seulement à l'oral, mais à « quelque chose de construit, quelque chose qui reste ». On peut être présent dans le monde à travers l'oralité et « doublement présent » avec l'écriture – et

ainsi percer dans le monde scientifique. Sidi décrit comment les TIC lui permettent d'être doublement présent auprès de ses étudiants : physiquement mais aussi à travers le partage électronique de son cours. Il insiste pour que l'étudiant, à son tour, soit présent – dans la création des connaissances, de la science, dans les débats de société. Au lieu de consommer simplement les TIC et être « culturellement pauvres », il voudrait, avec ses étudiants, les repenser et les adapter aux besoins du milieu et ainsi enrichir l'enseignement et la culture. Une pédagogie africaine se crée seulement en repensant les innovations « dans le contexte des possibilités et des exigences locales » (SAC, 1965, p. 8).

Isadora introduit l'idée de se rendre disponible avec les TIC, de rendre la culture, l'histoire et les connaissances africaines accessibles à l'Afrique et au monde. Aaron met un accent particulier sur la création et le partage des contenus pédagogiques sur le continent et au-delà. Tandis qu'elle voit les TIC comme une clé pour « entrer dans le monde scientifique » et contribuer ainsi au développement national, Kadijatou introduit un élément très pragmatique quand elle insiste sur la nécessité de maîtriser les TIC pour être en mesure de trouver du travail, pendant et après les études, pour pouvoir apprendre tout au long de la vie.

Tableau 13. Motivations des professeurs pour l'appropriation pédagogique des TIC

1. Partager des expériences pédagogies positives – inspirées par des expériences passées
Trois professeurs ont partagé le désir de recréer des expériences positives d'apprentissage, similaires aux leurs, pour leurs étudiants. - A la stupéfaction de ses camarades de classe en France au milieu des années 1980, Sidi a utilisé l'ordinateur pour effectuer des calculs. En interagissant avec ses étudiants, il pense à cette expérience d'utilisation des TIC. Il veut que ses étudiants travaillent avec intelligence et, comme lui, qu'ils expérimentent et intègrent ce qui est nouveau, et gagnent du temps dans leur travail de réflexion. - Bakri a raconté comment, dans la tradition malienne, les jeunes sont envoyés loin de chez eux pour apprendre avec d'autres dans des centres de connaissances. Les TIC offrent une métaphore moderne, pour cette expérience, d'apprentissage par le voyage, la rencontre et la collaboration. - Satisfait de l'autonomie qu'il a gagnée en dactylographiant ses propres rapports, Kannou souhaite que ses étudiants se sentent aussi autonomes dans leurs études; ainsi il a facilité la mise en place de plans de remboursement afin qu'ils puissent acquérir des ordinateurs, et il met ses cours en ligne.
2. Faciliter la participation africaine dans le monde – accent sur le présent
Cinq des six professeurs ont exprimé le désir d'utiliser les TIC pour faciliter la participation de l'Afrique au monde. Ils ne se contentent pas des outils de leurs grands-parents. Ils cherchent à les enrichir grâce à des nouvelles connaissances et des méthodes d'enseignement, d'apprentissage et de communication – et ainsi étendre la portée des idées et des perspectives africaines. Façonnées par la créativité et la convivialité africaines, les TIC peuvent rendre les Africains et les histoires et ressources d'Afrique – pas naturelles mais intellectuelles et épistémologiques – disponibles au monde. Les TIC mettant les connaissances à la portée de tous et facilitent les relations d'apprentissage, de Bamako à Bamenda, de Mopti à Mumbai. Ces professeurs réfléchissent à comment les Africains peuvent laisser leur marque dans la recherche prédominée par la pensée occidentale, et comment les TIC peuvent être une passerelle dans cette démarche. Les TIC peuvent faciliter plusieurs niveaux de présence et de participation aux débats de société et à la production scientifique. Selon

ces professeurs, ce serait tout simplement une erreur d'ignorer les TIC et de perdre l'occasion de renforcer les voix africaines dans les échanges locaux et mondiaux.
3. Transformer les relations et la culture – regard vers l'avenir
Trois des professeurs souhaitent exploiter les TIC dans la transformation de la culture et des relations. - Selon Bakri, les TIC peuvent aider à faire de la place dans l'enseignement et l'apprentissage pour ce qui était connu mais oublié. Les TIC ouvrent la connaissance et la culture à l'inspection et à l'interrogation, et à une renégociation de ce qui doit y être inclus et comment. - Sidi insiste sur la formation des enseignants aux TIC et aux méthodes actives et interactives d'enseignement, car la transformation de la culture implique une transformation de soi et de l'enseignement. - Isadora songe à l'évolution de la personnalité africaine – en utilisant les TIC avec ses étudiants pour synthétiser de façon créative ce qui était et ce qui est pour créer l'avenir. Tout comme la connaissance et la culture, les identités africaines et les relations avec les autres ne sont pas figées dans le temps.

Trois professeurs, en expliquant leur rapport avec les TIC, vont au-delà de leur utilisation en relation avec les expériences pédagogiques, ou pour assurer une présence africaine dans le monde du savoir, pour répondre à la problématique de la transformation des relations et de la culture. Les propos d'Isadora font transparaître son désir de faire évoluer la personnalité africaine. Est-ce qu'elle n'introduit pas dans la salle de classe, grâce à internet, Bob Marley (par exemple) et d'autres personnalités de la culture populaire afin de comprendre, questionner et redéfinir l'identité africaine? Isadora reconnaît que les TIC sont un carrefour, des moments de rencontres, des croisements où l'on peut changer de direction. Des rencontres qui peuvent transformer. Elle voit les TIC comme les outils des colonisés. Les TIC leur offre un moyen de communication universel pour s'affranchir de l'image laissée par la colonisation et pour « défendre notre personnalité, notre culture » (Sidi).

7.6 Conclusion

Les parcours des six enseignants ouest-africains du supérieur montrent que l'appropriation des TIC dans l'enseignement et l'apprentissage a changé leur pratique pédagogique. Et ceci, tous domaines confondus – de la statistique et la biologie à la littérature et les sciences sociales. Ils pensent que les étudiants apprennent mieux avec les TIC et que l'utilisation des TIC dans l'enseignement et l'apprentissage remet en question le rapport enseignement-étudiant, la gestion du temps et de l'espace, ainsi que le rapport avec le savoir. Tout le monde ne s'accorde pas cependant sur cette flexibilité que les étudiants obtiennent – comme ceux de Sidi quand il met en ligne son cours que l'étudiant peut parcourir dans l'ordre et au rythme qui lui convient.

Après la découverte des possibilités pédagogiques des TIC, les six professeurs interviewés ont persisté dans leur intégration dans leur enseignement pour trois raisons relatives au passé, au présent et à l'avenir. Ils souhaitent reproduire pour leurs étudiants des expériences pédagogiques positives qu'ils ont connues, mais aussi forger une plus forte présence africaine dans l'espace scientifique à travers la création et le partage de connaissances. De plus, avec leurs étudiants, ils souhaitent questionner les perceptions et les relations établies et interroger l'identité africaine pour comprendre et contribuer à l'évolution de la culture africaine. Avec la venue des TIC et le bouleversement des habitudes, ils pensent participer à la transformation des relations et de la culture. Bakri évoque aussi la restauration des éléments positifs des enseignements traditionnels. C'est un va-et-vient entre restauration et intégration (Fonlon, 2010), entre nouveau et ancien que les enseignants effectuent lorsqu'ils s'approprient les dernières innovations technologiques, lorsqu'ils invitent les élèves à les mettre à l'essai dans l'exploration et la construction de leurs mondes intimes et lointains. Le résultat est une rénovation graduelle de l'enseignement et de l'apprentissage, de leur rapport avec soi et avec le monde. Par leurs initiatives, ils font vivre et évoluer leur culture, donnant lieu aux métamorphoses qu'évoque Fonlon (2010).

L'enseignant a pour mission de « bien transmettre une culture existante, mais sans cesser de l'interroger, sans cesser de l'interpeller » Zakhartchouk (1999). Les Africains dans le système éducatif colonial sont comme des plantes transplantées dans des pots et qui ne bénéficient donc pas de l'enracinement dans la terre (Nyamnjoh, 2012) avec les valeurs et les cultures des sociétés africaines. En terre africaine, l'étudiant peut mieux s'enraciner, mieux s'ouvrir, mieux contribuer à l'évolution dynamique de sa société et de la culture et mieux peser sur la scène globale, pour façonner le monde. Selon Tchombe (2011), les intellectuels africains doivent assumer un rôle de leadership dans l'éducation, la recherche et l'utilisation des TIC et les forger selon une ontologie, une épistémologie et une philosophie africaine. Karsenti et Larose (2011, p. 11) s'étale aussi sur l'importance, dans les pédagogies universitaires de façon plus générale, des « postures épistémologiques » qui servent de contexte à l'intégration des technologies. En Afrique, il faut restaurer la culture et les valeurs africaines pour une meilleure intégration de l'homme et de la femme dans son environnement (Fonlon, 2010) – et par extension de l'Africain dans la société et dans le monde.

