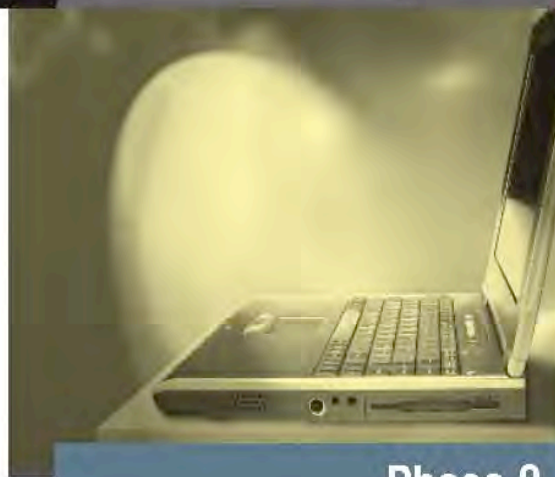




Agenda panafricain de recherche sur l'intégration pédagogique des TIC



Phase 2

Panafrican Research Agenda on the pedagogical integration of ICTs

PROJECT PROPOSAL

Université 
de Montréal

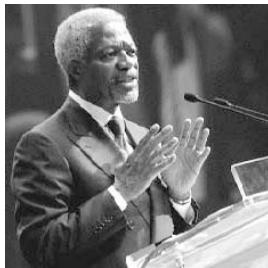


PANAFRICAN RESEARCH AGENDA ON THE PEDAGOGICAL INTEGRATION OF ICTs: **PHASE 2**

PROJECT PROPOSAL



Université 
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*Information and communication technologies
are not a panacea or magic formula, [...]
But they can improve the lives of everyone on this planet.*

Kofi Annan, 2005

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EXECUTIVE SUMMARY

This document presents the executive summary of the second phase of the PanAfrican Research Agenda (PanAf) on the Pedagogical Integration of Information and Communication Technologies (ICTs). Phase 2 of PanAf represents a logical and necessary progression from Phase 1, to apply, share, and expand research along the initiative's core themes. This Phase 2 proposal was developed in response to needs expressed in the findings of the past two years' work of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs, culminating in a survey of all PanAf researchers in December 2008. A draft of this document was validated at the international meeting concluding Phase 1 in Dakar, April 22nd and 23rd, 2009 – the proposals herein voice the priorities of a network of nearly 70 African education researchers, practitioners and policy decision-makers, based in evidence representing nearly 260 000 African educators, learners and policymakers.

Mission, research questions and objectives

Through IDRC's Acacia program, the PanAf network's mission is to contribute to the development of African countries and people by increasing knowledge on the pedagogical integration of information and communication technologies (ICTs) in African schools and education systems. It is important to note that this research focus is entirely consistent with the IDRC mission, which is embodied in the five-year Acacia program, that is ***to support research leading to recommendations for concrete improvements in the quality of teaching and learning***. Moreover, greater knowledge of the realities of teaching and learning with ICTs in African education institutions will enhance the potential of ICTs for national and international socio-economic development - in today's globalized world, ICTs are not only a necessary tool for the learners within these institutions but also a compulsory skill for participation in a more global, international knowledge society.



The main research question of Phase II is How, for ***whom and under what circumstances can the pedagogical integration of ICTs substantially improve the quality of teaching and learning at all levels and scales of African education systems?*** It is important to note that this main research question - central to the PanAfrican Research Agenda on the Pedagogical Integration of ICTs (Phase 2) - falls directly in line with IDRC's mission of "Empowerment through Knowledge", promoting interaction, cooperation and mutual learning through knowledge creation and adaptation.

Phase 2's research objectives and research questions will target the individual as well as classroom, or school (micro), organization or community (meso) and the system (macro) scales. PanAf Phase 2 will also include, for all objectives and research questions, comparative analyses along the themes of gender, the urban-rural and public-private divides, questions of language-based and regional differences, and refer and contribute to international literature and experiences. The main research objective of Phase II is ***To better understand how, for whom and under what circumstances the pedagogical integration of ICTs can substantially improve the quality of teaching and learning at***

all levels and scales of African education systems. Again, it is important to highlight that the accompanying main research objective is closely related to IDRC's mission.

Main research activities

The PanAf agenda's sustained effort to focus on the challenges presented by the pedagogical integration of ICTs in teaching and learning in Africa will mainly consist of:

- concerted scientific, policy-oriented, and practice-oriented dissemination efforts;
- a variety of new partnerships and international collaborations;
- continued collection of new data, focusing solely on the pedagogical integration of ICTs;
- continued detailed analysis of new and existing data.

As noted above PanAf Phase 2 is made up of precise research objectives that respond directly to needs flowing from the general objective and main research question. The major research themes of the project are expressed in the 12 categories of indicators for which data is currently available on the Observatory (www.observatoireict.org). These indicator categories will serve as the foundation for rigorous thematic and comparative scientific analysis over the course of Phase 2. These analyses depend on networks of collaboration between researchers working on similar or complimentary themes, and the production of relevant and rigorous scientific, political and practical publications that are at the heart of PanAf's objectives.

Main expected outcomes of Phase 2

With Phase 1, the PanAf network has succeeded both in collecting and sharing an unprecedented depth and quality of data, and developing exceptional international partnerships with the World Bank and UNESCO. The institutions participating in the Phase 1 research represent nearly 245 000 learners, 9000 educators and other education stakeholders, painting a never-seen portrait of the pedagogical integration of ICTs across Africa. However, the detailed analysis of this new knowledge remains, in order to draw out empirically supported conclusions and recommendations, has only just begun. In order to support improvements in education outcomes through the integration of ICTs, be they addressed to policy decision-makers, academic researchers, teacher-trainers, school managers, or educators themselves, must stand on a solid empirical base of evidence – data rigorously and meticulously collected and analyzed. After collecting an exceptional quantity and quality of data in Phase I, PanAf Phase 2 will clearly provide such an opportunity for African researchers to formulate recommendations based in the data they have collected.

The Phase 2 proposal highlights several specific research questions and objectives including: classroom impacts (1), policy (2), teacher training (3), the role of connectivity (5), innovation (6), or publications (8). It is potentially helpful to group into four the types of recommendations that will be produced based on PanAf Phase 2 activities:

- Recommendations for decision-makers seeking to develop or refine sectoral policies dealing with the pedagogical integration of ICTs¹, especially as more and more countries are working on ICT-policies for education;
- Recommendations for researchers working on themes aligned with the pedagogical integration of ICTs;
- Recommendations for teacher-training;
- Recommendations for education practitioners including school managers, educators, academic advisors, or other stakeholders in the field.

With the data collected and the analysis conducted in Phase 2 of the Pan-African Research Agenda on the pedagogical integration of ICTs, we expect a set of long-term outcomes including:

- understanding and influencing how and under what circumstances teachers use ICTs in African schools;
- understanding and influencing educational reforms in Africa, in particular on the pedagogical uses of ICTs;
- understanding and influencing how and under what circumstances ICT-education policies are developed in African countries;
- understanding and influencing the impact of ICTs on the school achievement of all learners in Africa.

The importance of conducting continued PanAfrican research on the pedagogical integration of ICTs

PanAf is the first representation of ICTs in education across Africa, and Phase 1 has been widely and internationally recognized for its boldness and innovation in terms of data collection and sharing, capacity building, and communication style. You are encouraged to read the Phase 2 proposal where these innovations continue in terms of application and impact of research results. This only underscores the importance of this extended study - that promotes the effective use of ICTs to enhance learning and develop education systems. ICTs themselves do not necessarily encourage students to be creative or to grasp the scientific approach. No matter how powerful the hardware, it serves no educational purpose if it is not applied appropriately. Hence, PanAf Phase 2's education research has a responsibility to identify best practices in the pedagogical uses of ICTs, a societal issue of enormous import.



PROJECT PROPOSAL

1. INTRODUCTION

This document presents the second phase of the PanAfrican Research Agenda (PanAf) on the Pedagogical Integration of Information and Communication Technologies (ICTs). Phase II of the PanAf project represents a logical and necessary progression from Phase 1, to apply, share, and expand research along the project's core themes. This Phase 2 proposal was developed in response to needs expressed in the results of the past two years' work, specifically through a survey of all PanAf researchers in December 2008. At the international meeting concluding Phase 1 of the PanAf network in Dakar, April 22nd and 23rd, 2009, this document was validated – the proposals herein voice the priorities of a community of nearly 70 African researchers, practitioners and policy decision-makers.

According to many researchers, ICTs in an educational context refers to a set of combined technologies that enables not only information processing but also its transmission for purposes of learning and educational development. In this proposal, we have attempted to define the pedagogical integration of ICTs, according to Karsenti and Larose (2005), as a use that permits either enhanced teaching or enhanced learning. More precisely, the pedagogical integration of ICTs into schools means the appropriate, habitual and sufficiently regular use of ICTs that produces beneficial changes in educational practices and improves students' learning. This type of integration implies the routine use of ICTs in the teaching and learning processes. The pedagogical integration of ICTs must therefore be understood as integration such that the student learns and socializes through a multitude of interactive and communication channels. It cannot be reduced to mere physical integration, which is nonetheless imperative.

First, the guiding pedagogical principles for better usage of technologies, across all teaching levels and in varied educational contexts, are briefly outlined; next, we identify the main issues related to the pedagogical integration of ICTs into education systems; following that, we stress the importance of conducting research on this problem. Based on our findings, drawn from limited African scientific literature combined with the abundant English and European literature, we define key issues and research objectives. With support from the International Development Research Centre - Canada (IDRC), African training and research institutions in the education sciences will continue to focus on these key issues and objectives within the framework of the second phase of a continent-wide project addressing the pedagogical integration of ICTs into African education systems.

Following this initial justification of the project covering definitions, theoretical approaches and a review of the literature and concepts relating to the pedagogical integration of ICTs in African schools, the PanAf network is re-introduced. Investment in research on the pedagogical integration of ICTs in Africa continues to fall short of the demonstrated importance of the issue for social and economic development, while the level of material aid invested in technologies for schools on the continent grows, and policies to manage its implementation lack a scientific evidence base. Results of past studies have lacked a harmonized communication facility that supports the sustainability of project actions; additionally, African education researchers would benefit from methodological and dissemination capacity building. The PanAf network addresses these challenges, in that it collects new school-scale data, using mixed methodologies, creates innovative opportunities for knowledge sharing, and provides learning opportunities for those involved.

The first phase of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs (PanAf) have been successful in establishing dynamic research teams in 12 Sub-Saharan African countries, creating an open, online Observatory where researchers currently share approximately 20,000 data points for 180+ indicators along 12 themes, from 100+ African schools (including hundreds of downloadable raw data files including policy documents, recorded interviews, scanned questionnaires, and examples of ICTs in teaching in learning). Section 4.3 presents a synthesis of research results from Phase 1 related specifically to the pedagogical integration of ICTs.

Support for the importance of continued research in this domain is presented, arguing that it is essential that the project continue as planned into a second phase - moving towards better understanding of the pedagogical integration ICTs in African schools, and towards enhancements in teaching and learning based on this understanding. Phase 2 activities will aim beyond issues of "connectivity" and "access", to address the integration of technologies into learning per se, as upheld by both theoretical and practical approaches. In the medium and long term the research undertaken by participants in the PanAf network, and work grounded in

data available on the Observatory, can have a significant and broad, positive ICT4ED impact across Africa. A better understanding of successes and challenges in the pedagogical integration of ICTs should be applied not only to academic publication but also to improved practice and evidence-based policy.

The functions of the primary research tool of the PanAf network - the Observatory at www.observatoireict.org - are reviewed, and finally the mission, objectives, questions, priority activities and specific actions of Phase 2 are introduced. A sustained effort to focus on the challenges presented by the pedagogical integration of ICTs in teaching and learning in Africa will consist of: concerted scientific, practical, and policy-focused dissemination; new institutional partnerships; and continued collection and analysis of high quality data. Following a quick review of Phase 2 methodology, and a renewed focus on Gender issues, the research actions are detailed: PanAf Phase 2 will focus first on strategies to support publication on the subject of ICTs in education by African researchers, through improved scientific, policy-focused, and practical writing; second, it will approach innovative institutional collaborations for the project; and finally it will take on additional field research – in new countries, institutions and for new indicators.

2. JUSTIFICATION OF THE PROJECT - IN AN AFRICAN CONTEXT

The concept of a developmental “divide” in ICTs for education is not proprietary to the digital age. In the 1970s, a few of the better-endowed African schools were already undergoing a minor audiovisual crisis. They were using fragile, cumbersome and costly equipment that necessitated time-consuming repairs, and there was also a compatibility problem between the different components. However, the underlying reason for the scholastic failure of these new technologies was that this audiovisual breakthrough took place at the margins of pedagogy - creating a pedagogical divide between the powerful learning tool and educational actions. As Michel (1981) explains, education practitioners and policy-makers did not know what to do with new and unfamiliar tools. To add to the problem, educators were unsure as to which overall strategies to use - integration across disciplines, independent work, individual or collective work, and so on. Advances in educational applications of audiovisual technology were hindered by both the fears and hopes it raised. Against this background, the first computers began to infiltrate African schools.

Computers made their first appearance in certain schools in North Africa at the end of the 1960s, mainly for management applications. It was only in the 1970s that they were used in educational institutions in North America and Europe. In Africa, the first computers arrived in educational institutions per se at the end of the 1970s, for instance, with the LOGO project in Senegal in partnership with the Massachusetts Institute of Technology (MIT).

Governments at the time were apparently motivated by a dual goal: to initiate students to the computer, and to introduce certain software programs. Two streams were very dominant: Skinner’s programmed teaching and LOGO language, developed by Papert. LOGO, the first computer language for children, was especially popular in North America. Seymour Papert, LOGO’s creator, had completed his studies with Piaget in Geneva and was working at MIT at the time. His most famous work, *Mindstorms - Children, Computers, and Powerful Ideas*, became a universal reference. Papert’s overriding aim was to develop educational tools and software with Socio-Constructivist potential. More precisely, he wanted to develop a language that would allow students to construct their own knowledge. LOGO software was initially developed for the Apple II, and later for IBM computers.

For more than a decade, introductory computer courses in Africa were offered in only a few lycées and some universities. While Information and Communication Technologies came to the forefront in North America and Europe in the 1980s with the Personal Computer (PC), they were largely ignored in Africa and computer processing was instead considered the requisite discipline. The urgency of this “divide” was particularly felt in Africa in January 1982, when Time Magazine acknowledged the importance of the computer by naming it “Man of the Year,” the first time a machine was honoured. Computer processing was, and still is, taught in many schools throughout the 54 countries on the continent.

The next development in North America and Europe was Computer-Programmed Teaching (CPT). Teachers then became interested in teaching certain subjects with the help of technology. From teaching computer programming per se and computer programmed teaching, we move to Computer-Assisted Teaching (CAT), which was widely adopted and now an entire spectrum of tutorials has since been developed for educational purposes. Tutorials, or educational software, were designed to help learners acquire knowledge and develop skills (Clark & Mayer, 2003). By the early 1980s, Computer-Assisted Learning (CAL) emerged on the scene, and in the mid 1990s, ICTs were being used in a variety of disciplines. Since the late 1990s, the pedagogical integration of ICTs appears to be ascendant in educational circles. The hope now is that teachers can better teach all manner of subjects with the help of Information and Communication Technologies, and that students will learn more, and more easily. In today’s education community, Information and Communication Technologies are recognized as a cross-curricular competency for students and teachers alike.

In 2006, the Internet celebrated its 37th birthday. In the space of only a few short years, this tool that was initially limited to use by military, and later, higher education institutions, increasingly became a familiar tool used daily by individuals on every continent. The number of Internet users on the Earth vaulted from 16 million in 1995 to over 650 million in 2006. The exponential use of technologies also heralds a revolution long awaited by some educators - the global knowledge community, promised in the 1970s, proclaimed in the 1980s, and anticipated in the 1990s with mixed feelings of fear and disbelief, has in the 21st century become an undeniable reality for all people.

In a speech delivered at the University of Nairobi, Barack Obama by then a Democratic Senator criticized the inertia of many African countries in matters of technology and education. For instance, he noted that South Korea and Kenya have had similar economies for the past 40 years, but South Korea now enjoys an economy that is 40 times larger than its African counterpart, particularly due to the successful implementation of technologies into all spheres of Korean society, including education.¹

Although technology has jump-started the engine of the information era, it is now incumbent on all nations to take part in constructing the information society such that no person is barred from access to the knowledge available on the Internet, and so that every person might share the benefits of a better future, market globalization and internationalization. (From a speech delivered on August 28, 2006.)

2.1 Pedagogical integration of ICTs: what is it?

Drawing from the existing literature, this section presents a brief overview of the various visions and concepts of ICTs integration into education, the principles and theories of the pedagogical integration of ICTs, and the potential uses of ICTs in various African learning contexts.

According to many documents and authors (UNESCO, 2004; Grégoire, Bracewell & Laferrière, 1996; Karsenti & Larose, 2002; Tardif, 1998), ICTs in an educational context refers to a set of combined technologies that enables not only information processing but also its transmission for purposes of learning and educational development.

The scientific literature describes different pedagogical approaches to the integration of ICTs into education. Raby (2004), building on the works of Lauzon Michaud and Forgette-Giroux (1991), made a clear distinction between two different types of ICTs integration: physical and pedagogical. Physical integration consists of making technological equipment available to teachers and students and promoting its use for occasional pedagogical needs. Physical integration is therefore understood as a process that leads to the introduction and/or deployment of technologies in the educational institution.

In contrast, the pedagogical integration of ICTs into schools means the appropriate, habitual and sufficiently regular use of ICTs that produces beneficial changes in educational practices and improves students' learning (Depover & Strebelle, 1996; Isabelle, 2002). This type of integration implies the routine use of ICTs in the teaching and learning processes. The pedagogical integration of ICTs must therefore be understood as integration such that the student learns and socializes through a multitude of interactive and communication channels. It cannot be reduced to mere physical integration, which is nonetheless imperative.

Furthermore, the pedagogical integration of ICTs does not necessarily mean introducing these technologies as a new curriculum subject and instructing students in its operation (MEQ, 2000;

Karsenti, Savoie-Zajc & Larose, 2001; Raby, 2004). Rather, students and teachers who are actively engaged in real-life learning contexts in order to support and improve the teaching and learning experiences and make them more meaningful should use ICTs habitually and regularly.

Taken as a whole, pedagogical integration of ICTs means not only the implementation of networks and equipment, but also the use of a set of innovative technological techniques—audiovisual, information processing and telecommunications—to enhance learning at schools and in continuing education programs and for economic, social and cultural development.

The theories and principles of pedagogical integration of ICTs may be grouped into six main orientations for the utilization of ICTs for educational purposes:

1. Adopt a critical and discerning attitude toward the pros and cons of ICTs as a teaching and learning support, and critically assess the data gathered by networks;
2. Identify and evaluate the potential for information processing tools and networks to develop educational competencies;
3. Identify and communicate information using pertinent and varied forms of multimedia;
4. Use ICTs effectively to research, interpret and communicate information and to solve problems;
5. Use ICTs effectively to build networks for exchange and continuing education in specific subject areas for teachers, learners and pedagogical practitioners;
6. Tap into ICTs opportunities for learning and assessment activities.

2.2 Use of ICTs in various learning contexts in Africa

In Africa, we find multidimensional uses of ICTs, from primary school to higher education. ICTs are increasingly used in primary schools, including the preschool, kindergarten, primary and elementary levels. Aside from entertainment value, the greatest benefit of ICTs at this level is the liberation of the students' ideas and aspirations. ICTs also provide valuable and varying support for child learning, as it fosters emotional and social development, motor skills, physical health, language acquisition, general knowledge, cognitive skills, etc. The use of ICTs in preschool and primary school is a core-learning tool for the educational basics: reading, writing, communication, listening, patience, and so on.

ICTs utilization appears to be more widespread in African secondary schools, including general secondary and technical schools, where teachers and students use it to teach and learn subjects. In the technical and professional schools, ICTs are used more specifically to teach and learn specialized disciplines. Thus, we observe that certain disciplines have developed ICTs-related practices. Accordingly, ICTs integration into learning activities in secondary schools would seem to be all the more important, since it goes beyond interpersonal communication and integrates several dimensions such as interactive learning, collaborative learning, and research for information for analysis and problem-solving.

In the higher African educational institutions, ICTs integration also appears to be considered a necessity both for university students and teachers. Indeed, as we highlight below in the section on issues, numerous disciplines are either not taught or poorly taught in Africa owing to lack of teachers.

ICTs utilization for online learning (e-learning) is one way to address this lack, as it would provide broader access to higher learning. Moreover, the higher education sector includes graduate teaching and continuing education, where ICTs hold enormous potential for adult self-training and lifelong learning. Distance education has become increasingly common, particularly in adult learner communities in various university programs. In many African universities and training schools, ICTs utilization in this context fosters self-training and successful cyberspace initiatives that are independent of time or location. Thus, ICTs enable coaching and tutoring outside regular class hours. This opens the way to a new approach to the concept of time units, learning locations and learning activities. How is distance education serving the education system? Are there new ways of thinking about curriculum development? What are the impacts on teacher training, in a context where there is a significant lack of trained and qualified teachers in Africa? Aside from all this, online learning allows international cooperative teacher training. It also promotes national and international exchanges between teachers and contributes to the fine-tuning of pedagogical practices.

2.3 *From digital divide to technopedagogical divide*

Although information and communication technologies occupy an ever-larger place in the daily lives of an enormous number of people, we must recognize that the ingress of ICTs has not been consistent across all societies. This leads to the well-known “digital divide” between the so-called developed and developing countries. In fact, many African countries, which are also some of the poorest on the planet, are increasingly living in a world of technological deficiency, i.e. lack of access to knowledge that is available to everyone else via the Internet.

The OECD (2006) recently demonstrated that this lack of basic network infrastructure and international connection might be blamed on the more pronounced digital divide in the world’s lowest income areas. In concrete terms, apart from countries at war, the West and Central African countries are lagging the furthest behind the Western World in this respect. For instance, Niger regularly ranks at the top of the list in two categories: poorest countries in the world and countries where information and communication technologies are particularly slow to arrive.

Accordingly, if Africa aims to better prepare its citizens for the challenges of the third millennium, it must also foster a thorough integration of information and communication technologies, i.e. the regular and routine pedagogical integration of ICTs into education in order to tap new, attractive, promising and diversified potentials. On the other hand, we must note that African initiatives to connect to the Internet are not in their infancy. In fact, despite the great divide between Africa and the Northern countries and within African countries and regions as well, technologies appear to be gaining ground with exponential speed. To illustrate, the Senegalese capital Dakar has a constantly growing number of households with high-speed connection, which was almost inconceivable a few short years ago. Moreover, a recent study funded by the IDRC (Karsenti et al., 2005) revealed that almost 75% of students in certain Senegalese lycées had an email account. And yet, particularly in the southern part of the country, a large number of schools and villages have never had electricity. Thus, the phenomenon of the digital divide is not limited to Northern and Southern countries; it is also felt within the African continent and within specific countries.

Caused by a combination of social, economic, political and environmental factors, the digital divide is a complex and widespread issue in Africa. Nevertheless, our view is that there is another, ever more important, concern: the pedagogical integration of ICTs into African schools. Recognizing that, in some cases, ICTs have barely penetrated African society, the digital divide in schools remains a great worry. In the pedagogical integration of ICTs, Africa is largely still at square one.

