L'agenda panafricain de recherche sur l'intégration pédagogique des TIC

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Synthèse de la phase 1

The PanAfrican Research Agenda on the Pedagogical Integration of ICT

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Résumé

L’agenda panafricain de recherche vise à « mieux comprendre comment l’intégration pédagogique des TIC peut améliorer la qualité des enseignements et des apprentissages en Afrique ». Au cours de la première phase du projet, une équipe nationale de recherche a recueilli des données à propos des usages des TIC pour l’enseignement et l’apprentissage dans chacun des onze pays suivants : le Ghana, le Sénégal, la République centrafricaine, l’Ouganda, le Mozambique, le Mali, le Kenya, la Côte d’Ivoire, le Congo, le Cameroun et l’Afrique du Sud. La collecte de données a reposée sur des méthodes mixtes, à la fois quantitatives (questionnaires, etc.) et qualitatives (entrevues, observations, etc.) portant sur l’intégration pédagogique des TIC. En tout, ce sont près de 120 écoles, 800 cadres scolaires, 8 940 enseignants, et quelque 242 873 élèves qui ont participé à ce projet. La Phase I du projet PanAf a permis la collecte de quelque 20 000 données en tout, organisées soigneusement en fonction d’indicateurs qui ont été déterminés à la fois par la littérature scientifique, mais aussi lors de nombreuses réunions des chercheurs de tous les pays participant au projet. Les données recueillies ont toutes été déposées sur l’Observatoire de l’intégration pédagogique des TIC [www.observatoiretic.org] (présenté sommairement à la section VI). Des analyses accompagnant ces données brutes sont aussi disponibles sur l’observatoire, tant pour les chercheurs de l’équipe PanAf que pour tous les autres chercheurs d’Afrique et du monde. En fait, notre projet a été pionnier sur le plan du libre accès. Nous sommes un des premiers projets à donner libre accès aux données de recherche. L’avantage incontestable de ces données, outre le fait qu’elles soient librement accessibles en tout temps, c’est qu’elles permettent une meilleure compréhension des politiques TIC en Afrique, une plus grande connaissance des impacts des TIC – tant auprès des apprenants que des formateurs. Soulignons enfin que ces données ont le plus souvent porté une attention particulière à la question du genre, afin de bien pouvoir distinguer les inéquités présentes dans ce domaine. La Phase I du projet PanAf a également mis l’accent sur le développement des capacités des chercheurs du projet.

Keywords

Africa, education, pedagogy, ICT, qualitative methodology
Ce rapport synthèse sur portant sur la Phase I du projet PanAf présente d’abord une synthèse globale du projet (Section I), il dresse la liste des partenaires, chercheurs, coordination, comité scientifique, etc. (Section II). Il propose ensuite une synthèse de la problématique de recherche sous-jacente à la mise en place d’un tel projet (Section III). Les questions et objectifs de recherche pour la Phase I sont ensuite présentés (Section IV). Ils sont suivi de la Méthodologie de recherche novatrice qui a été mise de l’avant pour le projet PanAf (Section V). L’Observatoire sur l’intégration pédagogique des TIC, une des réalisations majeures de la Phase I du projet PanAf est par la suite succinctement esquissée (Section VI). Étant donné l’importance accordée au genre dans le projet PanAf, la Section VII est consacrée à cette question. À la Section VIII, on retrouve les principales activités réalisées au cours de la Phase I. On retrouve ensuite une présentation des principales réalisations (outputs) du projet (Section IX). Enfin, à la section X, on retrouve une présentation minutieuse et détaillée de la synthèse des résultats de recherche spécifiques à chacun des pays, en fonction des rapports nationaux produits justement par les chercheurs de ces pays. La Section XI se veut une synthèse générale, presque sous forme de recommandations, sur les types d’intégration pédagogique des TIC retrouvés dans les quelque 117 écoles du projet PanAf. Afin de montrer que ce projet était – et est toujours – solidement ancré dans la littérature scientifique internationale, la Section XII présente un aperçu des principaux éléments théoriques sous-jacents à ce projet : Pourquoi un tel projet en Afrique ? (12.1); Qu’est-ce que l’intégration pédagogique des TIC (12.2); Que sait-on des usages des TIC dans divers contextes éducatifs en Afrique (12.3); Du fossé technologique au fossé technopédagogique (12.4); L’importance des TIC en Afrique (12.5); Quels sont les défis inhérents à l’intégration pédagogique des TIC dans les pays du Nord (12.6); Quels sont les défis inhérents à l’intégration pédagogique des TIC dans les pays du Sud (12.7); L’importance de réaliser des recherches panafricaines sur l’intégration pédagogique des TIC (12.8). Enfin une liste des écoles participant au projet PanAf est présentée en annexe, pour chacun des pays.
I. What is PanAf? a synthesis

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.observatoiretic.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.

The objective of Phase 1 of the PanAfrican Research Agenda on the Pedagogical Integration of Technologies (PanAf) was to better understand how the pedagogical integration of ICT can improve the quality of teaching and learning in Africa through mixed methodology research conducted at the school-scale by African researchers across the continent. The main activity in the initial two-year phase was the development of an Observatory on ICT in African education, modelled on observatories in other research disciplines, such as oceanography.
graphy, which have successfully gathered, organized and updated data for researchers and practitioners in specific fields. The PanAf indicators were developed through a highly participatory process involving researchers—male and female—from universities in 11 countries in different parts of the African continent at a workshop held in Dakar in September 2006. The approximately 180 indicators ensuing monitor ICT in education policies, access, teacher training, ICT use, impact, management, and issues such as gender, language etc. Both qualitative and quantitative research methods were used to gather Observatory data.

Data on several of the indicators currently exist in some of the countries or on the Internet, but rarely in peer-reviewed international academic journals. Brought together in one place, and made freely available, by PanAf’s African research network, unprecedented new data now provide a baseline for future research and collaborative efforts on the pedagogical integration of ICT in Africa. Observatory data is intended to support policy development initiatives, particularly those related to teacher training, as well as scientific and practical publications. Over the course of PanAf Phase 1, partnership agreements were signed with organisations including the World Bank’s Infodev and UNESCO’s UIS, to collaborate and contribute towards the project’s objectives. Besides producing enriching information and organizing it via a user-friendly interface, the research process contributed to capacity building in African higher educational institutions, with a particular focus on research methodology as well as the pedagogical integration of ICT, a sector that can advance educational change in the 21st century.

A newsletter was created for the network to report on PanAf activities. Special mechanisms were put in place to encourage all participating researchers to contribute to the newsletter content and to work towards preparing scientific articles for publication, based on knowledge and analyses generated by project fieldwork. Under the communication strategy each participating country held a policy dialogue workshop.

The PanAf network consists of national research teams based at education faculties in twelve countries across West, Central, East and Southern Africa: Cameroon, Central African Republic, Congo, Ghana, The Gambia, Kenya, Mali, Mozambique, the Republic of South Africa, Senegal and Uganda. A management team based at the Educational Research Network for West and Central Africa (ERNWACA) and the Université de Montréal (www.crifpe.ca) were responsible for continent-wide scientific, technical and administrative coordination. National Committees took responsibility for content uploaded to the Observatory content, and an International Scientific Committee is responsible for the overall rigour of the PanAf network’s research. The Observatory was assessed in part by a statistical analysis of Internet data and an online survey. Lessons learned were documented and continuously incorporated as the project evolved.
II. PanAf partners

2.1. Research

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

2.2 Coordination

• Educational Research Network for West and Central Africa (Bamako) www.ernwaca.org
• Université de Montréal www.cripe.ca

2.3 External partners

• infoDev (World Bank) www.infodev.org
• UNESCO Institute for Statistics www.uis.unesco.org

2.4 International Scientific Committee

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• Pr. Thèrèse Tchombe tmtchombe@yahoo.co.uk
• Dr. Abdoulaye Barry a.barry@unesco.org
The challenge presented to PanAf Phase 1 can be summarized in three basic points:

- The depth of previous research on the pedagogical integration of ICTs in Africa does not reflect the demonstrated importance of the issue
- Results of past studies have lacked a harmonized communication facility
- African education researchers would benefit from methodological and dissemination capacity building

There has never before been a comprehensive PanAfrican study of ICTs in education. To enhance learning and develop education systems through ICTs required a baseline study of use and impact was required in order to facilitate the application of best educational practices, according to the principles proposed by Chickering and Gamson (2004):

- 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.

PanAf Phase 1 research shed light on the pedagogical uses of ICTs in varied African learning settings and areas such as student learning, programmes 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.
IV. Research objectives of PanAf Phase I

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.

As a synthesis, and in response to the challenges highlighted in the literature and on the field, PanAf Phase 1 aimed to:

• Collect new school-scale data, using mixed methodologies
• Create innovative opportunities for knowledge sharing
• Provide learning opportunities for those involved

4.1 Main research question

How can the pedagogical integration of ICT into African education systems improve the quality of teaching and learning?

This question is entirely consistent with the IDRC mission, which is embodied by the five-year Acacia
program to support research leading to recommendations for concrete improvements in the quality of teaching and learning, and was central to PanAf Phase 1.

4.2 Secondary research questions

- Several sub-questions related to the main study question were addressed:
- What ICT usage policies are in force in African education systems?
- What is the state of connectivity, equipment and its management in African education institutions?
- How are African teachers trained in the pedagogical uses of ICT?
- What is the ICT usage profile across the education systems?
- How does ICT impact the various teaching/learning levels in Africa?
- What is the role of administration in the ICT integration process?
- What strategies could be used to promote relative gender equity in ICT use in African education systems?

4.3 Overall research objective

To better understand how the pedagogical integration of ICT can improve the quality of teaching and learning in Africa.

This overall research objective, stemming directly from the research question, as recommended by most research methodology experts (see Huberman & Miles, 1994), was accompanied by specific research objectives that were set to promote research development on the pedagogical integration of ICT in Africa.

4.4 Specific research objectives

- Appraise ICT policies in African education systems
- Report on the state of connectivity and equipment and its management in African institutions
- Describe African teacher training systems in the pedagogical uses of ICT
- Draw a portrait of ICT use in African educational institutions
- Better understand the impacts of ICT on education
- Better understand the roles of school principals, administrative staff and the community in ICT integration
- Identify guarantor strategies for the equitable use of ICT in education.

The above-listed objectives were the cornerstone for more specifically targeted examinations of the pedagogical integration of ICT into African teaching systems. These objectives were combined, depending on the education stakeholders addressed (principals, teachers, students, parents, governments, etc.) as part of the empirical research carried out under this project. Achievement of these research objectives gave an overall understanding of the educational potential of ICT in a range of African contexts. This in turn shed light on existing usage in the different pedagogical fields and promoted mutualisation.
V. Methodology

There are at least four important methodological issues to keep in mind with regard to PanAf Phase 1:

1. The research fieldwork was undertaken via school-scale questionnaires and recorded interviews with educators and learners. The project indicators are both quantitative and qualitative, and therefore the fieldwork instruments required both numerical and text-based responses.

2. Summary analyses of the qualitative responses are uploaded in real-time to www.observatoiretic.org by network’s national experts. These analyses are accompanied by the “raw” data (mp3 files of recorded interviews, scanned completed questionnaires, etc.), and are updated in an ongoing fashion as new information is gathered (data points on the Observatory are clearly time-stamped).

3. In no way did PanAf Phase 1 aim to be nationally “representative” in its selection of schools (explained below). Rather, the research aimed to share real examples of leadership, best practices and challenges in a selection of African schools that already have and are using computers. The Observatory indicators are concentrated at the school (“institutional”) scale, while national data are simply compilations of the results from the selected schools – at a national scale there are complimentary direct links to infoDev and UIS data.

4. While we realize that cybercafés, mobile handsets, television and radio play various roles in technology enhanced learning in Africa, PanAf Phase 1’s definition of ICTs in education was purposefully limited to “computer use in schools” for reasons of inter-institutional and international comparability.

“It was an ambitious and presumptuous, a vain and envious brain that tries to persuade others that there is but a single path to investigate and grasp the knowledge of nature. And it is a foolish and gullible man who chooses to believe in it himself. Therefore, although the steadiest and firmest path, the most contemplative and distinct, the highest reflective mode, must always be preferred, and honoured and cultivated as well, we nevertheless must not find fault with another path that is not without fruition, even though the fruits do not come from the same tree”. (Giordano Bruno, 1548-1600, free translation).