Les professeurs interviewés s'engagent dans une telle restauration quand ils investissent leurs expériences de vie, leurs valeurs et leurs rêves dans l'appropriation des TIC. C'est ainsi que les TIC trouveront une place utile dans le processus éducatif. L'appropriation a pris la teinte de la curiosité et de l'amour des professeurs pour la rencontre. La vie leur a appris à s'intéresser aux autres, à être curieux, à prendre des initiatives, à faire face aux défis, à se débrouiller avec les moyens disponibles, à être enracinés dans leur culture et ouverts aux autres traditions, à partir vers de nouveaux horizons et à franchir de multiples frontières, et à combiner utilement ce qu'ils ont appris chez eux et ailleurs. Ce sont ces mêmes stratégies qu'ils utilisent en s'appropriant les TIC. Ils y investissent leur expérience, leur personnalité, leur culture pour domestiquer les TIC et réaliser leurs aspirations. « C'est par une activité créatrice répondant aux aspirations profondes des masses africaines […] que les enseignants africains peuvent contribuer […] au progrès de nos pays » (Moumouni, 1964/1998, p. 301). Cependant, l'essor des TIC dans l'enseignement supérieur, et son utilisation émancipatrice et transformatrice, dépend autant de l'économie globale, des intérêts des gouvernements, des acteurs du secteur privé, et du milieu linéaire, limité et rigide dans lequel l'université évolue (Selwyn, 2007). En Iran, par exemple, les professeurs utilisent et reconnaissent l'apport des TIC dans la collaboration et l'apprentissage au sein et au-delà de l'université, mais ils n'ont pas beaucoup d'autorité ou marge de manœuvre par rapport à la transformation du curriculum et la formation du personnel dans un système universitaire centralisé, même si la situation evolue (Vajargah, Jahani, & Azadmanesh, 2010).

La convivialité et la socialité des Africains (Nyamnjoh, 2015; Piot, 1999) trouvent leur expression dans l'utilisation créative des TIC mais peuvent aussi être annihilées ou tout au moins étouffées par des systèmes universitaires hautement hiérarchisés qui privilégient le travail disciplinaire et l'avancement individuel au détriment du travail transdisciplinaire et collaboratif. Même s'il faut « placer l'enseignant au centre du dispositif d'intégration » (Tiemtoré, 2007, p. 10) des TIC dans l'éducation, l'effort semble reposer sur les épaules de quelques enseignants seulement. En Afrique, « le nombre d'enseignants [du primaire à l'université] formés à l'utilisation des TIC dépasse rarement 25% » (Barry, 2011, p. 15). Sans une approche plus systémique, les inégalités d'accès entre les milieux ruraux et urbains s'exacerberont, concentrant le pouvoir de transformation de la société dans une élite urbaine qui peut se permettre de faire des investissements personnels. L'engouement pour les TIC en

Afrique et dans l'éducation est réel (Bomda, 2010), et peut-être les possibilités de transformations grâce à l'utilisation des TIC peuvent être illusoires et basées sur une « interprétation mythique des technologies » (Tiemtoré, 2007, p. 1). De fait, ce ne sont pas les TIC toutes seules qui changeront l'éducation : c'est plutôt l'esprit avec lequel leur utilisation est investie qui déterminera la nature des évolutions à venir.

Des études futures pourraient apporter un regard sur des professeurs dans d'autres contextes sortant de la colonisation, ou non, pour comparer et différencier les raisons de leur appropriation des TIC dans l'enseignement et l'apprentissage.

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CHAPTER 8. General discussion and conclusion

This chapter presents the conclusions of the research papers, to respond to the question raised by this thesis. More broadly, it enters into a discussion of the impact of information and communication technology (ICT) on pedagogy, according to the West African teachers, administrators and professors interviewed, proposes some directions for further research, and suggests policy implications for education ministries.

8.1 Synthesis of results

At the outset of the thesis we asked how and why West African educators, particularly teachers in Bamako, Mali but also university professors, appropriate ICT for pedagogical purposes and with what effects. Because educators are at the heart of pedagogic activity, we considered it important to understand the appropriation process from their perspectives. We were interested in how teachers shape ICT and how they are shaped by it. We came to realize the extent to which the ICT appropriation process is complex and nuanced, and far from always straightforward and predictable. We assumed that educators appropriate ICT to improve the quality of teaching and learning and that the use of ICT is transformative, but we did not guess at deeper aspirations to use ICT in ways that alter how Africans engage in the world and project Africa into the world on a daily basis. By perceiving and relating to education as a sociocultural process, we were able to fathom longings for both continuity and change, and pedagogical shifts underway and being facilitated by ICT.

Table 14 lists the three research objectives and the findings. We will discuss the findings in relation to each research objective and how they respond to the overall research question in interrelated and complementarity ways.

Table 14. Research Objectives and Findings

Research objective	Findings
Research objective 1: **Understand how and why primary and high school teachers in Bamako, Mali appropriate ICT in teaching and learning, and, according to them, changes seem to ensue in the process** Findings presented in Chapter 5: Blacksmiths of Internet in African Classrooms	The 23 teachers interviewed first became familiar with ICT through others, in academic or non-academic settings, demonstrating from the outset how appropriation is a social process. As it was digested, ICT became part and parcel of their beings and everyday lives. ICT was mobilized in learning activities in relation to pedagogical objectives and broader goals, which ranged from students being able to speak foreign languages to them being prepared for university and responsible citizenship. The teachers observed that their pedagogical

	approaches became more active and interactive, relationships with students less hierarchical, and classrooms and schools more open and dialogical. As teachers creatively and strategically calibrated the use of ICT to contextualized needs and the possibilities of these new tools, it seems there were shifts toward more co-construction of learning. Teachers harnessed ICT for its transformative possibilities and in ways that suggested ICT can be a catalyst for pedagogical change – in contexts weighed down by the legacy of colonialism.
Research objective 2: **Understand how teachers' conversations beyond the classroom, about the use of ICT in teaching and learning, contribute to the pedagogical appropriation of ICT** Findings presented in Chapter 6: Teachers Dialoguing about ICT at the Borders of Transformative Possibilities	Through conversations with peers, school administrators, parents and other community members, about the use of ICT in teaching and learning, teachers facilitated the social shaping of ICT. The conversations seemed to open doors to the reconsideration of local and global cultures and their remixing and to point out pathways for the renewal of education. By facilitating informal and participatory processes about how new ideas and objects should be introduced into learning and life, in harmony with evolving social values, teachers worked as cultural agents, mediating between ICT and society.
Research objective 3: **Understand why West African university professors pedagogically appropriate ICT** Findings presented in Chapter 7: *Pourquoi les professeurs ouest-africains s'approprient-ils l'internet?*	From interviews with six university professors three principal reasons emerged for appropriating ICT: (a) share positive learning experiences, similar to ones they had experienced, with their students; (b) facilitate African presence and participation in global debates, knowledge production and the scholarly realm; and (c) transform relations and culture through critical positions with respect to history, habits and hierarchies, and to examine African identities, past, present and future.

8.1.1 Synthesis of findings in relation to research objective 1

The first research objective was to understand how and why teachers in Bamako, Mali appropriate ICT and changes that ensue in the process. Findings were presented in Chapter 5, in the paper titled "Blacksmiths of Internet in African Classrooms." We compared teachers to blacksmiths and potters who work in their milieu, not with ICT but with metal or clay, and fire, to fashion tools useful to society. We suggested that teachers, as they shape the way ICT is used in teaching and learning, interface between technology and the changing needs of society and in that sense are Africa's new potters and blacksmiths.

Conceptually, we drew on the concept of appropriation introduced in Chapter 2. Appropriation of ICT is a process of domesticating them, until they mesh into everyday lives (Verenikina, 2010) and are used purposefully in the milieu. That is when their potential in the context emerges. "Starting with strategic uses in mind, it is often possible to mold technology to your needs and wishes" and even create political and social impact (Surman & Reilly, 2003, p. 45).

We also drew on socio-constructive views of education of Bruner (1996) and Obanya (2012a, 2014).[66] Like Vygotsky (1978), they situate education in sociocultural and historical contexts. For them, learning is a process of awakening the potential of learners by encouraging higher level psychological processes such as analyzing and creating.[67] Learning is not just about receiving information but understanding it and making meaning of it. While learners actively engage in meaning making (Bruner, 1996), teachers provide guidance and move from wanting to "know all" to "seeking to know how to know" (Obanya, 2012a, pp. 14-15). The objective of schooling is to help young people "adapt to the world in which they find themselves and to help in the process of changing it as required" (Bruner, 1996, p. 20) or, as Obanya (2012a) put it, transform people so they are capable of the "continuous regeneration of Society" (p. 23).

We employed qualitative research methods to understand the meanings people give to their reality and experiences (Savoie-Zajc, 2011). We also used an interpretive approach – which sees reality as holistic and seeks to understand the dynamic of a phenomenon in context – along with a critical approach – in which knowledge produced about how society functions is considered an instrument of emancipation (Freire, 1970/2014; Savoie-Zajc & Karsenti, 2011[68]). Twenty-three primary and high school teachers known to be experimenting ICT in teaching and learning in schools in Bamako, the capital city of Mali, were interviewed. The interviews were analyzed via thick description (Geertz, 1973), which involves understanding what is shared in context and interpreting it when describing it, and organized by theme with the use of QDA Miner. Findings were presented in narrative form and in a dialogue of discovery rather than a logic of proof (Paillé, in Savoie-Zajc, 2011).

So how and why did the teachers interviewed pedagogically appropriate ICT and what changes ensued? Teachers first became familiar with ICT through personal contacts – friends,

[66] Bruner studied psychology at Duke and Harvard Universities in the USA in the 1930s and 1940s, and Obanya studied education at the University of Ibadan in Nigeria in the 1960s and 1970s. They both became full professors and have had significant impact on outlooks on education in their countries and beyond. Bruner's *Culture of Education* (1996) drew on 30 years of his research in educational psychology. Obanya's paper (2012a), now a chapter in his *Educationeering* (2014), draws on over four decades of teaching, research, curriculum development and educational planning in various African countries, including in his homeland, the most populous country of the African continent.