2.4 *Why ICTs in African education?*

Despite the progress Africa made in the late 1970s, we note 30 years later that the introduction of Information and Communication Technologies into the education system—which is fundamental to the knowledge economy— has been a difficult struggle, and in the opinion of some researchers, far too slow.

Many have pointed out that it is utopian to talk about education technologies in a continent where great numbers of schools have neither electricity nor running water, or where there are no schools at all. The current situation of the African education system would appear to rule out ICTs use in schools. This is because school policies must address such overwhelming needs that hard choices must be made. Little priority is given to computer equipment, and even less to the pedagogical integration of ICTs. Consequently, the ICTs needs of students and teachers are typically the last on the list. These arguments are important, but they should not be used to eliminate technologies completely from the African education system. Education should be able to prepare Africans for today's realities, and this is paramount. The African education system must also prepare children for tomorrow's realities. At the same time, it must help preserve the past so that technologies do not become a Trojan horse in the form of cultural or intellectual imperialism.

Why introduce ICTs into education? As explained above, ICTs wield a fundamental impact on political, economic and social conditions in changing societies. For this reason, the key stakeholders in African education—teachers, school principals, specialists, parents, and government ministers and officials—must be actively involved in ICTs uses and content, and above all the pedagogical integration of ICTs into education. Furthermore, we must be concern about ICTs in education because it is clear that ICTs will continue to significantly impact all societies worldwide, in all economic, social, and cultural aspects. Education cannot escape this trend. While ICTs have infiltrated schools in the Northern countries in great numbers, Africa lags far behind. For several years now, African education systems have been coping with a multitude of problems, and countries have initiated reforms that generally do not attach much importance to ICTs. The ADEA (2002), for its part, has stressed that ICTs represent a learning channel with the potential to enormously improve the quality of basic education teaching. And yet, as noted by the World Bank (2002) and in a report by the Massachusetts Research Association (2005), there is a serious lack of ICTs research in Africa in the areas of effective educational uses and potential impacts on the quality of African education. Moreover, an exhaustive review conducted in 2003 by the IDRC (Karsenti, 2003) clearly showed that only a very few studies on the integration of ICTs into African education have been carried out, apart from a few works by South African scholars.

Moreover, the findings of these studies are striking and paradoxical: the more African societies use ICTs, the less they appear – proportionally - in schools. The spill over into education has not yet occurred. Should we be concerned about when ICTs arrive or the disparity between the social and educational use of ICTs? Do we really need to question why or why not schools are equipped with ICTs? It is not surprising that schools are slow in adapting to social change. After all, schools are considered as noble institutions that embody a commitment to the long term, with a mission to instruct and educate. So the important issue is probably not so much a question of when ICTs arrive in the classroom, but rather their enhanced pedagogical use for teaching and learning toward educational goals. The importance, in our view, is focusing less on the digital divide debate but more on the pedagogical integration of ICTs into education.

Finally, we must stress that many researchers (see BECTA, 2005), have demonstrated that technologies are likely to have greater impact when integrated pedagogically, providing the following benefits:

- Better mastery of basic competencies,
- Better mastery of the technologies themselves,
- Better skills preparation for the knowledge society,
- Higher motivation for school learning and advancement to higher learning.

In sum: Why introduce Information and Communication Technologies (ICTs) into African education?

- To help students preserve their past,
- To prepare students for today's reality,
- To ensure a future for African students.

2.5 Challenges of ICTs integration: industrialized countries

The problems and barriers with respect to ICTs integration by teachers stem from several sources: inadequate initial training, insufficient motivation, absence of technical support, a school administration that does not embrace ICTs usage, lack of administrative support, etc. (see Cuban, 2001; Dede, 1998; Means, Penuel & Padilla, 2001). To better identify the many barriers to the pedagogical integration of ICTs into education, we have classified them into two main categories: external barriers (connected to the school, society, etc.) and internal factors (connected to the teacher or the teaching process). Among the key external barriers, the hardware issue is usually at the forefront (McCrorry Wallace, 2004).

In the so-called industrialized countries, barriers to ICTs integration are limited to three main components: hardware, software, and technical support. Heavier investment in all three areas would foster the pedagogical integration of ICTs into education. However, as demonstrated by Cuban (1997, 1999), technological access is an essential yet insufficient condition to foster the pedagogical integration of ICTs by teachers. Investment in hardware and technical training is simply not enough. Cuban's argument is based on a series of surveys conducted on professors at Stanford University—a relatively well endowed institution where professors have enjoyed over twenty years' access to the latest technologies and good technical support. Cuban's findings reveal that these professors use little or no ICTs in their teaching practice, never mind all the resources at their disposal. He characterizes this as a "[...] limited and unimaginative instructional use of computers." In his view, they use it in the same manner as primary and secondary teachers, who have neither the technical nor material resources of the university teachers. Although Cuban (1997) does not deny that equipment and technical support are essential for the pedagogical integration of ICTs into education, he points out that these conditions are nonetheless insufficient, since teaching cannot be considered a manufacturing process where productivity may be raised—and time saved—by investing in technological resources. Teaching, as Rousseau (1966, p.112) explains, is an art, the goal of which is not always to save time: "Dare I expound the greatest, the most important, and the most useful rule

in all education? It is not to save time but to waste it.” (free translation) Depover and Strebelle (1996, p. 24), who researched ICTs use in Belgian schools, are entirely of the same opinion, noting that:

Many studies have shown that the pedagogical effectiveness of ICTs depends more on the capacities of teachers to integrate and operate new technologies in a relevant pedagogical context than on the available information technology infrastructure. (free translation)

For several years now, the international scientific literature (Becker, 1994, 2000; Cuban, 1997; Scottish Board of Education, 2000; Pouts-Lajus & Riché-Magnier, 1998) has highlighted eleven key issues in the pedagogical integration of ICTs:

1. Lack of time (ICTs integration is not prioritized in teaching practice, where the workload is already very heavy);
2. Hardware issues (lack of hardware, difficulty of access, obsolescence, defects, lack of adequate peripheral devices such as printers and scanners, too-slow or non-functioning Internet connections, etc.);
3. Technical difficulties (technical problems encountered when using technologies);
4. Absence or lack of technical support for ICTs integration;
5. Absence or lack of administrative support by the educational institution;
6. Absence or lack of support, training, or technopedagogical skills (inadequate initial training for new teachers and non-existent or inappropriate continuing education for practicing teachers);
7. Class management problems that limit the potential for technopedagogical innovations in the classroom;
8. Group size (too many students in the class for effective ICTs integration);
9. Organizational constraints and barriers within the education system;
10. Group heterogeneity of technical skills, which complicates the task of pedagogical ICTs integration;
11. Absence or lack of relevant pedagogical materials.

The primary problem that teachers face appears to be lack of time (Cuban, 1997). In fact, since ICTs can be very time-consuming, they are usually feared by many teachers who are already at the end of their rope and are intimidated or even overwhelmed by what has been known for many years as the “technological change” (Karsenti & Larose, 2001). As Chenevez (2002) explains, it is no easy task to prepare today’s students for tomorrow’s technological challenges when the teachers themselves are out of date. It is also true that ICTs usually complicate teaching routines at the beginning, even though, after a certain adjustment period, the rewards may be great (Pouts-Lajus & Riché-Magnier, 1998).

Some studies, e.g., by Depover (2005) and Leclerc (2003), show that teachers’ beliefs and resistance to change are basic factors in the use or non-use of ICTs. The Québec Conseil supérieur de l’éducation (CSE) (2002) and Fullan (2001) also stress the importance of training and awareness raising for all stakeholders on the relevance of integrating ICTs into schools. Without the

commitment of teachers, it would be hard to image successful ICTs integration (Isabelle & Lapointe, 2003; CSE, 2000).

According to numerous authors (Leclerc, 2003; CSE, 2000; Isabelle, Lapointe & Chiasson, 2002; Rogers, 2000; Sherry, 1998; Depover & Strebelle, 1996; Bibeau, 1996; Fullan, 2001), ICTs use in education must surmount organizational, administrative, human, pedagogical, training, informational, technical support, funding, and technological problems. Lack of training, and time required to master technology and develop appropriate classroom courses, represent tremendous odds that educational institutions must overcome if they are to adopt and integrate ICTs into their portfolios (Tunca, 2002; CSE, 2000; Pajo & Wallace, 2001).

Turning to the organizational, administrative, and human factors, barriers include lack of vision and strategic planning (Bibeau, 1996), scattered efforts, disorganization and uncooperativeness between sectors and users, and poor organization.

2.6 Challenges of ICTs integration: Africa

There are several explanations for the failure of ICTs utilization for pedagogical purposes in certain African educational contexts (see Karsenti, 2003). According to Howell and Lundall (2000), the key factors blocking educational institutions from using microcomputers as teaching and learning tools are insufficient funds, insufficient number of computers, lack of teachers with IT skills, teachers' inability to integrate the computer into the different subject areas, and lack of appropriate microcomputer teaching programs.

As mentioned above, computer usage has not evolved consistently across Africa. In South Africa, for instance, certain fringe elements of the school age population are using computers for educational purposes at a level comparable to that of developed countries, while the majority of schools in sub-Saharan Africa are still exploring the ways and means of connecting to the Internet, with many in the introduction and launching phase.

The overall findings of the studies consulted point to the hardware issue as the primary constraint on the equitable use of innovative technologies. The dearth of structures and the high costs of equipment greatly exacerbate the group usage ratio. Even so, all 54 African countries have connected to the Internet (Jensen 2002). However, there remains the mind-bogglingly difficult feat of achieving a student-computer ratio of 10 to 1 and 100% Internet connection in most of the primary, secondary, and higher educational institutions in Africa. To illustrate, the World Bank's World Links for Development (WorLD) project (2000) estimated a ratio of 139 students per computer across Africa.

Other studies show that the problems blocking African educational institutions from equipping themselves with computers are, in descending order: lack of electricity, lack of funds, insufficient accommodation capacity, lack of qualified staff, and insecurity. On top of that, very little of the equipment available nationally is allocated for ICTs use in education, in schools. Furthermore, in sub-Saharan Africa, the low density of telephone lines and the high costs of installing and maintaining them constitute a major barrier

Numerous authors (Oladele, 2001; Intsiful, Okyere & Osae, 2003; Selinger, 2001; Tunca, 2002; Bakhoun, 2002) have also cited lack of tools; inoperative software; insufficient or absence of technological infrastructure such as telephone lines; marginal, disparate, inadequate and obsolete communications networks; fluctuating electric power supplies; recurrent power brownouts and

blackouts; ailing road systems, etc. In fact, it would seem that most African countries have neither the infrastructure to ensure nation-wide Internet connection nor the wherewithal to install it. Thus, UNESCO found that the overall rate of Internet penetration across Africa was only about 1.5%, with wide variations across regions, always keeping in mind that these conditions are determinant yet insufficient for ICTs literacy.

With the help of organizations such as WorldLinks, African countries have made determined progress in the areas of computer equipment and Internet connections in schools. Clearly, there has been a substantial influx of computer hardware in many lycées and colleges in several African countries. Nevertheless, as revealed in a recent study funded by the IDRC, these investments are not enough to ensure a genuine pedagogical integration of ICTs. In fact, the study showed that once the WorldLinks funding was used up, IT use gradually faded in the institutions, with a few rare exceptions where students were highly motivated to use ICTs (see Karsenti et al., 2005).

To these hard-to-control variables we can usually add the high numbers of students required for an efficient pedagogical use of computers. And this despite the fact, as noted by Depover (2005), that enrolment in basic education in Africa is barely 50%, while access to secondary school is an option for only a minority of students.

In addition, the issue of ICTs utilization becomes more acute when we consider access by women. In most cases, women are unable to take advantage of the opportunities offered by ICTs. In many regions, women have been accorded second-class status in the areas of self-government and the interconnectedness offered by the information era. In some communities, cultural restrictions that prohibit girls from attending school at all add further barriers to effective ICTs utilization in schools (Draxler & Haddad, 2002; Karsenti et al. 2005).

Marie Hélène Mottin-Sylla and colleagues (2005) studied six French-speaking African countries (Benin, Cameroon, Burkina Faso, Mali, Mauritania and Senegal) from 2004 to 2005. They found that, overall, women have much fewer opportunities than men to benefit from the African digital revolution, as they have been allotted the roles of consumers and “helping hands.” Their research reveals the scope of the ICTs gender divide and voices a plea for greater equality in the digital revolution. Section X of this document specifically addresses the gender issue.

In most African universities, training appears to have reached a limit in terms of overcrowded auditoriums and classrooms teeming with hundreds, even thousands, of students. Open and distance education (Formation ouverte et à distance – FOAD) is one response to this problem. However, a successful FOAD initiative, considered a panacea by many, including l’Agence Universitaire de la Francophonie and the African Virtual University (AVU), requires the appropriate usage of ICTs, in other words comprehensive pedagogical ICTs integration.

Aside from the time and place constraints on ICTs development, the use and maintenance of existing infrastructures runs up against the lack of local expertise and user know-how in the African education system.

On top of this, there is the thorny problem of infrastructure, which is indispensable for ICTs use by educational institutions. For instance, staff must be found to implement technological applications and develop teaching programs (Murphy, Anzalon, Bosch & Moulton, 2002). For ICTs, as in all pedagogical contexts, the human factor is paramount. For example, if taught by a trained teacher’s assistant, children might learn computer skills that are never or rarely used at school. And it is no surprise that Africans who learn how to use ICTs tools consume more resources than they produce (see Karsenti, Touré & Tchameni Ngamo, 2006). This is because the lack of information, training, experience, as well as pedagogical, staffing, professional, technical, and financial support impedes

the development of uses and teaching content adapted for African contexts as well as the construction of student-run education portals.

Of all the human resources deficiencies, the most important is surely that of teachers. Generally, initial teacher training in Africa does not prioritize the use and pedagogical integration of ICTs (Karsenti, 2006; ROCARE-Cameroun et al., 2006).

To ensure the participation of all teachers in the ICTs integration process and to mobilize their interest and encourage them to use ICTs in practice, it would seem indispensable to create favourable conditions. This problem is all the more urgent since many African schools do not have a specially equipped room or convenient time-space for those teachers who would like to work with computers.

In fact, in most African countries, schools have very little computer access time, and rarely at times that are convenient for teachers or students. Since teachers are not very familiar with media use, they often adopt inappropriate pedagogical strategies. Students do not have standardized background knowledge in the different subject areas, nor do they have standardized technological skills or experience with multifaceted learning styles. All these shortcomings impede the pedagogical use of ICTs.

ICTs integration into education also raises new challenges for teachers as students begin handing in assignments lifted straight from the Internet. Aside from the low pedagogical value of such effortless work, teachers must now add exposure and confrontation of plagiarizers to their many other duties. And although teachers bear the burden of proof in such cases, when they are not ICTs-savvy, the task becomes practically impossible.

ICTs also threaten the teacher's classroom authority. ICTs appeal to the students and leave the teacher with a feeling of powerlessness. This can be very unsettling, especially for teachers who follow traditional, encyclopaedic approaches. However, current research (see BECTA, 2005) indicates that ICTs should not replace open pedagogical approaches. Rather, it should provide practical assistance by improving teaching activities and facilitating student learning. Children are rapidly won over by a story told on an educational CD-ROM. The animated images and sound tracks are attractive extras that teachers could probably not produce themselves. Nevertheless, children will immediately invite the teacher to watch the story with them and ask them to explain various elements or the ending of the story, and so on. James (2001) noted that, even in South Africa, which seems to be far ahead of other African countries, less than 5% of educational institutions that are equipped with computers have budgets for teacher training in ICTs use. And yet, to ensure the sustainable use of ICTs in teaching, investment in human capabilities is paramount.

In many sub-Saharan African countries, there is a real political will to introduce ICTs into the education system, but no clearly formulated national ICTs policies. Information technology is more or less lumped in with the official school programs, with no budget allocations for ICTs. Funds for ICTs equipment and operation generally comes out of school fees, fundraising campaigns, and donations from national and international organizations and partners, and in countries like Nigeria and Cameroon, state funding. Meanwhile, the research literature has repeatedly stressed the need to adopt stable, ongoing policies and budgets for ICTs utilization (Karsenti & Larose, 2005).

Beyond developing human resources and building the capabilities to design, install, maintain and use new ICTs infrastructures and applications, a key challenge for ICTs use in African societies is to arrange for their distribution and use in distant and isolated rural schools (Chéneau-Loquay & N'diaye Diouf, 1998). Cyber-café's are an important vehicle for ICTs use in many African countries. They act to spread ICTs use to areas where there are few access points. Aside from the issue of unequal distribution of technological equipment across the regions, there are concerns about the

equitable use of ICTs in a continent where a substantial portion of children without opportunities to use computers in class have no computers at home either, unlike children in developed countries. These problems are liable to hinder the pedagogical integration of ICTs into many African schools. All this against a background of the relatively recent and limited introduction of ICTs into Africa, the lack of appropriate equipment, the lack of qualified human resources, and the enormous number of disadvantaged populations. A further serious handicap is the acknowledged fact that people need time to familiarize themselves with the computer and explore its potential before they can use it to revolutionize classroom activities.

2.7 The importance of conducting PanAfrican research on the pedagogical integration of ICTs

The majority of strategic studies on ICTs in African education differ according to the country studied. Objectives vary from collaborative learning to providing communities with information. Some objectives are unclear. Other objectives are relatively precise and measurable, or else more general and instructive in studies that clearly describe the various applications of ICTs in African schools.

This only underscores the importance of this extended study - that promotes the effective use of ICTs to enhance learning and develop education systems. It is important to continue research that describes how ICTs are used in order to facilitate the application of best educational practices, according to the principles proposed by Chickering and Gamson (2004):

- Good practice in undergraduate education,
- encourages contact between students and faculty,
- develops reciprocity and cooperation among students,
- encourages active learning,
- gives prompt feedback,
- emphasizes time on task,
- communicates high expectations, and
- respects diverse talents and ways of learning.

This research also sheds light on the pedagogical uses of ICTs in varied African learning settings and areas such as student learning, programs and pedagogy, online education (e-education), professional development, evaluation, etc. Results of both the trans-national research project on ICTs integration in African ICTs pioneer schools (see Karsenti et al., 2005), and PanAf Phase 1 clearly demonstrate that ICTs usage in Africa has been inadequately documented compared to other parts of the world.

This view is supported by UNESCO (2004):

[...] monitoring and evaluation are the weakest components in most ICTs in education programs. While a number of stocktaking research studies have been conducted on ICTs infrastructure penetration and access in schools, there have been minimal monitoring and evaluation of ICTs integration and its impact on teaching and learning. Evaluation is

an important phase in the formulation and implementation of an ICTs in education program. Evaluation, both formative and summative, means that policies, practices, and activities are documented, interpreted and analyzed (p. 135).

Pedagogical ICTs integration initiatives have involved a variety of situations such as visual projection, preparation of class notes, and distance self-learning. A promising research approach would be an attempt to provide an overview of the diverse experimental uses of ICTs in learning. Long-terms ICTs initiatives, national and continental, have not yet been clearly monitored or evaluated.

It would also seem urgent to reflect on the pedagogical integration of ICTs into teaching in particular African localities where learning with these tools is a very chaotic process. ICTs themselves do not encourage students to be creative or to grasp the scientific approach. That requires a pedagogical framework within which technology can facilitate the use, processing and production of relevant information, among others. No matter how powerful the hardware, it serves no educational purpose if it is not used for appropriate purposes. Hence, education research has a duty to shine a scientific spotlight on training in the pedagogical uses of ICTs, a societal issue of enormous import.

As a continent that lags far behind in ICTs adoption, use and innovation, Africa is not at the point where it can use educational ICTs to provide its people with a better education or to take advantage of the investment potential and opportunities it offers. Nevertheless, several countries are convinced that ICTs use is an undeniably sound economic development strategy when viewed as an investment in the future. This raises possibilities of ICTs utilization for African development and a restructuring of knowledge based on a consideration of local African realities.

3. THE PANAFRICAN RESEARCH AGENDA ON THE PEDAGOGICAL INTEGRATION OF ICTS

At the second World Summit on the Information Society (Tunis, November 2005), Kofi Annan reminded us that we are living in a world of rapid change where technologies play a multitude of roles. How we tap this technology's potential will shape our future together. We cannot remain indifferent to this enormous metamorphosis.

“The participation of researchers and educators in the processes of change that information and communication technologies bring to education is an opportunity to construct, shape and share development knowledge.”

ICTs are increasingly present in African societies and have been introduced to varying degrees at all education levels from preschool to university, and in both the formal and informal sectors. They are also used to offer distance education to teachers and other adult learners. However, in various education systems across Africa, ICTs are increasingly being taught as a completely separate discipline, while the integration of ICTs into pedagogical practices to improve the quality of teaching and learning across disciplines remains the exception.

The rationale of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs' research challenges can be summarized in three points:

- The depth of previous research on the pedagogical integration of ICTs in Africa does not reflect the demonstrated importance of the issue for social and economic development, nor to the level of material aid invested in ICT4ED on the continent.
- Results of past studies have lacked a harmonized communication facility that supports the sustainability of project actions.
- African education researchers would benefit from methodological and dissemination capacity building.

The PanAf agenda addresses the three challenges above, in that it:

- Collects new school-scale data, using mixed methodologies.
- Creates innovative opportunities for knowledge sharing.
- Provides learning opportunities for those involved.

Particular added values of PanAf's online Observatory (www.observatoireict.org) include that it:

- Voices “user-scale” knowledge from African learners, educators, and institutions.
- Mixes “numbers with narratives”, for greater depth than aggregate national data.
- Creates an innovative, “open”, professional space owned by African education researchers.

Annex I presents Phase 1 REVISITED – objectives, research questions and accomplishments.

4. LESSONS LEARNED - IMPORTANCE OF CONTINUED IDRC SUPPORT FOR RESEARCH ON THE PEDAGOGICAL INTEGRATION OF ICTS IN AFRICA

Table 1 highlights PanAf main outcomes for Phase I. It is important to note that a thematic review of research findings will appear in a separate Phase 1 synthesis document currently in development.

TABLE 1: PanAf Outcomes for Phase I

PARTNERS	OUTCOMES
Researchers, Universities	<ul style="list-style-type: none"> The PanAf network has raised the awareness and increased the analyses/reflections of researchers and universities on the importance of ICT4ED research (pedagogical integration and use of ICTs). This project has made available to the researchers a large number of data to be used in their research activities (publications in scientific reviewed journals, books and newsletter). This project has promoted the south-south cooperation between African universities and researchers in sharing research outputs and experiences in the field of ICTs issues in Africa (policy, integration, use, durability). This project has built the capacity of researchers in scientific writing and policy dialogue (i.e.: researchers of Cameroon contributed to the writing of a booklet on how to better use ICTs in Education in Cameroon). This project has promoted gender equity, in the field of educational research on information and communication technology. This project has increased the number of scientific communications, in international conferences, by African researchers.
Policymakers, Educationalists, Planners etc.	<ul style="list-style-type: none"> This project has promoted the establishment of a strong and constructive dialogue between policy-makers, educationalists and researchers to raise their awareness on the importance and for a better use of ICTs in African education systems in order to improve the quality of teaching and learning (i.e. policy dialog workshops, PanAf international meetings).
Resource providers (infoDev, SchoolNet Africa, UIS, ICBA, AAU, AVU, GeSCI) etc.	<ul style="list-style-type: none"> This project has promoted the establishment of partnerships with the World Bank (InfoDev), UNESCO (UIS), SchoolNet Africa, NEPAD eSchools etc. in order to exchange/share data and experiences and to collaborate in the field of ICT4ED. This is an exceptional partnership between an IDRC project and such valued partners.
Participating Schools (primary, secondary, tertiary schools in 12 countries)	<ul style="list-style-type: none"> This project has provided international presence and visibility to the participating schools and has contributed in putting these schools on the map - which is a strong source of motivation for all the school stakeholders.
ERNWACA/ROCARE, University of Montreal	<ul style="list-style-type: none"> The network has reinforced the visibility of the expertise of UdeM and ERNWACA in the field of ICTs-Research. It has also promoted a strong North-South cooperation between UdeM and ERNWACA, based on synergy and complicity.

