

# **Towards a framework for the use of ICT in Teacher Training in Africa**

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# Towards a framework for the use of ICT in Teacher Training in Africa

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*Abstract There is a gulf between the rhetoric of those advocating the use of ICT in education in Africa and the reality of classroom practice. This paper explores some of the reasons for this, and outlines a possible framework for the successful implementation of teacher training programmes that make advantageous use of appropriate ICTs. It argues that six fundamental principles of good practice must be addressed for such programmes to be effective: a shift from an emphasis on 'education for ICT' to the use of 'ICT for education'; an integration of ICT practice within the whole curriculum; a need for integration between pre-service and in-service teacher training; a need for the development of relevant and locally produced content; a need for appropriate educational partnerships; and an emphasis on the development of sustainable costing models. The paper concludes with a framework for action to deliver the very real benefits of ICT for teacher training in Africa.*

## **Introduction and context**

It is essential to have motivated and well trained teachers if the Millennium Development Goals (MDGs) for Africa are to be achieved by 2015 (UN, 2004). Without successful teacher training programmes it will be impossible to ensure that all girls and boys complete a full course of primary schooling (Goal 2), and that gender disparity in primary and secondary education is eliminated (Goal 3) (see also UNESCO, 2003). Given the very great importance of teacher training, it is surprising that not more emphasis is placed on its enhancement by national governments, donors and civil society organisations alike. Teacher training is all too often neglected in the face of more immediately visible educational goals and objectives; it is much easier to

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build a gleaming new school in an urban community than it is successfully to train a cadre of teachers willing to work in poor, rural areas, far from the centres of social and commercial life of a country.

The urgency of this issue has frequently been identified. In the *EFA Global Monitoring Report* for 2002, UNESCO (2002a) thus emphasised that some 3 million new teachers are required in Africa if the MDGs are to be achieved. Over and above this, there is a pressing need for teachers with a minimal level of training to have opportunities to upgrade their skills and qualifications. In Ghana alone, for example, it was estimated in 2003 that there were some 30,000 untrained teachers working in schools. Both the quantity of teachers, and the quality of their expertise need to be enhanced. This has become all the more significant in the face of the HIV/AIDS crisis that is decimating the lives of people across Africa. In Zambia, for example, it has been estimated that more teachers are dying of AIDS than are being trained (DFID, 2001).

In the face of these figures, commentators have increasingly argued that distance learning models, delivered through the use of new Information and Communication Technologies (ICTs), have much to offer in overcoming existing constraints within the education systems of African countries (see, for example, DFID, 2001; Perraton, 2000a; Yates and Bradley, 2000; Grace and Kenny, 2003; Gaskell and Tait, 2003). Advocates thus argue that when distance education is used for 'teacher education, completion rates are typically higher, and costs per successful student in distance education generally compare favourably with conventional education' (DFID, 2001, p.11; for a wider discussion of costs of open and distance learning, see Rumble, 2001). Perraton (2000a) suggests that distance education can be used effectively for all four main aspects of teacher training: providing trainee teachers with a general education; improving their knowledge of the subjects they will teach; teaching them about children, the curriculum and pedagogy; and developing their classroom skills (for a wider discussion on relevance of distance learning see Hegarty, Phelan and Kilbride, 1998; OECD, 2000; Perraton 2000b).

It is nevertheless important to distinguish between the principles of 'education at a distance' and the 'technologies' used to deliver such learning. All too frequently in the debates on the use of ICT for teacher training the two have been conflated. Moreover, ICTs have far too often been interpreted merely in the very restricted notion of the use of computers and the internet (Grace and Kenny, 2003) for teacher training, rather than in the wider sense of the technologies used to deliver a diversity of learning solutions. This paper therefore advocates the value of blended learning solutions, defined as the combination of printed text materials, radio, video and face-to-face practical experiences alongside the use of computers and the internet in enabling people to learn effectively in ways that are appropriate to their needs.