[67] See Figure I in Chapter 1, section on Complex cognitive operations.

[68] Regarding the nature of knowledge in the critical approach:
"*Le savoir est aussi vu comme instrument d'émancipation*" (Savoie-Zajc & Karsenti, 2011, p. 115).

family, colleagues, teachers –, showing from the outset the social nature of the appropriation process. They learned about ICT through others, as they brought their initiative and interests to bear. Eventually ICT "meshes into the user's real life activities" (Verenikina, 2010, p. 19). The experience of Jeremiah is indicative; the computer, which was foreign, became something intimate: "It's like the cellphone; it has become a part of our habits, and we can no longer do without it." Once familiar with ICT, most of the teachers integrated it into learning activities in relation to their pedagogical goals and objectives and visions of the world, which varied from wanting to enliven and update lessons to wanting to inspire responsible leadership in students.

The teachers described going from thought to action which lead to change – in relations and spaces, in what is taught and how. They described pedagogical approaches becoming more active and interactive, students becoming more vocal and visible, and teachers becoming humbler about their knowledge. Course content was enriched and updated. Dialogue and diverse perspectives became possible in classrooms that had heretofore been lecture halls with virtually no back and forth between teachers and students. Schools opened to knowledge near and far, and teachers pursued their professional development in newly networked and informal ways. Table 15 summarizes the process of becoming familiar with ICT and using it in teaching and learning, as well as the changes teachers noticed occurring in the process.

Table 15. **Teachers Learning and Using ICT to Bring about Pedagogical Changes**
(summary of results in relation to objective 1)

Becoming familiar with ICT	Becoming familiar with ICT, like all phases of the appropriation process is highly social in nature.
Hearing about and learning ICT	These teachers, between the ages of 25 and 52, are not digital natives. They heard and learned about ICT through personal contacts – friends and family – and different places – university, school, cybercafés, or private courses.
ICT meshes with self	"It's like the cellphone; it has become a part of our habits, and we can no longer do without it" (Jeremiah). "I can no longer live without technology; it is linked to me" (Hamidou). "I cannot go 48 hours without touching a computer. I work with it everywhere, at school, outside school, at home" (Abdul).
Using ICT in teaching and learning	
Pedagogical goals and objectives	It was clear that teachers were appropriating ICT in relation to goals and objectives, which varied from wanting to enliven lessons, update lessons or fill curriculum gaps to wanting to share a love for learning, help students discover their hidden talents, or inspire responsible leadership in students.

ICT use in a variety of activities	Teachers organized pedagogical activities using ICT and in relation to their goals and objectives. The activities varied from students going to cybercafés to conduct thematic research in groups and reporting on it in class to sharing PowerPoint presentations or videos with schoolchildren in other countries to recording elders sharing about local geography and typing up a synthesis of such interviews.
Perceptions of change	
in pedagogy	Teachers moved away from pedagogical methods used by their teachers toward more active and interactive approaches, in which students are involved and considered and teachers guide students in learning to learn.
among students	As teachers retreat from the blackboard, students become more visible and vocal, according to what teachers related. They are motivated to speak, ask questions and be active and engaged in their learning. Teachers said they learn better. They verify what teachers say and create and share representations of themselves and their culture.
among teachers	Teachers are motivated by the use of ICT and energized. They use their time differently – whether preparing for class, in class, or grading. They are humbler about what they know and know that they must keep learning.
in course content	The curriculum is less monotonous and stagnant. Courses from language and literature to geography, math and science are enriched and updated, including in relation to content on Africa, with information garnered from the net. And locally available knowledge may even be revalorized as it too is interrogated and integrated.
in classrooms	The classroom space becomes less rigid, more fluid. There is more time and space for dialogue and diverse voices and perspectives, with information and knowledge from several sources, such as textbooks, TV, the Web and local communities. There is more student initiative and participation and more power sharing in the classroom.
at school	School life transcends boundaries. It is more open to the community and the world and vice versa. School culture can be refreshed and reinvigorated by contact with other cultures and reflection and discussion on teaching. New spaces such as computer labs appear along with new opportunities – for example for interdisciplinary collaboration and project-based work.
in teachers' professional development	The internet becomes a companion for teachers in deepening their knowledge and evolving their pedagogies, as they use it to dialogue with peers, ideas and developments in and outside the country. Formal training remains of value, and spaces and opportunities for informal learning multiply.

As students directly mediate their cultures via internet, they discover, create and contest identities and roles and responsibilities. Teachers become guides as power dynamics in classrooms are renegotiated. A shift from knowledge acquisition to the construction of meaning and to learning to learn appears to accompany these teachers' use of ICT in teaching and learning. Learners learn to be part of Malian and global cultures and position themselves to regenerate them, in ways called for by Bruner (1996) and Obanya (2011, 2012a, 2014). It seems teachers leverage ICT creatively and strategically to help refresh school culture –

without losing sight of the high-stakes exams their students must take. They make education more responsive to students' needs, thus more resilient, and more reliant on local and global resources beyond textbooks.

Frustrated with monotony and the status quo and envisioning a different tomorrow, teachers used ICT to infuse new flexibilities into learning. ICT became an ally for them in negotiating changing times and awakening and nourishing their potentialities and those of their students – and those of various cultures. Whether the impetus for the appropriation of ICT was internal (initiated by the teacher) or external (encouraged by the school administration) or both, the teachers interviewed harnessed ICT because of the transformative possibilities of its use or simply to remain qualified to teach. Our supposition about the transformative nature of the pedagogical appropriation of ICT was confirmed, suggesting that ICT use can be a catalyst for pedagogical change especially in a context that has been locked into a colonial educational system and where access to documentation has been difficult.

In pedagogically appropriating ICT, teachers navigated and persevered through tensions between old and new, conservation and change, the linearity of conventional teaching and the fluidity of dialogical learning. They brought their hopes and fears, their frustrations and hesitations, and their imaginations, intuition and initiative to bear as they straddled different ways of knowing and being and doing, gradually working toward synthesis between tradition and novelty in themselves and their classrooms.

8.1.2 Synthesis of findings in relation to research objective 2

The second research objective was to explore how teachers' conversations with persons beyond the classroom contribute to the pedagogical appropriation of ICT. Findings were presented in Chapter 6, in the paper titled "Teachers Dialoguing about ICT at the Borders of Transformative Possibilities." We suggested that teachers are cultural change agents as they engage in conversations about the pedagogical appropriation of ICT beyond their classrooms. In setting the stage, we mention the cultural alienation that colonial schools produced (Pence & Nsamenang, 2008), as well as calls for reconnection with culture (Diop, 1960/1974; Fonlon, 2012), for African renaissance (wa Thiong'o, 2009), and for better integration of schools into their milieu (ERNWACA, 2002; République du Mali, 2003).

We recalled the concept of appropriation, which has been used in sociology, anthropology, communication and media studies, and cultural studies but much less so in education. In appropriating technology, individuals and societies turn it and tune it to serve their purposes, ensuring it reflects their goals and culture (Jouët, 2000; Surman & Reilly, 2003). We also drew on concepts of culture, cultural initiative, and culture as dialogue. Reshaping school culture is part of the process of regaining responsibility for cultural initiative and creating a "new, rich, harmonized and dynamic culture" (Fonlon, 2012, p. 91). Like Fonlon (2012), philosophers Hassoun and Wong (2012) view culture as a living, changing thing; they go on to propose conversation as culture, which perspective acknowledges the internal contestation, diversity and fluidity of culture, as well as the agency and participation of people in transmitting, interpreting and revising their culture.

We also mentioned Soumba Ngolo (Niane, 1974), possessor of the treasured *balafon* of Sundiata, founder of the Mandika Empire in the 13th century. With this musical instrument – or cultural tool – Soumba Ngolo transmits history and tradition. At the same time, he is inventor of instruments such as the *signbin*, the *dan* and the *siramon*. His story illustrates how social and cultural practices are constantly evolving, how certain people in society help orchestrate cultural preservation and change, and also that cultural tools are employed in the process.

Studying the appropriation of ICT is not the study of users and products or cultural tools but of social practices (Jouët, 2000) in all their thickness (Geertz, 1973). To gain insight into contextualized educational and social practices, we employed an interpretive approach, which is "interested in people and the way that they interrelate – what they think and how they form ideas about the world; how their worlds are constructed" (Thomas, 2013, p. 108). To broaden the context for discussion, in addition to the 23 primary and high school teachers interviewed, two administrators were interviewed, one at the sub-district level and the other at the national level.

Several of the teachers described beyond-the-classroom conversations and interactions with other teachers, school and district directors, pedagogical advisors, parents, and community members. With their peers, teachers encouraged each other in the appropriation of ICT. With directors they strategized about how to achieve more systematic and systemic

appropriation of ICT. For pedagogical advisors[69] – who have less access to ICT and less opportunity to experiment it in teaching and learning –, teachers became resources. For example, when an advisor asked Alassane if knowledge from the Web is credible, Alassane responded: "Some is; some is not. You have to know how to navigate… know what you want and how to obtain it." The teachers reported dialoguing with skeptical parents about more active pedagogies, which come with the appropriation of ICT, and guiding students not just in gathering information from the Web but also from persons living in the communities around their schools. Table 16 describes the conversations and interactions of teachers with these different social actors.