Open access to these newly collected narratives from the field is an unprecedented ICT4ED resource, and an example of great leadership by African researchers. From a scientific perspective, Phase 1 of the project has contributed enormously by making available gender-disaggregated data on the pedagogical integration of ICTs in African schools – as noted by Dr. Nancy Hafkin (retired director of UNECA ISTD, an ICT4ED pioneer, and member of the project's international scientific committee: *"The PanAf Observatory is to be congratulated for its commitment to the collection of sex-disaggregated data [...] Researchers participating in this project may not be aware of the uniqueness of this [...] but what they are doing by collecting sex-disaggregated data is still the rare case..."*

Of particular interest to African researchers, graduate students, education and development practitioners, and policy decision-makers are the qualitative responses from educators and learners regarding use and impact of computers for teaching and learning in the participating schools. Among these, perhaps the most important are educators' and learners' reflections on the impact of ICTs on their lesson planning and access to knowledge.

To reiterate, the principal objectives of the project are first to collect, analyze and share high quality data on the pedagogical integration of technology at schools across Africa, and second to build capacity in the individuals and institutions involved. Investment is also made in appropriate dissemination strategies - to ensure the Observatory sees use and that stakeholders (see Figure 2, p. 22, for a mapping of the stakeholders targeted by PanAf Phase 2) recognize its importance as a resource. International researchers, for example, simply need to be made aware of the data available on the Observatory, while development practitioners, school managers, educators and national policy decision-makers generally require appropriately packaged knowledge products based in rigorous research results.

It is essential that the project continue as planned into a second phase - moving towards better understanding of the pedagogical integration ICTs in African schools, and enhancements in teaching and learning based on this understanding. All Phase 2 activities will aim beyond issues of "connectivity" and "access", to address the integration of technologies into learning per se, as upheld by both theoretical and practical approaches.

It is important to note that this research focus is entirely consistent with the IDRC mission, which is embodied in the five-year Acacia program to support research leading to recommendations for concrete improvements in the quality of teaching and learning. Moreover, greater knowledge of the realities of teaching and learning with ICTs in African institutions will help improve its contribution to national or international development. In today's globalized world, it is not only a necessary tool for learners but also an entry ticket into the knowledge society. This must also be combined with national policy that recognizes its importance. IDRC has explored in depth the role of research for policy-making and maintains that making informed decisions can lead to effective change, even if it may take time.

In the medium and long term the research undertaken by members of the PanAf network and work grounded in data available on the Observatory can have a significant and broader ICT4ED impact on the continent. A better understanding of successes and challenges in the pedagogical integration of ICTs should be applied to improved practice and evidence-based policy.

5. PHASE 2 – MISSION, RESEARCH QUESTION, AND OBJECTIVES

It is important to note that this research focus is entirely consistent with the IDRC mission, which is embodied in the five-year Acacia program to support research leading to recommendations for concrete improvements in the quality of teaching and learning. Moreover, as previously mentioned, greater knowledge of the realities of teaching and learning with ICTs in African institutions will help improve its contribution to national or international development. In today's globalized world, ICTs are not only a necessary tool for learners but also a compulsory skill to participate to the knowledge society.

5.1 Mission

Through the Acacia program, the PanAf network's mission is to contribute to the development of African countries and people by increasing knowledge on the pedagogical integration of ICTs in African schools and education systems.

5.2 Research questions

5.2.1 Main research question

It is also important to note that the following main research question - central to the development of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs into Education (Phase 2) - falls directly in line with IDRC's mission of "Empowerment through Knowledge", promoting interaction, cooperation and mutual learning through knowledge creation and adaptation.

How, for whom and under what circumstances can the pedagogical integration of ICTs substantially improve the quality of teaching and learning at all levels and scales of African education systems?

5.2.2 Specific research questions

1. What are the **specific impacts** of ICTs on the quality of teaching and learning in African schools (including gender differences)?
2. What are the **policies and strategies** that can mostly effectively support and impact embedded and systemic pedagogical integration of ICTs in education?
3. What **teacher training strategies for the pedagogical uses of ICTs** impact most on the quality of teaching and learning?

4. What are the differences and similarities in **ICT integration practices in Anglophone and Francophone countries** in Africa?
5. What is the **role of access and connectivity, other resources, school management, administrative personnel and the larger community** in the integration of ICTs by educators and learners?
6. How and under what circumstances can **innovative ICTs in education strategies** improve equity and the quality of teaching and learning in African contexts?
7. What recommendations should be made to teachers, school principals and teacher training institutions, with regard to their use of ICT in African educational contexts?
8. What recommendations should be made to political leaders, with regard to ICT-education policies and ICT-curricula to be developed or implanted in their country?

5.3 Research objectives

5.3.1 Main research objective

Again, it is also important to note that the following main research objective is closely related to IDRC's mission. In particular, comparative analyses along the themes of gender, the urban-rural and public-private divides, questions of language-based and regional differences, and with reference to international literature and experiences will be further integrated across Phase 2 research objectives and questions. Phase 2 research objectives and research questions will target the individual (micro), plus classroom, school, organization or community (meso) and the system (macro) scales.

To better understand how, for whom and under what circumstances the pedagogical integration of ICTs can substantially improve the quality of teaching and learning at all levels and scales of African education systems.

5.3.2 Specific research objectives

1. To describe and analyze the **specific impacts** of ICTs on the quality of teaching and learning in African schools (including gender differences).
2. To describe and analyze the **policies and strategies** that can mostly effectively support and impact embedded and systemic pedagogical integration of ICTs in education.
3. To better understand and analyze what **teacher training strategies for the pedagogical uses of ICTs** impact most on the quality of teaching and learning.
4. To describe and evaluate the differences and similarities in **ICT integration practices in Anglophone and Francophone countries** in Africa.
5. To describe and analyze the **role of access and connectivity, other resources, school management, administrative personnel and the larger community** in the integration of ICTs by educators and learners.

6. To describe and analyze how and under what circumstances can **innovative ICTs in education strategies** improve equity and the quality of teaching and learning in African contexts.
7. To make recommendations to teachers, school principals and teacher training institutions, with regard to their use of ICT in African educational contexts.
8. To make recommendations to political leaders, with regard to ICT-education policies and ICT-curricula to be developed or implanted in their country.

6. MAIN EXPECTED OUTCOMES OF PHASE II: INFLUENCING AFRICAN ICT-RELATED POLICIES ON EDUCATION, THE WAY TEACHERS ARE TRAINED, AND TEACHING PRACTICES AND CURRICULUM

With Phase 1, the PanAf network has succeeded both in developing exceptional international partnerships (with the World Bank and UNESCO), and in sharing an unprecedented quality and volume of data, from a record number of participants for an ICT4ED study. The institutions participating in the Phase 1 research represent nearly 245 000 learners, 9000 educators and other education stakeholders, painting a portrait of the pedagogical integration of ICTs across Africa. However, detailed analysis of this new knowledge remains, in order to draw empirically supported recommendations. Recommendations for improvement of education outcomes through the integration of ICTs, be they addressed to policy decision-makers, academic researchers, teacher-trainers, school managers, or educators themselves, must stand on a solid base of evidence – data rigorously and meticulously analyzed.

PanAf Phase 2 will clearly provide such an opportunity, that is to formulate recommendations based in the data collected by African researchers.

Objectives 7 and 8 of the project reflect this focus on developing recommendations, in order that Phase 2 contributes substantially to educational change through ICTs. These recommendations, born of the 8 Phase-2 objectives, will support real change in African education systems, from a policy and curriculum development perspective, and in terms of initial and in-service training for educators.

For example, **Objectives 1 and 3** (*To describe and analyze the specific impacts of ICTs on the quality of teaching and learning in African schools; To better understand and analyze what teacher training strategies for the pedagogical uses of ICTs impact most on the quality of teaching and learning*) will support concrete recommendations with regard to teacher training and application of pedagogical integration of ICTs.

Objective 2 will support clear recommendations to policy decision-makers regarding the formulation of strategies for the pedagogical integration of ICTs in African schools. **Objective 4** (*To describe and evaluate the differences and similarities in ICT integration practices in Anglophone and Francophone countries in Africa*) supports a better understanding of the integration of ICTs in schools across the continent, indicating the diversity of challenges and successes associated with the issue, and informing subsequent transnational studies.

Objective 5 will support the formulation of concrete recommendations addressed to various education stakeholder (policymakers, school managers, educators, parents and community members) regarding the technopedagogical environment necessary for successful pedagogical integration of ICTs in African schools. **Objective 6** (*To describe and analyze how can innovative ICTs in education strategies improve equity and the quality of teaching and learning in African contexts.*) brings to the fore innovative projects where pedagogical integration has had a tangible impact on the quality of teaching and learning - supporting recommendations directly relevant to schools for their own initiatives.

It is potentially helpful to group into four the types of recommendations that will be produced based on PanAf Phase II activities:

- Recommendations for decision-makers seeking to develop or refine sectoral policies dealing with the pedagogical integration of ICTs², especially as more and more countries are working on ICT-policies for education (see figure 1 below);
- Recommendations for researchers working on themes aligned with the pedagogical integration of ICTs;
- Recommendations for teacher-training;
- Recommendations for education practitioners including school managers, educators, academic advisors, or other stakeholders in the field.

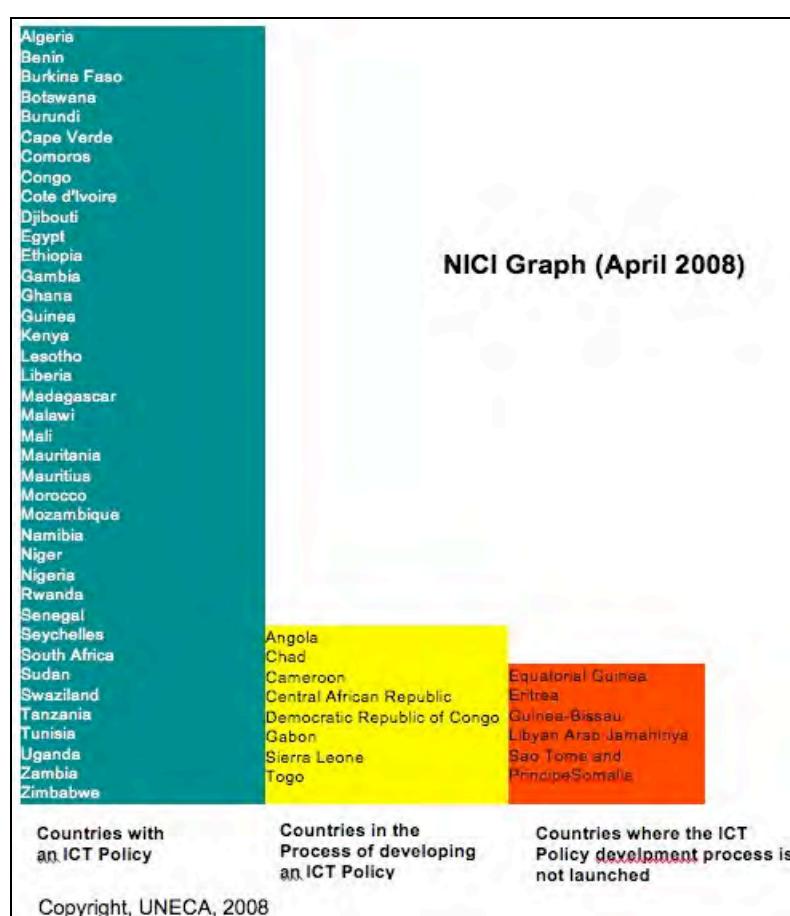


Figure 1 : ICI-related policies for African Countries.

² Note that on the Observatory (www.observatoireict.org) there are only seven African states where a national ICT policy is not in place or in the process of development (Equatorial Guinea, Eritrea, Guinea-Bissau, Libya, Sao Tome and Principe, and Somalia).

With the data collected and the analysis conducted in Phase 2 of the Pan-African Research Agenda on the pedagogical integration of ICTs, we expect a set of long-term outcomes including:

- **Being able to impact how teachers use ICTs in African schools.**
- **Being able to impact educational reforms in Africa, in particular on the pedagogical uses of ICTs.**
- **Being able to impact how ICT-education policies are developed in African countries.**
- **Being able to impact on school achievement in Africa.**

A simple mapping of the stakeholders targeted by PanAf Phase 2 outcomes is presented below in Figure 2. Strategies, in particular, for policy influence are recognized to be a continuous process.

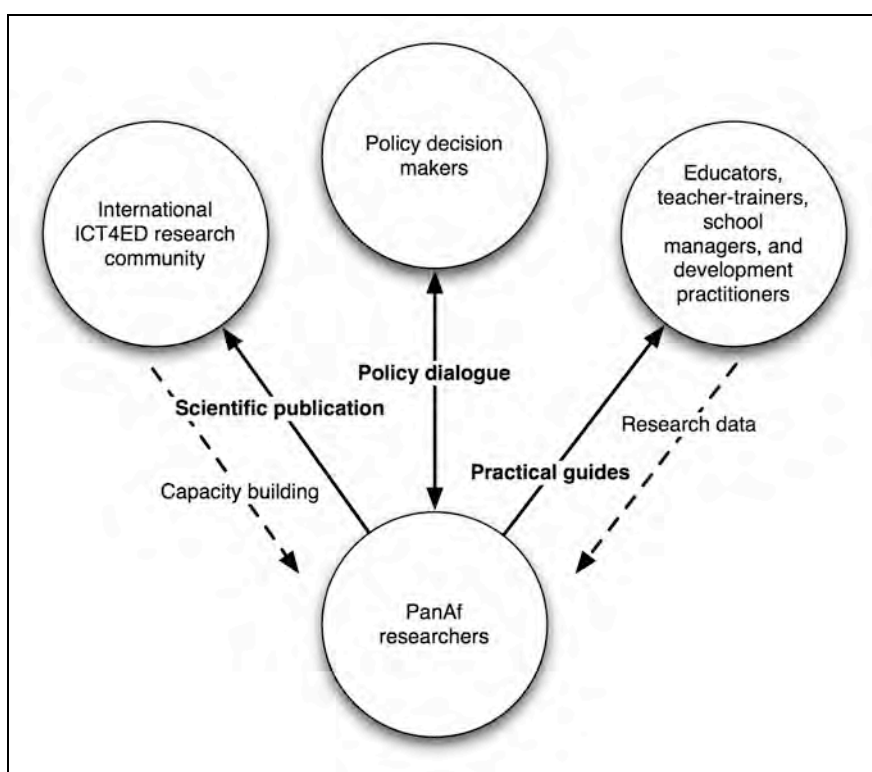


Figure 2 : Mapping of the Stakeholders Targeted in PanAf Phase 2.

7. RESEARCH METHODOLOGY

Methodology means the “science of the method” or the “science of how to do it,” according to Lessard-Hébert, Goyette and Boutin (1990), who emphasized that research methodology is a “set of guiding ideas that direct the scientific investigation” (p. 17) (free translations). For Crotty (1998), methodology is the strategy, the action plan, and the process that underlies the choice and application of specific working techniques known as methods. It matches the choice of methods with the expected results (p. 3).

This section presents the methodology of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs, Phase 2. First, we introduce a new, broadened, definition of ICTs for education (Section 7.1). Then, we present a justification of the chosen methodological approach, known as the *mixed-methods* research approach, one of the more promising methodological research approaches (Section 7.2). Next, we present the links between Phase I and Phase II (Section 7.3). Then, we highlight the main methodological approach: the multi-case study (Section 7.4), a very effective method for this type of study. The strengths of the proposed study (Section 7.5) and the triangulation method, used to validate data collection techniques and verify the authenticity of information sources (Section 7.6), are then presented, as well as the main data collection instruments (Section 7.7), used in Phase I, and still used in Phase II. Following that, there is an important section on video observation (7.8), one of the new and important data-collection methods of Phase II. Finally, we introduce the planned strategies for data analysis (Section 7.9).

7.1 Broadening definition of ICTs for education

Integral to the methodology of PanAf Phase 2 is recognition of the dynamic profile of ICT4ED in Africa. The arrival of web 2.0 has not necessarily been manifested in an abrupt technological change, but rather a progressive trend towards applications that enable creative communication on the part of the user. From passive receptor, to participating producer, users actively create content and share knowledge, reflecting on the creations of others. While the definition of ICTs for research purposes remains relatively limited to “computers in schools” in order to support transnational comparisons, the introduction of pedagogical uses such as social networking and mobile devices will be addressed. Specifically, Phase 2 research will begin to address mobile and social networking applications such as Facebook, YouTube, and MySpace. These new technologies, combined with open education resources, might change the collaboration between teachers, and the role of ICTs in this context. Therefore, it might be interesting to examine the quality of teaching and learning because of this. Moreover, it could be important to better understand their impact on the professional development of teachers. Also, it appears important to understand the social networks and collaboration emerging out of open education resources, as well as how teachers are creating online resources and how this could affect the curriculum, etc.

To underline the evolution of the role of users, and semi-structured user-groups, the Social Web designation is often attached to Internet applications that have emerged in recent years. This designation emphasizes the role of the group – sometimes referred to as “collective intelligence” – the capacity of a group of individuals to organize loosely around a common product of quality exceeding what might have been otherwise possible. This notion, of course, is not new with the Web 2.0, and its roots range from the works of Salomon (1933) and Perkins (1996) through the concepts of “distributed intelligence”. Recent evolution in the use of the Internet leads, as well, to a modified vision of the personal computer, putting more focus on the network itself. This emphasis is multiplied through widespread use of software housed on remote servers, available for “free” public use, rather than on home computers. Examples of this include word-processing (Google

Documents), which allows not only remote storage, but also collaborative work at a distance. These applications simplify work processes while adding functionality not found in traditional word processing. As announced by Sun Microsystem's John Gage several decades ago, the network has become the computer. With some confidence we can say that future use of personal computers will rely increasingly on network-based applications.

So, what does Web 2.0 change with regard to pedagogical usage? With the arrival of new applications, computers have become easier for use by all. They are not only facilitators of information gathering but also spaces in which individuals can create content and communicate it with others, for exchange between diverse and remote communities, where each can express their capabilities – a space open to those with the opportunities and competencies to access it. Services currently available on the Internet are favourably aligned with the needs of new generations of learners, who are adept at discovering computing through free Web 2.0 applications that are only a “click” away. Speed, simplicity, low cost – these are the current wants of learners for computing in educational contexts, where older and heavier programs often prevail. To address this new challenge, especially for educators who have in some cases invested heavily in mastering traditional applications, several approaches are proposed.

First, as in the case of open-access word-processing, spreadsheet and database software, the pedagogical use of web-based applications has already begun. This approach has the advantage of not requiring heavy investment in software development, and necessarily engages educators' creativity. A second, far less developed approach, involves applications specifically designed for pedagogical use, based in Social Web and emphasizing collaboration, exchange and remote co-construction of knowledge. Though applications that fall into this category remain rare, the path towards their development is clear. Pedagogy specialists, in the field of educational technology, are conscious of the formative potential of remote collaboration in adapted computer environments. What remains is to maximize the opportunities currently available to render these applications more accessible and easier to use. With regard to strategies to increase access to the applications described above, a clear opportunity presents itself in the form of “repositories” – databases where information is tagged for efficient retrieval. Several “repositories” are currently available, indexing pedagogical applications available on the Internet. French language sources include Edusource Canada (www.edusource.ca/french), which uses a metadata language (LOM) to index a substantial number of pedagogical applications.

Strive to use You Tube, and social media to stay in touch, promote dialogical interaction, The use of applications described above will be applied to network management, research capacity building, as well as data collection in PanAf Phase 2.

7.2 The importance of mixed-methods research

It is noteworthy that, for the last 20 years, many researchers have adopted one of two main methodologies or paradigms for education sciences research (see Krathwohl, 1998). These methods are considered so different as to be diametrically opposed: quantitative and qualitative research. Proponents of the quantitative approach contend that research in the education sciences must be objective, free of bias and conclusions easily transferable to the general case. At first glance, this is the approach advocated by the Canadian Council on Learning (CCL), which supports research on learning based useful base of evidence. Enthusiasts of the qualitative approach (see Lincoln & Guba, 1985), for their part, have rejected the idea of objectivity as the *sine qua non* for research in the social sciences. For strict believers objectivity and generalization in the social sciences are both impossible and undesirable. In contrast, qualitative research is characterized by an inductive focus,

extensive descriptions, etc. These two epistemologically incompatible positions have often evoked what Howe (1988) calls the “quantitative-qualitative incompatibility thesis” in support of the research methods and data collection methods inherent in these two conflicting approaches. Consequently, for the past 20 years, most researchers in the education sciences have felt they had to choose between the qualitative and quantitative approach.³ Why did the education sciences advocate this methodological dichotomy, which does not seem to account for the complexity of real-life situations? Why did they not seek a compromise between these “two solitudes”?

Note that although for a long time researchers felt they had to choose between qualitative and quantitative approaches in social sciences research, in 1986 this was considered progress compared to the previous research mindset. Let us recall that education research used to be dominated by a method that directed researchers to begin their studies with hypotheses and then seek to prove or disprove them. An additional option was then introduced whereby the researcher could choose between quantitative or qualitative studies, options that became increasingly popular after the mid 1980s (see Erickson, 1986).

These days, the methodology of choice in the education sciences is a mixed methodology, also known as *mixed methods research*.⁴ This is a natural and particularly pragmatic outcome of both the traditional quantitative *and* qualitative methods. Mixed methods research is actually a kind of methodological eclecticism that strategically marries qualitative and quantitative data into a coherent and harmonious union. Consequently, the research results are enriched. This mixed approach borrows from diverse methodologies, both qualitative and quantitative, depending on the research objective. The result is a kind of methodological pluralism. Moreover, a mixed research methodology facilitates the triangulation of research results. In fact, the use of diverse methods to ensure that researchers draw rigorous conclusions based on an assortment of research data is a highly promising research direction. Johnson and Onwuegbuzie (2004) also noted that mixed-method research usually generates superior results to those of single-method research.

It is only quite recently that *mixed methods research* has grown in use and recognition in education sciences circles, despite the fact that several authors have defended this union for almost 20 years. Indeed, the works of Mark and Shotland (1987), Reichardt and Gollob (1987), Brewer and Hunter (1989), Caracelli and Greene (1993), Van der Maren (1995), Behrens and Smith (1996), and Krathwohl (1998) all point out that the two approaches are usually opposed, when they could just as well be complementary (Van der Maren, 1995), allowing a more complete and sensitive understanding of the phenomenon studied (Moss, 1996, p. 22). Krathwohl (1998) stressed the importance of combining different methods as a way to better “attack” the research problem (p. 618).

He also stressed the importance of creative combinations of the diverse methodological elements in a coherent and organized manner so as to better address the research question. In addition, he felt that the only limits on researchers were their imaginations, and that research findings must be presented in a convincing manner (p. 27). Indeed, by choosing one particular method over another, certain benefits are lost while others are gained. Thus, Brewer and Hunter (1989) argue that each method has its own particular drawbacks, but fortunately, the drawbacks usually differ. They add that researchers can use a variety of imperfect research methods, combining their strengths while compensating for their respective drawbacks and limitations (p. 16-17). Johnson and Onwuegbuzie (2004) have gone further by proposing three major research paradigms: quantitative, qualitative and mixed research.