Methodological approach: the mixed method era. 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 as 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 broadly applicable. At first glance, this is the approach advocated by the Canadian Council on Learning (CCL), which supports research on learning based on a 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 the more orthodox, 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 incompatible 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. 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 social science researchers felt they had to choose between qualitative and quantitative approaches, in 1986 this was considered progress compared to the previous mindset. Let us recall that education research used to be dominated by the so-called quantitative method, which directed researchers to begin their studies with hypotheses and seek to prove or disprove them. An additional option was then introduced whereby researchers could choose between the quantitative and qualitative approaches, an option 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. 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 rigorous conclusions are drawn based on a range 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. What is more, regardless of student preferences, a good number of universities still offer courses whose structures reflect this dichotomy. Students must sign up for either qualitative or quantitative research. Also called mixed research. It is only quite recently that the mixed research methodology has gained 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 thorough 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 to combine 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.

Our original proposal for a Panafrican Research Agenda on the Pedagogical Integration of ICT definitely called for this new research methodology. It would not be a question of imposing a mixed methodology on this important project. Instead, we could choose from an eclectic assortment of data collection methods to address the research questions 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, the methodology 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 would carry out both qualitative and quantitative methodologies and apply twice the rigor.

Case and multi-case studies: the main methodological approach. This study aims to better understand how the pedagogical integration of ICT can improve the quality of teaching and learning in Africa. Thus, the aim is to demonstrate the interactions (relations between ICT and teaching/learning) while seeking to better understand and explain them. With the objectives providing a starting point for the study, the methodological approach retained is the multi-case study, as described by Yin (2000) and Stake (1996). Contandriopoulos and colleagues (1991: 37) have also called this type of research investigation a case synthesis.

Case synthesis or case study research is a strategy whereby the researcher decides to work on an analysis unit (or a very limited number of them). Observations are made within the case. Yin (1994) defines the multi-case study as distinct from the single-case study; it aims to reveal the convergences between several cases while examining the particularities of each case. However, note that this method requires a certain rigor as well as similar investigative procedures applied to different situations in order to compare the different case studies. Merriam (1988), and Miles and Huberman (1984) point out the undeniable advantages of the multi-case study over the single-case study: If time, money, and feasibility permit, a researcher might want to study several cases. In so doing, one increases the potential for generalizing beyond the particular case. An interpretation based on evidence from several cases can be more compelling to a reader than results based on a single instance (Merriam, 1988: 154). By comparing sites or cases, one can establish the range of generality of a finding or explanation, and at the same time, pin down the conditions under which that finding will occur [...]. The researcher attempts to see processes and outcomes that occur across many cases or sites and to understand how such processes are bent by specific local contextual variables (Miles & Huberman, 1984: 151). This method would appear to be particularly suited for the present study; specific cases liable to demonstrate the interactions studied (ICT and education) could be selected. The multi-case comparison (Yin, 2000) would also be suitable for the proposed study because it would facilitate an understanding of the dynamic relations between ICT, learning, teaching, educational administration, etc. The multi-case study approach would incorporate multiple data collections and results derived from similar indicators. The particular relevance of this method stems from the case study criteria defined by Yin (2000: 23), which correspond to the methodological features of the present study.

Case study criteria according to Yin (2000) and features of this research project Yin’s (1994) criteria for the case study Features of the present research project 1) The case study investigates a Real-life phenomenon (pedagogical contemporary phenomenon within its integration of ICT) studied in a real-life real-life context. The boundaries between To date, little is known about the phenomenon and context are not impacts of ICT on teaching and learning clearly evident in Africa. 3) Multiple sources of evidence Researchers will use multiple sources of are used. Data and information to better understand the impacts of ICT on teaching and learning clearly evident in Africa. Miles and Huberman (1991) also pointed out the indisputable advantages of the multi-case study over the single-case study. Nevertheless, we are aware of certain methodological limitations in this study, and precautions, such as data triangulation (Huberman and Miles, 1994), would be taken to ensure validity.
5.1 Strengths of the study

A key strength of the 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 the proposed Panafrican Research Agenda on the Pedagogical Integration of ICT. The originality of Yin’s (2000) multicase study is certainly an asset that could facilitate the uncovering of basic convergences between ICT and teaching/learning in widely varying 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 would obtain a more global, complete and extensive perspective on this phenomenon. Similarly, Van der Maren (1993: 17) emphasizes that the great advantage of the case study is that it reveals general, if not universal, features based on a detailed and thorough study of one or more cases. Contandriopoulos and colleagues (1991: 37) also state that: The explanatory strength of this strategy [the case study] rests in the structural coherence of the relations between the case components and the coherence of the variations of these relations with time. The explanatory strength therefore derives from the depth of the case analysis and not the number of analysis units studied.

5.2 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 in light of the collected results to ensure good correspondence with the perception of the phenomenon. Therefore, all the researchers under this project would adopt this method for a given indicator. The methodology workshops would also be very useful, since they would set the methodological guidelines and foster complementary methods used between different researchers, as appropriate. This is because the methods would change according to the different indicators. Consequently, all the researchers would use the same methods for a given indicator, but overall, diverse methods would be used to achieve our indicators.
5.3 Main data collection instruments

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

- Survey questionnaires
- Interviews (individual and group)
- 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 would be very useful for our research project, particularly to obtain responses on the diverse indicators requiring consultations with specific populations (students, educators, etc.). For example, to obtain responses on an indicator showing learner and educator ICT usage, national teams could administer the survey questionnaires to reach a substantial number of subjects relatively rapidly and easily. Goyette (1994) describes the interview procedure as highlighting 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 corroboration. 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 would draw up an interview guide so that the interviews would be semi-structured (Sedlack & Stanley). For instance, the interviews were structured to enable the national teams to better understand the difficulties that teachers encounter in the pedagogical integration of ICT in Africa. Aside from providing information on the general use of the methodological approach, the methodology workshop was a forum to train researchers on how to conduct the interviews.

The compendium of textual data primarily gathered, organized, analyzed and synthesized diverse documents that are closely related to the Observatory indicators. The scientific coordinator of the project, compiled all ICT policies in African countries.

5.4 Determination of the indicators

The indicators were the main activities to the ICT Observatory. An indicator is a category of information that is collected and stored in an observatory from where it may be retrieved. In this case, it consisted of a reliable qualitative or quantitative variable to measure and evaluate conditions and equipment over time in order to monitor the pedagogical uses of ICT. The ICT indicator would be an index of the quantity or quality evidenced by a specific aspect of ICT integration. This would allow the actual performance and effectiveness of each study objective to be assessed, thereby simplifying the data collection process. The indicators would play an integral part in determining the effective-
ness of the pedagogical uses of ICT and their impacts on the entire learning process. To achieve the study objectives, the research employed clearly defined and consistently applied indicators to better assess the conditions for optimum ICT use in the learning process. To define the indicators, we have drawn from the scientific literature on the pedagogical integration of ICT as well as real-life situations. Thus, to supplement the literature review, we held a Project Development Workshop under the auspices of the IDRC in Dakar in September 2006, where we consulted with 35 experts in the field of ICT in education and drew up the indicators. We classified the indicators into twelve main categories:

### 5.5 Main indicator categories

1) National education and ICT policies
2) Equipment, connectivity and access
3) Teacher training
4) Utilization of ICT
5) Impacts on teaching and learning
6) Institution/school management and integration of ICT
7) Equity policies and practices.

### 5.6 Data collection strategy

The first step in the data collection strategy—and one of the most important steps in the study—was to gather, analyze and synthesize the data for uploading to the online Observatory. This necessary and crucial phase started in January 2007 to June 2009 on gathering data for approximately 90% of the indicators. The first step in the uploading of the ICT Observatory indicators compiled all the available data on ICT in African education systems onto this platform.

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

### 5.7 Selection of partner countries

The selection of partner countries began prior to the Project Development Workshop held in Dakar in September 2006. We looked for countries where ICT were present in educational institutions so as to maximize the participation of people with experience in the educational uses of ICT. The IDRC has supported and continues to support projects in this area. At the same time, we did not want to exclude countries such as the Central African Republic and Congo, where ICT use in education is less common but the same challenges to its use prevail. In addition, we decided to adopt an adaptative approach towards the countries identified as main Observatory partners. The research teams from these countries played a key role in constructing and managing the Observatory.
Research Agenda, the 11 following countries were approached and they expressed their intentions to participate in the project:

1. South Africa
2. Cameroon
3. Congo
4. Egypt
5. Kenya
6. Mali
7. Morocco
8. Mozambique
9. Uganda
10. Central African Republic
11. Senegal

In the course of the project, Morocco dropped out and they were replaced by Côte d’Ivoire. Later on Egypt also dropped. Two ERNWACA members (Ghana and Gambia) indicated their intention to join the project and they were accepted in November 2008.

To participate in the Observatory, the research teams from these countries gathered data from various pre-school, primary, secondary, higher level and professional and technical schools.

5.8 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.

Figure X: Illustration du fonctionnement du Comité scientifique et technique de coordination

PanAf Scientific and Technical Coordination
5.9 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.

5.10 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 online, 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 24 months of PanAf Phase I, participating researcher were invited to present results in dozens of major international conferences, including:

• World Conference on Educational Multimedia, Hypermedia & Telecommunications, Vienna, Austria, June 30 - July 4, 2008;
• eLearning-Africa 2009, Dakar, Senegal, May 27 – 29, 2009;
• eLearning-Africa 2010, Lusaka, Zambia, May 27-29, 2010;
• Invitation to present PanAf research results at an Association Universitaire Francophone’s conference, (March 3, 2009)
• 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;

5.11 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 ERN-WACA 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:
Quality verification cycle for data on observatoiretic.org

1. **Fieldwork**
   - Data collection and analysis
   - Upload to Observatory

2. **Management team**
   (ERNWACA / UdM)
   - **Support**
     - Methodological and scientific
     - Administrative and technical
   - **Quality control**
     - Completeness of responses
     - Logic and accuracy
   - **Scientific committee**
     - Oversight and guidance
     - Broad feedback and direction

3. **Completion of data**
   - Finish "blocks" of indicators
   - Upload supporting files

4. **Improvement of quality**
   - Continuous updating
   - National committee validation

5. **Other national teams / users**
   - Transnational comparisons
   - Constructive feedback

6. **Shared methodology**
   (see "x" for each indicator on the Observatory)
VI. The PanAf Observatory revisited

The place of the Observatory (www.observatoiretic.org) is central in the PanAf projet. 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…
Agenda panafricain de recherche sur l’intégration pédagogique des TIC : synthèse de la Phase 1

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

**Tamale Senior High School**

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

General information

Tamale senior high school is a public, boarding, and mixed secondary institution. It was the first public school in Tamale. It is located in the Tamale Metropolis, the northern regional capital (Latitude 9° 24’ 01” and now has an ICT lab with access to the Internet. It offers science, agriculture science, general, and creative streams (GCE) at Senior High School (SHS) level. The school has a student population of One Thousand, Seven hundred, and Seventy-five students. The headmaster is Alhaji T. A. Mahamah, himself a past student of the school. The school has a well-equipped laboratory with computers, CD-ROMS and pen drives, which...
2. Advanced Search, which creates tables of data from multiple institutions…

For multiple indicators...

<table>
<thead>
<tr>
<th>Country</th>
<th>Institution</th>
<th>3.1.1 Number of educators who have completed 1 to 50 hours of continuing education/professional development which included ICT integration</th>
<th>3.1.2 Number of credits of continuing education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>CISM Lamina Senghor de Jos</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Collège Africais des Etudes</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Collège Sacré-Cœur</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Ecole Francaise de Terre</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>École Sénière Anandou Aby</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Faculté des Sciences et Technologies de L’Education et de la Formation (FASTE)</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Lycée Commercial El Hadj Abdoulaye Niaf</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Lycée Du Bois de Mbour</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Lycée John Fitzgerald Kennedy</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

And is exportable to Microsoft Excel.
3. Summary Search, which uses Google Maps…

**Summary Search**

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.
Since January 2007, more than 1 500 000 visitors. As illustrated in Figure X, in the first 9 months of 2010, there were 486 241 visitors, an average of 1621 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).

![Graph showing visitor data from 1/2010 to 12/2010.](image-url)
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-cafés. 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.)

7.1 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.

7.2 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.

7.3 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
VIII. Project Activities of PanAf Phase I

8.1 Workshops

The methodology workshop would be held three months after the start of the data collection. Its purpose would be to better prepare the researchers to carry out the field tasks. By bringing together researchers from the various participating countries, the workshop would constitute an oversight group that could explain the methodological approach adopted for the study. Aside from sharing and evaluating the information collected in the first three months, the workshop would be an ideal opportunity for preparing the researchers for a much more extensive field data collection. During the workshops the researchers had the opportunity for the first stocktaking of progress by means of summaries of the types of information gathered and made available online and the potential problems identified. At the same time, it was an opportunity for the participants to check the consistency of their methodological approaches and fine-tune their procedures. Aside from providing information on the general use of the methodological approach, the methodology workshops were used to train researchers to conduct the interviews.