Table 16. **Beyond-the-Classroom Conversations and Interactions of Teachers with Different Social Actors about ICT in Education**
(summary of results in relation to objective 2)

Social actor	Nature of conversations
Other teachers	Conversations with or about other teachers are ones of mutual support and complicity regarding pedagogical approaches deemed useful and important *or* ones of frustration and impatience with peers "caught in a rut" (Hamidou) and slower to embrace change.
School and district directors	Teachers put themselves in the shoes of school and Academy (or district) directors and, with concern for the evolution of the education system, engage them in dialogue about the practicalities and possibilities of ICT use.
Pedagogical advisors	Teachers become resources for pedagogical advisors, who have less access to ICT and less opportunity to experiment its use in teaching and learning.
Parents	Teachers listen to the concerns of parents and reassure them about new teaching methods and more active pedagogies that come with the appropriation of ICT.
Community members	Teachers guide students in the navigation of internet, but they also guide them in turning for expertise to elders in their communities and in the synthesis of information from several sources.

These conversations and interactions reveal how the pedagogical appropriation of ICT in the context of the teachers interviewed is a social process, embedded in schools, systems and communities. Some teachers seemed content to work out in their classrooms and schools changes that ICT appropriation brings, whereas others seemed particularly committed to ensuring broader participatory discussion about the appropriation of ICT and its use in

[69] Pedagogical advisors visit schools and classrooms throughout the year to assess the quality of teaching and coach teachers. Teacher promotion is dependent upon evaluations by the pedagogical advisors.

teaching and learning. They discuss the risks and the benefits, what Africa has to gain and to contribute in the use of ICT. Though these teachers use ICT with intentionality and exercise agency, they are not working on their own but rather in a spirit of consensus that characterizes their culture. They went into communities "with their resources and possibilities" to help create "borderlands for dialogue" about the construction of tomorrow (Giroux, 2005, p. 135). They do not ignore opinions and viewpoints of parents but rather consider them seriously. They manifest impatience toward peers "caught in a rut" and feel their reluctance to embrace ICT hinders the teaching corps and its capacity to shape the education system.

Teachers reported encountering interest and support as well as disinterest and resistance – probably a reflection of wider societal dialogues, in progress and to come. Society has a say about how ICT is used (Jenkins, 2009; Surman & Reilly, 2003) in teaching and learning, and teachers play a role in brokering that dialogue. They are revitalizing learning by facilitating the selective integration of elements from multiple approaches and cultures (Fonlon, 2012). They are engaged in the quotidian exercise of collectively designing the future (Appadurai, 2013). At the same time they bring the world to Mali, they bring Malian culture to bear on the appropriation of ICT. Teachers are working as cultural agents, like Soumba Ngolo, to (re)connect with African culture and community and engage with traditions from elsewhere to construct what makes sense in their context, in and beyond their classrooms. Perhaps they are idealist, but they are probably representative of others in similar contexts acting in similar ways and on similar desires.

8.1.3 Synthesis of findings in relation to research objective 3

Considering the formal educational system a continuum from primary school through university, we were also interested in the appropriation of ICT by university professors. The third research objective was thus to better understand why they pedagogically appropriate it. Findings were presented in Chapter 7, in the paper titled "*Pourquoi les professeurs ouest-africains s'approprient-ils l'internet?*" We argued that the professors interviewed consciously invested their experiences and their intentions in their use of ICT, making its use strategic in their milieu.

We mobilized the concepts of culture and of appropriation. Culture has been described as the creative force of a people, with which they transform their natural and social milieu (Ki-

Zerbo, 2010a) and which guides a people's ingenuity to produce lasting fruits for happiness and wellbeing (Fonlon, 2010). Education is a sociocultural process that should not only expose young people to modern arts and sciences but also restore humanity to a dehumanized people, and technology – which can be used to oppress and liberate, construct and wound – should also be used to help people become more human (Fonlon, 2010). Appropriation is the process of absorbing new cultural acquisitions until they become integral (Fonlon, 2010) to users and their society. Teachers appropriate ICT when they adapt its use to their context; its potential emerges when it is used for strategic purposes (Surman & Reilly, 2003).

We employed a qualitative research methodology. We drew on ethnographic (Bernard, 2006; Gupta & Ferguson, 1997) and life history (Pilote & Garneau, 2011)[70] approaches in interviewing six university professors. They were women and men, Muslim and Christian and taught different disciplines of the humanities and of the natural and social sciences in Mali and three other West African countries. The interviews were constructed into narratives that recount the ICT itinerary of each person interviewed so as to allow the reader to enter into the lived experiences of the teachers and perceive from their cultural and political positions the importance of ICT in teaching and learning, and life. The itineraries, and their discussion, relate the complexities of everyday lives in educational settings filled with various influences and tensions, and generalizations make sense only in relation to the specificity of the sociocultural and historical context (Geertz, 1973).

We had supposed that university professors appropriate ICT to improve the quality of teaching and learning. There were indeed very practical reasons to use it. For example, professors and students could communicate via email even outside amphitheaters and classrooms, which allowed the completion of courses via distance learning even when strikes perturbed campus life or students lived far from the city. ICT use provided students with more autonomy and flexibility because they could access course content, including auto evaluations, from beginning to end and in any order. It allowed professors and students alike to defy time and space. It facilitated teaching, learning and access to documentation and multimedia material. And pedagogical shifts ensued. Kannou for example explained how he began to perceive learning not as the accumulation of facts but as a process of constructing

[70] Life history approaches were employed by historians and then sociologists like Robert Part at the University of Chicago beginning in the 1920s and Daniel Bertaux after the events of 1968 in France (Sanseau, 2005).

understanding; applying that approach meant being more a guide to students – who became more active in their learning.

We also found deeper aspirations. The professors expressed desires to shape learning experiences for their students, ensure as Africans they participate in the world, and help position them to transform relations and culture. They invested these deep-seated desires in the way they appropriate ICT. Table 17 synthesizes how professors expressed aspirations to (a) recreate positive learning experiences, (b) facilitate African participation in the world, particularly of knowledge, and (c) transform relations and culture.

Table 17. **Reasons Expressed by Professors for Their Pedagogical Appropriation of ICT** (summary of results in relation to objective 3)

1. Recreate positive learning experiences – inspired by past experiences
Three professors described wanting to recreate positive learning experiences for their students - To the amazement of his classmates in France in the mid-1980s, Sidi used the computer for calculations. He thinks of that experience in using ICT with his students. He wants them to be clever and agile, and, as he does, experiment, integrate newness, and gain time for more complex intellectual work. - Bakri shared how in the Malian tradition, young people are sent away from home to learn with others in centers of knowledge. ICT provides a modern metaphor for that experience of learning through travel, encounter and collaboration. - Kannou felt empowered typing his own reports and wants his students to experience similar proactivity and autonomy in their studies; thus he facilitates payment plans so they may acquire computers and puts his courses online.
2. Facilitate African participation in the world – focus on the present
Five of the six professors shared about using ICT to facilitate African participation in the world. They do not content themselves with the knowledge and tools of their grandparents. They seek to enrich them with new knowledge and ways of communicating and teaching and learning – and in the process extend the reach of African ideas and perspectives. Shaped by African creativity and conviviality, ICT renders Africans and African histories, stories and resources – not mineral but intellectual and epistemological – available for global consumption. ICT challenges ideas of centers and metropoles, bringing knowledge closer to home, and making the nourishing of learning relationships easier, from Bamako to Bamenda, from Mopti to Mumbai. These professors discuss how Africans can make their mark, even on modern science informed by western ideas, and how ICT is a gateway. ICT facilitates multiple levels of presence and participation in social debates and scholarly production. According to these professors, it simply would not make sense to ignore ICT and bypass opportunities to enhance African voices and participation in worlds near and far and to enrich local and global dialogues. ICT is a partner in working toward flexibility, diversity, and balance in the process of becoming.
3. Transform relations and culture – looking toward the future
Three of the professors mention desires to harness ICT in the transformation of culture and relations. - According to Bakri, ICT may help make room in teaching and learning for what was known but forgotten. ICT opens up knowledge and culture for inspection and interrogation and a renegotiation of what is to be included and how. - Sidi insists how teachers need opportunities to actively engage with ICT, as transformation of culture involves transformation of self and of teaching. - Isadora talks of evolving African personality as she and her students appropriate ICT in teaching and learning, creatively synthesizing what was, is and can be. Just as knowledge and culture are not frozen in time, neither are African identities – or relations with others.

Three professors recounted using ICT to share with their students the excitement of studying abroad or the thrill of autonomy in using a computer to advance their own learning.

Five were concerned with participation in the world of knowledge and science. They appropriated ICT not only to make the world available to Africa but to make available to the world African culture, knowledge, perspectives and experience. The professors wanted their students to use ICT to cultivate learning relationships, develop and share learning materials and scholarly reflections, occupy cultural and scientific and political spaces, and contribute to the development of their country and the construction of Africa.

Three evoked cultural transformation, with dreams of putting learners more in touch with themselves and making people more human (Fonlon, 2010). For them, ICT is an intersection of people and times and worldviews, with opportunities for intermixing and rerouting. Opportunities to reconnect and break with the past, interrogate and evolve African identities, and challenge history, hierarchies and habits – which activities bring about cultural metamorphoses (Fonlon, 2010). In using ICT they call into question accepted identities and ways of relating and open possibilities for reshaping and renegotiating what exists.

The professors' experiences, attitudes and approaches to life informed their teaching – and their appropriation of ICT. These had to do with straddling different ways of knowing in forming their identities and professional practices; for example Kannou combined what he learned with his grandmother and what he learned at school. Travel and encounter were an important part of learning and of developing one's social utility. Rootedness in African culture, connecting with others and being open to change are ways of constructing a composite being with multilayered ways of perceiving the world. Being creative in overcoming difficulties, taking advantage of opportunities, and managing with available resources were also valued strategies for getting along in life and shaped the professor's pedagogical appropriation of ICT.