³ What is more, regardless of student preferences, a good number of universities still offer courses whose structures reflect this dichotomy. Students therefore must sign up for either qualitative or quantitative research.

⁴ Also called *mixed research*.

Our proposal for a PanAfrican Research Agenda on the Pedagogical Integration of ICT definitely calls for this new research methodology. It will not be a question of imposing a mixed methodology on this important project, to which our team is looking forward. Instead, we could choose from an eclectic assortment of data collection methods with the potential to address the research question and objectives. In some cases, a single quantitative approach might be best; in other cases, the qualitative approach might be preferable. In any case, a mixed methodology could be used as well. Clearly, however, it must be rigorously, rationally, coherently and harmoniously articulated. It must also be consistent with the overall research objective. Thus, by adopting the mixed research method, we will have to work with both qualitative and quantitative methodologies, with twice the rigor.

7.3 *Links between Phase 1 and Phase 2*

In keeping with the methodology identified for PanAf Phase 1, as well as adapting to recent methodological innovations, Phase 2 will maintain IDRC's tradition of rigorous data collection, analysis and knowledge sharing – through fieldwork, collaboration, and publication. Phase 2 will include capacity building in Outcome Mapping (Earl, Carden, Smutylo. Outcome Mapping, building learning and reflection into development programs, 2001) for participating researchers.

Phase 2 of the PanAf network will continue on the mixed-methodological path begun in Phase 1, combining quantitative and qualitative data collection, and dynamic instruments including audio and video recording. Basic statistics analysis, and summaries of qualitative data remain the two principle methods of analysis. As in Phase 1, the quality of the statistical analysis and the summaries shared on the Observatory is initially the responsibility of the national research teams. The raw data (including scanned questionnaires and recorded interviews) is also made available in the Auxiliary Documents section of the Observatory page for each institution. National research teams are also encouraged to update indicators as information becomes available – each indicator is “time stamped” to show how recent it is – adding to the dynamic, wiki-like style of the project.

As noted in section 4, the sample of participating institutions will remain purposefully unrepresentative of the general state of African education systems, and will instead be selected for their ability to convey best the practices and particular challenges experienced by leading primary, secondary and tertiary institutions across the continent. The means of dissemination of research results will remain open, with raw data made immediately publicly available on the Observatory in a “wiki” style, and with the specific expansion of scientific, policy, and practitioner-focused writing.

7.4 *Strengths of the proposed study*

A key strength of the present study is undoubtedly the research methodology retained. Multi-case studies are rarely encountered in the education research field. And yet, this approach is well suited to the issues, research question and objectives of this proposed PanAfrican Research Agenda on the Pedagogical Integration of ICT. The originality of Yin's (2000) multi-case study is certainly an asset that could facilitate the uncovering of basic convergences between ICT and teaching/learning in completely different contexts, on the one hand, and distinguish innovations particular to each context on the other. Thus, according to Merriam (1988), an investigation conducted in different settings will obtain a more global, complete and extensive perspective on this phenomenon. Similarly, Van der Maren (1993: 17) emphasizes that the case study above all reveals general, if not universal, features, based on a detailed and thorough study of one or more cases.

7.5 Triangulation as a methodological precaution

An important element in all education research is triangulation, which means viewing research results from diverse perspectives. The mixed approach can be incorporated as a very valuable element in the triangulation procedure. According to Bogdan and Biklen (1992), research validity resides primarily in determining whether the data collected by the researcher actually correspond to the phenomenon studied. Triangulation is a common, practical and relevant method to offset validity bias. Thus, triangulation validates the researcher's hypothesis through diverse verification methods.

Methodological triangulation combines dissimilar methods such as interviews, observations, and physical evidence to study the same unit (Merriam, 1988: 69).

The rationale for this strategy is that the flaws of one method are often the strengths of another, and by combining methods, observers can achieve the best of each, while overcoming their unique deficiencies (Denzin, 1970: 308).

The achievement of useful hypothetically realistic constructs in a science requires multiple methods focused on the diagnosis of the same construct from independent points of observation through a kind of triangulation (Campbell and Fiske, 1959: 81).

According to Stake (1995), aside from the use of different methods, an excellent way to triangulate research results is to review the phenomenon studied in light of the collected results to ensure good correspondence with the perception of the phenomenon.

In Phase 1, all the researchers under this project had to adopt this method for a given indicator. Methodological workshops were also be very useful, since they helped set the methodological guidelines and foster complementarities between the methods used by the different researchers, as appropriate. Consequently, all the researchers used the same methods for a given indicator. This also applies for Phase II.

7.6 Main data collection instruments (mainly for additional countries, institutions, indicators)

In addition, as suggested by Yin (2000), the investigative methods used in a multi-case study must be standardized to a certain extent. It is therefore important for researchers to use similar data collection instruments as far as possible. As in Phase 1, Phase 2 research program that we are undertaking will include four main data collection instruments:

- Survey questionnaires
- Interviews (individual and group)
- Class observation checklists
- A compendium of textual data.

As explained by Krathwohl (1998) and Van der Maren, the survey questionnaire has the advantage of achieving rapid contact with a large number of people. It will be very useful for our research project, particularly to obtain responses to the diverse indicators requiring consultations with specific populations (students, educators, etc.). For example, to respond to an indicator showing learner and educator ICT usage, national teams could administer the survey questionnaires and hence reach a substantial number of subjects relatively rapidly and easily.

Goyette (1994) describes the interview procedure as shedding light on the research process through an informal conversation. He further explains that the interview procedure facilitates the planning, conduct, and even the analysis of the interview. Mishler (1986) stresses the need for properly trained interviewers. A well-prepared interview is more likely to obtain more accurate and relevant information on the research topic in question. On the other hand, a badly prepared or inexperienced interviewer would be less likely to obtain meaningful research data (Mishler, 1986).

During the interview, the subject should always be encouraged to speak on the issue at hand. According to Mishler (1986), it is essential to keep the subject directly on topic. Finally, the conclusion is the last step of the interview (Mishler, 1986). At this point, the interviewer should ensure that he/she has truly understood what the respondent wanted to say by summing up the responses for the interviewee's approval. This constitutes a form of triangulation (Stake, 1995), since the subject is "confronted" (Huberman & Miles, 1994) with the collected data.

As part of this research project, we will draw up an interview guide to make the interviews semi-structured (Sedlack & Stanley). For instance, the interviews could enable the national teams to better understand the difficulties that teachers encounter in the pedagogical integration of ICT in Africa. Aside from information on the general use of the methodological approach to be developed, we will offer a methodology workshop with specialized training in administering the interview guide.

We will also conduct classroom observations, which will be made available on the Observatory so that researchers worldwide could view African classrooms along with analyses of the observations performed by African researchers. The national teams involved with the project will be in charge of filming certain classrooms. To systematize the observations made, we will use a classroom checklist. Note that the observation checklist will serve as a basic research tool—an instrument to enable rapid retrieval from sound or video recordings of the interactions relevant to the study. Using the observation checklist, researchers could readily retrieve a significant event for transcription and further examination. Finally, the observation checklist will only be used with sound- or video-recorded classes.

The compendium of textual data will primarily gather, organize, analyze and synthesize diverse documents that are closely related to the Observatory indicators. To cite a previous example, we plan to gather all the ICT policies in African countries.

7.7 Video observation

In order to address the challenges of pedagogical integration of ICTs, sharing concrete experiences with education practitioners and policy decision-makers, PanAf Phase 2 will produce and make available on the Observatory, two videos per participating country exemplifying best practices. On the one hand these videos will provide observational data for further analysis of pedagogical integration of ICTs, on the other they will serve in and of themselves as examples for practitioners and policy-makers across Africa. The Observatory, at the end of Phase 2, will contain at least 24 videos - virtual demonstrations of pedagogical integration of ICTs for other education stakeholders

As noted in *L'utilisation de la vidéo en classe* by Goyer (in press), the practitioner must first decide what type of video to use, in which context. Video styles vary widely - from feature length, to short, from documentary to journalistic etc. It is important to determine the style (particularly research versus fiction) and nature of the video to be created. As much as possible, research shows that 10 to 15 minute films are most appropriate for use in classrooms, (and therefore it is this type of video that should be created for pedagogical integration within the context of the PanAf network. Researchers

should keep in mind that videos must have a pedagogical intention, and "add-value" to learning activities. How, then, can practitioners apply video pedagogically including to learning activities and documentation?

A variety of modes of video application have been successful in enhancing the quality of teaching and learning, particularly when paired with activities before, during or after the presentation. Concrete ideas for the application of video to both research and practice will be developed throughout PanAf Phase 2, including as a method to stimulate communication, reflection, and observation.

7.8 Data treatment and analysis

Because the data will include figures, texts, images, photos, etc., following the above-presented arguments, quantitative analyses will also be appropriate for this research project, with an explicit invitation to use qualitative methods as well. Qualitative data analyses will be carried out using a coding strategy with classification codes and precise coding categories. Accordingly, codes will be assigned to define the qualitative variables. In addition, the data categorization could incorporate many levels of definition.

The qualitative data analysis strategy was derived from the approaches proposed by L'Écuyer (1990), and Huberman and Miles (1991, 1994). We have adopted the *content analysis* approach (see Table 2). According to Sedlack and Stanley (1992), and L'Écuyer (1990), content analysis is a classification method whereby the diverse elements of the material analyzed are coded to allow a better understanding of the characteristics and meanings (L'Écuyer, 1990; p. 9).

Table 2 General model for the content analysis procedure (adapted from L'Écuyer, 1990)

<i>Step</i>	<i>Characteristics</i>
I	Reading of the collected data
II	Definition of the classification categories for the collected data
III	Categorization of the collected data
IV	Quantification and statistical data treatment
V	Scientific description of the studied cases
VI	Interpretation of results from step V.

Note that L'Écuyer's model will be well suited for analyzing interviews, classroom observations and other situations as well as political speeches and official documents, among others.

An adapted content analysis strategy will be used to analyze the substantial body of data collected in this multi-case study. Thus, data obtained from the different sites will be coded according to the predetermined indicators as well as other indicators that might arise from the collected information. These data will then be categorized under a codification procedure. To illustrate, for the "National education and ICT policies" indicator, a mixed coding could be used to analyze the contents of political speeches on the subject of pedagogical ICT uses. This indicator will precisely identify various kinds of information such as 1) availability of documents and texts addressing national ICT policies; 2) education sector(s) covered by the documents or texts; 3) existence of a specific national ICT education program; 4) availability of regulation, monitoring and incentive programs for ICT access (connection, equipment and training); 5) local developments in ICT educational activities, etc.

Furthermore, the indicators could provide accurate reports on current usages of computer units for ICT applications. This data analysis strategy will also highlight the salient data that emerges and allow per-site classification. Comparisons and explanations that arise could be measured against the study objectives.

The qualitative analyses will be performed with NVivo 2.0, commonly used in qualitative research data analysis (O'Connor, 2002; Willis & Jost, 1999). NVivo will be very useful in combination with Merge Module to pool the data from various sites. Methodology workshops will be offered to train researchers in Nvivo so they could better comprehend, understand, handle and manipulate the compiled data. Also, the workshops will help the research team fine tune the methods to address the specific research questions.

For the quantitative analyses, SPSS 13.0 and LISREL 8.51 will be used to perform descriptive and inferential statistics, including variance analysis to better understand the impacts of ICT on teaching and learning.

8. PHASE 2 – ACTIONS AND ACTIVITIES

8.1 Research activities

The PanAf agenda's sustained effort to focus on the challenges presented by the pedagogical integration of ICTs in teaching and learning is shaped by the results and priorities of Phase 1 of the project and its community of researchers, and will consist in brief of:

- concerted dissemination efforts,
- new partnerships,
- and continued collection and analysis of new as well as existing data.
-

As noted above PanAf Phase 2 is made up of precise research objectives that respond directly to needs flowing from the general objective. The major research themes of the project are expressed in the 12 categories of indicators for which data is currently available on the Observatory. These indicator categories will serve as the foundation for thematic and comparative analysis in the course of Phase 2. Among the actions of these analyses will be networks of collaboration between researchers working on similar or complimentary themes, as well as ensuing scientific and practical publications that are at the heart of the project's objectives.

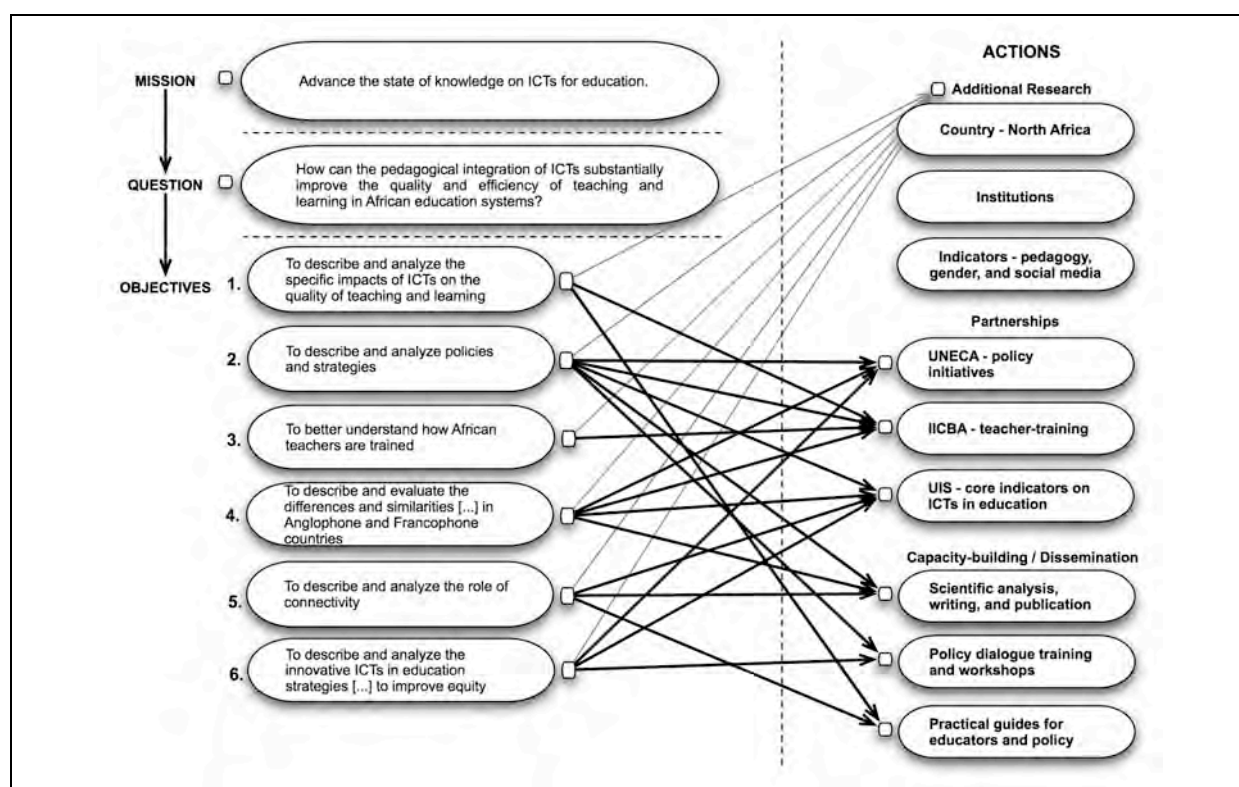


Figure 3: Links Between Mission, Research Questions, Objectives and Actions

Through the research actions of PanAf Phase 2, described below, the project will directly address its specific objectives, and have a substantive impact on the quality of the pedagogical integration of ICTs in education systems across Africa.

9. PHASE 2 – SPECIFIC ACTION – SUPPLEMENTARY DATA COLLECTION AND ANALYSIS

As noted above, while the focus of PanAf Phase 2 will be analysis, dissemination and application of results from ongoing data collection, the Observatory will remain central to the project. Quality control, updating and adding additional data are an important part of ensuring the relevance and sustainability of IDRC's investment. Therefore, Phase 2 actions will include focused strategies to share new knowledge, from:

9.1 *Additional countries*

Add a North African national research team (initial links are underway with a Tunisian institution). As well, described in the Partnerships section above, a collaboration with the UNESCO Institute of Statistics will grant access to indicators from 25 pilot countries from around the world – this opportunity for comparative studies at a global scale will be invaluable to researchers in their efforts to contextualize the pedagogical integration of ICTs in Africa. Remaining open to other partnership opportunities, Phase 2 will welcome the addition of national teams who wish to contribute data to the Observatory and have secured independent funding to do so – for example, the PEDAGO-TIC project propose by the Fondation Paul Gérin-Lajoie in Burkina Faso and Bénin, financed by the Fonds francophone des inforoutes.

9.2 *Additional institutions*

Focus on two leading schools per participating country, with the goal of capturing best practices in the pedagogical integration of ICTs. Also, as described in the Partnerships section above, through a collaboration with the UNESCO International Institute for Capacity Building in Africa, Phase 2 will collect a full set of Observatory indicators from the largest public teacher training institution in each African countries – an unprecedented response to the question “How are African teachers trained in ICTs?”.

The Ghanaian national team, who joined the project midway through Phase 1, will likely increase their number of participation institutions from the initial five, to the more standard ten.

In all cases, researchers adding institutions to the Observatory will be responsible for the complete set of PanAf indicators, in order to maximize comparability.

9.3 *Supplementary indicators focusing on pedagogy*

PanAf Phase 2 researchers will collect (using new methods including video), analyze and share data for a selection of additional indicators, including those reserved for Phase 2 from the original set (specifically transnational indexes and rankings that are of particular interest to policy decision-makers) and a selection of others developed through the course of Phase 1 to prioritize the project's focus on pedagogical integration and to address issues of the broadening definition of "technologies" beyond computers in classrooms. The following lists potential new indicators to be pursued in all PanAf Phase 2 participating institutions...

Specifically addressing pedagogical integration (inquiry regarding pedagogical integration – “teaching and learning with/through computers”, rather than “teaching and learning about computers”):

- Institution ICTs-connectivity and ICTs-enablement indices;
- Pioneering initiatives in ICTs for teaching and learning;
- Perception of parents (or community-members) of the relationship between the first language(s) of the learners and ICTs for learning;
- Reflection by educators and learners on the relationship between ICTs and the quality of - spelling and vocabulary, exam preparation/results, reasoning skills, knowledge of other cultures, attitudes towards school/learning, self esteem.
- Reflection by graduates (associated with a specific participating institution) on the relationship between ICTs integration in their education as preparation for employment opportunities.

Specifically addressing gender issues (adding depth to the sex-disaggregated indicators in Phase 1):

- Perceptions of female and male educators and learners of the quality of teaching and learning with ICTs;
- Perception by educators of constraints to the use of ICTs for learning by female and male learners;
- Perception by female and male educators of the benefits of ICTs to the quality of their teaching;
- Types/examples of ICTs use for learning (disaggregated for female and male learners).

Specifically addressing a broader definition of ICTs (PanAf Phase 1 limited its definition of ICTs to computers in schools. Phase 2 will attempt to address various stages of pedagogical integration, including computers in classrooms, omnipresent computers, and eventually new mediums including mobile handsets, which appear to have promising role in the delivery of university courses):

- Reflection by educators and learners on various points of access to computers/Internet (cybercafé, home, mobile...).

10. PHASE 2 - SPECIFIC ACTION – A SPECIAL FOCUS ON GENDER AND ICTS : CINDERELLA OR CYBERELLA?

From the literature review, research on ICTs and gender centres on three themes: women's access to ICTs; women's ICTs usage and expertise; and ICTs access and use equity between men and women.⁴ The results do not prove the hypothesis that gender issues go away because the Internet is a virtual environment. It appears that the virtual space is still dominated by men, and that some spaces initially occupied by women were later taken over by men. Women's limited access to ICTs would certainly result in negative educational and economic actions.

The little research that exists on ICTs and gender in the Southern countries aims to identify the barriers to women's access and use of ICTs and the solutions that should be implemented, but it does not explore structural issues. These studies are also combined with studies on poverty, demonstrating that economically "poor" women are the most disadvantaged in society. The barriers include lower literacy and education levels, time and cost constraints, geographical locations of access points, insufficient number of computers, sociocultural norms, and lack of information processing skills.

Overall, we note that ICTs projects have been carried out in the Southern countries without adapting technical solutions and management approaches to the characteristics, needs and contexts of the countries. It would be important to develop tools to better collect and analyze quantitative and qualitative data on the tendencies of men and women to access and use ICTs and to identify the needs and aspirations of men and women in this area.

The PanAf Observatory is a unique source of data for an examination of social factors in the application of information technology to education in Africa. Disaggregated data is vital to unmask internal inequalities while aggregate data allows for vital national and regional comparisons. The variables in the Observatory indicators offer the possibility of comparing the situation of learners and teachers in varying social contexts within African countries to see divides that might otherwise be overlooked between rural and urban locations, private and public schools and by gender. Aggregate data is then needed to make more general comparisons regarding the use of ICTs in education between Africa countries and with other regions of the world.

Given the opportunities presented for further investigation, in PanAf Phase 2, a small group of researchers under Dr. Hafkin's leadership will continue to focus on analysis and writing specifically from a gendered perspective.

Additional gender-focused findings from Phase 1 are presented in Annex III.

11. PHASE 2 - SPECIFIC ACTION – STRATEGIES TO IMPROVE SCIENTIFIC PUBLICATION ON ICTS IN EDUCATION IN AFRICA

PanAf Phase 1 was exceptionally successful in producing a baseline “portrait” of data on the pedagogical integration of ICTs in schools across Africa. An initial “writing workshop” in Johannesburg, South Africa in February 2008 took first steps towards developing a culture of publication in the PanAf network. Therefore, Phase 2 will move the project along the scholarly publishing route. Doing so, the team leaders are committed to give all the participating African researchers and academics the tools, the capacity (through a series of workshops), and the possibility to publish. More precisely, Phase 2 will focus heavily on analyzing and sharing this new knowledge, building on IDRC’s legacy of writing and publication capacity building. In Phase 2, investment will be made in the publication of papers and other documents based in Observatory data, by participating African researchers. This will be grounded in:

- Organizing qualitative data analysis workshops, writing workshops, etc.
- Rigorous analysis of the existing data - focusing on transnational and thematic lessons-learned on subject of the pedagogical integration of technologies.
- Continuing to encourage scientific dissemination through communication in international, relevant conferences such as eLearning-Africa, and the Society for Technology and Teacher Education.
- Continuing to encourage scientific publication based on Observatory data - supporting thematic transnational research projects (and strengthening the capacity of researchers, institutions, and graduate students, within the participating countries).
- Continuing the policy dialogue initiated in each participating countries at the end of Phase 1.
- Producing practical publications to support research, classroom practices, and teacher-training (including a Handbook for Research on the Pedagogical Integration of ICTs in African Schools; Handbook for Research on the Pedagogical Integration of ICTs in Africa: 50 strategies for educators - a practical guide for educators; Road Map for a Successful Integration of ICTs in African Schools – a brief pamphlet for educators and school administrators).

11.1 *Strengthening research capacity*

Apart from promoting the sharing of information and expertise, the PanAf Observatory will address the current shortage of scientific publication and collaboration among the researchers. One of the chief benefits of the project would be the strengthening of research capacities in Africa. It is noteworthy that, although the case for ICTs and their integration into the teaching/learning process has been demonstrated and acknowledged, this project would produce further benefits through the acquisition of new research knowledge.