The first methodology workshop was held on the 6-7th September 2007 after the start of the data collection in Bamako for the Francophone countries. The second was held from the 24-25 September for the Anglophone countries. The main purpose of these two workshops was to better prepare the researchers to carry out the field tasks. By bringing together researchers from the various participating countries, the workshop constituted an oversight group that could explain the methodological approach adopted for the study. Aside from sharing and evaluating the information collected in the first three months, the workshops provided ideal opportunities for preparing the researchers for a much more extensive field data collection. During the workshops the researchers had the opportunity for the first stocktaking of progress by means of summaries of the types of information gathered and made available online and the potential problems identified. At the same time, it was an opportunity for the participants to check the consistency of their methodological approaches and fine-tune their procedures. Aside from providing information on the general use of the methodological approach, the methodology workshops were used to train researchers to conduct the interviews.

There was a scientific training workshop that took place in South Africa from the 11-12 February 2008. The main objectives were:

1. Reinforce importance of data analysis, writing, and scientific publication within PanAf project
2. Work systematically with peers and resource persons to review steps of writing process
3. Develop paper outlines for papers to be presented at May 2008 e-learning conference in Ghana and for submission to journals
8.2 Fieldwork

Following the methodology workshop, the third step would be the field data collection, which would be ongoing for 20 months. This procedure would require a lengthy duration to enable the researchers to observe as much as possible and gather the most accurate information. Complete observation of certain types of information might require the setting of minimum durations.

This initial step of the investigation was aimed at compiling a maximum amount of information and to make it available on the project Website. A 3-month period was enough for field researchers to gather as many data as possible. Prior to the data collection, a meeting was held to set up partnerships with the institutions and projects willing to share their document and data resources with the Observatory.

8.3 School visits

During the phase I, the management team carried out school visits in ten countries covering 20 schools (compiled trip reports attached). Since Ghana and The Gambia joined the project late it was not to carry out any school visits there.

8.3.1 Objectives of the visits

- To grow methodological and publication capacity.
- To provide the coordination team with an overview of the fieldwork participating countries/institutions.
- To allow the national teams to present their preliminary findings, and to raise issues regarding the ongoing project.
- To allow the coordination team to visit two schools from the project.

8.3.2 Activities during/before the visits

1. Draft versions of publications of national team members must be submitted to visiting team one week before the visits take place.
2. During the stay, visit to two schools:
   a. meet school management (director, principal etc.)
   b. meet educators (teachers, trainers etc.)
   c. meet students
   d. visit ICT facilities
3. During the stay, meeting with members of the national teams during teams during an informal meal, to get to know each other, and also to share lessons learned, challenges, opportunities and expectations with regard to the PanAf project.
4. Formal feedback session on publications submitted (the goal of the session is to support the national team members to publish their work in peer-reviewed and other professional journals).

8.4 Policy dialogue

Toward the end of the project the various teams organised national workshops to present project results to all concerned, particularly the schools, partners, policymakers and local and national elected representatives. Out of the twelve countries participating in the project, ten countries (Cameroon, Côte d’Ivoire, Central African Republic, Ghana, Kenya, Mali, Mozambique, Republic of Congo, Senegal, South Africa and Uganda) presented their country reports and also shared the recommendations brought forth during their national policy dialogue workshops. The Republic of Congo could not organise a national policy dialogue workshop. Gambia did not produce a country report or a policy dialogue workshop.
8.5

As an opportunity for knowledge sharing, networking and capacity building, the eLearning-Africa conference is unsurpassed in the domain. Officially called the International conference on ICT for Development, Education and Training, it took place this year from the 27th to 30th of May in Accra, Ghana. The PanAf Observatory project was represented by researchers from each of the participating countries, members of the management team, and associated partners – of note, IDRC supported the participation of 19 individuals from 12 countries.

A highlight of the conference was a special session dedicated to the presentation of the Observatory. In the main conference hall, after a brief introduction to the overall project, PanAf researchers (from Kenya, Central African Republic, Congo and Mali) presented recent papers grounded in data available publicly online via the Observatory.

PanAf Observatory team members also took the eLearning conference as an opportunity to forge new connections, begin or continue discussions with new partners, and generally advance the study of the pedagogical integration of technologies in African education systems, with their peers from around the world.

In accordance with PanAf’s capacity-building objectives, programme manager Dr. Moses Mbangwana and Kenyan researcher Dr. Harriet Kidombo represented the project by participating in a “Gender Awareness Workshop” organised by IDRC October 11th and 12th, 2008 in Johannesburg South Africa.

The workshop provided an opportunity to assess and reinforce the PanAf Observatory’s targeted and integrated approach to crosscutting development issues including gender, as well as providing a forum for awareness-building, reflection and exchange for attendees.

Many present noted that the Observatory has succeeded, where many other projects have not, in putting gender at the fore of its research activities.

8.6
Calendar

One on one communication being crucial to create personal rapport, and to share more complex learning opportunities, the project teams meet occasionally as a group:

- Indicator development workshop, Dakar, September 2006
- Management team workshop, Bamako, February 2007
- Coordination team leaders meeting, Ouagadougou, December 2007
- Methodology workshop in French, Bamako, September 2007
- Methodology workshop in English, Nairobi, September 2007
- Congo team meeting, Brazzaville, October 2007
- Scientific Writing Workshop in Johannesburg, February 2008
- Upcoming country/school visits (see above)

One on one communication being crucial to create personal rapport, and to share more complex learning opportunities, the project teams meet occasionally as a group. In this latest reporting period:

- Scientific Writing Workshop in Johannesburg, February 2008
- Country/school visits to South Africa and Mozambique, February 2008
- A management team meeting in Bamako, April 2008
- Country/school visits to Mali and Senegal, April 2008

“” to Congo “”
Participation in the eLearning-Africa conference in Accra, May 2008

In accord with dissemination goals, from the 21st to 24th of October 2008, PanAf programme manager Moses Mbangwana attended USAID’s Regional Higher education Summit in Kigali, Rwanda. There he presented the project, its partners, and some preliminary results related to the pedagogical integrations of ICTs in participating higher education institutions.

PanAf project teams meet occasionally for various purposes. In this latest reporting period, three meetings took place, those of the:

- international scientific committee, in Bamako, September
- Kenyan and Ugandan country teams and school visits, in Nairobi and Kampala, October

### 8.6.1 Calendar of main activities for PanAf, Phase I

<table>
<thead>
<tr>
<th>Dates</th>
<th>Task</th>
</tr>
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<tbody>
<tr>
<td>• July- September 2007</td>
<td>• End of data input for the 12 first indicators <em>(Block 1)</em></td>
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<tr>
<td></td>
<td>• Finalisation of the selection of the 10 institutions (according to the criteria)</td>
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<tr>
<td>• October – November –December 15th</td>
<td>• Forms for the 10 institutions</td>
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<td>• Form for the country</td>
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<td>• Questionnaires for the Managers (same for teacher-training inst.) <em>(Block 2)</em></td>
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<tr>
<td>• December 15th – January 15th</td>
<td>• data verification (coordination team)</td>
</tr>
<tr>
<td>• December 15th – February 15th 2008</td>
<td>• Questionnaires for the Educators (same for teacher-training inst.)</td>
</tr>
<tr>
<td>• February 11th-12th 2008</td>
<td>• Workshop on scientific writing</td>
</tr>
<tr>
<td>• February – May 2008</td>
<td>• Visit of national teams (coordination team)</td>
</tr>
<tr>
<td>• March – May 15th 2008</td>
<td>• discussion group with the Learners</td>
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<tr>
<td></td>
<td>• Interview with the Educators <em>(Block 3)</em></td>
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<td>• May 28th – 30th</td>
<td>• eLearning Africa, Accra</td>
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<tr>
<td>• May 15th – 31st 2008</td>
<td>• data verification (coordination team)</td>
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<td>• June – August 15th 2008</td>
<td>• Follow-up work, etc.</td>
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<tr>
<td>• August 15th – September 15th 2008</td>
<td>• data verification (coordination team)</td>
</tr>
<tr>
<td>• September 2008</td>
<td>• End of data input for all indicators <em>(Blocks 1-3)</em></td>
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<tr>
<td></td>
<td>• Planning of Phase 2</td>
</tr>
<tr>
<td>• October–December 2008</td>
<td>• New publications, including “100 Schools” book and thematic articles</td>
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<tr>
<td></td>
<td>• Remaining country/school visits by project management team</td>
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<tr>
<td></td>
<td>• Quality review of all data by international scientific committee</td>
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<tr>
<td>• January-May 2009</td>
<td>• Phase 1 extension period expected to re-synchronize management team • partner institution budget cycles</td>
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<tr>
<td>• May 2009</td>
<td>• Beginning of Phase 2</td>
</tr>
<tr>
<td>• November-December 2008</td>
<td>• End of data input and quality checks for all indicators <em>(Blocks 1-3)</em></td>
</tr>
<tr>
<td></td>
<td>• Planning of Phase 2</td>
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<tr>
<td></td>
<td>• New publications, including “100 Schools” book and thematic articles</td>
</tr>
<tr>
<td>January-May 2009</td>
<td>• Remaining country/school visits by project management team (cm, ci, cf, gh, gb)</td>
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<tr>
<td></td>
<td>• Phase 1 extension period expected to re-synchronize management team partner institution budget cycles</td>
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<tr>
<td>May 2009</td>
<td>• Beginning of Phase 2</td>
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<tr>
<td></td>
<td>• eLearning-Africa conference (Dakar)</td>
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IX. Project outputs and dissemination

The Observatory itself is the primary output of the PanAf research project – however it is important to view it not as a product of 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.

To reiterate, the principal objectives of the project are first to collect, analyse 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. To ensure the Observatory sees use and stakeholders recognize its importance as a resource, investment is also made in appropriate dissemination strategies. 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 research results.

In addition to the regular project newsletter produced by ERNWACA (www.panaf-edu.org), during this reporting period a book was produced, for imminent publication, called “Pedagogical Integration of ICT: successes and challenges from 100+ African schools”. The book brings together summary data from the institutions participating in the project, bracketed by analysis from the international scientific committee and project director Professor Thierry Karsenti.

In accord with dissemination goals, from the 21st to 24th of October 2008, PanAf programme manager Moses Mbangwana attended USAID’s Regional Higher education Summit in Kigali, Rwanda. There he presented the project, its partners, and some preliminary results related to the pedagogical integrations of ICTs in participating higher education institutions.

PanAf project teams meet occasionally for various purposes. In this latest reporting period, three meetings took place, those of the:

- international scientific committee, in Bamako, September
- Kenyan and Ugandan country teams and school visits, in Nairobi and Kampala, October
Two new developments in knowledge sharing occurred during this reporting period, one being an advancement towards partnership with the United Nations Economic Commission for Africa’s National Information and Communication Strategies initiative in order to leverage the Observatory as a dissemination facility for their ICT policy data from across Africa. This mutually beneficial relationship both provides an important communication tool for NICI’s investments, and complements the Observatory’s focus on institutional scale knowledge sharing.

9.1 Capacity-building

In accordance with PanAf’s capacity-building objectives, programme manager Dr. Moses Mbangwana and Kenyan researcher Dr. Harriet Kidombo represented the project by participating in a “Gender Awareness Workshop” organised by IDRC October 11th and 12th, 2008 in Johannesburg South Africa.

The workshop provided an opportunity to assess and reinforce the PanAf Observatory’s targeted and integrated approach to crosscutting development issues including gender, as well as providing a forum for awareness-building, reflection and exchange for attendees.

Many present noted that the Observatory has succeeded, where many other projects have not, in putting gender at the fore of its research activities.

9.2 Les incidences du projet PanAf sur les différents acteurs

La phase 1 du projet panafricain de recherche sur l’intégration pédagogique des TIC dans l’éducation était essentiellement basée sur 1) la collecte des données 2) l’observation de salle de classes au niveau des 12 pays participants. Ces deux activités ont créé un cadre propice d’échanges entre chercheurs, enseignants, élèves et administrateurs des écoles sélectionnées, décideurs politiques, planificateurs, donateurs, fournisseurs de ressources pédagogiques et partenaires stratégiques et le grand public.

Il est tout à fait remarquable de constater que déjà au terme de cette phase de mise en place du projet, des changements importants ont pu être observés au niveau de chacun des acteurs concernés. Ces incidences sur les capacités individuelles, les comportements, les réflexions des groupes cibles concernés peuvent être définies comme suit :

1. Les chercheurs/Universités partenaires : Le projet panAf a permis d’accroître, en leur donnant matière à réflexion, leurs capacités d’analyse sur l’importance de la recherche sur l’intégration et l’utilisation pédagogique des TIC. Il a mis un grand nombre de données à la disposition des chercheurs, données qu’ils ont utilisées dans les publications qu’ils ont effectué dans des revues scientifiques spécialisées, des livres ou dans le bulletin d’information du PanAf.