Accustomed to straddling different ways of knowing and producing knowledge, they felt comfortable bridging between their grandparents who relied mainly on oral tradition and their students whom they expected to know African traditions and also imbibe and influence global cultures increasingly accessible and reachable via ICT. With their open-mindedness and forward-looking use of ICT, they sometimes found themselves questioning the status quo.

Putting a course on line and communicating with students by email might seem quite mundane, but those acts challenged established roles of professors and students and relations between them. As social creatures attracted to connecting with others in their process of becoming, they used ICT to enhance contact and sociality. They could be very present half way around the world while physically distant, mobile while staying put. They could project their multidimensional selves and other things African, making them perceived and palpable, without having to board a plane. They could bring Bob Marley or Lady Gaga into amphitheaters in Africa, making what would otherwise seem more distant quite intimate and accessible for interrogation and understanding. ICT provided them with new pathways to define themselves and their identities rather than having them defined and limited by others and by limiting notions and practices. Becoming skilled at the appropriation of ICT is the point, "with our skills giving us the ability to mold the technologies as issues and political strategies for change" (Surman & Reilly, 2003, p. 72). The professors interviewed adapted ICT to their milieu, in relation to educational needs and cultural values and desires to fruitfully engage the past, present and future.

8.1.4 Additional findings related to ICT and inequalities

In addition to sharing the findings regarding each of the three specific research objectives, we deemed it necessary to mention how issues related to equitable access to ICT transpired, without prompting, whether during interviews with primary through and high school teachers or university professors. Here we share some of those perspectives, which are important to consider in any ICT in education initiatives. From the professors: "Some of the greatest frustrations are around access; availability is not synonymous with affordability" (Isadora); "*Seulement ceux qui ont étudié à la capitale utilisaient l'ordinateur, pas les autres*" (Kadijatou).[71]

Though it is a means of rapprochement, ICT could also become an additional means of distancing people living in cities from people living in rural areas. "New opportunities, especially if they rely on out of school resources, generate new inequalities" (Livingstone, 2012, p. 21). Teachers stress the need for ICT to be available to all. "*Les TIC ont leur place,*

[71] "Only those that studied in the capital use the computer." (Kadijatou)

une grande place, mais il faut que ça soit à portée de tout le monde" (Jeremiah). "*Mon souhait est de voir tous les enfants du Mali en train de profiter de ces nouvelles technologies*" (Nafi). "*Si vous êtes dans un village, ça pose des problèmes, par rapport à la ville*" (Drissa). "*Vous voyez l'école publique qui n'en bénéficie pas, ça ne va pas*" (Daouda).[72] Xavier speaks of improving the material conditions for learning, talking about hot classrooms where students fall asleep or choose to stay at home because it is so hot. There is electricity but no fans. "*Je pense qu'on ne peut pas domestiquer l'utilisation de l'ordinateur si on n'a pas les moyens*." (Xavier)[73]

In addition to concerns about equitable access to ICT – by urban and rural dwellers, schools in both urban and rural areas, and public as well as private schools – is a concern about equitable opportunities for both men and women to experiment and shape ICT. Male teachers in particular reported crossing borders between the school and its milieu and taking the initiative to engage their supervisors about the ICT appropriation process. Although both girls and boys seem to use computers in relation to their school learning, it seems that male teachers can be favored when it comes to opportunities to appropriate ICT. And they also seem more visibly active in the social negotiation about how ICT should be used in education. If the appropriation process is to challenge prevailing patterns of privilege, measures to ensure that women's situations and perspectives are considered need to be actively encouraged.

Another concern is teacher access to computers. Alassane integrates ICT into his teaching but has no personal computer. He has to go to cybercafés or borrow a friend's computer to prepare lessons. This limits him. As Surman and Reilly (2003) explain, "Unless we move beyond the role of information consumers to also act as producers, those technologies that have powerful potential today may quickly become the consumer mush of tomorrow" (p. 10). Alassane would like to develop a website for an association of Malians from the north of the country, to share cultural information, yet: "*Vous ne pouvez pas faire cela sur la machine d'autrui.*"[74] Similarly, renowned historian Joseph Ki-Zerbo said that one cannot sleep on the mat of another – which would be like sleeping on the ground. The

[72] English translations: "ICT has its place, a big place, but it needs to be accessible to everyone" (Jeremiah). "My hope is to see all children of Mali benefiting from these new technologies" (Nafi). "If you're in a village rather than a city, it can be problematic" (Drissa). "You see how public schools are left out; it's not ok" (Daouda).
[73] "I do not think we can domesticate the computer without the minimum of resources." (Xavier)
[74] "You cannot do much creative work on another's machine." (Alassane)

computer becomes a place of reflection, writing and cultural and scholarly production. It becomes a field where ideas are planted and nourished to maturity. But: "*On a laissé de côté beaucoup de projets de création de contenu par manque d'ordinateurs*" (Alassane)[75].

Almost every educator and administrator interviewed mentioned the need for widespread access to ICT if the appropriation process is to reflect the richness and diversity of Malian culture and benefit all.

8.2 Discussion of results

It was our intent in the research to relate to education as a sociocultural process (Bruner, 1996; Nasir, 2009; Obanya, 2012a, 2014; Rogoff, 1995; Vygotsky, 1978) and to view the pedagogical use of ICT through the lens of appropriation, a process in which users shape cultural tools to make them useful and meaningful in their contexts and in the process are themselves transformed (Jouët, 2000; Nyamnjoh, Durham, & Fokwang, 2002; Surman & Reilly, 2003). To holistically comprehend people and phenomena in educational settings, sociocultural theory encourages multilevel understanding (Nasir & Hand, 2006; Rogoff, 1995). This could include moment-to-moment changes as well as relations and behaviors shifting over time; cultural interaction in school settings as well as larger societal structures; individual agency as well as interaction with those in social settings; and personal perspectives and actions in the context of wider communities of peoples with shared histories, values, beliefs and identities.

To better understand and appreciate the appropriation of ICT by teachers and professors, we thus considered the spaces they described to us in interviews, and the changes, according to them, taking place in those spaces. Figure II illustrates the spaces in which changes seem to be – or at least have possibilities of – occurring.

These changes described by educators seem to be underway – or at least anticipated – judging from the ways in which they were consistently evoked and described by interviewees at different levels of the education system, by triangulation with administrators and available documentation, and by how the changes match up with literature about the use of ICT in education. The suggested changes deserve to be studied over time, via more interviews with

[75] "We have passed up many content creation projects for lack of a computer." (Alassane)

teachers and learners and via classroom, school and social observation, because, with the integration of ICT into education, the nature of change "to all components of the system – including people – is unpredictable. Worryingly for some, it might be outside the control of policy makers, and it might take a significant time to 'bed down.'" (Kirkup & Kirkwood, 2005, in last paragraph of the discussion, p. 10 of the final handover version)

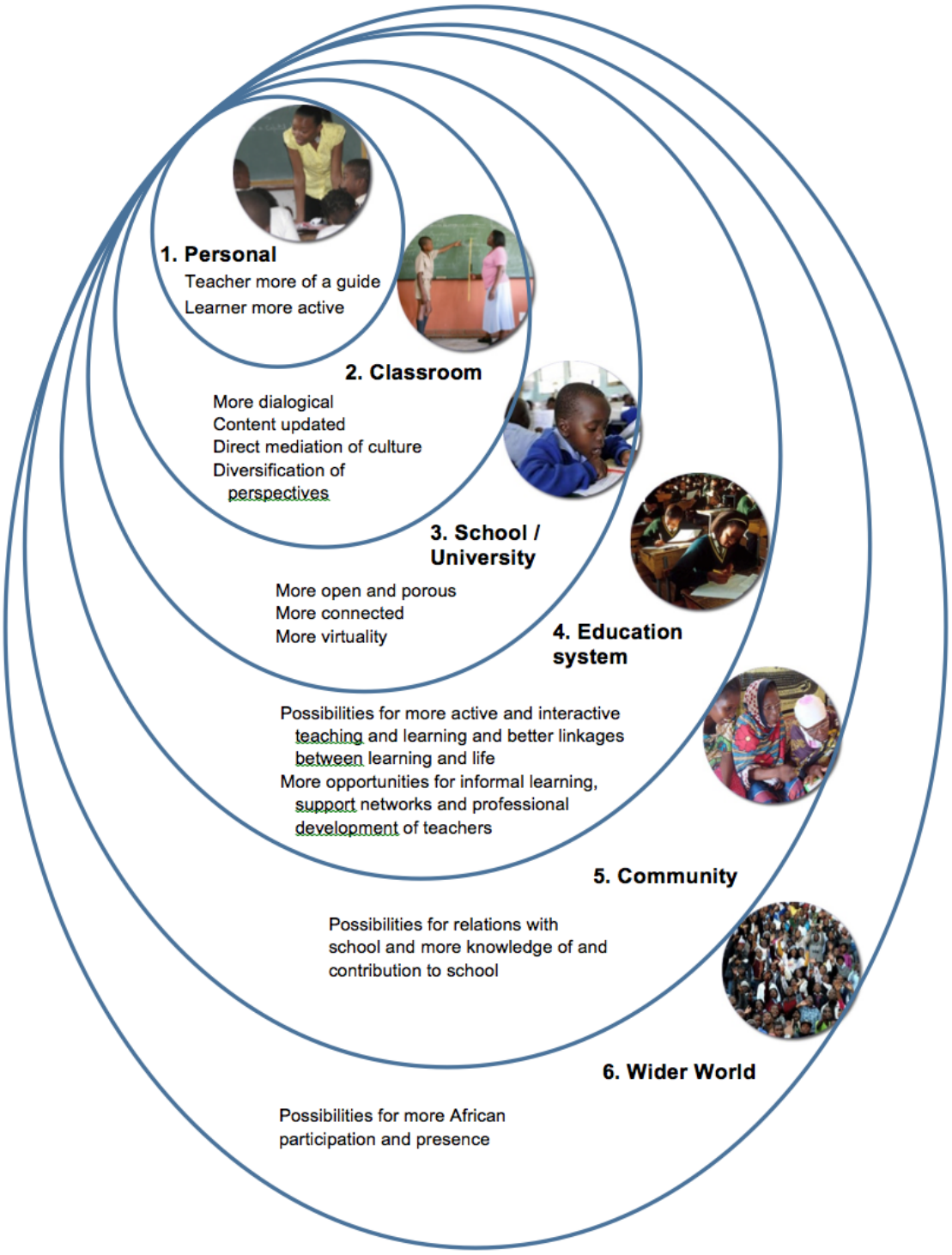

Figure II. Changes and possibilities of change evident at multiple levels with the pedagogical appropriation of ICT