If developing African countries are to escape from the research rut in which they are caught, they need to embark on large-scale research projects that reach larger audiences. This would be

essential for the mutual strengthening of research capacities among African researchers. All project participants would greatly benefit from the store of research methods and tools available on the Observatory. Moreover, the range of methodological approaches adopted would strengthen research capacities and be instrumental in obtaining better and more coherent research results in a medium-term perspective. Using the key elements to strengthen research capacities, as explained below, the countries could work with the entire body of data on ICTs integration, drawing from a variety of sources as well as interfaces between authors of previous works and users of those works. Finally, to strengthen their capacities, the partner countries would also have to be willing to participate in the project.

As previously demonstrated in numerous studies on the pedagogical integration of ICTs, this project should have a major impact on the capacity development of teachers and researchers. The quantity and quality of the data for collection and analysis would help researchers develop their knowledge and professional abilities, and would also constitute a training resource for improving teaching practices and scientific undertakings.

This research project therefore offers multiple scientific benefits. The research model would allow researchers from the participating countries to develop their capacities to assume shared responsibility for the research data and results they produce. The sequencing strategy for the data collection and in-depth analysis steps would help the researchers develop at each level the critical stance and synthetic approach required for sound scientific research. Furthermore, since the data collection would be carried out across a variety of primary, secondary and tertiary schools as well as diverse professional, technical, specialized and partner organizations, the resultant research dynamics would promote greater collaboration and shared responsibility.

These are some of the chief dividends that would help develop and strengthen researchers and contribute to national research, with a view to comparisons with similar international studies using similar tools and indicators. The national researchers and research teams and scientific committees would have opportunities to voice their opinions, independently of their country, on the overall study results. This would be an undeniable asset, as it would encourage a general openness to other people, ideas and realities. Through the data confrontation process and exchanges of views from many African perspectives, combined with an objective oversight by scientists from abroad, very high quality results should come out of this international research project.

Because the research focuses on the pedagogical integration of ICTs from primary to tertiary school, it would also contribute to strengthen research capacities in many African educational institutions through national and/ or sub-regional methodology workshops. They would be held with the aim of adopting a consistent investigative approach and results distribution procedure. These methodology workshops would help teachers and researchers improve their skills in data collection and processing as well as publishing the results of their work. Furthermore, this study would help reinforce collaboration between researchers within the countries, while fostering bilateral and international cooperation between researchers and institutions within and between countries. In addition, this study would facilitate coordinated research initiatives on ICTs use among the various African educational institutions. At the same time, this research would confer more widespread recognition on national experiments in the pedagogical integration of ICTs.

11.2 Analytic capacity building

Referred to as “writing workshops”, PanAf Phase 2 will include several opportunities for participating researchers to build their analytic and writing capacity, with the specific objective

of creating publishable articles based in Observatory data (see Figure 4 below). As opposed to past workshops, these will be smaller group gatherings, delivered in a single language, over a greater period of time.

In PanAf Phase 2 the principal strategies to support scientific publication based in Observatory data will include a series of four writing workshops where participants, in small groups (2-3 country teams per workshop) will proceed from the first stages of writing, to the submission of an article for publication.

Specifically:

- Five-day writing workshops with a ratio of at least 1:4 trainer to participants, where researchers emerge with an article ready to submit for peer review; and five-day writing workshop with a ratio of at least 1:4 trainer to learners, where researchers from different countries, in teams of two, emerge with an article on a comparative transnational theme ready to submit for peer review.

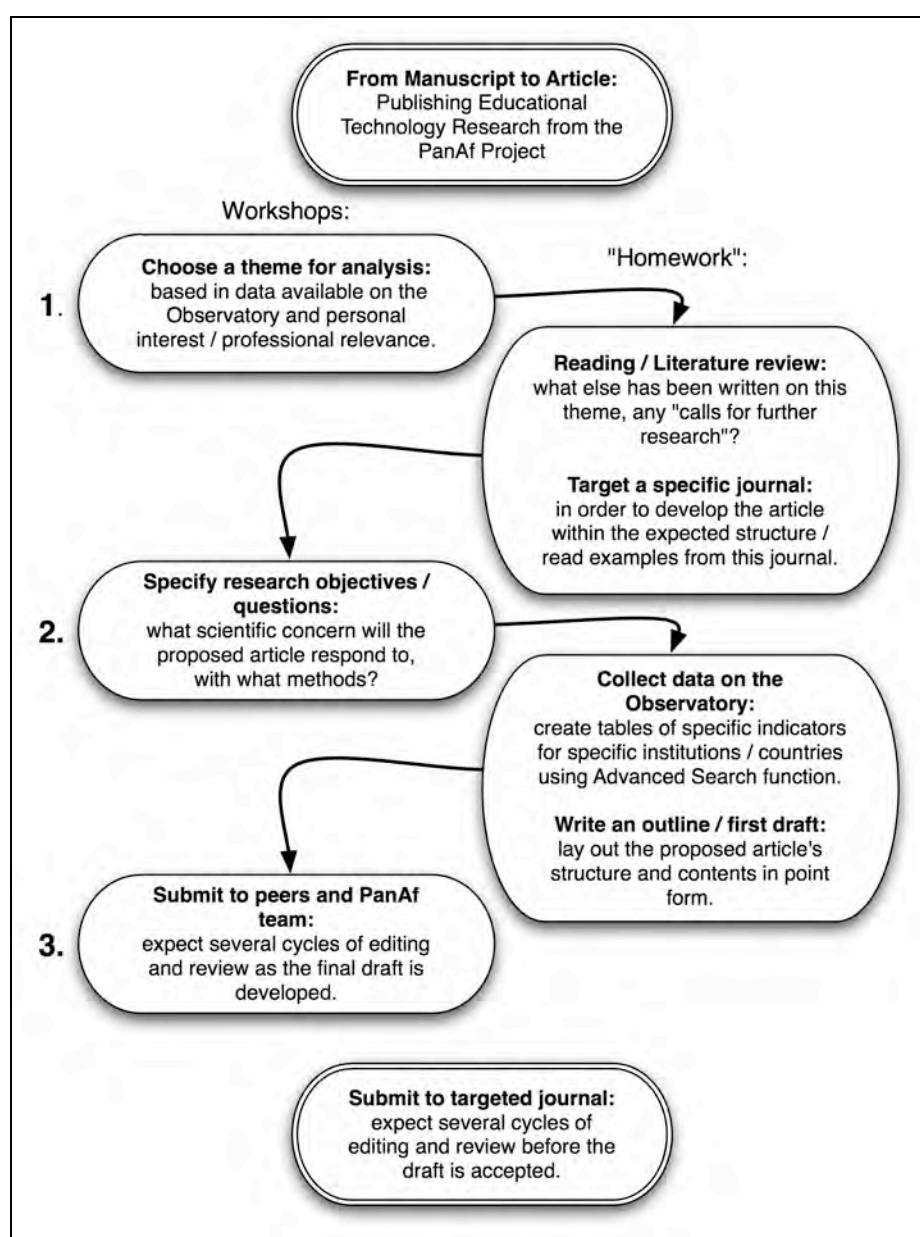


Figure 4: From manuscript to Article or Sample Writing Progression Planned in Phase II.

Through this strategy, in the two years of Phase 2 (2009-2011), the PanAf network aims to support the development of some 50 scientific articles on the pedagogical integration of ICTs in Africa. Initial analysis of the data demonstrates opportunity for articles on an unprecedented breadth of ICT4ED in Africa topics – beginning perhaps with a comparative analysis of the continent’s national ICT in education policy documents. Additionally, the project will establish more formalized online resources to support researchers in their analysis, writing and submission of articles for publication. The project will continue to offer remuneration to researchers tied directly to the number of articles a) submitted, and b) accepted by scientific journals. There will also be investment across Phase 2 to support dissemination of research results in alternate forms, including through participation in international conferences. Researchers will continue to be invited to participate in conferences such as eLearning-Africa, and The Society for Information Technology & Teacher Education (SITE).

11.3 Available data

The unprecedented depth of data made available by the PanAf network in its first phase, in order to support scientific, political and practical analysis and writing in Phase 2, is illustrated in Figure 5 below.

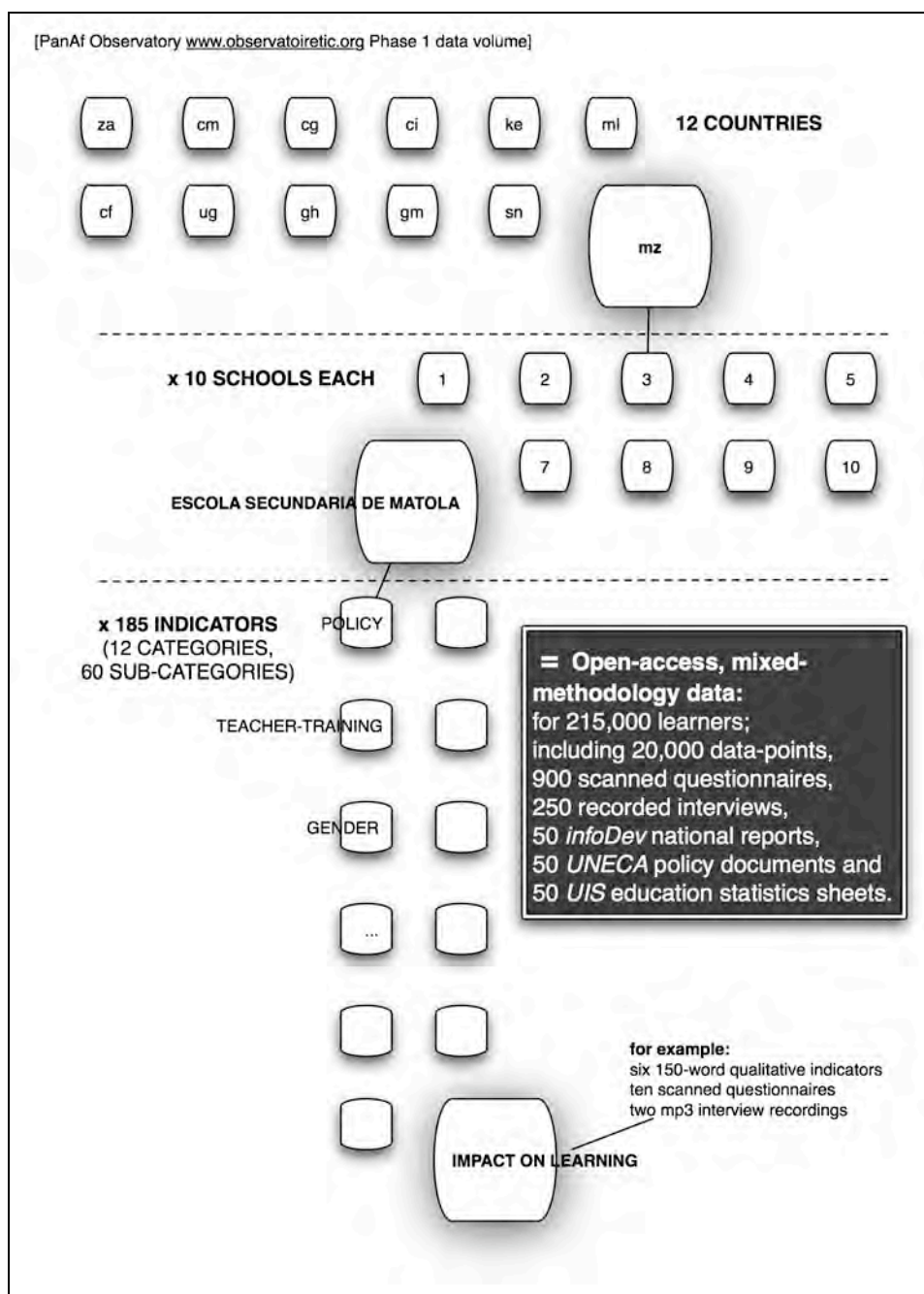


Figure 5: Depth of Data Available on the Observatory for Phase II Analysis.

11.4 Practical guides

Building on the Phase 1 publication *Successes and Challenges of ICTs in teaching and learning: 100 African schools*, and in addition to initiatives aimed at scientific publication and policy dialogue, PanAf Phase 2 will produce practical guides for education researchers and practitioners. Based in analysis of the Observatory data, and condensed from the scientific described above, these guides (or “handbooks”) could take the form of wikis - for example: http://ltc.umanitoba.ca/wikis/etl/index.php/Handbook_of_Emerging_Technologies_for_Learning or educational YouTube-style videos to communicate research results to a broader audience.

The subjects of these practical publications would be ICTs integration competencies for educators and school managers, and ICT4Ed research competencies for researchers – for example:

- Handbook for Research on the Pedagogical Integration of ICTs in Africa: strategies for education researchers,
- Road Map for a Successful Integration of ICTs in African Education Systems: strategies for policy decision-makers and development practitioners,
- Principles and Guidelines for Successful Pedagogical Integration of ICTs in African Schools: strategies for educators and managers.

12. PHASE 2 - SPECIFIC ACTION – POLICY DIALOGUE

With their phased integration into African educational institutions, ICTs are attracting increasing attention from governments who see them as tools to raise the quality of teaching and learning at a national scale. Programs and projects to equip schools are underway, and some countries have prioritized this area through the development of education sector ICTs policy strategies. However, in general, studies demonstrate that Sub-Saharan African governments lack the capacity and expertise to develop and implement such strategies and policies effectively. More worrying still is the fact that in a number of countries there is no state body responsible for the coordination of this sector, which is marked by a certain anarchy arising from the multiplicity of initiatives both public (government, bilateral and multilateral cooperation) and private (enterprises, NGOs, patronage, etc.). So that interventions in this area might have a meaningful impact, it is necessary to initiate and support fruitful dialogue between different stakeholders in the education system. High quality PanAf network data and analyses are already made available via the Observatory to policymakers and practitioners in order to inform, develop and implement ICTs integration in educational institutions. Formal policy dialogue sessions further the accessibility of these research results and ensure that the project’s future work takes into account current needs and priorities expressed by the national education development community.

PanAf Phase 2 will include the continuation of fruitful dialogue between researchers and education stakeholders, particularly policy decision-makers, at the national and regional scale. National teams have the responsibility to synthesize and communicate their research results for a policy decision-making audience. With the goal of supporting evidence-based ICTs, Education, and ICT4Ed policies at the national scale, PanAf national research teams must both create a space for dialogue on a new and oft-overlooked subject, as well as develop clear

recommendations for curriculum reform, teacher-training, school management, and other topics aligned with the major themes of the project. The more specific the researchers' recommendations, the more clearly they are communicated, and the more appropriate the individuals identified to participate in the dialogue, the more effective the potential actions.

Existing regional integration organizations across the continent offer spaces and opportunities for policy dialogue in the framework of sectoral programs such as education, a chief priority. These would be suitable venues for establishing collaborative relations with organizations such as the Union Économique et Monétaire Ouest Africaine (UEMOA), the Communauté Économique des États de l'Afrique de l'Ouest (CEDEAO) in West Africa, the Communauté monétaire et économique d'Afrique centrale (CEMAC) in Central Africa, the Union du Maghreb arabe (UMA) / Arab Maghreb Union (AMU) in Northern Africa, the Southern African Development Community (SADC) and the Common Market for Eastern and Southern Africa (COMESA) in East and Southern Africa, and the Union africaine (UA) / African Union (AU). Continent-wide and internationally, the Association pour le développement de l'éducation en Afrique (ADEA), the Commonwealth of Learning and UNESCO offer frameworks for dialogue with decision-makers. ROCARE has acquired extensive experience in this field of political negotiation, which could be leveraged to further develop relationships.

Beginning with the "communication for influence" capacity-building workshops, PanAf policy dialogue interventions at the national scale will be cyclical over the course of Phase 2.

12.1 Strengthening policy dialogue capacity

The link between the unprecedented data now available and its potential to influence evidence-based improvements in teaching and learning lies in PanAf researchers' ability to communicate results of their analyses to policy decision-makers.

Phase 1 concluded with national policy workshops undertaken by the research teams in each country in order to present their fieldwork, gather recommendations from stakeholders, and begin a dialogue to improve policy based on research results.

In order to make this dialogue sustainable and effective, building on a model pioneered by DFID, PanAf Phase 2 will include "communication for influence" capacity-building workshops. Independent of scientific writing workshops, "communication for influence" involves strategies for targeted and measurable impact on national ICT in education policy.

13. PHASE 2 – SPECIFIC ACTION – PARTNERSHIPS


In recent years, Africa has seen a growing number of initiatives to improve ICTs access in schools. Aside from the IDRC, several other national, regional and international public and private organizations have set up programs and projects to expand ICTs uses for teaching and learning purposes. In addition, there is Schoolnet, the Nepad eSchools, WorldLinks and infoDev, under the World Bank, The African Virtual University, etc. Some of these players, such as the

Nepad eSchools and infoDev, have undertaken ambitious data collections to gain deeper knowledge of the sector.

Other organizations, such as UNESCO's International Institute for Capacity Building in Africa (IICBA) and the RESATICE online resource network, specialize in research on ICTs in education, which would be very useful for the PanAfrican Research Agenda.



All these organizations are potential partners for this project. Contacts have already been initiated, and some have expressed a willingness to collaborate by providing information to the Observatory. The forms of partnership could vary across institutions according to their area of expertise. Useful complementarities could be identified, and the Observatory could offer a common platform for improved data collection and analysis on the state of ICTs in education, an area in which Africa is severely lacking.

In support of project objectives, PanAf Phase 2 will continue to establish strategic partnerships with complimentary institutions and projects working in ICT4ED in Africa - in line with IDRC's belief that communication and partnerships is key, between organizations and between networks.

In Phase 1, the Observatory partnered with the World Bank's infoDev  program to communicate their national ICTs in education report for each African country. This summary of the state education system and ICT4Ed challenges and initiatives in each country balanced the institutional scale data that is the focus of the PanAf network, and provided an alternate channel of communication for infoDev's research results.

In Phase 2, the Observatory plans to expand this adaptive style of collaboration with international organizations. Three potential initiatives are already underway:

- Partnership with UNECA's National Information and Communication Strategies (NICI) program to communicate up-to-date African ICTs policy information via the Observatory.
- Partnership with UNESCO's Institute for Capacity Building in Africa (IICBA) to create an Observatory profile for the largest public teacher-training institution in each African country.

- Partnership with UNESCO's Institute of Statistics   to communicate results from the pilot phase of their recently developed national ICTs in education indicators.
- Partnership with other international, bilateral and local education development organizations and programs, including perhaps SchoolNet, AVU, AAU, NEPAD eSchools, AUF, GeSCI, and APC etc.

14. EVALUATION OF THE PROJECT

For this phase of the project, we strongly believe that regular meetings between IDRC, ERNWACA and the University of Montreal team will ensure the success achieved in Phase I. Nevertheless, we also believe that an external evaluation will also help the research team achieve high standards. Our team strongly believes that an external evaluation could bring to this project :

- new perspective;
- have a capacity building benefit for the PanAf researchers;
- assist the management team with appropriate performance measures;
- add value to the evaluation plan;
- be seen to be adding objectivity to the PanAf project;
- evaluation report is more likely to be seen by IDRC (and others) as a more objective measure of success than an evaluation managed by ourselves.

Nevertheless, though the management team is more that opened to welcome an external evaluator, it is important to note that the International scientific committee already serves as an external evaluation unit. Also, the following should be taken into account before deciding to bring in an external evaluator:

- an external evaluator should have specific expertise that can assist with planning and implementing the evaluation;
- detailing the role of the external consultant also needs careful thought.

15. INSTITUTIONAL FRAMEWORK

The Educational Research Network for West and Central Africa

ERNWACA, whose regional office is located at the Institut Supérieur de Formation et de Recherche Appliquée (ISFRA) in Bamako, Mali, would be jointly responsible with the University of Montreal team for project coordination in Africa. ERNWACA is a bilingual network of 400 researchers with over 17 years of experience in trans-national and networking research. ERNWACA works to mobilize researchers and partners and strengthen capacities, research, policy dialogue, scientific publication and institutional development. ERNWACA was created in 1989 by researchers following a seminar held in Freetown. Its regional coordination office is housed by the Institut Supérieur de Formation et de Recherche Appliquée (ISFRA) in Bamako, Mali. In collaboration with the IDRC, ERNWACA's mission is to promote African expertise so as to positively influence education practices and policies. ERNWACA would be represented by Djénéba Traoré, who would act as Regional Coordinator for the project.

Djénéba Traoré has been a Professor of Higher Education at the École Normale Supérieure (ENSUP) et à la Faculté des Lettres, Langues, Arts et Sciences Humaines (FLASH) of the Université de Bamako in Mali, since 1985. Pr Traoré has a PhD in social science from Humboldt University in Berlin (Germany), a DESS in the Pedagogical Integration of Technologies from the Faculté des Études Supérieures de l'Université de Montréal (2006) and a Masters in Grman from

the ENSup. In Bamako (1979). As Coordinator of the Réseau Ouest et Centre Africain de Recherche en Education, she is responsible for strategic and partnership development. Her management has contributed to greater visibility for ERNWACA research and greater demand for researcher services.

The Université de Montréal

Scientific development and the advancement of knowledge at the Université de Montréal are part of a long tradition of research that dates back to its early years. Basic or applied, theoretical or practical, research at Université de Montréal covers the full range of modern thought and encourages interdisciplinary research.

The Université de Montréal, which ranks second among Canada's most active institutions of higher learning in terms of research and development, with close to \$400 million in research funding, enjoys an outstanding reputation in the international scientific community.

The Faculty of Graduate Studies, which boasts Canada's largest body of graduate and post-graduate students, attests to the dynamic and collaborative spirit of UdeM's research teams made up of professors, researchers and graduate students. The University of Montreal, Canada, and more specifically the Faculty of Education Sciences, would coordinate the project jointly with ERNWACA. The project would particularly benefit from the acknowledged expertise of the contact network of the Canada Research Chair in Information and Communication Technology (ICT) in Education. Professor Thierry Karsenti, Chair holder, would be responsible for scientific aspects of the project. He is a full professor at the University of Montreal, where he teaches in the area of ICT Integration into Teacher Training. His accomplishments and technopedagogical innovations in distance learning have been recognized province-wide and across Canada. He has obtained several Awards of Excellence from the Canadian Association of Distance Education for teaching and pedagogical innovation. He has also earned distinction for his research contributions to the quality of university pedagogy. His research interests lie in the pedagogical integration of new technologies, pedagogical practices of teachers, open and distance learning, and motivation. Note also that besides organizing numerous micro programs to integrate ICT for purposes of distance teacher training in Africa, Professor Karsenti is the principle designer and overseer for the first distance Ph.D. program in Education with a specialization in ICT integration. He also acts as a consultant for several organizations (UNESCO, the World Bank, IDRC, AUF, la Francophonie, etc.), various authorities (Canadian government, the Ministère de l'Éducation, du Loisir et du sport du Québec) and groups concerned with education. In connection with diverse projects aimed at reducing the digital divide between the Northern and Southern countries, Professor Thierry Karsenti is also responsible for several projects addressing educational technologies in Africa. He is also President of the Réseau international francophone des établissements de formation de formateurs (RIFEFF), which regroups over 450 establishments from Francophonie member states that train teachers, and is a founding member of the Réseau pour la Formation des maîtres en Afrique.