Le projet a été le moteur de la coopération Sud-Sud entre les universités africaines et les chercheurs qui ont échangé sur les résultats de la recherche ayant trait aux questions relatives à la politique TIC, à l’intégration et à la pérennisation des TIC dans l’éducation.
Le projet a également renforcé les capacités des chercheurs en rédaction scientifique (par exemple, les chercheurs du Cameroun ont collaboré à l'écriture d'un ouvrage sur « comment mieux utiliser les TIC dans l’Education au Cameroun » et dans la maîtrise du dialogue politique.

2. Les décideurs politiques, pédagogues, planificateurs : Un dialogue fort et constructif est né durant les ateliers et les rencontres internationales auquel le PanAf a pris part, entre ces différents acteurs et les chercheurs dont les travaux et les échanges ont contribué à accroître leur intérêt pour l’intégration des TIC dans l’Education et à leur faire prendre plus conscience du fait qu’une meilleure utilisation des nouvelles technologies à l’école pouvait contribuer à améliorer la qualité des enseignements-apprentissages et de la gestion scolaire.

3. Les fournisseurs de ressources pédagogiques ((infoDev, SchoolNetAfrica, UIS, ICBA, AAU, AVU, GeSCI etc.) : des partenariats ont été développés avec ces sociétés en vue d’échanger, de partager des données et des expériences et de collaborer dans le domaine de ICT et développement durable.

4. Les donateurs (CRDI, UNESCO, ADEA) : le PanAf a fourni aux donateurs des documents écrits et sources d’information divers (bulletins d’information, conférences, livrets etc.) permettant de mieux comprendre les questions liées à l’intégration et l’utilisation pédagogique des TIC dans le système éducatif africain.

5. Les écoles participantes des 12 pays membres du PanAf : le programme a mis ces écoles au devant de la scène internationale, leur donnant ainsi présence et visibilité – occasionnant une source de motivation pour tous les acteurs des écoles concernées.

6. ROCARE, Université de Montréal : Le PanAf a renforcé la visibilité au niveau de l’expertise de l’université de Montréal et du ROCARE dans le domaine de la recherche sur les TICE. Le projet a également insufflé une nouvelle dynamique à la coopération entre le Nord et le Sud, en l’occurrence entre l’Université de Montréal et le ROCARE, coopération basée sur le déploiement de synergie et la franche collaboration.

7. Le grand public qui comprend toutes les couches professionnelles a également été informé sur le programme via les médias qui ont couvert les réunions du PanAf et certains chercheurs ont été approchés par des auditeurs ou des spectateurs intéressés par la question des TICE.
### 9.3 PanAf network Outcomes

<table>
<thead>
<tr>
<th>Partners</th>
<th>Outcomes</th>
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</table>
| Researchers, Universities | • 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).
  • It 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).
  • It 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).
  • It 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). |
| Policymakers, Educationalists, Planners etc. | • A strong and constructive dialogue has been established 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. | • Partnerships have been established with infoDev, UIS, SchoolNet Africa, Nepad eSchools etc. in order to exchange/share data and experiences and to collaborate in the field of ICT4ED. |
| Participating Schools (primary, secondary, tertiary schools in 12 countries) | • The program 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 | • 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. |
Cette section présente une synthèse et une analyse minutieuses des rapports nationaux présentés par chacun des pays. On y présente donc une synthèse panafricaine des résultats présentés dans chacun des rapports nationaux.

10.1 Échantillon sélectionné

Au Ghana, cinq établissements représentatifs des systèmes d'éducation pré-tertiaire et tertiaire ont été choisis : University of Education, Winneba (formation des enseignants, région centrale, milieu urbain); Senior High Secondary-Technical (secondaire supérieur technique, région centrale, milieu non-urbain); Asuasi Technical Institute (secondaire supérieur technique, région centrale, milieu non-urbain); Ayirebi Junior High (secondaire inférieur, région de l'Est, milieu non-urbain); le Tamale Senior High Secondary School (secondaire supérieur, région du Nord, milieu urbain). Au Sénégal, 10 établissements ont participé à la recherche : CEMLS, CASE, CSSC, École FT, École SAAM, Fastef, LTEAN, LDD, LJFK et LSLL. En Centrafrique, on a sélectionné 10 institutions qui ne sont pas représentatives de tout le pays puisque la méthodologie panafricaine adoptée exigeait que seulement les établissements qui possèdent des ordinateurs puissent faire l'objet de la recherche. Les établissements retenus dans ce pays sont le lycée Barthélémy, le Lycée Marie Caron, le Lycée Pie XII, l'École Normale Supérieure, l'École Internationale Turque, le Groupe Élite Formation, la Haute École de Gestion et de Comptabilité, l'École Saint Charles et le lycée scientifique Ben Rachid. Ces établissements ont été choisis en respectant un équilibre entre le secteur privé et le secteur public; chaque institution se situe à un niveau différent en matière de ratio d'ordinateurs disponibles, d'accès à une connexion Internet ou non et de présence ou non d'un plan d'intégration des TIC. En Ouganda, on a choisi onze établissements d'enseignement : cinq écoles primaires, quatre écoles secondaires et deux établissements tertiaires de formation des enseignants. 8 établissements étaient publics et 3 étaient privés. Ils étaient tous situés dans la région centrale de l'Ouganda, plus précisément dans les districts de Kampala, de Wakiso et de Mukono. Au Mozambique, 10 établissements d'enseignement ont participé à la recherche à savoir 1 école privée de ni-
veau primaire et secondaire; 1 école communautaire pour filles de niveau primaire et secondaire; 1 établissement public de formation des enseignants et 7 écoles secondaires qui enseignent principalement à deux cycles du secondaire. Au Mali, on a sélectionné 10 établissements d’enseignement dont un établissement d’enseignement supérieur de formation des professeurs d’enseignement secondaire général, un établissement de formation des maîtres de l’enseignement fondamental, trois établissements d’enseignement fondamental, quatre établissements d’enseignement secondaire général et un établissement d’enseignement technique et professionnel. Au Kenya, 10 établissements d’enseignement ont participé à l’étude : 4 écoles primaires, 5 écoles secondaires et un collège de formation des enseignants. En Côte d’Ivoire, on a retenu 10 établissements d’enseignement dont un du primaire, huit du secondaire et un supérieur. La moitié des établissements sont privés et l’autre moitié, publics; sept établissements sont situés en zone urbaine et les autres sont en zone semi urbaine. Au Cameroun, on a choisi un établissement public d’enseignement supérieur, 7 établissements d’enseignement secondaire (dont 5 sont publics), une école privée d’enseignement primaire et une école publique d’enseignement primaire. Au total, deux institutions sont situées en zone rurale et les autres sont en zone urbaine. En Afrique du Sud, on a retenu cinq écoles primaires, 4 écoles secondaires et un établissement d’enseignement tertiaire qui proviennent tous de la province de Gauteng. Huit écoles sont publiques et deux sont privées. Ces écoles représentent bien la grande variété de contextes sociaux que l’on retrouve en Afrique du Sud.

10.2 Défis méthodologiques

Les équipes nationales ont souligné différents défis méthodologiques auxquels ils ont fait face. Ces difficultés et contraintes concernent principalement le temps, les instruments de mesure, les participants eux-mêmes, l’équipement et l’aspect géographique.

- **Contraintes de temps** : grande quantité d’information requise en peu de temps, horaire planifié peu réaliste compte tenu du travail à réaliser (Ghana); difficultés à conjuguer exigences habituelles de travail à l’université et travail de recherche (Ouganda).
- **Contraintes liées aux instruments de mesure pré-élaborés** : impossibilité pour l’équipe locale de modifier l’instrument de mesure pour s’adapter à la situation particulière de son pays (Ghana, Ouganda); les chercheurs suggèrent de participer tous ensemble à l’élaboration de l’instrument (Sénégal, Afrique du Sud).
- **Contraintes liées à certains items difficiles à comprendre** : manque de pertinence ou équivoque de certains items par rapport au contexte (politique d’équité dans l’utilisation des TIC, sensibilité culturelle au contenu, éducation spéciale, relation entre l’intégration des TIC et la langue maternelle), terminologie parfois équivoque ou peu adaptée au contexte (Sénégal, Afrique du Sud); manque de précision sur certains indicateurs (Impacts [indiqués par les managers] sur le développement des contenus des cours africains, nombre d’apprenants aux besoins spéciaux) (Centrafricain, Côte d’Ivoire); il a fallu expliquer point par point les questions même si les questionnaires avaient été préalablement envoyés aux enquêtés (Mali); questions ambiguës (Kenya).
- **Contraintes liées aux réponses données par les participants** : réponses à caractère laconique, absence de données fournies pour certains indicateurs, indisponibilité des productions évoquées lors des entretiens (Sénégal); refus de répondre de certains participants qui affirment ne pas s’y connaître en TIC (Centrafricain); parfois, refus de la part des enseignants de partager les plans des leçons (Kenya); nombreux éducateurs qui refusent de répondre à cause d’un climat sociopolitique de méfiance (Côte d’Ivoire).
• Autres difficultés liées à la compilation des données : difficulté à respecter le nombre de mots requis lorsqu’un indicateur n’existe pas ou ne s’applique pas dans une situation (Ghana); ordre différent des items dans le questionnaire de ce qui avait été présenté à l’observatoire, ce qui retardait l’entrée des données (Ghana).

• Contraintes liées à la motivation des répondants : plusieurs enquêtés montraient peu d’intérêt lors des réponses même lorsqu’ils reconnaissaient que le sujet était important pour eux, ce qui pourrait être causé par le grand nombre de questions du sondage (Ouganda); le questionnaire a paru long aux répondants (Mali); au départ, difficultés à convaincre les participants du bien fondé de l’enquête (Congo); scepticisme des participants dans un contexte où les établissements ont été surévalués par les chercheurs (Afrique du Sud).

• Contraintes liées au manque de culture des participants sur l’impact des TIC sur la planification des leçons, la politique nationale en matière d’usage des TIC, sur l’existence de documents relatifs à la politique de l’équité dans l’utilisation des TIC (Côte d’Ivoire).

• Contraintes liées aux participants qui demandent une compensation financière (Centrafrique, Mozambique, Cameroun); établissements qui ne sont pas à l’aise avec les photographies et qui demandent une compensation financière pour celles-ci (Kenya).

• Contraintes liées aux disponibilités des participants qui obligent les chercheurs à revenir plusieurs fois sur le même lieu (Centrafrique); difficultés à avoir accès aux bons répondants, ce qui oblige l’équipe à se déplacer plusieurs fois (Ouganda); difficulté à faire des focus groupes lorsque les enseignants ne viennent pas tous à l’école à la même heure (Mali); enseignants chefs qui sont très occupés (Kenya).

• Contraintes liées à l’équipement : faible bande passante et pannes électriques qui rendaient difficile l’entrée de donnée dans l’observatoire (Ouganda); caméra ou iPod qui s’éteint pendant l’enregistrement (Kenya); pas de budget alloué pour le matériel numérique pour enregistrer les entrevues ou pour numériser les questionnaires, qui sont nécessaires pour certaines étapes exigées par le processus de recherche (Ghana).

• Difficultés à trouver des établissements équipés d’une salle d’informatique (Côte d’Ivoire); difficulté à trouver des établissements qui ont une quelconque forme d’engagement par rapport aux TIC (Afrique du Sud).

• Contraintes géographiques : éloignement des institutions situées en campagne et coût relié aux déplacements (Congo).