1. Changes at the personal level of teachers and students. With the pedagogical appropriation of ICT teachers become more of a guide for learners and are less inclined to have to be mere possessors and transmitters of knowledge, a change described by Obanya (2012a; see also Depover, Karsenti, & Komis, 2007) and which occurs when teachers shift toward socio-constructive pedagogical approaches. Students seem to become more motivated, confirming Karsenti (2003a, 2003b), and engaged in their learning and the construction of their identities. "Identity (or one's sense of one's place in the world and connection to others) has profound implications for the ways in which one engages in learning settings" (Nasir, 2009, p. 2). Identity is part of the construction of knowledge.

2. and 3. Changes in classrooms and in schools. Whether teachers had anticipated or intended it at the outset, it seems classrooms became places where more diverse perspectives were encouraged or allowed, or just seeped in, and where there was more time for discussion. The content of courses was diversified and updated – beyond what is available in textbooks. Students and teachers alike began to discover and appreciate in the classroom dialogical learning, in which dialogue and students' interests, not just noting down teachers' words, have a place and contribute to learning and development. Schools became more porous – as their staff developed websites to share information; created computer laboratories, from which teachers and students engage with new ideas and with peers in Mali and other countries; and also sent groups of students into nearby communities to converse with residents and learn more about local culture, history and geography.

4. Changes in the education system. Here a bit of extrapolation – beyond the original observations – is required. If we think of the "cumulative effect of participation in these cultural and social activities" (Nasir, 2009, p. 3) of pedagogically appropriating ICT – in which students become more involved in dialogue with their peers and teachers, course content evolves, and schools become more open and in interaction with their environment –, we could imagine the education system being more linked to everyday life. We could also imagine more informal opportunities for teacher networking and development. However these possible effects of the use of ICT in education on the education system in Mali have yet to be confirmed, as the changes described by the 29 educators and two administrators interviewed were in a nascent phase.

5. At the level of communities in which schools are located. Through the exploration of beyond-the-classroom conversations about the use of ICT in education (objective 2), it became evident how parents and elders had their word to say. Teachers exerted their individual agency (van Binsbergen, 2004) in appropriating ICT and also considered the opinions and perspectives of others. In this we saw culture as conversation (Hassoun & Wong, 2012). Deciding what to graft into existing (pedagogical and school) culture – the cultural initiative described by Fonlon (2012) – seems to be a collective effort. Cultural renewal involved confrontational and convivial communication and collaboration between schools and communities, including interaction in which local knowledge and ways of knowing could be revalorized, as deemed necessary by Ela (2006) and Hountondji (2002), and find their way into schools that had sought to stamp out African traditions and Africaness (Fonlon, 2010; Moumouni, 1964/1998; Nyamnjoh, 2004; Pence & Nsamenang, 2008). Though ICT alone will not make communities more welcoming of schools and schools more in fruitful interaction with host communities, the appropriation of ICT use as described by the teachers interviewed seems to play a role in opening up these relations for interrogation and renegotiation.

6. The wider world. It was in relation to trying to understand why professors pedagogically appropriate ICT (objective 3) that the wider world – beyond West Africa – was most evoked. Almost all six professors interviewed discussed their desires to use ICT to facilitate and enhance African participation in global debates and scholarly production and to transform how Africa and Africans are perceived and projected. Future research is required to confirm how the desired technologically mediated changes are actually taking place (or not).

Evidence of changes at multiple levels – personal level, level of classrooms, schools and universities, of education systems, communities and the wider world – is not surprising to the extent that theories of appropriation refer to the transformative nature of appropriation processes, as newness is integrated into individual and societal practices. Artifacts, such as computers and internet, and social others "as carriers of culture" become "points of interchange between cultural processes and individual learning and developmental processes" (Nasir, 2009, p. 2). Educators, as they resist, envision, act, create, dialogue and synthesize across multiple borders in their pedagogical appropriation of ICT, work as agents of change (Andersson, 2006) in multiple milieus.

Had we considered changes only the personal level – of teachers and students – or stopped our reflection at the level of classrooms and schools and universities, we would have missed out on how the pedagogical appropriation of ICT is embedded in and likely shapes and is shaped as well by the educational systems and communities in which schools are located, not to mention the wider world. "Development occurs simultaneously on multiple planes of experience […] All of these planes of change influence all the others planes" (Nasir, 2009, p. 2).

Appropriation processes can lead to change and also to enforcing habits, hierarchies, and power dynamics. Digital technologies can support more flexible learning and the acquisition of soft skills for 21st century living, however the evidence is still out as to "whether society really desires a transformed […] relation between teacher and learner" (Livingstone, 2012, p. 9) – and all that such a transformation implies in relation to existing balances of power. Although the transformative possibilities of ICT use were evident in our study, the evidence is indeed still out on how embedded ICT appropriation will become in schooling in Mali and more generally in formal education in West Africa. As a representative from a Malian ministry told us: "*Le travail de certains enseignants au Mali avec les TIC peut être innovant, mais ça reste au niveau de l'informel*.[76]" And a supervisor of pedagogical advisors explained – with a mixture of desire and fear – how: "*Les jeunes deviendront plus habiles et plus intelligents que nous*.[77]"

What we can retain is the opening or the potential for change that the pedagogical appropriation of ICT introduces. ICT disrupts the flow of everyday activities and invites people to question activities and relationships and possibly to perceive them differently – rearranged. How dialogues about the appropriation of ICT are ignored and encouraged, solicited and suppressed may well be telling of how ICT will be appropriated beyond innovative teachers and professors by West African education systems.

The propensity in individuals and society for hope, imagination and joy may be indicative of readiness to work toward change. It was interesting to see the place of hope, imagination, and joy in the appropriation process. Teachers were able to embrace ICT and its

[76] Translation from French: Certain teachers innovate with ICT, but informally.
[77] Translation from French: Young people are going to become more intelligent than we were in our day.

transformative potentialities because they saw change around them and had hope (Freire, according to Giroux, 2010) that change is possible. They were also able to imagine the future (Appadurai, 2013) and set pedagogical goals and objectives in relation to their vision. Teachers explained how they felt empowered and how students experience a real sense of joy, not only in surfing the Web with classmates and corresponding with peers from around the world, but also in going out to learn from people – who may not have been to school – in nearby communities. It is as if the pedagogical appropriation of ICT helps unbind learning from what has defined and shaped it. With ICT, learning goes beyond the textbook and has room for multiple sources of knowledge – and ways of knowing. Things get mixed up, and messy. Things known but forgotten may be revalorized, old habits revisited or tossed aside, and newness interrogated with interest and a view toward selective integration, engagement with the world, and the shaping of the future.

The pedagogical appropriation of ICT is motivating and bewildering. It liberates time and energy, but it also takes time and energy and the courage to question habits and norms and ways of perceiving and acting and interacting. Teachers experience tensions between continuity and change, between old and new, between autocracy and democracy, between the known and the unknown, and between different cultural concerns and contexts. Despite trepidations and ambiguities, and even as they worry about equitable access to ICT throughout their country, teachers are maneuvering with ICT as a way of adapting to and bringing about change in the contemporary world where "change is the norm" (Bruner, 1996, p. 15). The pedagogical appropriation of ICT facilitates mobility between one thing and another, between one condition or mindset and another, on pathways of continuous cultural change.

8.3 Strengths and limits

We believe this exploratory research, with Bamako, Mali as a site of focus, provides insight into the pedagogical appropriation of ICT in West Africa.

8.3.1 Limits of the research

The work nonetheless has limits, given that only 31 persons participated in the research. Although there is some claim to possibilities of similitudes within the historical,

socioeconomic and cultural settings in which the interviews took place, and even, through naturalistic generalization, lessons for other peoples and cultures, the findings are not generalizable across the board.

In the methodological approach, teacher interviews were the point of entry, and the results are based on the interpretations of their points of view. Whether the changes reported by teachers are actually taking place could be confirmed via classroom observations and interviews with others actors (i.e. students, parents, school directors, members of the community).

All participants were teaching in urban settings, thus the results do not claim to capture or reflect the realities of the pedagogical appropriation of ICT in rural areas, where access to electricity and to ICT is more difficult and the conditions for teaching and learning can at times be more challenging. The understanding of the pedagogical appropriation of ICT by West African educators is incomplete without reflecting rural perspectives.