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ANNEXES

ANNEX I. PHASE I REVISITED – OBJECTIVES, RESEARCH QUESTIONS AND ACCOMPLISHMENTS

IDRC's Acacia program rests on the statement that:

Research on ICTs in education in Africa remains rare. [...] a niche for Acacia in supporting research that contributes to a better understanding of the educational uses of ICTs in the socio-cultural context of Africa; that produces evidence that can inform the main stakeholders (policy-makers, practitioners, researchers, parents, students, etc.); and that promotes the formulation and implementation of policies and reforms supporting the introduction of ICTs in the educational systems.

The purpose of the PanAfrican Research Agenda on the Pedagogical Integration of Information and Communications Technologies (ICTs) is to contribute to this broadening process and to participate in the access, construction, and production of knowledge in the information era.

The PanAf network's aim is to better understand how the pedagogical integration of ICTs can enhance the quality of teaching and learning in Africa.

The first phase of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs (PanAf) has been successful in:

- Establishing dynamic research teams in 12 Sub-Saharan African countries.
- Creating an open, online Observatory where researchers currently share approximately 20,000 data points for 180+ indicators along 12 themes, from 100+ African schools (including hundreds of downloadable raw data files including policy documents, recorded interviews, scanned questionnaires, and examples of ICTs in teaching in learning).
- Initiating processes to encourage academic and practical publications by participating African researchers.

In line with IDRC's objectives to encourage free and open access to information, that flows through new ICTs networks, and enhances the ability to create knowledge, the greatest strengths of the project's Phase I outputs include unprecedented access to qualitative and quantitative, socially and gender-disaggregated, school-scale knowledge - via an innovative open access database. The Observatory itself is the primary output of the PanAf research project – however it is important to view it not as a product of the participating researchers' efforts but rather a structure central to the project, which houses the results of their work. It is an unprecedented knowledge resource owned and updated by African researchers in the field.

A.1 National research teams

The twelve national partner research institutions that participated in PanAf Phase I are:

- School of Education, University of the Witwatersrand (Wits), Johannesburg, South Africa
- Département de Sciences de l'Education, Ecole Normale Supérieure, Université de Yaoundé I, Yaoundé, Cameroun
- École Normale Supérieure, Brazzaville, Congo
- École Normale Supérieure, Abidjan, Côte d'Ivoire
- School of Continuing and Distance Education, University of Nairobi, Kenya
- Département des Sciences de l'Éducation, Institut Supérieur de Formation et de Recherche Appliquée (ISFRA), Bamako, Mali
- Department of Evaluation and Research, National Institute for Education Development (INDE), Mozambique
- School of Adult Education and Communication Studies, Makerere University, Kampala, Uganda
- École Normale Supérieure, Bangui, République Centrafricaine
- Faculté des Sciences et Technologies de l'Éducation et de la Formation (FASTEF), Université Cheikh Anta Diop de Dakar (UCAD), Dakar, Sénégal
- Science and Technology Department of the University of the Gambia, Banjul, The Gambia
- University College of Education, Winneba, Ghana

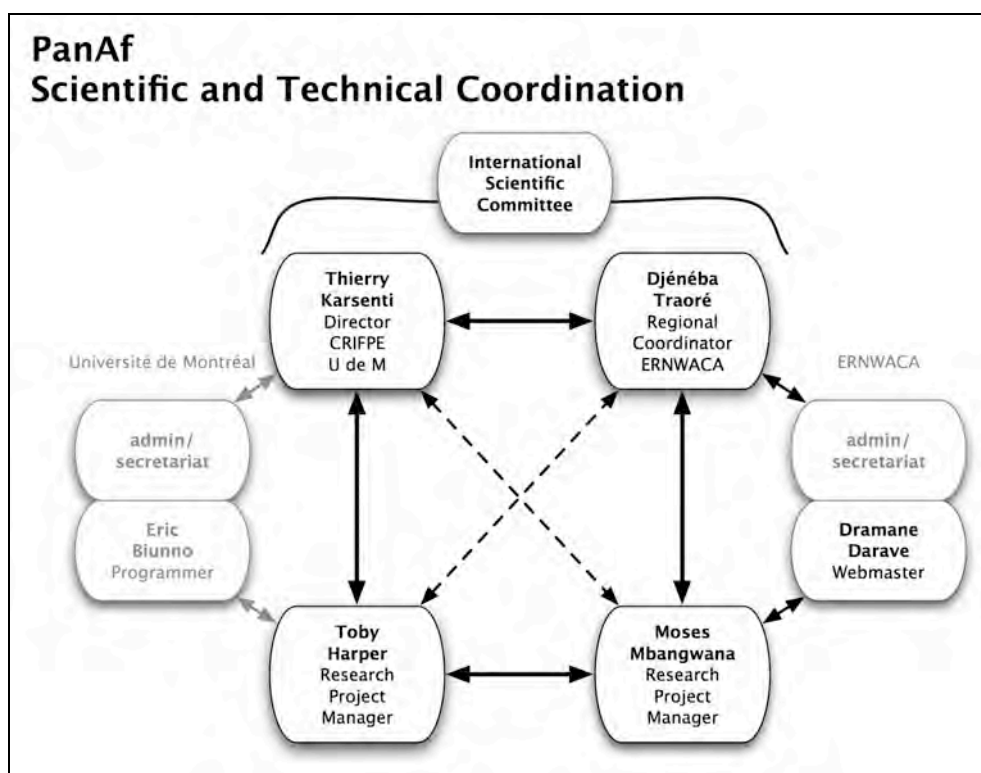
Research teams based at the above institutions make available an unprecedented set of data for ICT4ED in Africa. Currently the Observatory shares knowledge from:

- 117 African schools - 71% of which are publicly funded, and 42% of which are secondary level institutions;
- 8 940 educators - 84% of whom teach in publicly funded institutions, and 56% of whom teach in secondary institutions;
- 242 873 learners - 90% of whom attend a publicly funded institution, 52% of whom attend secondary institutions.

As mentioned above, this represents approximately 20 000 data-points, over 180 indicators (qualitative and quantitative, national and institutional scale) along 12 major themes (Policy, Access, Training, Use, Impact, Management, Gender, and Language...).

PanAf Phase II will continue to rely on a multi-institutional partnership, with a focus on the tertiary level research institutions of the participating countries, preferably attached to

universities. They would work under the scientific and technical coordination of ERNWACA and the Université de Montréal.



A.2 Criteria for selection of participating schools

Participating schools selected for Phase I of the study by the national research teams were chosen to represent both leading strategies and significant challenges in pedagogical integration of technologies. The selection was explicitly not one meant to represent a national-scale sample of all institutions, rather to capture knowledge to be shared from schools that had computers and were attempting to apply them to teaching and learning. The selection of ten schools (for most countries, although the Ghanaian and Gambian teams began with only five institutions each at the end of Phase I) therefore followed a general set of criteria and guidelines. These were applied in order to balance – as throughout the research – maximum transnational comparability with maximum openness to the teams’ expertise in their own context. The schools had to include, at least:

- Computers in operation in the institution
- One tertiary-level teacher training institution
- One primary-level institution
- One institution located in a non-urban environment
- More than one public secondary institution
- More than one mixed boys and girls secondary institution

The 12 national research teams were effective in choosing schools according to the guidelines above, while choosing institutions that they felt would provide interesting results, particularly in terms of the study’s qualitative indicators. The diversity of the selection of schools is illustrated in Annex 1.

A.3 Communication and sharing of research results

Communication of data and results has been central to the project - beginning with the creation of the Observatory (described below) where all project data has been uploaded.

In addition to this “living” resource, where data is made continually and permanently available, a project news portal maintained by ERNWACA www.panaf-edu.org act as the main point for dissemination of reports and information related to project activities.

Large-scale diffusion of research results has been taken up through:

- Reports produced by the participating countries
- Discussions with the project partners and stakeholders
- A bi-annual newsletter which can be accessed on line, produced by ERNWACA and distributed to researchers and practitioners as well as education administrators and policymakers
- Results presentations at forums and other gatherings
- Overall results presentation in a collective work “100 Schools”
- Results presentation to the media at conferences organized by ERNWACA and other partners.
- Organization of national policy dialogue workshops to present project results to all concerned, particularly the schools, partners, policymakers and local and national elected representatives
- Results presentation at an international forum organized by the IDRC, April 22nd and 23rd, 2009, in Dakar, to provide closure to Phase I of the project, to present the overall results of the study, to globally evaluate the activities carried out. It would also allow an exploration of future directions, including program exchanges, institutional strengthening, the development and implementation of policies and projects for the pedagogical integration of ICTs, etc.

In the final 12 months of PanAf Phase I, participating researcher were invited to present results in dozens of major international conferences, including:

- eLearning-Africa 2008, Accra, Ghana, May 28 – 30, 2008;
- World Conference on Educational Multimedia, Hypermedia & Telecommunications, Vienna, Austria, June 30 - July 4, 2008;
- eLearning-Africa 2009, Dakar, Senegal, May 27 – 29, 2008;
- Invitation to present PanAf research results at an Association Universitaire Francophone’s conference, (March 3, 2008)
- Invitation to present PanAf research results by the Director general of UNESCO, Paris, France, May 11, 2009;

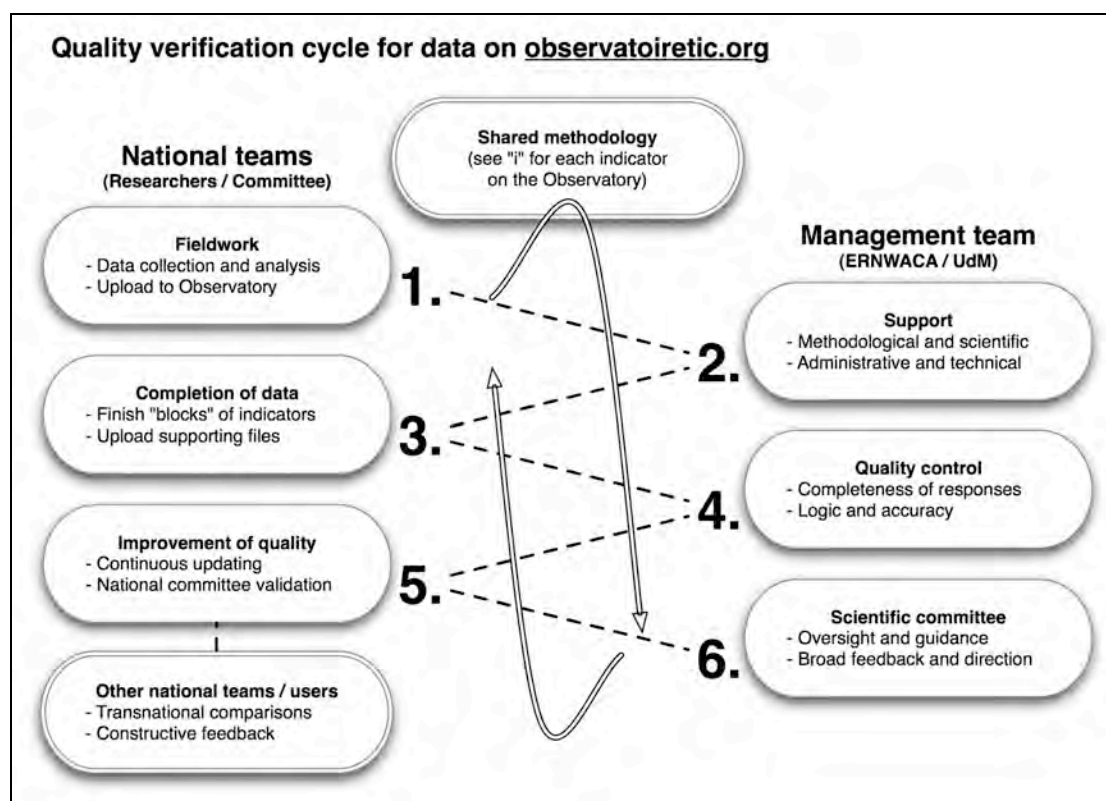
- Invitation to present PanAf research results at the 17th International Congress of Ministers of Education of the Commonwealth, Kuala Lumpur, Malaysia, June 16 - 19, 2009;

A.4 Evaluation

Evaluation of this first phase of the PanAfrican Research Agenda on the Pedagogical Integration of ICTs has been carried out on an ongoing basis and with diverse means - drawing lessons as activities progress. Ongoing evaluation has been part of the continuous reflective process whereby the lessons learned are continuously reinvested into project management and partnerships in order to improve the quality and relevance of the research. These lessons are shared with the community of practice that the research network providing the Observatory data constitutes, thus contributing to the community's development.

The participants at the various methodological, capacity-building and dissemination workshops have completed evaluations and the results have been communicated shortly thereafter. A formal electronic survey has been administered to national participants (responses received from at least one representative researcher in each country) on the quality of implementation and suggestions for next steps. Both Université de Montréal and ERNWACA submit interim technical reports to IDRC in accordance with guidelines and expectations. Finally, a cyclical process of feedback throughout the PanAf network community seeks to maximize the quality of ongoing activities and of the scientific

rigor of the research actions, as illustrated below:



A.5 Main research findings

We will not present herein the whole of the research results emerging from the analysis of the ambitious volume of data collected during Phase I of the project. Rather, we will focus on presenting a synthesis of results specifically related to the pedagogical integration of ICTs. Analysis of the data collected by the 12 national research teams reveals a multitude of uses of ICTs in the nearly 120 African schools participating in the project. These uses vary from initiation of learners to the fundamentals of computing, to the creation of elaborate projects involving learner-created websites, videos, field research and experimentation content. The types of ICTs uses found in PanAf Phase I data can be grouped as follows:

1. Use as the subject of learning;
2. Use as the means of learning;
3. Other uses.

As noted in other ICT4ED projects in African schools with support from IDRC (for example the “Pioneer Schools” project), Phase I data shows that the majority of the uses of ICTs fall into the first of the groupings above, while very few fall into the second (use of ICTs to teach subjects other than computing itself) while current literature argues that the latter is where usage should be concentrated. In this context, ICTs are not used as a “way” to learn, they are “what” is taught – educators focus on initiating new users to the basic functions of the machine. For many it seems especially important to understand these functions fully before proceeding to applying them to other learning situations. The data shows that many educators are convinced that in order to use computers for learning one should first be able to name the parts of the machine. The interviews conducted in the course of Phase I were inconclusive in identifying the sources of this conviction, however the link between educators’ attitudes reported, and the uses of ICTs in teaching and learning, seems strong.

This teaching “of” (rather than “with”) ICTs that characterizes usage in African schools is limited to demonstrating to learners how the computer functions, occasionally through the presentation of certain tools including word processing or spreadsheet software popular with the educators responsible for the actual computer rooms. It is challenging to quantify this observation precisely, but the evidence suggests that about half of institutions from which data collected in Phase I subscribe to this mode of “pedagogical integration” – teaching computers to learners. Though the teaching of computers may have its place in numerous regions of Africa where schools are the only venue for accessing and learning ICTs, it is paradoxical that in cities where 75% of learners report frequent use of cybercafés– and are comfortable with at least the basic functions of computers – the approach to computers in schools would be so limited. In this context, PanAf Phase II presents doubly important opportunities to permit education practitioners and policy decision-makers to move beyond this initial mode of the integration of ICTs.

Nonetheless there are nuances to the generalization – some learners are actively involved in gaining competency with ICTs, rather than passively absorbing the subject matter as presented by educators they maximize opportunities presented to become engaged in the learning process. These learners are called upon to appropriate ICTs, and the data shows they are relatively successful in doing so, though practical sessions presented by educators are often brief and resources otherwise limited. This second mode of integration presupposes that

learners will at some point have access to computers, in order to apply their lessons to real situations. These situations, educators report, are more challenging to manage, even if they understand their value from a pedagogical perspective. Some educators have indicated that they would prefer not to facilitate this type of learning situation, given the impression that they would “lose control” of their classrooms – and demonstrating, through this, an attitude that ICTs present a menace to the role of teacher. It is important to retain, despite these challenges to directly and actively implicating learners in the use of ICTs, that this mode of use is particularly valuable in enabling a learner-centred style. Recent literature clearly shows that learners gain ICTs competencies better through active manipulation of the machines as opposed to a ‘hands off’ theoretical approach. Across all schools participating in Phase I, the use of ICTs to teach subject matter other than computing itself was almost completely absent. In fact, despite the demonstrated potential impact of this type of use on the quality of education in Africa, such pedagogical integration is rarely observed.

Finally, PanAf Phase I research showed that several educators use ICTs to conduct research with the objective of better informing their lessons in mathematics, philosophy, chemistry, history, electro-mechanics, industrial design, etc. ICTs, therefore, are serving to improve the lessons prepared by educators, notably through Internet-based searches resulting in updated and enhanced professional knowledge.

Rare is the case of learners called upon to learn a variety of subject matter, and to appropriate their own educational experience, through ICTs. This mode of usage could accompany use of ICTs by educators, and coaching of learner ICT-use. The goal, however, is to avoid passivity and rote learning. Learners should, at some point in the lesson, actually use ICTs to learn. For example, in the case of primary school projects, learners can gain social or natural science knowledge directly through the use of ICTs. Education should no longer be centred on the educators, but rather on the learner. Scientific literature supports the effectiveness of this type of usage, and by extension its potential for the improvement of the quality of education in Africa. Here again is the role of PanAf Phase II – to directly support this type of change in education systems on the continent.

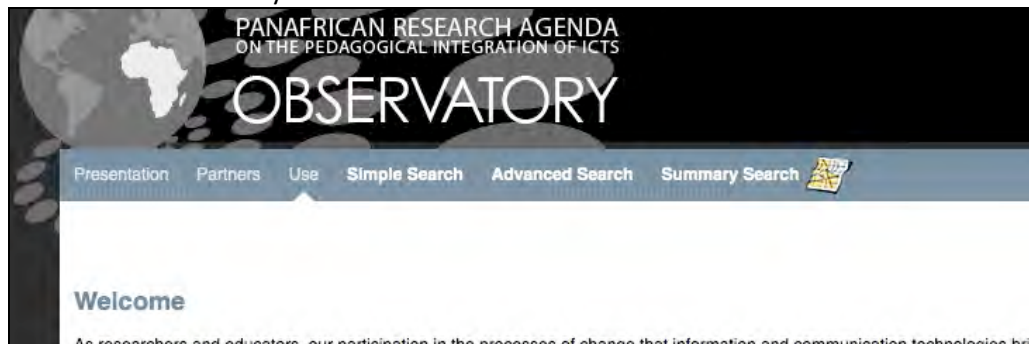
ANNEX II. THE PANAF OBSERVATORY REVISITED – AN UNPRECEDENTED RESOURCE FOR DATA ON THE PEDAGOGICAL INTEGRATION OF ICTS IN EDUCATION

WWW.OBSERVATOIRETIC.ORG

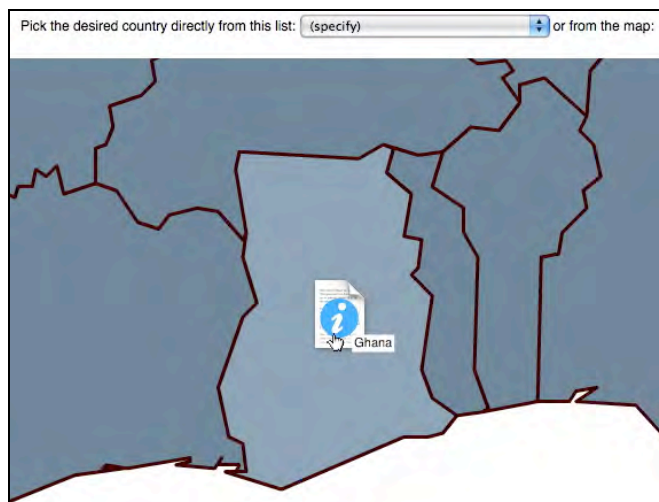
The place of the Observatory in this next phase will remain central – it is integral to sustaining and leveraging the investment already made. This is also in link with IDRC's initiative to grow an innovative database on ICT4ED, which insists on:

- Systematic, large-scale documentation and distribution of ICTs policies across Africa.
- Global access to analyses of the uses and impacts of ICTs at different teaching levels and in different learning contexts.
- Inventory and large-scale distribution of African teaching and teacher training methods in the pedagogical uses of ICTs.
- Better understanding of the roles of school principals, administrative staff and the community in the ICTs integration process.

The PanAf Observatory has three main search functions:



1. Simple Search...



Which allows a user to access data at an institutional scale...

Tamale Senior High School

Return to the country's page: [Ghana](#).

General information

Description	Tamale senior high school is a public, boarding, and mixed secondary institution. It was the first in the 1950's. It is located in the Tamale Metropolis, the northern regional capital (Latitude 9° 24' 00" N, Longitude 0° 00' 00" W) and now has an ICT lab with access to the Internet. It offers science, agriculture science, general education, and vocational education at the Senior High School (SHS) level. The school has a student population of One Thousand, Seven Hundred and Seventy (1,770) students. The headmaster is Alhaji T. A. Mahamah, himself a past student of the school. The school has a
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Both qualitative...

Impact on educators and teaching (1 available subcategory; 1 has data, including 0 document)

5.1 The impact of ICT on teaching

5.1.1 Stated impact (by educators) of ICT on lesson-planning (150 words)	The Internet has had the greatest impact on teaching and learning. It is a source of teaching and learning materials, to rehearse lessons and to prepare lessons. Another area teachers reported was the use of CD-ROMS and pen drives, which
5.1.2 Stated impact (by students) of ICT on lesson-planning (150 words)	Students' knowledge in ICT has helped them to learn new ideas in class during lessons.

And quantitative.

7.4.5 Percentage of managers trained to use ICT (in education)	6.67 % (1 / 15)	2008-12-15
7.4.6 Number of female managers (total for the institution)	5	2009-02-28
7.4.7 Number of male managers (total for the institution)	10	2009-02-28
7.4.8 Number of female managers trained to use ICT (in education)	0	2008-12-15

2. Advanced Search, which creates tables of data from multiple institutions...

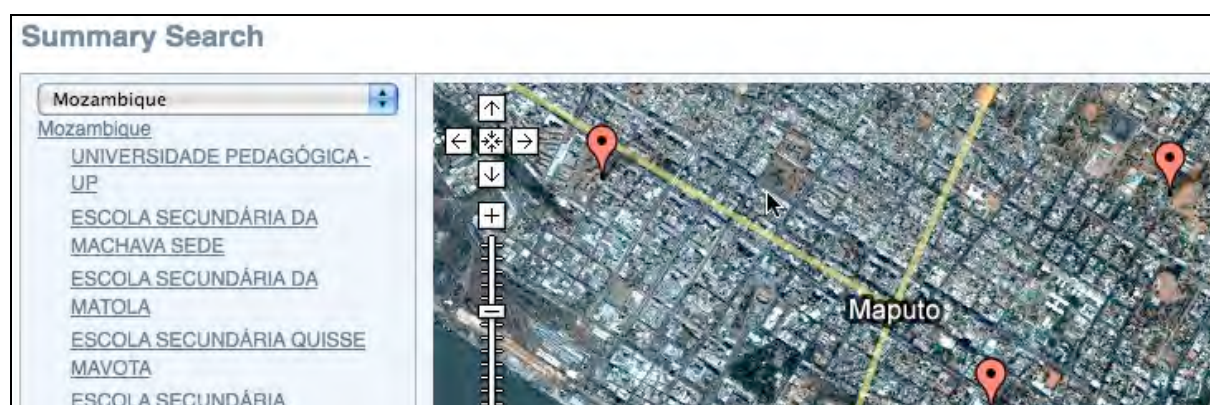
For multiple indicators...