10.3 Existence d’une politique nationale à propos des TIC

Au Ghana, la politique nationale sur les TIC a été élaborée au départ en 2003 et, depuis 2006, elle est en processus de révision. Ce processus vise à y tracer, entre autres, les grandes lignes de stratégies et de procédures d’implantation qui vont guider le déploiement des TIC dans le système scolaire. En Ouganda, il existe plusieurs politiques en lien avec les TIC. Des discussions sont en cours à propos d’une ébauche de politique des TIC élaborée en 2008. Cette politique engagerait le gouvernement, par l’entremise du ministère de l’Éducation, à garantir l’éducation aux TIC tout au long du cheminement scolaire, à rendre l’usage des TIC obligatoire et à développer des curriculums pour les établissements primaires, secondaires et tertiaires. Au Mozambique, le nouveau curriculum présenté en 2008 introduit les TIC comme discipline pour les étudiants des trois dernières années du secon-
Le gouvernement a pour objectifs d’introduire cette discipline dans toutes les écoles secondaires générales d’ici 2010 et aussi d’amener les enseignants à utiliser cette technologie pour concevoir et pour piloter leurs leçons. Au Kenya, il y a une politique nationale des TIC (2006) ainsi qu’une stratégie nationale pour l’éducation et la formation, ce qui illustre que le gouvernement a conscience du rôle des TIC dans l’éducation et dans le développement. Des objectifs d’augmentation des infrastructures numériques, de la connectivité et de la mise en réseau aux niveaux primaire et secondaire sont à atteindre d’ici 2011. On constate par contre qu’au Kenya, les écoles publiques n’intègrent pas autant les TIC que les écoles privées. En Afrique du Sud, il existe une politique : le South African White Paper on eLearning et la plupart des écoles visitées s’assurent que tous les apprenants ont accès à l’ordinateur. Au Congo, il n’existe pas de politique nationale ou de politique en éducation, mais il y a tout de même 3 documents fondamentaux qui donnent des orientations générales en matière de politique nationale des TIC. Au Cameroun, la situation est semblable : bien qu’il n’existe pas de politique nationale légale des TIC, il y a tout de même 3 documents fondamentaux qui donnent des orientations générales en matière de politique nationale des TIC. Au Sénégal, le ratio varie de 6 élèves par ordinateur à 262 élèves par ordinateur selon les établissements; en Mozambique, le meilleur taux d’accès est de 18 apprenants pour un ordinateur et le pire, de 456 apprenants pour un ordinateur; au Mali, les résultats varient entre 250 apprenants par ordinateur et 5 apprenants par ordinateur. Entre les divers pays ayant participé à l’agenda, on observe aussi des différences. Au Kenya, le ratio moyen était de 24 apprenants par ordinateur, tandis qu’il est d’environ 148 apprenants par ordinateur en République centrafricaine. En Côte d’Ivoire et au Cameroun, 9 établissements sur 10 en avaient une connexion Internet, tandis qu’au Congo, aucun établissement n’était connecté à Internet. Enfin, au Ghana, on rappelle que les quelques ordinateurs que les écoles prêtetaires possèdent se brisent facilement à cause du manque de climatisation, de l’instabilité de l’alimentation électrique et des infections par les virus informatiques et en Ouganda, on précise que l’accès des apprenants aux ordinateurs est contrôlé par des règles strictes. Dans quelques établissements, principalement niveau primaire, les élèves n’ont pas d’accès à l’ordinateur que lors des cours d’informatique. Dans d’autres écoles, la priorité d’accès est donnée aux membres du club d’informatique.
10.5 Types d’usages des TIC par l’administration, par les apprenants et par les enseignants

Dans la plupart des pays, l’administration fait usage des TIC pour consigner des données comme les dossiers scolaires, les frais d’admission, les données personnelles, les résultats aux évaluations, les emplois du temps et les calculs de notes. Pour leur part, les apprenants se servent des TIC pour produire des documents (notamment à l’aide du traitement de texte), pour faire des recherches, pour communiquer et pour se distraire. Les enseignants, quant à eux, se servent des TIC pour la planification des leçons (recherche de ressources documentaires sur Internet, préparation de documents), pour le déroulement des leçons (vidéoprojecteurs, cd-rom, logiciels éducatifs) et pour la confection d’évaluations. Cependant, au Ghana, ce sont seulement les enseignants du cours de TIC de base qui utilisent les TIC au cours de leur enseignement (la plupart des autres enseignants ne font pas usage des TIC pendant leur cours) tandis qu’en Ouganda, au niveau secondaire et supérieur, les TIC sont intégrés dans une variété de matières comme les mathématiques, la biologie, la chimie et la géographie en plus de l’informatique, bien sûr.

10.6 Formation universitaire et formation continue

En général, la formation à l’intégration pédagogique des TIC est insuffisante dans les différents pays étudiés. Au Ghana, les éducateurs ne reçoivent pas de formation à l’usage des TIC pour l’enseignement et pour l’apprentissage. Les programmes destinés aux futurs enseignants offrent peu d’occasion d’apprendre les habiletés nécessaires pour intégrer les TIC dans l’enseignement. Au niveau pré-tertiaire, ce sont principalement les enseignants du cours de TIC de base qui ont suivi des formations professionnelles sur les TIC d’une durée de moins de 50 heures tandis qu’au niveau tertiaire, pratiquement tous les éducateurs ont affirmé avoir participé à des activités de formation continue d’une durée de moins de 50 heures. En Ouganda, on souligne que la majorité des éducateurs n’ont pas été suffisamment formés puisqu’ils ont participé pour la plupart à moins de 50 heures de perfectionnement professionnel qui incluait l’intégration pédagogique des TIC. Les enseignants qui intègrent les TIC dans leur enseignement ont reçu leur formation par différents moyens : par l’entremise de collègues de travail ou par des cours privées, souvent du niveau de la maîtrise. En Côte d’Ivoire, seuls deux établissements ont organisé des formations en TIC ; dans les autres cas, les éducateurs se sont formés par leurs propres moyens. Au Congo, la formation des managers basée sur l’apprentissage de Word et d’Excel, ce qui apparaît très insuffisant pour ce type de fonctions. Enfin, au Cameroun, 50 % des éducateurs et 20 % des éducatrices ont suivi plus de 50 heures de formation permanente ou de développement professionnel intégrant les TIC.

10.7 Impacts sur l’enseignement et sur l’apprentissage

Autant les apprenants que les enseignants des différents pays font ressortir de nombreux avantages liés à l’utilisation des TIC : gain de temps (entre autres par l’accès facile et rapide aux connaissances lors de l’utilisation d’Internet), augmentation des aptitudes de recherche d’information des étudiants et diminution des erreurs typographiques et grammaticales grâce aux fonctions de révision du logiciel de traitement de texte, allègement du travail de l’ensei-
gnant, communication facilitée entre enseignants et élèves ou entre les élèves eux-mêmes, possibilité d’améliorer les leçons grâce au matériel pertinent disponible sur Internet, gestion plus facile des notes aux évaluations, apprentissage plus intéressant avec les TIC, augmentation de la motivation et développement de compétences, apprenants plus attentifs, amélioration des performances scolaires des apprenants, enseignants qui n’ont plus besoin de secrétaires pour l’élaboration de sujet d’examens, diminution des erreurs dans le calcul des notes, diminution des demandes de révision de notes, possibilité pour les enseignants d’utiliser les outils de communication pour faciliter la réflexion, diminution des dépenses en papier grâce aux communications par courriel, etc. Par contre, en Ouganda, des éducateurs relèvent aussi quelques impacts négatifs comme le fait que les étudiants deviennent parfois dépendants des ressources numériques et apprennent alors moins facilement par les autres méthodes pédagogiques. Certains étudiants en viennent à ne plus prendre de notes en classe, à ne plus se présenter aux cours ou à perdre leur temps à clavarder ou à regarder du matériel pornographique. Enfin, dans quelques cas, les apprenants font trop confiance à Internet et manquent d’esprit critique en classe. Des éducateurs se sont plaints que les étudiants devenaient paresseux et se disaient qu’Internet avait réponse à tout. Par conséquent, en certaines occasions, les TIC pouvaient décourager le goût de l’effort soutenu et l’esprit d’innovation. Bref, les impacts des TIC sont majoritairement perçus par les éducateurs comme étant très positifs, mais certains enseignants craignent malgré tout des impacts négatifs amenés par les TIC.

10.8 Les acquis en matière de TIC

Malgré les nombreux besoins auxquels font toujours face les établissements africains, notamment en ce qui a trait à la formation et à la présence suffisante de matériel informatique, certaines projets vont déjà de l’avant et constituent les premiers pas vers une intégration des TIC. Au Ghana, il y a des manuels et des plans de cours disponibles pour faciliter l’enseignement. De plus, les enseignants de cours de TIC sont prêts à offrir de la formation aux éducateurs et aux apprenants. Enfin, il y a des laboratoires informatiques auxquels il est possible d’accéder périodiquement. Au Sénégal, on souligne l’existence de salles informatiques fonctionnelles, un début d’initiation des enseignants aux TIC et la réalisation par les apprenants de différents supports (textes d’exposés, dépliants, affiches, diaporama). Au Congo, l’intégration pédagogique des TIC fait déjà partie du paysage scolaire : en effet, il y a des cours qui font appel à l’ordinateur, c’est-à-dire des cours qui sont enseignés avec la technologie et des cours spécifiques qui enseignent la technologie. Au Cameroun, diverses initiatives pionnières ont eu lieu, notamment la création d’un courriel pour l’évaluation des apprenants à l’école normale supérieure pour résoudre le problème de la perte de copie, de revendications sur les notes et d’anonymat des notes; l’utilisation systématique des vidéoprojecteurs pour les soutenances au département des sciences de l’éducation par le coordonnateur du ROCARÉ, le soutien à l’achat des ordinateurs portables dans une opération un chercheur un ordinateur portable; l’apprentissage à distance, un blogue pour la publication en ligne des productions des apprenants; des jumelages entre établissements équipés d’Internet. En Afrique du Sud, on souligne que dans la province de Gauteng, toutes les écoles publiques qui ne sont pas capables de se procurer de TIC pour les apprenants et les formateurs d’une autre manière reçoivent le Gauteng Online Package (25 ordinateurs reliés en réseau pour une classe, dont un ordinateur perçu pour l’enseignants et les autres pour les élèves; ces ordinateurs contiennent des logiciels prescrits comme la suite Microsoft Office et d’autres ensembles de logiciels éducatifs).
10.9
Les défis en matière de TIC

Il reste beaucoup à faire d’ici à ce que les TIC soient complètement intégrés dans l’enseignement et l’apprentissage en Afrique. Les différents obstacles à surmonter sont : les pannes fréquentes d’électricité ou de réseau; l’absence de connexion Internet ou de réseau dans certains établissements; le matériel informatique désuet, en quantité trop limitée, mal protégé des virus ou mal entretenue; la durée limitée d’accès au laboratoire informatique; dans certains cas, l’absence des TIC dans la politique nationale d’enseignement; le manque de temps pour préparer du matériel didactique intégrant les TIC ou pour faire pratiquer les élèves à utiliser les TIC dans un contexte de curriculum surchargé; le manque de financement, l’évolution rapide de la technologie et les nombreux coûts indirects liés à l’achat de matériel informatique; le manque de formation du personnel; l’absence de récompenses et de reconnaissance aux enseignants qui font preuve d’innovation pédagogique avec les TIC; l’attitude négative de certains enseignants ou managers; le manque d’intérêt, la méconnaissance ou la peur face aux TIC manifestée par certains enseignants plus âgés.

10.10
Recommandations

Dans chaque pays, des recommandations variées ont émergé à la suite d’un dialogue politique national avec différents acteurs impliqués dans l’éducation. Bien que les personnes à qui ces recommandations sont destinées varient en raison de l’organisation politique nationale, on remarque que les mêmes thèmes reviennent fréquemment.

10.10.1 Énergie

Diversifier les sources d’énergies en vue d’étendre l’utilisation des TIC au niveau national (Centrafricque); trouver des sources d’énergies pour installer un centre informatique dans chaque école (Mali); développer l’énergie solaire, la rendre accessible et promouvoir les ordinateurs qui consomment moins d’énergie (Mali).

10.10.2 Matériel informatique

Au niveau pré-tertiaire, acheter des logiciels servant au traitement des résultats des examens des étudiants (Ghana); mettre en place un dispositif souple favorable à l’accès au net dans l’ensemble des établissements en privilégiant l’installation du wifi et l’acquisition de portables (Sénégal); faire en sorte que les ordinateurs soient disponibles en salle de classe, pour favoriser une meilleure intégration, et non pas seulement dans une salle d’informatique (Sénégal); se doter de salles sécurisées (fermeture, climatisation) avec des outils didactiques nécessaires (logiciels, Internet et cédéroms) (Sénégal); expérimenter les possibilités offertes par les logiciels et les ressources éducatives libres, notamment pour la gestion et pour le soutien scolaire (Sénégal); implanter les TIC dans toutes les institutions de formation (Centrafricque); construire des laboratoires d’informatique (Mozambique); prendre des dispositions politiques urgentes pour que l’enseignement supérieur dispose de connexion et d’outils informatiques (Mali); créer un centre de ressources pédagogiques à travers les TIC (Mali); rénover les classes pour qu’elles puissent recevoir du matériel informatique (Kenya); les managers devraient fournir le matériel informatique et faciliter son utilisation (Côte d’Ivoire); construire des salles multimédia avec connexion Internet dans les différentes institutions scolaires (Congo); doter les institutions d’équipements adaptés en termes de quantité et de qualité (Cameroun).
10.10.3 Entretien

Se doter de spécialistes de la maintenance et prévoir des fonds pour l’entretien (Sénégal); avoir une politique qui répond aux besoins d’encadrement, de rémunération et de financement du poste de technicien informatique (Ouganda); effectuer un entretien régulier du matériel informatique (Kenya); nommer un coordinateur technique (Côte d’Ivoire); porter une attention particulière à la sécurité et à la maintenance des installations informatiques (Afrique du Sud).