In addition, all participating educators were already using ICT, even if not all were entirely enthusiastic about its use in teaching and learning. For the most part, with some exceptions, they were open and even seeking educational and societal change. Elementary and high school teachers and university professors as a whole, particularly those adverse to change, could have very different relations with ICT, pedagogy and culture.

We were also limited by the short term of the study. A longer-term perspective could examine more indepthly how encounters with ICT, such as those described in this thesis, evolve and affect the education and social system, and how ICT contribute to cultural change.

8.3.2 Strengths and contributions of the research

First strength and contribution of the research: Each paper **responded**, in different and complementary ways, **to our questions** about how and why West African educators pedagogically appropriate ICT and with what effects. We were able to show the highly social nature of the ICT appropriation process and that its use by educators and learners in the contexts studied seems to bring changes to teaching and learning and classroom and school cultures. We showed how some teachers appropriating ICT, according to what they shared with us, work well beyond their classrooms as cultural workers on behalf of society. We revealed the desires of teachers and professors to appropriate ICT not only to improve

teaching and learning but also to help prepare youth for engagement with the world and the reshaping of African personalities. The teachers considered not just what is, but what is possible (Nyamnjoh, 2015). We were also able to show how the ICT appropriation process is complex and multifaceted. In appropriating ICT, teachers come face to face with engrained habits and established expectations, protocols, and hierarchies, whether in the classroom, the educational system, or the communities in which they live, and they negotiate such encounters with varying degrees of satisfaction and frustration, anxiety and poise, confidence and doubt.

Second strength: evocation of **epistemological dilemmas** and opportunities. Some researchers focus on practical dilemmas such as high teacher-student ratios and lack of teaching and learning materials, while epistemological concerns, for example regarding the relevance of education, are just as important. We claimed that the complexities of the pedagogical appropriation of ICT cannot be deeply understood outside these concerns.

Third strength: **choice of the literature** with which we linked the findings. Throughout, we drew on sociological and anthropological understandings of appropriation (Do-Nascimento, 2005; Jouët, 2000; Nyamnjoh, Durham, & Fokwang, 2002; Nyamnjoh & Shoro, 2011; Surman & Reilly, 2003), and in the case of Hountondji (2002) on philosophical ones. We enriched understanding of appropriation by infusing it with thinking about hope (Freire, 1970/2014; Giroux, 2010), borders (Akkerman & Bakker, 2011; Giroux 1992, 2005), and the future as cultural fact (Appadurai, 2013). We drew on understandings of culture, cultural initiative and culture as conversation (Fonlon, 1965&1967/2010, 1960s/2012; Hassoun & Wong, 2012; Ki-Zerbo, 2010a, 2010b) including from African perspectives. To show continuities in the process of cultural transformation, we also drew on centuries-old West African history and lore about exploration and innovation and cultural encounters and change (Diawara, 2010; Niane, 1974). Finally, we drew on educationalists with backgrounds in cultural psychology such as Vygotsky (1978), Bruner (1969) and Obanya (2011, 2012a, 2012b, 2014) to understand characteristics of education and learning required for living in and evolving the postmodern era, and we considered the pedagogical appropriation of ICT in relation to their socio-constructivist views. Even when studying Africa, many researchers neglect African thinkers. Our work has certainly integrated and been shaped by their thinking.

Fourth strength: operationalization in educational setting in West Africa of the concept of the **pedagogical appropriation of ICT appropriation**. The concept of appropriation has

been operationalized in myriad African contexts, in relation to culture, knowledge, and media (i.e. Nyamnjoh, Durham, & Fokwang, 2002), but rarely in educational settings. The concept of appropriation of ICT has been used in Latin America (i.e. Phillippi & Peña), and the concept of appropriation of ICT in education has been employed in European contexts in particular (i.e. Lund, 2009). Other models of the appropriation of ICT in education (i.e. Raby, 2004) consider appropriation as a step in a rather linear process with much less emphasis on the interaction of users, ICT and the sociocultural context. What we contributed is nuanced understanding of what happens when teachers appropriate ICT and are appropriated by it, in contexts where little similar research had been conducted. Focusing on the pedagogical appropriation of ICT allowed us to perceive pedagogical shifts underway and being pursued clumsily and creatively by innovative teachers in touch with various communities and the pulse of the future.

Fifth strength: use of a **qualitative methodology** and an interpretive approach (Bernard, 2006; Karsenti & Savoie-Zajc, 2011; Thomas, 2013; Wertz et al., 2011) to understand pedagogical and social practices and the meaning of ICT appropriation in the West African contexts studied. Thick description (Geertz, 1973) provided a rendering of the everyday lives and challenges of educators. "Theoretical formulations hover so low over the interpretations they govern that they don't make much sense or hold much interest apart from them" (p. 25). The methodological approach adopted accounts for nuance, complexities and contradictions and the messiness of everyday and intertwined lives. The voices of both the educators and the researchers are present and in conversation, and the educators' narratives remain open to other interpretations.

Sixth strength: **perspectives of teachers**, which are often neglected or discounted. Interviews with teachers provided insight into the milieus in which they operate, in and beyond classrooms, and a sense of some of the questions and challenges with which they grapple in coming to terms with informational and technological revolution.

Seventh strength: **holistic approach to formal education**, as a continuum from primary and high school through university. Compartmentalization of the education system may have its place in some studies but has also been a source of dismay, for example by focusing on universal basic education for all and neglecting the development of higher education and lifelong learning in Africa. We showed that educators, whether working in

primary and high schools or at the university level, are acting on desires to use ICT in transformative ways, ones in which learners are considered and Africans and African creativity have a place.

Eighth strength: **upsetting of stereotypes** of culture as stagnant or frozen, rather than fluid, and of Africa and Africans as recipients rather than shapers of identities and futures. Cultural encounter and shaping are by no means new to West Africa. Malians travelled to Mecca and set out to discover the other shore of the Atlantic during Europe's Middle Ages. Indeed, the first human explorations of the world began from Africa. The exploration of the virtual is one more adventure. West African teachers and students will shape it as much as they are shaped by it. And through it project their ideas and personalities into a changing world, as suggested by Boubou Hama, primary school teacher, writer, historian and politician, cited at the outset of this thesis.

8.4 Recommendations

Having shared and discussed the finding in relation to our research on the pedagogical appropriation of information and communication technologies (ICT) by West African educators, we are now in a position to share practical recommendations, which we have limited in number to nine. The recommendations are presented in relation to three areas: education management and policy, teacher training and recognition, and pedagogical innovation.

Education management and policy

Recommendation 1 – accessibility for all

Most important is the recommendation, shared repeatedly by teachers, to make ICT available to all teachers and students.

Recommendation 2 – incentivizing women

We recommend that special efforts be made to encourage and incentivize women in the pedagogical appropriation of ICT. This involves understanding their perspectives and

catering to them. For example, they may feel less comfortable at computer labs than men. It is important to not pass over women in favor of men in relation to training opportunities; rather policies for equal participation by men and women or higher participation by women – as they and their views are currently underrepresented – should be considered.

Recommendation 3 – vision combined with negotiation and partnership management skills

Teachers stressed how pedagogical objectives must guide the appropriation of ICT in teaching and learning. Vision regarding the pedagogical appropriation of ICT is required at all levels of educational management, as well as strong skills in negotiation and partnership management. Private companies have and will continue to seek contracts for ICT-related equipment, software and services. If educationalists are not prepared to drive the bargains, education systems could be littered with technology that makes little difference for learning. Policymakers and program managers should be prepared to ask partners to co-finance, by way of example, the development of modules on using ICT in teaching and learning at *Ecoles normales supérieures* as well as of media labs for the development of online content.

The ICT appropriation process helps teachers and learners work across borders, opens up schools, evolves school culture, and intensifies dialogues of learning and change. This means teachers and learners and schools and systems need to be equipped, logistically and analytically, to deal with the intensification of dialogue, in line with their interests.

Teacher training and recognition

Recommendation 4 – initial teacher training

Having observed in the course of the study that training is provided either in ICT or in pedagogy, we recommend that the use of ICT in teaching and learning become a part of initial teacher training. Strengthening in the teaching corps the foundation in socio-constructive methods of teaching and learning could enhance the meaningful

integration of ICT, ensuring its use responds to needs of learners and their communities.

Recommendation 5 – ongoing professional and pedagogical development

The pedagogical appropriation of ICT requires practice, and practice can be enhanced via peer collaboration and learning. We thus recommend the provision and facilitation of dynamic and inspirational spaces for teachers for reflection on and discussion of pedagogical issues. These spaces could, for example, be in the form of pedagogical committees, of interdisciplinary collaborative projects involving teachers, students and others, or of clubs.

Recommendation 6 – teacher recognition

We recommend that the creativity and commitment of teaches be recognized, and that teachers be listened to. "As long as Society continues to devalue teachers and teaching, bringing Education back to the schools will remain a daunting task" (Obanya, 2012a, p. 17).

Pedagogical innovation

Recommendation 7 – pedagogical innovation at all levels

We recommend that processes for pedagogical innovation be embedded at all levels of education systems and that there be spaces for those processes to be in conversation with each other and nourish education systems. The conversations should be bottom-up, top-down and side-side (Obanya, 2012a). Such processes could be as simple as providing spaces for reflection and discussion, as mentioned in Recommendation 2, or more elaborated, for example the provision of computers and/or scholarships to teachers for pedagogical innovation[78] or the provision of grants for school projects[79].

[78] Schwille et al. (2001) describe an initiative that has worked well in Guinea since 1995, in which teachers that receive scholarships for pedagogical innovation present their project results at an end-of-year professional forum – where pedagogical advisors have learned to listen and learn rather than lecture.