	2.1.2 Percentage of computers connected to the Internet	4.5.4 The percentage of courses taught using ICT
Lycée Bilingue de Yaounde	100.00 % (72 / 72)	45.45 % (10 / 22)
Lycée Général Leclerc	94.03 % (63 / 67)	64.71 % (11 / 17)
Lycée Joss	92.00 % (69 / 75)	100.00 % (22 / 22)
Lycée Technique de Bafoussam	100.00 % (14 / 14)	40.00 % (20 / 50)

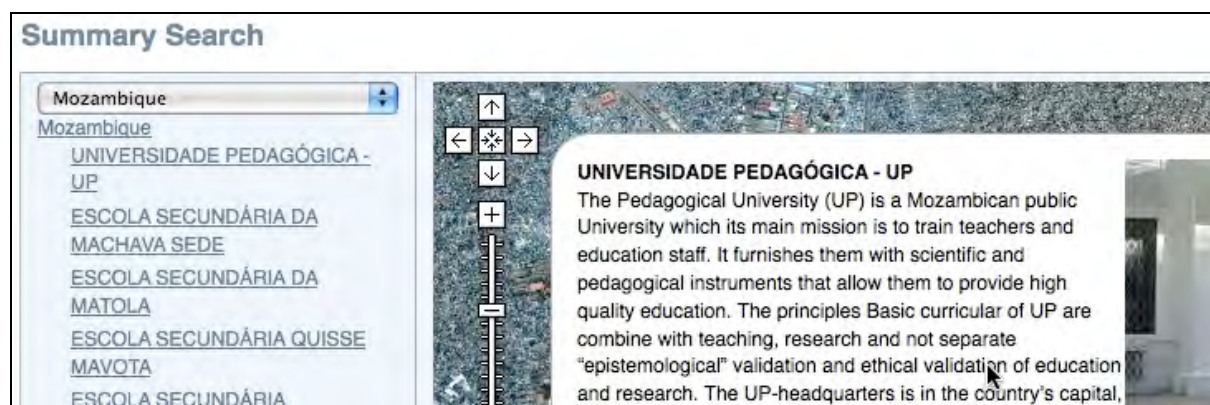
And is exportable to Microsoft Excel.

Country	Institution	3.11.1 Number of educators who have completed 1 to 50 hours of continuing education/professional development which included ICT integration	3.11.2 Number of educators who have completed more than 50 hours of continuing education/professional development which included ICT integration
Senegal	CEM Lamine Senghor de Joal	21	
Senegal	Collège Africain Sports et Etudes	9	
Senegal	Collège Sacré-Cœur	38	
Senegal	Ecole Front de Terre	0	
Senegal	Ecole Serigne Amadou Aly Mbaye	11	
Senegal	Faculté des Sciences et Technologies de l'Éducation et de la Formation (FASTEF)	23	
Senegal	Lycée Commercial El Hadj Abdoulaye NIASS	36	
Senegal	Lycée Demba Diop de Mbour	71	
Senegal	Lycée John Fitzgerald Kennedy	35	
Senegal	Lycée Serigne Umarou Laye	55	

3. Summary Search, which uses Google Maps...



To browse data from participating institutions across Africa.

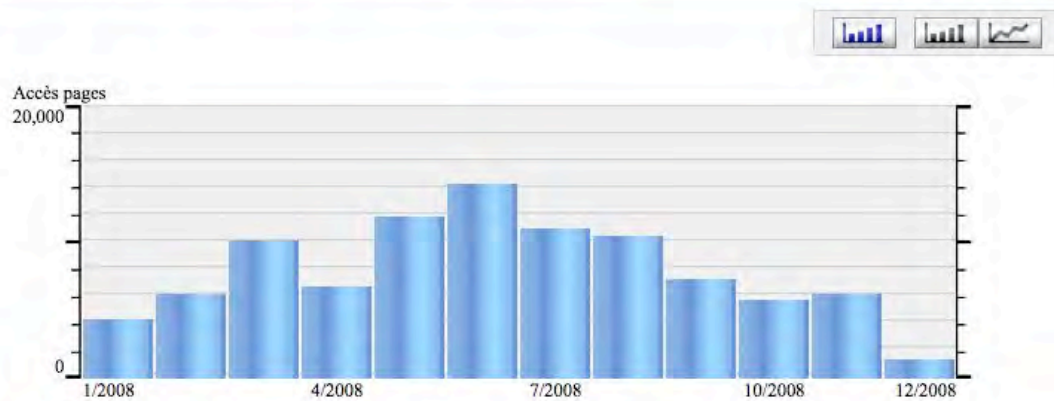


Perhaps the most innovative element of the Observatory as a research tool is that the data on the site are managed directly by researchers in the field. Each PanAf national research team has a number of login accounts with which they add and update data from their participating institutions. As illustrated in Figure 4.4, oversight, to ensure the expected level of scientific rigor, is provided by the project management team and international scientific committee, yet the researchers "own" the resources that they share on the Observatory.

The Observatory is a "living" resource, continually updated and improved from both content and functional perspectives. Throughout Phase I, the original design of the user interface has been adapted to respond to needs expressed by participating researchers. The resulting tool currently has three research functions (Simple Search – for data from individual institutions, Advanced Search – to create tables of data from multiple institutions for specific indicators, and Summary Search – to browse summaries of data from institutions on a Google map). Phase II will see the Observatory continually improved – with a migration to a new server expected shortly, and a Google search function integrated – and the addition of social media functions to encourage networking amongst the participating researchers. These new functions will include online researcher profiles with introductory videos, and instant messaging capabilities.

In 2008, nearly 100 000 visitors, an average of over 250 individual IP addresses per day, browsed the data available on the PanAf Observatory (according to Google Analytics – the most widely recognized site visit analysis tool):

Total de la période: 95,875 Moyenne mensuelle: 7,989.58



ANNEX III: ICTS AND GENDER IN PRIMARY AND SECONDARY EDUCATION IN WEST AND CENTRAL AFRICA

Under a project funded by the IDRC, research was conducted in 40 primary and secondary “ICTs pioneer” schools in five countries from 2004 to 2005. Discussions with the participants uncovered certain realities in West and Central Africa concerning ICTs and gender. In the course of this trans-national research project, we found that, although the computer rooms in the schools studied held an almost irresistible attraction for everyone, both students and teachers raised gender-related issues of ICTs access.

“The people in charge of the computer, multimedia and information processing rooms were mostly, if not exclusively, men. Women were rarely assigned ICTs monitoring or teaching duties. However, in about a dozen schools, we learned that special arrangements had been made to allow the less technically adept students to become more comfortable with ICTs use. Unfortunately, the scheduling was not always convenient, especially for women.

In the opinion of most school principals, if a difference existed between the boys and girls, it was not very apparent. They also stressed that both boys and girls exhibited computer savvy and enjoyed using ICTs. Generally, it appeared that the girls got better marks in the computer class as well as in other subjects.

At school, priority ICTs access was given to the most motivated pupils, regardless of sex, although the boys seemed to have more access to computers outside of school, e.g., at cyber-café. Some teachers remarked that, in terms of handling computer tools, the boys seemed to have mastered the computer better than the girls overall. In most cases, a few boys were known as ICTs experts by their friends. “

(Research into ICTs and Gender: Some Key Themes (2003). Butcher, Neil et al., unpublished paper, 21p.)

A3.1 Gender-specific examples of ICTs integration at different teaching levels

Many sub-Saharan African countries need to improve the quality of education and resolve the equity issue. Discrimination against girls, or sexual differentiation, is a serious concern and a barrier to the integration of ICTs in education. The disparities observed between girls and boys in learning to use ICTs, at all education levels, underscores the gender-specific nature of African societies, where women’s and men’s living conditions differ. Depending on the region, women enjoy less social access and are submitted to diverse forms of exclusion, which renders them more vulnerable. Sociocultural frameworks have confined African women to the role of housekeeper (RNN, 1997). In such conservative cultural environments, women and men take up distinct duties and roles, resulting in rather different lifestyles and conditions, which in turn produces different bodies of knowledge and gives rise to different informational needs. Thus, sexual differentiation results in a kind of second-class status for women, where women’s interests are shaped to comply with deeply held beliefs about their roles in various dimensions of life. These beliefs and ideologies are intrinsic to cultural practices and religious beliefs and practices as well as other aspects of African life (Wolpe et al. 1997). The problem is exacerbated by the fact that girls appear to be alienated by ICTs, considering them as belonging to the masculine realm. An investigation of computer savvy by university students revealed that female students were less skilled in the use of information technologies than their male counterparts (Sayed & Karelse, 1997). This imbalance at all levels is undoubtedly attributable to a mixture of cultural norms, but also to historical, economic, sociological, legal and traditional factors.

However, a certain balance between boys and girls in ICTs training would be required for the successful long-term integration of ICTs into schools. Moreover, girls make up slightly more than half the student population in most African countries. We cannot contemplate integrating ICTs into the schools without giving due consideration to girls. ICTs integration should not be allowed to be a domain strictly reserved for males. By raising awareness among girls and facilitating their access to ICTs, in short, by advocating sexual equality, we could enable a better implementation of ICTs into education systems. Any efforts to correct gender imbalances would require schools to encourage girls to use ICTs.

According to many studies (Huyer, 1997; CSTD–GES, 1995), several factors must take into account when developing ICTs integration policies so as to overcome the constraints that bar girls from using these technologies at school. For example, educators' (parents' and teachers') behaviours would have to change towards children, from a very young age. Above all, special measures would have to be implemented in the schools to facilitate girls' access to the computer rooms. There should be no barriers to girls. Otherwise, there is a risk for lack of interest and awareness, exacerbated by the influence of the socio-cultural environment. Every person who can read and write can use ICTs.

The ICTs integration process should therefore consider the entire environment, scholastic and socio-cultural, so as to correct the educational imbalance between the sexes and produce a new generation of young girls and women who are knowledgeable and trained in day-to-day ICTs use. In other words, girls should be offered the same educational opportunities as boys. Sexual discrimination, i.e. exclusion or marginalization, constitutes a serious hindrance to the effective integration of ICTs into the education system. The notion of discrimination should be banned from the integration process and replaced by provisions that allow all students to learn ICTs. In the interests of equity between the sexes, large-scale strategies should be designed to overcome the barriers to ICTs use by girls at school.

If ICTs is introduced into school systems without taking into account these social factors, there is a risk of introducing further disparities. The integration of ICTs might work to the disadvantage of girls by reinforcing their subordinate status. The best solution would seem to be to develop ICTs integration into schools based simply on the increasingly evident needs for efficiency, efficacy, flexibility and sustainability. The realities of the socio-cultural environment and the integration of ICTs into schools must be taken into account to prevent appropriation, pretence and ignorance. The lack of educational opportunities offered to females, the handicapped and other vulnerable sectors of society constitutes a fundamental obstacle to their participation in the information society and the use of ICTs.

In this perspective, the principle of equity is universal education and training that takes into account the diversity of the social mosaic, regardless of individual gender, social class, ethno-cultural group, or skills.

A3.2 Consideration of gender in the ongoing project

Inequity, at various scales, compounds the effects of risk and vulnerability among the poor. With the goal of better understanding the multiplex challenges of equitable development, this research will address gender, rural/ urban residence, and socioeconomic class, using both targeted and integrated methodologies. The indicators will engage these issues specifically, to produce tangible recommendations for improved ICTs-in-education equity while throughout the indicators, equity issues will be addressed in research design, implementation and evaluation. Since this research project aims to contribute to social and equitable change, and the issue of

Gender issue is an essential component, the project would incorporate a consideration of gender at many levels—from project management to data collection and analysis and results distribution.

A3.3 Preliminary findings on gender

ICT4ED in Africa pioneer, and PanAf international scientific committee member, Dr. Nancy Hafkin has been instrumental in shaping the project's gender integration. She notes the importance of gender analysis of the pedagogical use of ICT in the research, identifying the 17 sets of indicators with sex-disaggregated data. The PanAf research is unique in that a gender focus has been part of the project from the beginning, while collecting sex-disaggregated data is still the rare case in other studies. The PanAf approach is very much in line with international standards being established, in particular by the Partnership on Measuring ICT for Development (www.itu.int/ITU-D/ict/partnership/).

Gender analysis essentially means separating gender as a category and examining a given phenomenon to see if the results are different for men or for women. Given that the first phase of data collection for the PanAf Observatory project is complete, we can undertake a preliminary gender analysis of the data from some of the sex-disaggregated indicators.

Indicators that are important for looking at gender equality in access to ICTs include both the gender category 9 indicators (targeted) of whether teachers and students have access to computers, and other sex-disaggregated indicators (transverse, or integrated) related to ICT usage for which data collection is still underway, such as: teachers' computer-literacy (as indicated by the proxy of their having email addresses), whether they are using computers in their teaching. If there are significant gender differences in the statistics on any of these indicators, it means less than maximum utilization of a country's human resources for economic and social development. At the individual level it means barriers to entering the information/knowledge society.

Examining Phase I findings through a gender lens illustrates that the crux of gender analysis is identifying differentials in impact of results on the basis of gender. The basic question being asked is given the same variables, are the results different for men and women? Gender analysis is not an attempt to identify discrimination against women, but rather to see if there are differences in results on the basis of gender. Sometimes the results show women to be disadvantaged, but at other times it can be men in that situation.

The conclusion we have begun to draw from this preliminary look at quantitative data currently available on the Observatory is that there do seem to be gender differences in access to computers in schools by learners and educators. This statistical data in itself may not reveal the full extent of gender differentials. In Phase II, Qualitative research, such as that currently underway to inform PanAf indicators in categories 4, 5 and 6 will enrich the knowledge available on the Observatory through the analysis of responses to questionnaires and recorded interviews undertaken by expert researchers in the field. Throughout their analysis of questionnaires and recorded interviews in the remaining data collection, researchers are advised to keep their gender lens open, always looking for gender differences and the reasons therefore.

PanAf Phase I findings do show significant gender-based differences in the data for several categories of indicators, including some in Training (3) and Use (4). Drawing from the final reports of the national research teams, differences reported include...

in Ghana:

- At both the tertiary and the pre-tertiary levels male educators and learners in each institution outnumber the females. Overall, about 25% or less of the educators in the institutions are females, while about 40% or less of the learners are females. Generally, it was observed that the people in charge of the computer labs and information processing rooms in the institutions' administration were all men. Women were rarely assigned ICT monitoring or teaching duties. Though no differences were observed at the pre-tertiary level in the amount of time male and female learners use of ICT for academic purposes, a wide proportional gap of 0.56 was observed for learners at the tertiary level. That is, at the tertiary level (i.e. UEW), the average ICT usage (hours per week) for academic purposes among the male learners was about twice that of the females (average of 19 hours per week for female and 34 hours per week for male).
- A wide proportional gap of 0.56 was observed for male and female learners use of ICT for academic purposes at the tertiary level
- At the tertiary level, male educators average ICT usage (hours per week) for academic purposes was three times that of the females educators
- At the pre-tertiary level, very few (i.e. under 5%) of the female educators had participated in continuing professional development activities that did not exceed 50 hours and included ICT integration. (Overall was 10%)

yet in Kenya:

- In the case of the wide disparity between male and female teachers, this can be attributed to the large number of female teachers in urban and semi-urban schools in Kenya. This may also imply that since urban schools are better equipped with ICT, more female educators have access to ICT than their male counterparts who are more likely to work in disadvantaged schools in remote areas

ANNEX IV – PARTICIPATING AFRICAN SCHOOLS

Table 1 : Cameroon

N°	Name of school	school Level	Trains teachers?	Nature	Gender	Location
1	Ecole Primaire et Maternelle les Oiselets	Primary	NO	PRIVATE	Mixed	Urban
2	Ecole Les Champions FCB de MEMIAM	primary	NO	Public	Mixed	Semi Urban
3	Lycée Bilingue de Yaounde	Secondary	NO	Public	mixed	Urban
4	Collège des Lauréats (Bonamoussadi)	Secondary	NO	Public	Mixed	Urban
5	Longla Comprehensive College	Secondary	NO	PRIVATE	Mixed	Urban
6	Lycée Général Leclerc	Secondary	NO	Public	Mixed	Urban
7	Lycée Joss	Secondary	NO	Public	Mixed	Urban
8	Lycée Technique de Bafoussam	Secondary	NO	Public	Mixed	Urban
9	Lycée Classique et Moderne de MVOMEKA'A	Secondary	NO	Public	Mixed	Semi Urban
10	Ecole Normale Supérieure de Yaoundé	Tertiary	Yes	Public	Mixed	Urban

Table 2 : Central African Republic

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Ecole primaire de Begoua	primary	NO	Public	Mixed	Semi Urban
2	Ecole Internationale Turque	primary, Secondary	NO	PRIVATE	Mixed	Urban
3	Etablissement Groupe Elite Formation	Secondary	NO	PRIVATE	Mixed	Urban
4	Lycée BEN RACHID	Secondary	NO	Public	Mixed	Urban
5	Lycée Barthélémy BOGANDA	Secondary	NO	Public	Mixed	Urban
6	Lycée Technique de Bangui	Secondary	NO	Public	Mixed	Urban
7	Lycée Marie Jeanne CARON	Secondary	NO	Public	Girl school	Urban
8	Lycée PIE XII	Secondary	NO	PRIVATE	Girl school	Urban
9	Ecole Normale Supérieure de Bangui	Tertiary	NO	Public	Mixed	Urban
10	Haute Ecole de Gestion et de Comptabilité	Tertiary	NO	PRIVATE	Mixed	Urban

Table 3 : Republic of Congo

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	LYCÉE TECHNIQUE DU 1ER MAI	Secondary	NO	Vocational	Mixed	Urban
2	Lycée Victor Augagneur	Secondary	NO	Public	Mixed	Urban
3	LYCÉE TECHNIQUE D'OYO	Secondary	NO	Vocational	Mixed	Semi Urban
4	Lycée Savorgnan de Brazza	Secondary	NO	Public	Mixed	Semi Urban
5	Ecole Notre Dame du Rosaire	Secondary	NO	Public	Mixed	Semi Urban
6	Ecole Normale d'instituteurs de Brazzaville	Teacher training for Primary	Yes	Public	Mixed	Urban
7	Ecole de formation des instituteurs François Régis	Teacher training for Primary	Yes	PRIVATE	Mixed	Urban
8	Ecole Normale d'instituteurs de Dolisie	Teacher training for Primary	Yes	Public	Mixed	Semi Urban
9	Ecole Normale Supérieure	Teacher Training for secondary	Yes	Public	Mixed	Urban
10	Ecole Normale d'instituteurs d'OWANDO	Teacher Training for secondary	Yes	Public	Mixed	Urban

Table 4 : Côte d'Ivoire

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Le Nid de Cocody	primary	NO	PRIVATE	Mixed	Urban
2	Institut Raggi Anne-Marie (IRMA)	primary, Secondary	NO	PRIVATE	Mixed	Semi Urban
3	Groupe Scolaire Emmanuel (Bonoua)	primary, Secondary	NO	PRIVATE	Mixed	Semi Urban
4	Lycée Moderne de Treichville (Abidjan Treichville)	Secondary	NO	Public	Mixed	Urban
5	Collège International de la Corniche	Secondary	NO	Public	Mixed	Urban
6	Cours Secondaire Méthodiste de Cocody	Secondary	NO	Public	Mixed	Urban
7	LYCÉE SAINTE MARIE D'ABIDJAN	Secondary	NO	Public	Girl school	Urban
8	LYCÉE MODERNE ET CLASSIQUE GARÇONS DE BINGERVILLE	Secondary	NO	Public	Boy school	Rural
9	LYCÉE TECHNIQUE D'ABIDJAN COCODY (LTA)	Secondary, Tertiary	NO	Vocational	Mixed	Urban
10	Ecole Normale Supérieure d'Abidjan (ENS) Cocody	Tertiary	Yes	Public	mixed	Urban

Table 5 : Gambia

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Shilo Bilingual Educational Centre (SBEC)	Primary/Secondary	No	PRIVATE	mixed	Urban
2	Kinderdoff Bottrop Technical Secondary School	secondary	NO	PRIVATE	Mixed	Urban
3	Gambia Senior Secondary School	secondary	no	Public	mixed	Urban
4	University of The Gambia (UTG)	Tertiary	Yes	Public	mixed	Urban
5	Gambia College	Tertiary	Yes	Public	Mixed	Semi Urban

Table 6 : Ghana

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Methodist Junior High School, Ayirebi	primary	NO	PRIVATE	mixed	Semi Urban
2	Asuansi Technical Institute	secondary	NO	Vocational	mixed	Semi Urban
3	Obrachire Senior High Technical School	secondary	No	Vocational	mixed	Semi Urban
4	Tamale Senior High School	secondary	No	Vocational	mixed	Semi Urban
5	University of Education, Winneba	Tertiary	Yes	Public	mixed	Urban

Table 7 : Kenya

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	THE GREEN GARDEN SCHOOLS	Primary	No	PRIVATE	Mixed	Urban
2	MUSA GITAU PRIMARY SCHOOL	primary	NO	Public	Mixed	Semi Urban
3	RUARAKA ACADEMY	primary	NO	PRIVATE	Mixed	Semi Urban
4	TIGONI PRIMARY SCHOOL	primary	NO	Public	Mixed	Rural
5	AGA KHAN HIGH SCHOOL	Secondary	NO	PRIVATE	Mixed	Urban
6	MUSA GITAU SECONDARY SCHOOL	Secondary	NO	Public	Mixed	Semi Urban
7	ENNA SCHOOL	Secondary	NO	Public	Girl school	Semi Urban
8	ST. JOSEPH HIGH SCHOOL, GITHUNGURI	Secondary	NO	Public	Boy school	Rural
9	UTHIRU GIRLS HIGH SCHOOL	Secondary	NO	Public	single	Urban
10	KENYA TECHNICAL TEACHERS COLLEGE	Tertiary	Yes	Public	Mixed	Urban

Table 8 : Mali

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	ECOLE MAMADOU KONATÉ I	primary	NO	Public	Mixed	Urban
2	Complexe scolaire Mali - Univers Primaire	primary	NO	PRIVATE	Mixed	Urban
3	Lycée Kodonso	Secondary	NO		Mixed	Urban
4	LYCÉE CHEICK ANTA DIOP (LCAD)	Secondary	NO	Public	Mixed	Urban
5	INSTITUT DE FORMATION DES MAÎTRES (IFM) DE BOUGOUNI	Secondary	Yes	Public	Mixed	Urban
6	Complexe Scolaire Mali Univers - Lycée – Collège	Secondary	NO	PRIVATE	Mixed	Urban
7	Centre de Formation Professionnelle Soumangorou Kante (CFP SK)	Secondary	NO	Public	Mixed	Urban
8	LYCÉE BA AMINATA DIALLO (LBAD)	Secondary		Public	Girl school	Urban
9	Ecole fondamentale de Senou Aviation	Secondary	NO	Public	Mixed	Rural
10	ECOLE NORMALE SUPÉRIEURE (ENSUP)	Tertiary	Yes	Public	Mixed	Urban

Table : 9 Mozambique

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Centro de formação Profissional 'Dom Bosco'	Secondary	NO	Public	Mixed	Urban
2	Colégio Kitabu	Secondary	NO	Public	Mixed	Urban
3	Escola Secundária Francisco Manyanga	Secondary	NO	Public	Mixed	Urban
4	Escola Secundária Nelson Mandela	Secondary	NO	PRIVATE	Mixed	Urban
5	Escola Secundária Josina Machel	Secondary	NO	PRIVATE	Mixed	Urban
6	Escola Secundária da Machava Sede	Secondary	NO	Public	Mixed	Urban
7	Escola Secundária da Matola	Secondary	NO	Public	Mixed	Urban
8	Escola Secundária de Moamba	Secondary	NO	Public	Mixed	Urban
9	Escola Secundária Quisse Mavota	Secondary	NO	PRIVATE	Mixed	Semi Urban
10	Universidade Pedagógica – UP	Tertiary	NO	Public	Mixed	Urban