10.10.4 Politique nationale / priorité aux TIC / réflexion nationale sur les TIC

Définir une politique et un plan d’intégration TIC (Sénégal, Kenya); organiser un atelier national pour faire un état des lieux et fixer des orientations claires (Sénégal); élaborer des textes réglementaires sur l’utilisation des TIC à l’école (Sénégal); poursuivre la mise en place de la politique nationale des TIC (Centeрафrique); faire de l’intégration des TIC en éducation une priorité gouvernementale (Ouganda); accélérer la finalisation de la politique nationale des TIC (Ouganda); se doter d’une politique d’approvisionnement en TIC et, avec les écoles, superviser les achats (Ouganda); mettre la question des langues nationales au centre des TIC (Congo); se doter d’une loi portant sur la politique nationale des TIC (Cameroun).

10.10.5 Curriculums et programmes destinés aux apprenants

Réviser le curriculum ICT de base en éducation pré-tertiaire pour le rendre plus fonctionnel (Ghana); réviser tous les programmes pré-tertiaires de manière à permettre aux professeurs d’intégrer les TIC dans leur enseignement (Ghana); définir un curriculum TIC à tous les niveaux du système éducatif et des standards minimums à atteindre (Sénégal); intégrer les modules TIC dans les curriculums (Centeрафrique); se doter d’un programme de soutien aux jeunes pour l’appropriation des TIC (Centeрафrique); intégrer les outils TIC dans les filières professionnalisantes (Cameroun).

10.10.6 Formation et pratique pour les enseignants et les futurs enseignants

Encourager les écoles à organiser des sessions de formation à l’usage des TIC pour le personnel (Ghana); réviser les programmes TIC dans les établissements de formation des enseignants de manière à permettre aux futurs enseignants d’acquérir des habiletés d’intégration des TIC (Ghana); inclure au moins un cours en ligne dans les programmes pour les futurs enseignants, ce qui permettrait de développer des habiletés à utiliser les outils TIC (Ghana); initier des séances de démonstration d’intégration pédagogique des TIC et de vulgarisation prometteuse en matière d’intégration pédagogique (Sénégal); assurer la formation des formateurs en informatique et maintenance (Sénégal); former les formateurs en TIC (modules TIC pour les futurs enseignants, formation continue pour les enseignants) (Centeрафrique, Ouganda); reconnaître les TIC et leur intégration comme discipline dans les curriculums de formation des enseignants (Ouganda, Kenya, Côte d’Ivoire, Congo); mettre l’accent sur le partage des savoir-faire et des bonnes pratiques (Ouganda); mettre officiellement les TIC dans les programmes d’enseignement, au niveau de tous les ordres d’enseignement (Mali); promouvoir la formation à distance à l’université (Mali); éla-
border des curriculums de formation des formateurs (Côte d’Ivoire); assurer la formation continue des éducateurs et mettre l’accent sur les applications des TIC en classe (Côte d’Ivoire); renforcer les capacités des enseignants en matière d’appropriation des outils TIC par la formation initiale et l’amélioration de la pédagogie universitaire (Cameroun).

10.10.7 Financement et budget

Le ministère de l’Éducation devrait faire des allocations budgétaires pour maintenir, remplacer et augmenter les ressources et les aménagements TIC (Ghana, Congo); au niveau universitaire, maintenir les frais TIC aux étudiants et les GETFund... en plus, l’université devrait chercher du financement provenant de donateurs (Ghana); faciliter l’importation des matériels des TIC (xonération de taxes) (Centrafrique, Côte d’Ivoire); le gouvernement devrait négocier avec les fournisseurs de service pour faire réduire les coûts liés à la connectivité (Ouganda, Côte d’Ivoire); constituer des équipes nationales en vue de la négociation et de l’obtention à coûts réduits d’outils informatiques pour tous les ordres d’enseignement (Mali); investir de plus en plus dans la formation professionnelle des enseignants (Kenya); l’État devrait réduire le coût du matériel informatique (Côte d’Ivoire); intégrer la composante TIC dans les attributions des Conseils Généraux pour faciliter l’équipement des écoles en outils informatiques (Côte d’Ivoire); les parents et la société civile devraient demander aux Comités de Gestion de prendre en compte les TIC dans les activités à financer au sein des établissements (Côte d’Ivoire); prélever une taxe au profit des TIC et créer un fonds de solidarité numérique (Cameroun).

10.10.8 Coopération et partenariat

Au-delà des associations étudiantes, encourager les ONG et les associations parents-maîtres à s’engager plus activement dans la mise en place de laboratoires informatiques et dans l’augmentation du nombre d’ordinateurs et d’autres accessoires informatiques (Ghana); recourir au partenariat, aux fonds des établissements eux-mêmes et à l’appui institutionnel pour renforcer l’équipement (Sénégal, Centrafrique); mettre en place un dispositif de partage des ressources (Sénégal); favoriser une approche systémique qui prend en charge le curriculum, la formation initiale et continuée, les collectivités locales et les partenaires de l’école (Sénégal); mettre en place un comité interministériel pour élaborer un plan stratégique national d’introduction des TIC (Centrafrique); augmenter les débats et les discussions entre tous les acteurs au niveau de la province, des districts et des écoles puisque le ministère de l’Éducation ne peut résoudre tous les problèmes seuls (Mozambique); créer des partenariats entre le gouvernement et les entreprises privées (fabricants d’ordinateurs, fournisseurs de services) (Mozambique, Ouganda); les parents devraient contribuer au développement des TIC dans les écoles (Ouganda); établir des partenariats avec des institutions de recherche en éducation pour étudier les stratégies d’intégration pédagogique des TIC (Côte d’Ivoire); mettre sur pied un programme de développement des logiciels d’application en collaboration avec les autres ministères en charge de l’éducation (Cameroun).

10.10.9 Récompenses et reconnaissances des pratiques innovantes

Mettre en place un plan pour encourager les enseignants à se procurer leur propre ordinateur (Ghana); prendre des mesures incitatives pour promouvoir l’innovation pédagogique à travers les TIC dans tout le système éducatif (Sénégal); les champions de l’intégration des TIC devraient être récompensés (par exemple : allocations, formation supplémentaire, matériel informatique) (Ouganda); récom-
penser les enseignants qui ont des habiletés TIC et qui offrent déjà des services informatiques pour les motiver (Kenya); inclure une catégorie « habiletés TIC » dans l'évaluation annuelle du personnel enseignant pour le motiver à se former (Kenya).

10.10.10 Sensibilisation accrue des acteurs et recherches plus approfondies

- Organiser des séances d'accès à l'observatoire dans les établissements scolaires, inciter les chercheurs à réaliser des articles à partir de données de l'observatoire, mener une recherche transnationale sur le lien entre les mesures incitatives, l'engagement des enseignants vs des apprenants et des résultats scolaires (Sénégal, Afrique du Sud);
- organiser des séances de sensibilisation pour amener les chefs d'établissement à prendre conscience du besoin de l'outil informatique (Sénégal);
- sensibiliser les décideurs politiques (Centrafrique); soulignons à cet effet que les partenariats ont avec les ministères ont été important pour bon nombre de pays participant au PanAf et, à titre indicatif, le ministre de l’Éducation de la Centrafrique a même écrit une lettre d’éloge sur le projet.
- mettre en place des projets d’intégration des TIC ailleurs qu’en éducation pour convaincre les populations de l’importance des TIC (Centrafrique);
- intensifier les conférences débats sur les TIC en milieu scolaire et universitaire (Centrafrique);
- mettre en place des conditions favorisant la diffusion des activités du projet de recherche et l’implication massive de l’équipe nationale (Mozambique); développer du matériel didactique enrichi d’activités TIC qui répond aux besoins des différentes catégories d’établissements d’enseignement (Ouganda);
- concentrer les prochaines recherches sur le curriculum de formation aux TIC des enseignants à tous les niveaux, les méthodes utilisées et les impacts que cette formation a sur l’enseignement et l’apprentissage (Kenya);
- sensibiliser les enseignants à l’utilisation des TIC (Côte d’Ivoire);
- sensibiliser les élèves à s’intéresser à tout ce qui concerne les TIC (Côte d’Ivoire);
- sensibiliser les établissements à l’importance des recherches en général et à celles sur les TIC en particulier (Cameroun);
- faire des recherches plus approfondies sur les obstacles et les défis rencontrés par les éducateurs lors de l’intégration des TIC (Afrique du Sud);
- étudier aussi les TIC autres que l’ordinateur qui peuvent faciliter l’enseignement et l’apprentissage (outils complémentaires ou à faible coût) (Afrique du Sud).
10.10.11 Autres suggestions en général

- Œuvrer, grâce aux TIC, au décloisonnement des disciplines, à la pratique effective de l’interdisciplinarité et à la mise en œuvre d’une politique de projets intégrateurs (Sénégal);
- encourager les pratiques pédagogiques intégrant les TIC notamment par la numérisation des cours, l’accroissement du volume horaire alloué à la pratique des TIC, l’intégration dans l’enseignement des ressources multimédias (images vidéo, textes, etc.) (Cameroun).
XI. Main research findings of PanAf, Phase I: what pedagogical use of ICTs for African schools?

We will not present herein the whole of the research results emerging from the analysis of the national reports and 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.

11.1 General trends

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 that “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 ICT 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, electromechanics, 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.

Finally, and as noted in previous reports, the research indicators are divided into 12 themes. Of particular interest 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 lesson-planning, access to knowledge. Open access to these newly collected narratives from the field is an unprecedented IC-
11.2

Les TIC: quels types d’intégration pédagogique retrouve-t-on dans les écoles du projet PanAf?

L’analyse de l’ensemble des données nous a d’abord permis de découvrir une multitude d’usages des TIC dans les quelque 117 écoles participant au projet. Ces usages, présentés au Tableau X, varient de l’initiation des élèves à l’informatique jusqu’à la mise en place de projets complexes où les élèves sont amenés à réaliser des sites Web avec des images, des vidéos et des textes présentant, par exemple, le résultat d’enquêtes réalisées sur le terrain. Le Tableau X présente donc ces usages selon leur importance relative.

Tel qu’on l’a déjà indiqué et tel qu’il apparaît dans ce tableau, les types d’usage des TIC recensés peuvent être regroupés en trois catégories : (i) usage des TIC comme objet d’apprentissage; (ii) usage des TIC pour l’enseignement de disciplines scolaires; et (iii) autres types d’usage des TIC. On peut constater que presque 80% des usages se situent dans la première catégorie, alors que seulement 17% se situent dans la deuxième. Signalons toutefois que l’importance relative étant un pourcentage calculé selon la fréquence d’apparition des types d’usage dans l’analyse de contenu, toutes données confon-

dues, elle comporte possiblement un certain biais. Par exemple, la fréquence d’apparition d’un type d’usage ne prend pas en considération la durée pendant laquelle les apprenants ou les enseignants ont réalisé l’activité faisant appel aux TIC. Les pourcentages pourraient donc changer en faveur ou en défaveur de l’une ou l’autre catégorie si l’on intégrait le facteur temps dans le calcul.