In light of the increasing acceptance that technology enhanced learning can contribute significantly to the enhancement of teacher training across the world, this paper seeks to explore why they have not yet been used more widely and effectively for this purpose within Africa. The scale of this issue is striking. In UNESCO's (2002b) planning guide on *ICTs in Teacher Education*, for example, the word Africa is only mentioned six times, and then always in the context of South Africa; Ghana is mentioned but once; Kenya and Mozambique are not mentioned at all. Building on this analysis, the paper also aims to highlight a set of factors that are essential for the successful implementation of programmes that seek to enhance African teacher training through the use of ICTs.

Given the emphasis of this special issue on open learning in less developed countries, the focus of this paper is very much on the practical issues associated with teacher training in Africa. However, it is important to emphasise that this is undertaken within the context of a wide body of literature concerning educational theory in general (Bruner, 1996; Brooks and Brooks, 1999; UNESCO 2002b), and technology enhanced learning in particular (Selinger and Pearson, 1999; Selinger and Wynn, 2001). While it does not espouse an overtly constructivist approach to learning, it does

indeed seek to argue that new technologies can enable people to learn effectively at whatever level they choose, that they can encourage new modes of understanding, and that they can enable assessment to be part of the learning process.

### **ICTs in Teacher Training in Africa: existing interventions**

Drawing primarily on ideas originating in Europe, Canada, the USA, Australia and New Zealand (UNESCO, 2002b; Bof, 2004; Jenkins, Lieberg and Stieng, 1998; Shrestha, 2000; Somekh and Davis, 1997; and Cabanatan 2001, Anderson and Elloumi, 2004)., there is an emerging consensus on the general set of principles that need to be in place for ICTs to be used effectively in teacher training. Emphasis is frequently placed on the necessity for teachers first to be trained in basic ICT skills. Thus, at the beginning of their global overview, the writers of UNESCO's review on the subject comment that 'For education to reap the full benefits of ICTs in learning, it is essential that pre-service and in-service teachers have basic ICT skills and competences' (UNESCO, 2002b, p.13). Once this is in place, it is generally argued that the following four competencies need to be addressed: pedagogy, collaboration and networking, social issues and technical issues (UNESCO, 2002b). In turn, four key themes are seen as essential in any successful programme: context and culture (see also Selinger, 2004), leadership and vision, lifelong learning, and the planning and management of change. Such arguments build on the increasingly widely accepted principles of the Society for Information Technology and Teacher Education (SITE, 2002) that:

- Technology should be infused into the entire teacher education programme;
- Technology should be introduced in context; and
- Students should experience innovation technology-supported learning environments in their teacher education programme.

Practical experience from across the world sustains such viewpoints, although at the same time emphasising the difficulties and challenges faced in the implementation of such programmes in particular contexts. In her review

of ongoing work in the Asia-Pacific region, Cabanatan (2002) summarises the key issues that need to be addressed under the headings of 'Access' and 'Teacher Preparedness'. In particular, she comments on the scepticism among teachers in the region as to the utility of ICTs for student improvement and teacher fulfilment. Typical of innovative programmes being developed in some of the poorer countries of the world is the Proformação programme in Brazil, which aims to train some 27,000 uncertified teachers in 15 states (Bof, 2004). This is an intensive programme, involving some 3,200 hours of training, and costs \$1,100 per teacher trainee over two years (for a comparative example in Chile, see the Enlaces programme at <http://www.redenlaces.cl/paginas/index.htm>, and also <http://www.mineduc.cl/> and <http://www.educarchile.cl/>).