Table 10 : Senegal

N°	Name of school	School levels	Trains teachers?	Nature of School	Student Gender	Location
1	Ecole Front de Terre	primary	NO	Public	Mixed	Urban
2	Ecole Serigne Amadou Aly Mbaye	primary	NO	Public	Mixed	Urban
3	CEM Lamine Senghor de Joal	Secondary	NO	Public	Mixed	Urban
4	Collège Africain Sports et Etudes	Secondary	NO	PRIVATE	Mixed	Urban
5	Collège Sacré-Cœur	Secondary	NO	PRIVATE	Mixed	Urban
6	Lycée Commercial El Hady Abdoulaye NIASSE	Secondary	NO	Public	Mixed	Urban
7	Lycée Demba Diop de Mbour	Secondary	NO	Public	Mixed	Urban
8	Lycée John Fitzgerald Kennedy	Secondary	NO	Public	Girl school	Urban
9	Lycée Seydina Limamou Laye	Secondary	NO	Public	Mixed	Semi Urban
10	Faculté des Sciences et Technologies de l'Education et de la Formation (FASTEF)	Tertiary	Yes	Public	Mixed	Urban

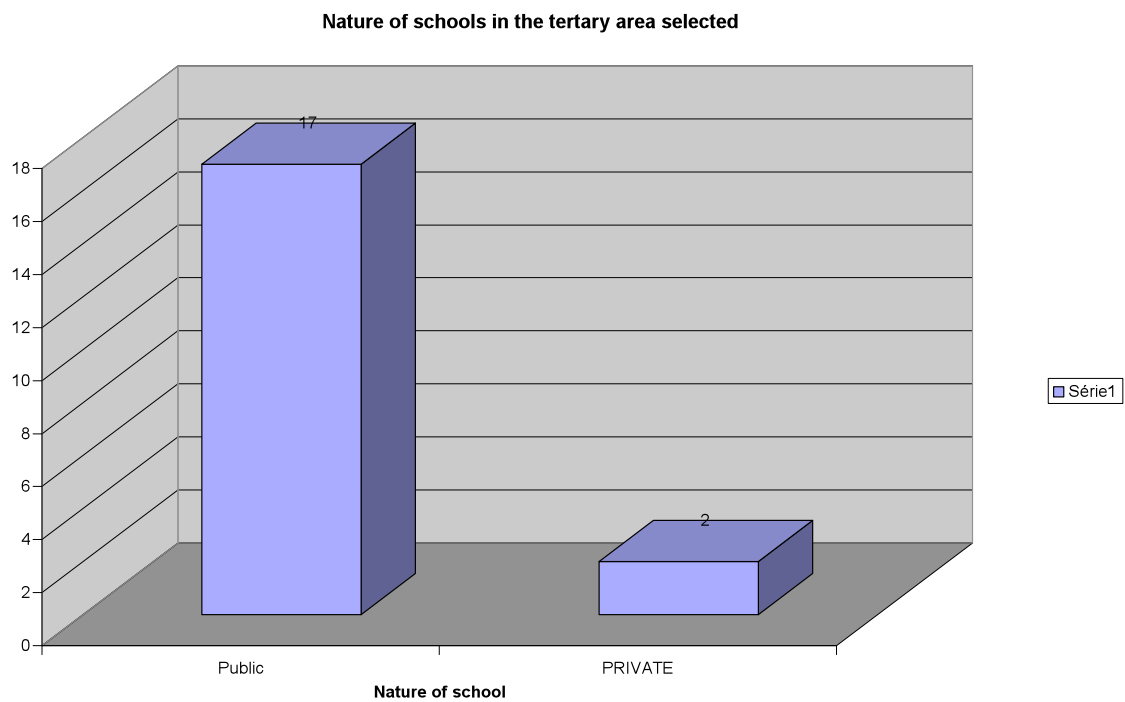
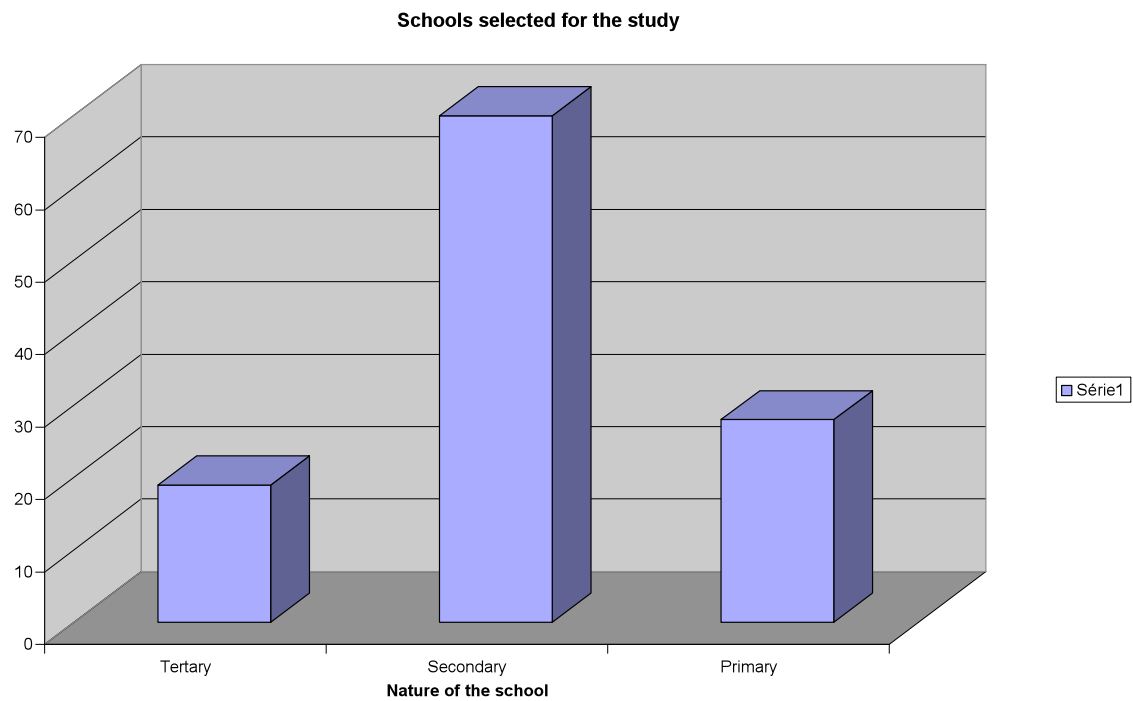
Table 11 : South Africa

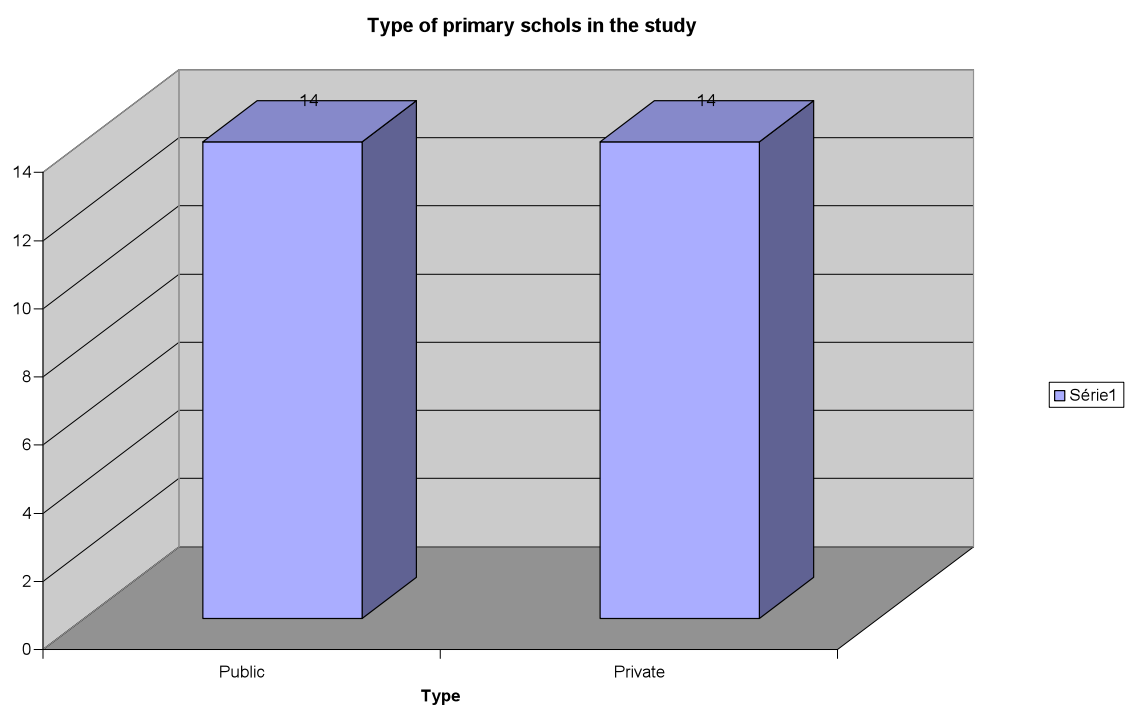
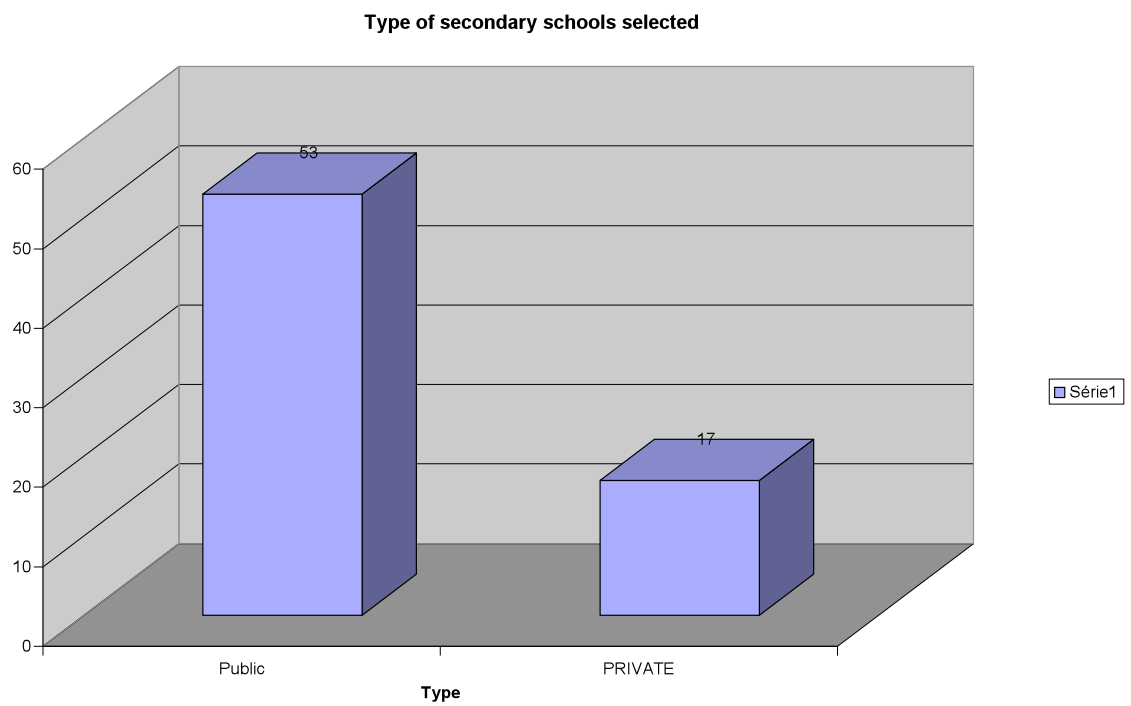
N°	Name of school	School levels	Trains teachers ?	Nature of School	Student Gender	Location
1	RANDPARK PRIMARY SCHOOL	primary	NO	Public	Mixed	Urban
2	PARK PRIMARY SCHOOL	primary	NO	Public	Mixed	Urban
3	MVELEDZANDIVHO PRIMARY SCHOOL	primary	NO	Public	Mixed	Urban
4	Eldocrest Primary School	primary	NO	Public	Mixed	Urban
5	ST JOHN'S PREPARATORY SCHOOL	primary	NO	PRIVATE	Boy school	Urban
6	Isikhumbuzo PRIVATE School (inc. Siyaphambili PRIVATE School)	primary	NO	PRIVATE	Mixed	Semi Urban
7	GREENSIDE HIGH SCHOOL	Secondary	NO	Public	Mixed	Urban
8	MAGALIESBURG STATE SCHOOL	Secondary	NO	Public	Mixed	Semi Urban
9	BB Myataza Secondary School	Secondary	NO	Public	Mixed	Semi Urban
10	Daliwonga Secondary School	Secondary	NO	Public	Mixed	Semi Urban
11	Wits School of Education	Tertiary	Yes	Public	mixed	Urban

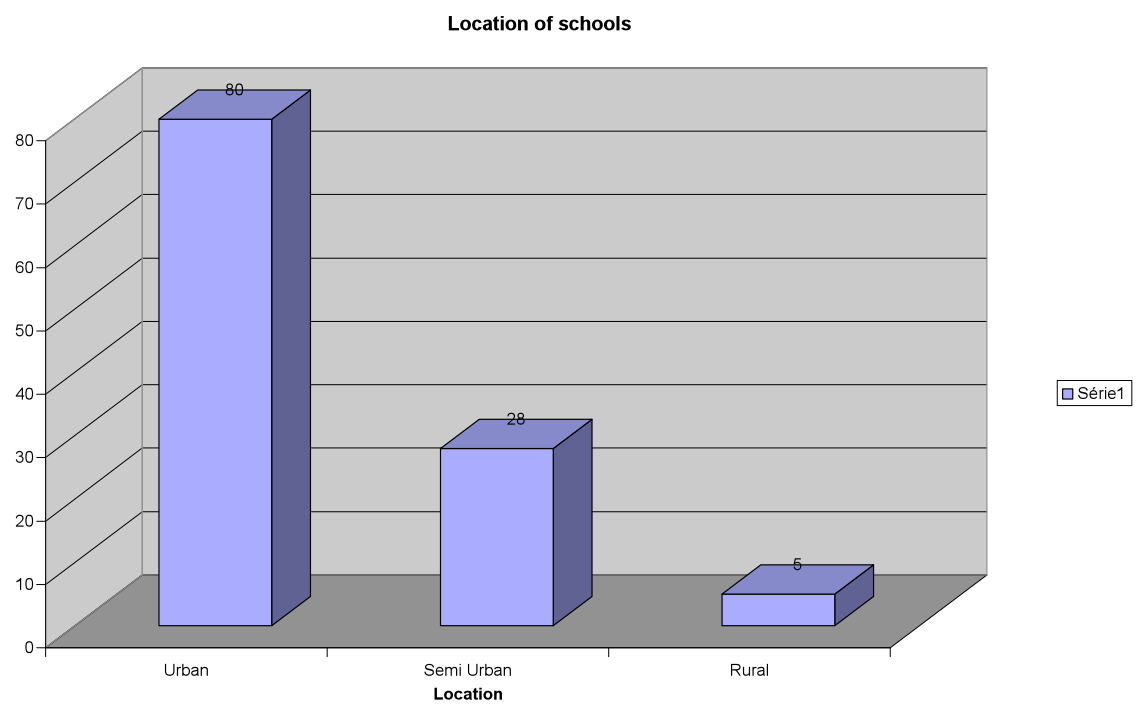
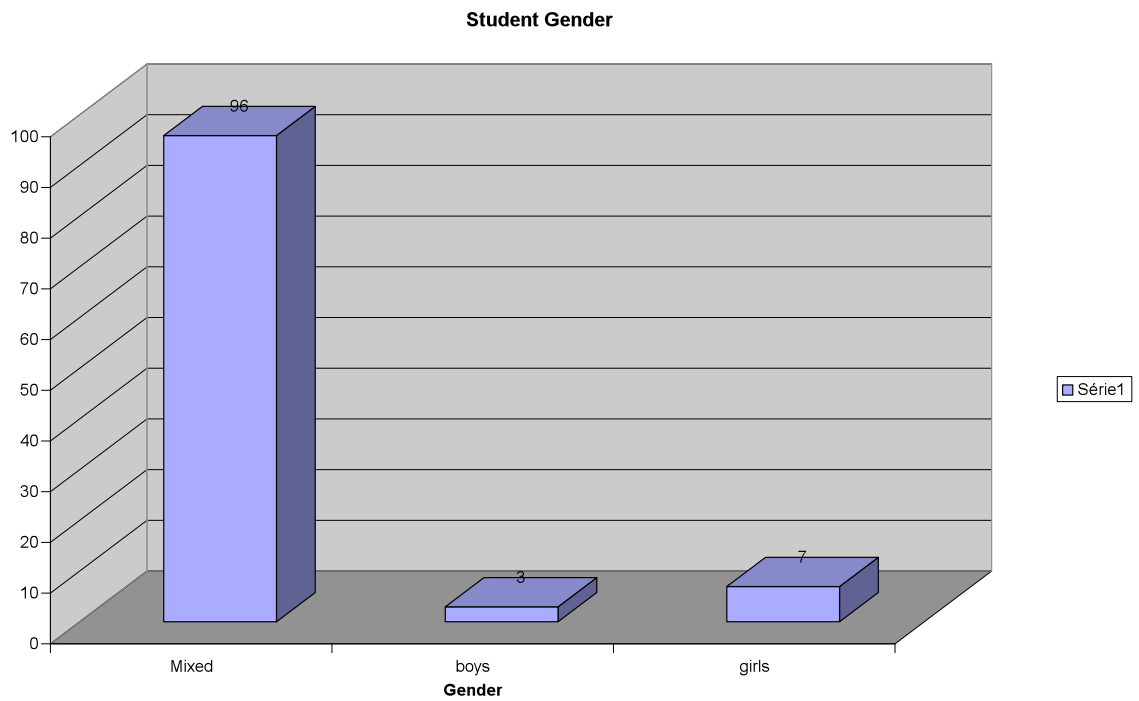
Table 12 : Uganda

N°	Name of school	School levels	Trains teachers ?	Nature of School	Student Gender	Location
1	Buganda Road Primary School	primary	NO	Public	Mixed	Urban
2	St Kizito Primary School Bugoloobi	primary	no	PRIVATE	Mixed	Urban
3	Kisowera Primary School	primary	NO	Public	Mixed	Semi Urban
4	ST ANTHONY DAY AND BOARDING PRIMARY SCHOOL	primary	NO	PRIVATE	Mixed	Semi Urban
5	St Peters Primary School Nsambya	primary	NO	Public	Mixed	Semi Urban
6	Kibuli Secondary School	Secondary	NO	Public	Mixed	Urban
7	Nabisunsa Girls School	Secondary	NO	Public	Girl school	Urban
8	King's College Budo	Secondary	NO	Public	Mixed	Semi Urban
9	St Mary's Boarding Secondary School Kitende	Secondary	NO	PRIVATE	Mixed	Semi Urban
10	St Peters Secondary School Bugolobi	secondary	no	PRIVATE	mixed	Urban
11	Kyambogo University School of Education	Tertiary	yes	Public	mixed	Urban
12	Department of Adult educ Makerere University	Tertiary	yes	Public	mixed	Urban

**ANNEX V : GENERAL INFORMATION ON THE SCHOOLS
SELECTED**







ANNEX VI: SURVEYMONKEY RESULTS

In December 2008 the PanAf network undertook a survey of all participating researchers to enable them to share their individual reflections on the successes and challenges of Phase I, and identify opportunities and suggestions for Phase II (the responses below are taken directly from the survey results, and are thus in both English and French):

Phase 1	
Challenges	
Internal	lack of cohesion within national research team travel to field to collect data and be compensated later entering and uploading data was time consuming writing publishable articles
External	convince managers and educators to respond to questionnaires and interviews availability of respondents participation of managers and educators, especially more senior ones educators disliked questionnaires, preferred interviews compensation expectation for participating institutions
Successes	
Internal	brings together researchers from all parts of Africa, potential for collaborations presentation of the project at eLearning-Africa in Ghana sharing experiences with other researchers during workshops and conferences collection of mixed-methodology data from institutions, uploading it to the Observatory, built in quality controls
External	first Pan-African research project on the pedagogical integration of ICTs, critical data has been collected better knowledge of what is happening in the schools, open access to data for comparison with other countries interest and participation by managers, educators and learners, appreciating the importance of the issue access to national ICT policy documents

Phase 2

Opportunities

- | | |
|----------|---|
| Internal | initial data collection funds to facilitate researchers' travel to the field
create time to conceive, write and publish
national research team needs to work in the spirit of teamwork and collaboration
plan network activities with closer consideration of researchers' schedules |
| External | compensatory elements to fulfill participating institutions' expectations
direct support for development projects within participating institutions |

Suggestions

- | | | |
|----------|---|--|
| Internal | <div>analyze and interpret the data collected</div> <div>enhance Observatory "online help"</div> <div>advanced methodological training via workshops</div> <div>organization of/participation in international meetings</div> <div>increase the number of members of national teams</div> | <div>integrate graduate students into research process</div> <div>more visits by management team to meet policy-makers</div> <div>emphasis on pedagogy instead of technology</div> <div>regional capacity-building workshops</div> <div>initial workshop to clarify Phase 2 expectations</div> |
| External | <div>publications based on Observatory data</div> <div>additional participating institutions</div> <div>communication with Ministry authorities</div> <div>USB keys with pedagogical resources for educators</div> <div>develop ICT integration for teacher-training courses</div> | <div>greater involvement of national civil society organizations</div> <div>increase the visibility of the network</div> <div>organize training for managers and educators</div> <div>add new schools</div> <div>produce plans/resources for ICT integration in schools</div> |

ANNEX VII: LETTER OF SUPPORT FROM THE MINISTER OF EDUCATION OF THE CENTRAL AFRICAN REPUBLIC

SUPERIEUR ET DE LA RECHERCHE

N° 204/MENESR/09-



Bangui, le

Le Ministre de l'Education
Nationale de l'Enseignement
Supérieur et de Recherche

Aux Responsables du Centre
de Recherche pour le
Développement International
(CRDI)

Objet: Avis sur les résultats des travaux de recherche
du Panaf.

Mesdames, Messieurs,

J'ai suivi avec une attention particulière les résultats des recherches effectuées dans le cadre du Projet panafricain sur l'intégration pédagogique des Tic. Sur le plan africain, je félicite les chercheurs pour la qualité et la pertinence des analyses que j'ai découvertes à travers l'Observatoire, véritable instrument d'échanges entre chercheurs.

Pour ce qui concerne mon pays, la République Centrafricaine, j'ai été émerveillé par la prestation des chercheurs lors du Dialogue Politique National et par la participation des acteurs du système éducatif et des Organisations Non Gouvernementales (ONG) intéressées par l'intégration des Tic dans le système éducatif centrafricain. L'ensemble de ces acteurs constitue une entité non négligeable pour la mise en œuvre d'une politique d'intégration des Tic dans le système éducatif centrafricain.

Je profite de cette opportunité pour adresser mes vifs remerciements au CRDI pour son appui multiforme au développement de la Recherche en Afrique et surtout dans le cadre de la recherche sur l'intégration pédagogique des Tic. Bonne continuation.

Haute considération.