L’analyse de l’ensemble des données nous a permis de tester un modèle élaboré dans le cadre d’un précédent projet du CRDI (Figure X) qui illustre ces types d’usage des TIC dans les quelque 117 écoles participantes. Ce modèle est constitué d’un graphique à deux axes qui comporte quatre cadres dans lesquels on peut situer les types d’usages des TIC dans les classes observées, soit : Enseigner avec les TIC (Cadran A); Amener les élèves à s’approprier les TIC (Cadran B); Enseigner les disciplines avec les TIC (Cadran C); Amener les élèves à s’approprier diverses connaissances, avec les TIC (Cadran D).
Tableau X : Principaux types d’usage des TIC retrouvés dans les écoles du projet PanAf

**Type d’usage**

<table>
<thead>
<tr>
<th>TIC comme objet d’apprentissage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation à l’usage de l’ordinateur (enseignement magistral)</td>
</tr>
<tr>
<td>Apprentissage de l’usage de l’ordinateur par les élèves (manipulation par les apprenants)</td>
</tr>
<tr>
<td>Initiation à l’usage de logiciels de bureautique (enseignement magistral)</td>
</tr>
<tr>
<td>Apprentissage de l’usage de logiciels de bureautique, incluant la saisie de textes (manipulation par les apprenants)</td>
</tr>
<tr>
<td>Enseignement de l’usage d’Internet et du courriel (enseignement magistral)</td>
</tr>
<tr>
<td>Apprentissage de l’usage d’Internet et du courriel (manipulation par les apprenants)</td>
</tr>
<tr>
<td>Enseignement d’autres logiciels (enseignement magistral)</td>
</tr>
<tr>
<td>Apprentissage d’autres logiciels (manipulation par les apprenants)</td>
</tr>
<tr>
<td>Enseignement de périphériques (appareil photos numériques, etc.; enseignement magistral)</td>
</tr>
<tr>
<td>Apprentissage de l’usage de périphériques (appareil photos numériques, etc.; enseignement magistral)</td>
</tr>
<tr>
<td>Autres types d’usage des TIC comme objet d’apprentissage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intégration des TIC à l’enseignement ou l’apprentissage de disciplines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation des TIC pour la planification d’activités d’enseignement ou d’apprentissage (par les enseignants)</td>
</tr>
<tr>
<td>Recherches thématiques sur Internet (par les élèves)</td>
</tr>
<tr>
<td>Utilisation de cédéroms pour apprendre des notions liées à des disciplines (par les enseignants)</td>
</tr>
<tr>
<td>Utilisation de cédéroms pour apprendre des notions liées à des disciplines (par les élèves)</td>
</tr>
<tr>
<td>Utilisation des TIC pour la présentation des notions et théories liées à une discipline (souvent, l’usage de PPT par les enseignants)</td>
</tr>
<tr>
<td>Utilisation de logiciels pour l’enseignement/apprentissage des mathématiques (par les enseignants)</td>
</tr>
<tr>
<td>Projet de présentation par les élèves à l’aide des TIC (surtout PPT)</td>
</tr>
<tr>
<td>Utilisation de jeux éducatifs, liés à une discipline scolaire (par les élèves)</td>
</tr>
<tr>
<td>Utilisation de logiciels pour l’enseignement/apprentissage des mathématiques (par les élèves)</td>
</tr>
<tr>
<td>Projet de correspondance par courriel lié à une discipline scolaire (par les élèves)</td>
</tr>
<tr>
<td>Projet de diffusion à l’aide des TIC (création de site Web, etc. par les élèves avec les enseignants)</td>
</tr>
<tr>
<td>Utilisation de périphériques pour l’enseignement de disciplines (appareil photo, caméra, etc.)</td>
</tr>
<tr>
<td>Autres usages liés à l’enseignement de disciplines (par les enseignants)</td>
</tr>
<tr>
<td>Autres usages liés à l’apprentissage de disciplines (par les élèves)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Autres usages (en contexte scolaire) non liés à l’apprentissage de l’informatique ou à l’usage des TIC dans une discipline per se</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeux à l’ordinateur (pour les élèves)</td>
</tr>
<tr>
<td>Usages personnels et sociaux (par les élèves ou les enseignants, en contexte scolaire)</td>
</tr>
<tr>
<td>Autres usages</td>
</tr>
</tbody>
</table>
L’axe 1 présente un continuum où les TIC sont utilisées soit par l’enseignant, soit par les élèves. L’axe 2 illustre un second continuum où l’accent de l’activité réalisée est mis tantôt sur les TIC comme objet d’apprentissage, tantôt sur les disciplines scolaires qui sont enseignées avec les TIC. Ce modèle a l’avantage d’illustrer l’éventail des types d’usage des TIC observés dans les quelque 12 pays couverts par l’étude.

Figure X: Représentation graphique des différents contextes d’usage des TIC dans les classes observées

1. Figure X: Représentation graphique des différents contextes d’usage des TIC dans les classes observées.


11.2.1 Explication et illustration du modèle

**Cadran A: Enseigner les TIC**


Plusieurs enseignants des écoles participantes ont ainsi la conviction que pour utiliser l’ordinateur en éducation, il soit d’abord nécessaire de pouvoir nommer ses parties. Les entrevues n’ont pas permis de bien identifier la source de cette croyance, et ce, même si une entrevue réalisée avec un enseignant s’avère être une piste d’explication fort intéressante; ce dernier semble justifier la façon dont l’informatique est enseignée à son école par la façon dont il a lui-même appris l’informatique:

Il y a quelques années, nous apprenions la micro-informatique […] C’était une base importante pour nous. On connaissait bien la machine. Les jeunes la connaissent peu. Il est important de connaître la base des choses avant de les utiliser […]. C’est pour cela que nous leur enseignons d’abord ce qu’est un ordinateur. […] Ce n’est qu’une fois qu’ils maîtrisent cette base que nous passons à autre chose (extrait d’entretien, enseignant).

Cet enseignement des TIC qui caractérise le Cadran A se limite tantôt à montrer aux élèves «[…] réellement comment fonctionne un ordinateur, de même que ses périphériques» (EntEns5E4, parag. 2), tantôt à la présentation de certains outils, comme les logiciels de traitement de texte ou de calcul qui sont très populaires auprès des enseignants responsables des salles informatiques:

Il est important de présenter à nos élèves comment fonctionnent les logiciels souvent retrouvés sur le marché du travail et dans les cybercafés […] Nous leur montrons Word et Excel surtout. C’est important de leur présenter ces logiciels. Ainsi, ils les auront déjà vus quand on leur en parlera ou quand ils auront un jour à s’en servir (extrait d’entretien, enseignant).

Environ 50% des institutions d’enseignement participant au projet PanAf se situent principalement dans le Cadran A caractérisé par l’enseignement de l’informatique aux élèves. Lors des observations réalisées, il a même été fréquent de retrouver des exposés magistraux portant sur l’usage de navigateurs Internet.

En effet, quoique l’enseignement de l’informatique puisse avoir sa place dans de nombreuses régions d’Afrique où l’école est pratiquement le seul lieu d’accès aux TIC et d’apprentissage de l’informatique, il est presque paradoxal de voir que dans certaines villes où plus de 75% des élèves fréquentent les cybercafés – et, donc, sont fort à l’aise avec l’usage de l’ordinateur - les types d’usage des TIC en éducation se limitent à cela. Dans ce contexte, il faut aussi savoir que l’enseignement est surtout de type magistral où les rares manipulations - lorsqu’elles ont lieu - sont très contrôlées et performées à l’unisson par les élèves. Dans certaines écoles, l’alphabétisation est même soigneusement découpée par année scolaire: « […] le programme de l’année 1 […] les parties de l’ordinateur […] année 2 […] le système Windows […] année 3 […] le logiciel de traitement de texte […] année 4 […] le logiciel Excel […] année 5 […] Internet Explorer […]» (extrait d’entretien, enseignant).
**Cadran B: Amener les élèves à s'approprier les TIC**

Dans le deuxième cadran du modèle développé, les TIC sont toujours objet d’apprentissage. Ce type d’usage des TIC caractérise près de 30% des écoles participant au projet PanAf. Le contraste est relativement important avec le Cadran A : au lieu de regarder, souvent de façon passive, l’enseignant présenter les TIC, les élèves sont appelés à manipuler, à faire usage des TIC, de façon plus active.

L’enseignement de l’informatique, c’est la base […]. La meilleure façon de leur montrer, ce n’est toutefois pas de leur faire des exposés sur les leçons […]. Les élèves apprennent mieux en utilisant eux-mêmes l’ordinateur. […] On leur laisse donc utiliser l’ordinateur au lieu de leur faire des présentations (extrait d’entretien, enseignant).

On montre aux élèves à utiliser Word, Excel et PowerPoint lorsqu’ils sont à l’ordinateur pour pouvoir s’exercer […]. Il est important pour eux de s’exercer tout en apprenant le logiciel […]. Sans cela, les activités sont trop théoriques et les élèves n’apprécient pas vraiment […]. Ils ont même l’air de s’ennuyer. Leur apprendre quand ils sont à l’ordinateur semble être la meilleure façon […](extrait d’entretien, enseignant).

Dans ce contexte, les apprenants sont donc appelés à faire usage des TIC dans le but de se les approprier, et ce, même si les séances de manipulation sont parfois précédées de brefs aperçus ou exposés de la part des enseignants.

Ce que nous faisons c’est de les entraîner à travailler avec Word pour saisir leurs épreuves, parce que nous constituons une banque d’épreuves aussi […]. Nous les amenons à travailler dans Excel pour leur permettre de faciliter leur travail dans le calcul des notes. Nous leur donnons un petit aperçu de l’utilisation d’Internet. Nous les accompagnons donc à l’utilisation de ces trois modules, Word, Excel et Internet (extrait d’entretien, enseignant).

Ce type d’usage pédagogique des TIC laisse également supposer que les élèves auront accès, à un moment ou un autre, à un ordinateur : il s’agit réellement de la seule façon de manipuler les TIC pour eux. Il appert important de souligner que cet usage des TIC est, en général, très apprécié par les apprenants puisqu’ils sont activement impliqués dans la leçon et sont appelés à utiliser l’ordinateur:

[…] les élèves adorent apprendre à utiliser Internet tout en étant à l’ordinateur. Avant […], je faisais des exposés magistraux. Là, je préfère que les élèves soient tout de suite à l’ordinateur […]. Ils sont beaucoup plus motivés ainsi […]. Les cours d’informatique sont très populaires à notre école […]. Les élèves savent qu’ils passeront un maximum de temps à l’ordinateur.» (extrait d’entretien, enseignant).

De très nombreuses remarques recueillies auprès des enseignants laissent ainsi entrevoir que les types d’usage pédagogique présents dans le Cadran B ont un important impact sur la motivation des élèves : « nos étudiants aiment apprendre avec les mains sur le clavier […]. Pour plusieurs, c’est leur cours préféré » (EntEns5E16, parag. 18), comme cela a souvent été démontré dans la littérature (voir Karsenti, 2003a, 2003b). Néanmoins, d’autres enseignants trouvent toutefois ce type d’enseignement beaucoup plus difficile à gérer, et ce, même s’ils reconnaissent l’intérêt inhérent à une telle pratique pédagogique.

J’ai essayé de les laisser à l’ordinateur pour leur montrer à utiliser la suite Office. […]. C’est certain qu’ils aiment ça, mais c’est impossible à gérer. […] j’ai l’impression que les élèves ne m’écoutent plus et qu’ils ne pensent qu’à l’ordinateur. Je préfère donc leur demander de ne pas être à l’ordinateur quand j’explique […]. Ça demeure quand même difficile à gérer (extrait d’entretien, enseignant).
Certains enseignants ont même indiqué ne plus vouloir utiliser cette méthode tellement ils avaient l’impression de perdre le contrôle de leur classe, voyant même l’ordinateur une certaine menace au rôle du professeur.

[…] leur enseigner quand ils sont à l’ordinateur ? Plus jamais. Les élèves ne nous écoutent plus après. Ils font tout sauf m’écouter […] C’est dérangeant […]. C’est un certain manque de respect […] comme si le professeur n’existait pas […]. Ce n’est pas bon pour la discipline de classe. Les élèves doivent comprendre que c’est l’enseignant qui dirige et qu’eux sont là pour suivre (extrait d’entretien, enseignant).

Malgré ces quelques défis inhérents aux types d’usage représentés par le Cadran B, ce qu’il faut retenir, c’est que ce type d’usage suscite l’engouement des élèves pour l’ordinateur et que ces derniers sont activement impliqués dans les leçons auxquelles ils participent. De surcroît, la littérature scientifique récente (BECTA 2002, 2003, 2006a, 2006b, 2007) montre clairement que les élèves apprennent mieux les TIC en les manipulant directement que lorsqu’ils en apprennent les rudiments de façon théorique.

Cadran C: Enseigner des disciplines avec les TIC

Par rapport aux cadrans A et B, le Cadran C s’inscrit dans un tout autre paradigme des usages pédagogiques des TIC en contexte scolaire. À ce niveau, les enseignants font un usage des TIC dans l’enseignement de diverses disciplines. Les TIC ne sont plus objet d’apprentissage per se. Elles sont des outils à potentiel cognitif (voir Depover, Karsenti et Komis 2007), des outils au service de l’enseignement de diverses disciplines scolaires. Malgré son potentiel sur la qualité de l’éducation en Afrique, un tel usage pédagogique des TIC n’a été observé que dans 11,3 % des écoles participantes.

Dans le Cadran C, l’enseignement est, en général, centré sur le maître. Par exemple quand les TIC sont utilisées pour faire des recherches en vue d’enseigner des disciplines comme les mathématiques, la philosophie, la chimie, l’histoire, la maintenance informatique, l’électromécanique, le dessin industriel, etc. : « Parfois j’utilise des images d’Internet pour illustrer mes leçons » (EntEnsE10, parag. 7). Les TIC servent donc d’abord à améliorer les leçons préparées par les enseignants, notamment par des recherches sur Internet qui viennent bonifier et actualiser les informations que l’enseignant possède déjà.

J’améliore mes leçons en faisant des recherches sur Internet. Cela me permet d’améliorer le contenu des notions présentées. […] ça me permet aussi d’avoir des informations plus récentes. […] je trouve aussi plusieurs images ou schémas qui m’aident à enseigner (extrait d’entretien, enseignant).

Les types d’usage des TIC liés à des disciplines scolaires représentés par le Cadran C dépassent aussi le stade de la planification des leçons. En effet, plusieurs enseignants intègrent les TIC non seulement dans la préparation de leçons, mais aussi en salle de classe, dans l’enseignement de certaines disciplines.