Turning to Africa, there have been numerous international and national schemes over the last decade designed to introduce ICT into schools (for a database on such activities see <http://www.infundo.org/kb/kbhome.asp>). Most of these have been introduced with the best of intentions, but many have failed to live up to the ambitious aspirations of those who have promoted them. This has often been because they have been top-down and supply led with insufficient attention being paid to the involvement and training of teachers. Nevertheless, there have been some interesting initiatives that have indeed sought to go beyond merely introducing computers into schools, and giving teachers some training in how to use Microsoft Office packages on them. Among these are the Connectivity for Educator Development programme in Uganda (<http://www.connected.ac.ug/frameset.htm>), Schools OnLine's programmes in Senegal (<http://www.schoolsonline.org/whatwedo/senegal.htm>) and Tanzania (<http://www.schoolsonline.org/whatwedo/tanzania.htm>), World Links' programmes in Ghana (<http://www.world-links.org/english/html/ghana.htm>) and Uganda (<http://www.world-links.org/english/html/uganda.htm>), SchoolNet Namibia's experiences in using Open Source and thin-client solutions in supporting youth empowerment (<http://www.schoolnet.na/>) and the Commonwealth of Learning's Southern Africa Teacher Training Programme (<http://www.col.org/programmes/catalyst/safricateacher.htm>). Even with such

programmes, though, there have nevertheless been significant implementation problems. As the SRI (2001) evaluation of the World Links' programmes reported, 'despite the significant progress that WorLD has made, particular barriers persist. For example, in the nations of both Latin America and Africa, teachers reported that the lack of computers, inadequate hardware/software, unreliable Internet access, and the scarcity of time constituted the major barriers keeping them from using computers in their teaching. A smaller number of teachers in selected countries also indicated a need for more technical support in integrating ICT into the curriculum and stronger national policies on the role of technology in student learning'.

Among the most ambitious African initiatives is the e-Schools programme being advocated by NEPAD (The New Partnership for Africa's Development) (<http://www.nepad.org/en.html>). This has developed through various guises since its announcement at the Africa Economic Summit in Durban in June 2003, and does now place growing emphasis on the important role of teacher training. Nevertheless, as with so many other educational-ICT initiatives in Africa, its focus remains primarily on the importance of giving pupils and teachers ICT skills, rather than on using ICT to enhance their wider learning experiences. At the All-Africa Ministers' conference on Open and Distance Learning held in Cape Town in February 2004 (<http://www.africaodl.org/conference/odl.htm>), Peter Kinyanjui (2004), NEPAD's e-Africa Commission Programme Commissioner/Coordinator, thus stressed that 'The e-Schools Initiative will ensure that a majority of the people on the continent have the skills required to function in the knowledge economy'. He went on to define NEPAD's e-Schools' objectives as follows:

- 'To minimise the effects of the digital divide on young people and provide them with ICT skills necessary to function in the knowledge economy;
- To ensure that every African youth leaving school has the necessary ICT skills that will assist them find jobs, create jobs or further their education optimally;
- To make universal e-access in every institution a policy priority on the African continent;

- To re-define universal service/access to meet the requirement of the new economy;
- To transform every institution of learning into a health literacy center and zone to combat diseases especially malaria, HIV AIDS and tuberculosis' (Kinyanjui, 2004, unpaginated).

The lack of mention amongst these objectives of the use of ICT to enhance wider learning and educational experiences clearly illustrates that despite NEPAD's increased rhetoric on teacher training, this initiative remains primarily about using education to enhance ICT skills, in the expectation, or hope, that this will in itself be of benefit to African people. The initiative aims to connect more than half a million primary and secondary schools in Africa to the internet, but without comprehensive frameworks developed at national level to train teachers in the appropriate use of such technology, it is likely that such activities will achieve little in the way of real educational change in the continent. Kinyanjui (2004) and others involved in the e-Schools initiative do comment that teacher training is important, but until the core emphasis shifts away from a focus on simply getting schools connected, to a deeper understanding of how this can transform children's learning experiences it will remain doomed to failure.

## **ICT Practice in African Education**

### *The computer tragedy*

All too often, computer laboratories in educational institutions across Africa are underutilised. Whilst there are indeed some notable exceptions to this generalisation, computer laboratories in schools and higher educational institutions stand idle for much of the time, piles of old or broken hardware accumulate in dusty corners, and very often one can find computers hidden under plastic covers that have rarely if ever actually been used. This is a wasteful tragedy, because new technologies can have a tremendously positive influence on learning attainment and educational practice if they are appropriately managed and used. There have been few substantial studies of the real costs of using computer laboratories across the continent, but in their

recent review Grace and Kenny (2003, p.633) estimate that internet access alone in 'Computer labs cost between 2.4 and 21 times the discretionary budget per primary school student' in the African countries that they examined. These costs are over and above the expense of the original hardware and installation. Poor utilisation of such expensive resources can be considered in two main ways: first, in terms of the amount of time each day that computers are actually used; and second, in terms of what it is this hardware is actually utilised for.