Recommendation 8 – promotion of social dialogue about pedagogical innovation

The pedagogical appropriation of ICT should be informed by the cultural initiative of the people of the milieu and by popular imagination, which requires the cultivation of dialogue between schools and the communities in which they are embedded. Practices to support such dialogue among multiple ways of knowing and doing and perceiving and projecting into the future can be inspired by experimentation and promising initiatives in this regard.

Recommendation 9 – creation of media labs to produce online content

At the systemic level, we strongly recommend the creation of media labs, involving practicing teachers, for the collaborative production – and guidance and training in the use – of online content, starting with priority curriculum areas.

8.5 Future research

We suggest more research on the social shaping of ICT in educational contexts in Africa. Studies beyond Mali's capital city could provide additional insight into the pedagogical appropriation of ICT. More research is required in rural schools and training centers on creative and strategic efforts to make ICT reflect rural issues and concerns.

Case studies of pioneering efforts in Africa to develop and use online content could inspire and inform. With the proliferation of social media, it could be insightful to research how teachers and students in different African contexts are appropriating, or not, social media for teaching and learning. It could be enlightening to follow a cohort of students to better understand how they are using ICT to mediate their culture and the influence this has on the construction of their identity and on their learning.

As mentioned in the discussion of the research results, it could be edifying to research how Africans are creatively and strategically harnessing ICT to facilitate greater participation

[79] In Senegal (see Diaoune & Cissé, 2006; Niane, 2006), as part of opening schools to their milieu, schools may apply for funds for school projects. The approach seems to liberate creative energies, even if certain aspects need to be improved. For example, pedagogical priorities can become secondary to economic concerns.

of Africans in scholarly production and global debates, as hoped and desired by the university professors interviewed in this study.

Comparative action research coordinated or sponsored by ministries of education in several countries could provide support to teachers and schools pedagogically appropriating ICT and insight for the development and implementation of educational policy.

Comparative studies, in Africa, Asia and the Americas, of beyond-the-classroom conversations and interactions about the pedagogical appropriation of ICT could advance attempts to combine theories of learning and sociocultural theories to reflect the diversity of human experience.

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[81] COST: longest-running European framework supporting transnational cooperation among researchers, engineers and scholars across Europe, see www.cost.eu

[82] "The COST Action A20 was formed in 2001 to establish a European-wide network of researchers investigating the impact of the Internet on mass media industries" (O'Neill, 2005).

Annex A: Statistics on primary and secondary education in Mali

Primary education in Mali is comprised of two cycles, one going from first through sixth grade and the second from seventh through ninth. Students must pass exams at the end of each cycle to access higher levels of education. There are about 223 high schools in Mali – only 43 (or about 20%) of them public[83]. Almost half of the 13 620 elementary schools are public; in addition there are community-run schools (22% of the total) and madrasas or koranic schools (17% of the total), both more so in rural areas, as well as private schools (12% of the total), more so in urban areas, and in the capital city of Bamako, private schools outnumber public schools. Completion rates for sixth and ninth grades were at 58% and 36% respectively in 2010-11, with lower completion rates for girls, even if enrollment rates between boys and girls is similar in grade one. The official teacher ratio is 1 to 49 students in grades one through six, but in some cases can be much higher. About 76% of elementary school teachers are male. A large portion of the national budget after servicing the debt, almost 30%, is invested in education, with a large portion of that consecrated to salaries. (République du Mali, 2011)

Teachers are part of the public service or hired on a contractual basis. About 81% of elementary school teachers were contract teachers in 2011 (République du Mali, 2011). Pedagogical support to teachers is a major challenge of the education system (Banque mondiale, 2010). Good contractual teachers may depart after gaining experience as soon as a better paying opportunity is available, contributing at times to a fairly unstable teaching corps. The hiring of contract teachers dates back to the times of structural adjustment programs of the 1970s and 1980s, when oil prices soared and prices for coffee and cocoa diminished, and public investments including in teaching training were reduced. Contract teachers must have a high school diploma and several months of training. Public service teachers have several years of training; elementary school teachers train at one of the 15 teacher training institutes or *Instituts de formation de maitres* (IFM) in the country and high school teachers at the *Ecole normale supérieure* (ENSup).

[83] Source: http://rue89.nouvelobs.com/2013/08/25/mali-a-fac-corruption-notes-sexuellement-transmissibles-245183

Annex B: Semi-structured interview guide

Recherche sur l'enseignement et
les technologies de l'information et de la communication (TIC)

Guide d'entretien semi-structuré pour les enseignants ayant intégré les TIC dans leur enseignement

OBJECTIF DE RECHERCHE : Comprendre comment et pourquoi les enseignants intègrent les technologies dans leurs enseignements et avec quels effets.
ANONYMAT: Les informations partagées dans cet entretien seront utilisées dans le cadre de la recherche doctorale de Kathryn Touré sur l'appropriation pédagogique des technologies et gardées de façon anonyme.

Nom de l'école, collège, lycée, groupe scolaire, université :
Ville :
Pays :
Enseignant :
Téléphone de l'enseignant si possible (pour d'éventuelles informations complémentaires) :
Date de l'entretien :
Durée de l'entretien :
Lieu de l'entretien :

Intervieweur :
Nom du fichier audio de l'enregistrement de l'entretien :

Information biographique
Sexe :
Lieu de naissance :
Année de naissance :
Age :
Diplôme(s) le plus avancé :
Date d'obtention :
Lieu (établissement) d'obtention :
Formation initiale à l'enseignement (nombre d'années) :
Autres formations pédagogique/technique :
Nombre d'années d'expérience dans l'enseignement :
Nombre d'années d'exercice dans l'établissement actuel :
Niveau(x) enseigné(s) :
Matière(s) enseignée(s) :
Nombre de classes par semaine :
Nombre moyen d'élèves/étudiant(e)s par classe :

Notes à l'intervieweur :

DE RELANCE : N'oubliez pas les questions de relance lorsque l'enseignant dit quelque chose d'intéressant qui mérite d'être approfondi, i.e. « Que voulez-vous dire par cela ? », « Pouvez-vous me donner un exemple ? », « Pouvez-vous approfondir/détailler ? ».

BREF APERCU DE L'ECOLE : Si c'est le premier entretien dans cet école, merci de joindre un bref descriptif de l'école tels que le niveau, nombre d'enseignants (femmes et hommes), nombre d'élèves (filles et garçons), adresse, nom et contact du directeur, milieu socio-économique, description physique, nombre de salles informatiques et nombre d'ordinateurs fonctionnels, nombre d'ordinateurs connectés à internet et autres informations utiles concernant l'établissement d'enseignement.

SYNTHESE DE L'ENTRETIEN : Insérer une synthèse, de préférence rédigée le jour même de l'entretien ou le suivant, faisant ressortir les points saillants de l'entretien et indiquant les conditions dans lesquelles il s'est déroulé.

Légende pour la transcription :

C.H. : Chercheur/Intervieweur
E.N. : Enseignant

Familiarisation avec les TIC

C.H. : Quand avez-vous **commencé** à utiliser l'ordinateur, l'internet ?
E.N. :
C.H. : Qu'est-ce qui vous a **attiré** au départ ?
E.N. :
C.H. : Comment avez-vous **appris** à les utiliser ?
E.N :
C.H. : **Où** et **quand** utilisez-vous l'ordinateur, l'internet, d'autres TIC ?
E.N. :

Utilisation des TIC

C.H. : Comment utilisiez-vous les TIC ? à quelles fins ?
E.N. :
C.H. : Et **dans l'enseignement**, les utilisez-vous ? à quelles fins ?
E.N. :
C.H. : Les **élèves** utilisent-ils l'ordinateur, internet, d'autres TIC ? dans quels buts ?
E.N. :
C.H. : Quel **soutien** recevez-vous pour l'utilisation des TIC à des fins pédagogiques ?
E.N. :
C.H. : Quels sont vos **difficultés** et **déceptions** par rapport à l'utilisation des TIC ?
E.N. :
C.H. : Quels conseils donneriez-vous à ceux qui aimeraient intégrer les TIC dans l'enseignement ?
E.N. :

Changements

C.H. : Qu'est-ce qui a **changé** pour vous depuis que vous avez commencé à utiliser les TIC ?
E.N. :
C.H. : Quelles **habitudes** avez-vous **abandonnées** ou **acquises** ?
E.N. :
C.H. : Comment décrivez-vous l'**enseignement avec les TIC** par rapport à d'**autres méthodes** ?
E.N. :
C.H. : Votre utilisation des TIC **se développe-t-elle** ? Comment ? Et **votre enseignement** ?
E.N. :
C.H. : Quelles **prochaines étapes** envisagez-vous ?
E.N. :

Attitudes et motivations

C.H. : Qu'est-ce qui vous **motive** dans l'enseignement ?
E.N. :
C.H. : Qu'est-ce qui vous conduit à utiliser les TIC dans l'enseignement ? Que souhaitez-vous **accomplir** en les intégrant dans l'enseignement et l'apprentissage ?
E.N. :
C.H. : **Que pensent les autres** par rapport à l'utilisation des TIC à l'école?
E.N. :
C.H. : N'avez-vous pas des inquiétudes en utilisant les TIC – qui **viennent d'ailleurs** ?
E.N. :
C.H. : Quels **sentiments** avez-vous lorsque vous êtes face à l'ordinateur ?
E.N. :

Autre

C.H. : Avez-vous des **questions à nous poser** ?
E.N. :
C.H. : Quelles **autres questions** auriez-vous aimé qu'on vous pose ?
E.N. :
C.H. : **Autre chose** à dire ou partager ?
E.N.

Remerciements.