Dans notre école, nous insistons pour que les enseignants utilisent l’ordinateur et les cédéroms pour enseigner les mathématiques, les sciences et le français. […] on veut aider les élèves à mieux apprendre et l’ordinateur les aide beaucoup […]. Cela fait déjà quelques années que nous avons mis ce système en place […]. Nos enseignants ont même créé plusieurs ressources […] (extrait d’entretien, directeur).

Selon la littérature scientifique, les TIC sont susceptibles de favoriser les apprentissages des élèves dans diverses disciplines comme les mathématiques (Luthven et Hennessy 2002), les sciences (Lewis 2003), les langues (Becta 2003) ou encore les sciences sociales comme l’histoire (Becta 2006a). Dans l’analyse des données réalisée, des exemples dans l’ensemble des disciplines scolaires présentes au programme ont été identifiés. En outre, plusieurs enseignants de sciences de la vie et de la Terre ont souligné le net avantage d’utiliser les TIC pour l’en-
seignement de cette discipline, comme le souligne un enseignant d’une école à Joal, au Sénégal.

Nous avons très peu de livres de ressources à l’école […]. Dans le nouveau curriculum, nous devons enseigner l’effet de serre. Il s’agit d’un thème qui est absent des livres de référence qui sont à notre disposition […]. Avec les cédéroms que nous avons achetés, il est maintenant possible d’enseigner cette thématique aux élèves […] et aussi bien d’autres choses. […] cela rend l’enseignement des sciences de la vie et de la Terre plus stimulant (extrait d’entretien, enseignant).

Dans les écoles participant au projet, l’enseignement des disciplines scientifiques comme la physique ou la chimie pouvait aussi être appuyé par les TIC. En effet, plusieurs des enseignants interrogés ont indiqué enseigner les sciences à l’aide des TIC, notamment afin de pallier au manque de laboratoires et de ressources disponibles.

Nous utilisons l’ordinateur pour l’enseignement des sciences comme la physique ou la chimie […]. Comme nous n’avons pas de laboratoire […], cela nous permet de simuler plusieurs expériences et de les montrer aux élèves. […] ils aiment beaucoup et cela les aide à apprendre. […] avant on présentait les expériences oralement […]. Là, ils peuvent les voir quand on les présente à l’écran. […] c’est plus imagé pour eux […] c’est aussi plus stimulant. […] c’est comme une télévision qu’ils peuvent contrôler (extrait d’entretien, enseignant).

Cet usage des TIC par les élèves peut certes être accompagné d’un usage des TIC par les enseignants, voire d’un appui de l’enseignant lors de l’usage de l’ordinateur, mais la différence majeure avec le Cadran C est que l’élève ne demeure pas passif, à écouter l’enseignant faire son exposé didactique avec les TIC. À un certain moment, dans la leçon, l’élève aura aussi à faire usage des TIC pour apprendre. Par exemple, dans le cadre de projets menés par des élèves du primaire, ils s’approprient des connaissances liées aux sciences de la nature, aux sciences humaines, etc., et ce, par l’usage des TIC. L’enseignement n’est plus centré sur le maître mais bien sur l’élève. Il s’agit, selon la littérature scientifique (voir BECTA, 2003, 2006a), de l’usage le plus susceptible de favoriser les apprentissages des élèves et, donc, du type d’usage à privilégier en salle de classe pour favoriser la qualité de l’éducation en Afrique. Ce type d’usage pédagogique des TIC est toutefois peu répandu. On le retrouve en effet dans à peine plus de 5% des écoles observées. Pourquoi en retrouve-t-on si peu ? Il est possiblement difficile de répondre à cette question à partir des données recueillies. Néanmoins, les propos de deux directeurs d’écoles semblent indiquer qu’une vision de l’intégration des TIC est importante pour dépasser le simple enseignement de l’informatique et progresser, éventuellement, vers un enseignement où les TIC aident les élèves à apprendre diverses disciplines scolaires.
Au début, nous avons enseigné des cours d’informatique [...]. Nos étudiants en demandaient toujours plus [...]. Grâce aux ordinateurs que nous avons pu nous procurer, nous sommes rapidement passés à l’usage de l’ordinateur pour apprendre les mathématiques, l’histoire, les sciences de la vie et de la Terre [...]. Cela n’a pas été simple, mais plusieurs de mes enseignants étaient convaincus que c’était important [...]. Ce n’est toujours pas facile, mais les résultats de nos étudiants aux examens montrent que nous avons peut-être choisi la bonne voie [...] (extrait d’entretien, directeur).

Certes, faire en sorte que les élèves utilisent les TIC pour l’apprentissage des disciplines scolaires est peut-être un stade d’intégration des TIC difficile à atteindre, mais l’impact sur la qualité de l’éducation en Afrique semble substantiel.

11.3 Vers quelle intégration pédagogique des TIC en Afrique ?

Dans l’étude réalisée, la majorité des écoles observées présente des usages des TIC qui se situent dans les cadrans A ou B (près de 80 %), soit des usages où les TIC sont objets d’apprentissage. Dans ces contextes, il est plutôt question d’enseignement de l’informatique ; il n’y a donc pas de réelle intégration pédagogique des TIC. Les données recueillies montrent que l’on retrouve beaucoup moins d’écoles (17,1%) dans les cadrans C ou D où les TIC sont des outils au service de l’enseignement et de l’apprentissage de diverses disciplines scolaires.

Alors qu’après un rigoureux processus de sélection 117 écoles ont été choisies dans quelque 12 pays d’Afrique, moins de 6 % de ces écoles amènent les élèves à utiliser l’ordinateur pour apprendre des disciplines scolaires. Pourtant, il s’agit là, selon la littérature scientifique, d’un des usages pédagogiques les plus susceptibles d’améliorer la qualité de l’éducation.

Le passage par les cadrans A et B est possiblement important au début du processus d’intégration pédagogique des TIC, voire peut-être nécessaire à l’intégration pédagogique des TIC, mais il ne faudrait pas en rester là. Tristement, c’est pourtant ce qui est observé. Le cadrant D du modèle présenté, où les élèves, sous la houlette de leur enseignant font un usage des TIC dans le but de développer des compétences ou d’acquérir de nouveaux savoirs inhérents à diverses disciplines scolaires, demeure donc le contexte le moins observé de l’intégration des TIC dans les quelque 117 écoles participantes.

Pour que les TIC contribuent réellement à améliorer la qualité de l’éducation en Afrique, il est indispensable, comme l’ont montré les observations réalisées et la littérature scientifique recensée, d’évoluer rapidement vers le cadrant C (où l’enseignant fait un usage pédagogique des TIC dans le cadre de l’enseignement de diverses disciplines), en vue d’arriver au cadrant D (où ce sont les élèves qui font usage des TIC pour apprendre diverses disciplines) qui semble être le contexte où les impacts sur la réussite éducative sont réellement les plus significatifs.

Néanmoins, même s’il est vrai que ce sont les contextes C et D qui sont les plus susceptibles d’avoir un impact sur la qualité de l’éducation en Afrique, il est important de souligner que tous les contextes – donc aussi les cadrans A et B – ont également un impact positif sur l’éducation. En effet, les études sont nombreuses à montrer que le simple enseignement des TIC (cadrans A et B) est susceptible d’avoir des impacts positifs sur la réussite éducative en favorisant une motivation scolaire accrue, une meilleure maîtrise des TIC qui aura, à son tour, un impact significatif sur l’apprentissage de diverses disciplines, qu’il s’agisse des sciences appliquées, des mathématiques, des sciences sociales ou même des arts (voir Becta 2003).
Ces résultats qui montrent que l’enseignement des TIC est important pour les élèves nous révèlent que les écoles du projet PanAf sont possiblement plus susceptibles de participer à l’amélioration de la qualité de l’éducation en Afrique que d’autres écoles où les TIC ne sont pas du tout présentes. Néanmoins, de tels résultats ne devraient pas conforter ces écoles qui semblent être enlisées dans l’enseignement de l’informatique, comme s’il s’agissait d’une fin en soi. Ce pourrait être une erreur car, un jour, les cours d’informatique perdront brusquement de leur éclat et deviendront très ennuyeux pour une majorité d’élèves, en particulier dans un contexte où la présence des TIC dans la société évolue de façon exponentielle.

Les données recueillies ont enfin montré qu’il était possible, surtout lorsque les acteurs des écoles se fixent d’ambitieux objectifs, de rapidement dépasser cet enseignement de l’informatique pour s’élève à un enseignement des disciplines scolaires bonifié par les TIC. De surcroît, ce type d’enseignement a l’avantage de faire des TIC un outil à potentiel cognitif retrouvé, de façon transversale, dans diverses disciplines.
XII. Théorème framework

À fin de montrer que ce projet était – et est toujours – solidement ancré dans la littérature scientifique internationale, cette présente un aperçu des principaux éléments théoriques sous-jacents à ce projet : Pourquoi un tel projet en Afrique ? (12.1); Qu'est-ce que l'intégration pédagogique des TIC (12.2); Que sait-on des usages des TIC dans divers contextes éducatifs en Afrique (12.3); Du fossé technologique au fossé technopédagogique (12.4); L'importance des TIC en Afrique (12.5); Quels sont les défis inhérents à l'intégration pédagogique des TIC dans les pays du Nord (12.6); Quels sont les défis inhérents à l'intégration pédagogique des TIC dans les pays du Sud (12.7); L'importance de réaliser des recherches panafricaines sur l'intégration pédagogique des TIC (12.8).

12.1 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 break-through 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 preci-
sely, 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.)
12.2
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 & Strebbelle, 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.
12.3
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 of the ways to address, in part, this lack, as it would provide broader access to higher learning. Also, consistent delivery of content is possible with asynchronous, self-paced e-learning, and expert knowledge can easily be communicated, but more importantly captured, with good e-learning and knowledge management systems. Along with other aforementioned benefits to students, particular advantages of e-learning include: on-demand availability enables students to complete training conveniently at off-hours or from home, self-pacing for slow or quick learners reduces stress and increases satisfaction; interactivity engages users, pushing them rather than pulling them through training, confidence that refresher or quick reference materials are available reduces burden of responsibility of mastery, etc. (e.g. Karsenti & Charlin, 2009).

Nonetheless, it is important to note, as we did many times in this proposal, that the lack of teachers in Africa (or elsewhere in the world for that matter) can never be overcome by ICTs alone (e.g. Karsenti, 2009; Depover, Karsenti & Komis, 2007; Karsenti & Larose, 2005). ICTs can however enhance the delivery of education in many ways (e.g. Karsenti & Charlin, 2009; Depover, 2009) such as in higher education and teacher training where adult learners in communities or faculties can foster self-training and successful cyberspace that extend tutoring and interaction with mentors to new approaches to the concept of time units, independent of learning locations and learning activities. For instance the contact encouraged using email or even mobile continued education content, or contact with a lecturer. 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 like the new World Bank initiative called IFADEM for the collaborative and cooperative training of teachers across Africa. It also promotes national and international exchanges between teachers and contributes to the fine-tuning of pedagogical practices.
12.4 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.

12.5 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 concerned 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.
12.6 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 (McCrary 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.

### 12.7 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; Bakhom, 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 enrollment 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 auditories 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 in-
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 come 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-cafés 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. 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.

12.8 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 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 stock-taking 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.
ANNEX I
Participating African schools

Table 1: Cameroon

<table>
<thead>
<tr>
<th>N°</th>
<th>Name of school</th>
<th>school Level</th>
<th>Trains teachers?</th>
<th>Nature</th>
<th>Gender</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ecole Primaire et Maternelle les Oiselets</td>
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<td>3</td>
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<td>4</td>
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Table 2: Central African Republic

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<th>N°</th>
<th>Name of school</th>
<th>School levels</th>
<th>Trains teachers?</th>
<th>Nature of School</th>
<th>Student Gender</th>
<th>Location</th>
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### Table 3: Republic of Congo

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<th>Location</th>
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<td>LYCÉE TECHNIQUE D’OYO</td>
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### Table 4: Côte d’Ivoire

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<th>Nature of School</th>
<th>Student Gender</th>
<th>Location</th>
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<td>5</td>
<td>Collège International de la Corniche</td>
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<td>Public</td>
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<td>6</td>
<td>Cours Secondaire Méthodiste de Cocody</td>
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<td>7</td>
<td>LYCÉE SAINTE MARIE D’ABIDJAN</td>
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<td>Girl school</td>
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<td>Boy school</td>
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ANNEX II
General information on the schools selected
Nature of schools in the tertiary area selected

Type of secondary schools selected
Type of primary schools in the study

- Public: 14
- Private: 14

Student Gender

- Mixed: 96
- Boys: 3
- Girls: 7
Location of schools

- Urban: 80
- Semi Urban: 28
- Rural: 5