There have been very few comprehensive reviews of the amount of time that computer laboratories in African educational institutions are indeed used. While usage in universities and higher educational institutions is generally higher than in schools, with secondary schools having higher rates of usage than primary schools, it is still possible to visit many educational institutions where large computer laboratories lie empty for much of the time. Furthermore, very few institutions have comprehensive plans for their hardware to be used at times of the day when pupils or students are not taking advantage of them. The potential for such laboratories to be used in the evenings and at night is immense, although the very real concerns of those responsible for running these facilities over security, access, staffing and training do, of course, need to be taken into consideration. Of perhaps even more significance is that most computers in educational institutions in Africa have little if any educational software installed on them, or on the servers with which they are networked. Despite what many users may say they use computers for, checks using 'Recent Applications' and 'Recent Documents' indicate that the vast majority of 'Educational Computers' are merely used for 'Office' type packages, be they Microsoft Office, Star Office or Open Office. It is my contention that word processing, presentation software, and spread-sheets are merely tools, and usually have little if anything to do with substantive educational or pedagogic practices.

### *Principles of good practice*

These arguments can be explored in more detail through the consideration of six key principles of good practice. Many of these apply to the use of ICTs

more widely in Africa, but the emphasis in this paper is primarily on their use for teacher training. Whilst not denying the importance of issues raised in previous accounts of the use of ICT for teacher training, such as UNESCO's (2002) planning guide on the subject, they do emphasise a rather different set of priorities.

*1. The need to shift from 'Education for ICT' to the use of 'ICT for Education.'*

The above comments about the use of Office packages in educational institutions are of fundamental importance. To date, almost all initiatives that aim to use computers and the internet in schools have focused initially on giving people ICT skills, in the expectation that once they have these they will be able to access a wealth of 'information' that will be of use to them. Information, is not, though, the same as knowledge, and mere access to information is not what education should be about. Even some of the best initiatives, such as those developed by World Links (<http://www.world-links.org/english/html/materials.html>) and the Commonwealth of Learning (see <http://www.col.org/programmes/training/toolkits.htm>) have a tendency to focus primarily on ensuring that teachers have ICT-skills rather than on the deeper processes associated with how the benefits of ICT can be used in teaching. Computers are immensely powerful educational tools. Their ability to enable interactivity in a multimedia (sound and vision) environment, to connect people in different places, and to store vast amounts of information in a small space can completely transform educational practices. These strengths of ICT have all too often tended to be subsumed beneath a rhetoric that emphasises that teachers and pupils first need to acquire basic ICT-skills by partaking in lengthy and often expensive certified courses. Providing someone can read, and that they have reasonable hand-eye co-ordination, there are many examples of good educational software that they can start using in a matter of minutes, without having had the need to go on word processing or presentational courses. Simple interactive software packages, such as *Webwise for Africa* (see <http://imfundo.digitalbrain.com/imfundo/frontpage/webwise/webwise1.htm?verb=list%20>), developed by the BBC in partnership with Imfundo, and freely available for use anywhere in Africa, can enable teachers in a few hours to

learn all that they need to know about using computers and accessing the internet, so that they can take advantage of educational software available in CD format or on the internet (for online resources, see for example <http://www.gg.rhul.ac.uk/ict4d/Learners.html>). The key message that needs to be understood is that using ICT *for* teacher training, and in education more widely, is about a fundamental shift in our ways of thinking. It is not about presenting existing educational content, such as books or posters, in a new way, but rather about enhancing the processes through which both teachers and pupils learn.

### *2. The need for ICTs to be integrated across the curriculum*

Acceptance of the above principle, means that it is crucial for ICTs, including print media, audio, video, computers and the internet, to be integrated throughout the curriculum in a blended way. Where computers are set aside in a laboratory, for use on only special occasions, they remain an object of curiosity, fear, uncertainty, awe or mystery, rather than being seen as the useful, enabling tool that they are. This has been neatly encapsulated in SITE's (2002) first principle on the use of ICT in teacher training: 'Technology should be infused into the entire teacher education program. Throughout their teacher education experience, students should learn about, learn with, and learn to incorporate technology into their own teaching. Restricting technology experiences to a single course, or to a single area of teacher education, such as the methods courses, will not prepare students to be technology-using teachers'. There are of course very real issues about access to computers in sufficient numbers, about security, about networking and about connectivity, but if we have learnt anything from the successful use of computers in education in Europe and North America in recent years it is that, particularly at primary level, it is of very much more benefit to have one or two computers in each classroom than it is to have them all together in a single laboratory. Computers, the internet, video and the radio all then become part of the panoply of tools that teachers have available to inspire, enthuse and educate their pupils and students across the curriculum.

### *3. The need to combine pre-service and in-service initiatives*

One of the main challenges facing teacher training in Africa is how best to achieve an appropriate balance between pre-service and in-service training. The education sector as a whole across the continent is under-resourced, and limited budgets have often meant that donor-funded programmes have concentrated on but a part of the teacher training agenda. In recent years, the need to enhance the capabilities and self-esteem of people already teaching in schools, as well as the high costs of running initial teacher training institutions, have meant that there has been considerable emphasis on in-service training (see for example, Monk, 1999; Anderson, 2002; Lewin and Stuart, 2003; for a comparative Chinese example see Ng and Chow, 1999). School-Based Teacher Development programmes, as in Kenya, Uganda and Tanzania, have thus widely been seen as providing valuable support to teachers. Not all such schemes, though, are successful, and important lessons have for example been learned from the difficulties encountered in delivering the Malawi Integrated In-Service Teacher Education Programme (MIITEP) (see Kunje, Lewin and Stuart, 2003). In introducing new ICTs to support teacher training, it is important that both pre-service and in-service environments are adequately supported. There is mixed evidence as to the types of teacher most adept at using new technologies, but it would seem that both young people as well as experienced teachers who have an understanding of ways that technology can be used to support their practice are most open to taking advantage of the potentials that new ICTs offer. Above all, it is crucial that there are champions throughout the system who can enthuse and inspire others to participate in their use (see experiences of SchoolNets in Uganda <http://www.schoolnetuganda.sc.ug/homepage.php> and Namibia <http://www.schoolnet.na/>). Given the limited resources available for the introduction of computers into the teacher training process, there is much logic in the suggestion that this should be done first in pre-service teacher training institutions, with these facilities also then being made available for the in-service training of existing teachers as appropriate.

#### *4. The need for relevant, locally produced content*

The importance of local content development is continually stressed in international meetings on ICT for Development (ICT4D). The World Summit

on the Information Society (WSIS) gathering in Geneva in December 2003 in particular emphasised the need for local content development (see for example, [http://www.ict-4d.org/Marketplace/fr/Program/ICT4DForum/local\\_content\\_knowledge/](http://www.ict-4d.org/Marketplace/fr/Program/ICT4DForum/local_content_knowledge/)) and scarcely an international ICT gathering takes place without a call for emphasis to be placed on the need not only to produce local content, but also to train people across Africa in appropriate content development. Yet despite this rhetoric, the picture on the ground is very different. There is very little multimedia content being developed by and for African people, let alone in local African languages. High quality multimedia educational content is expensive to develop, and companies with the experience of so doing are reluctant to lose market share by enabling local producers to expand their production of such resources. However, there is little point in introducing computers into educational establishments across Africa unless there is appropriate content that they can bring alive. There are indeed examples of shareware and free educational resources on the internet, but it is exceedingly difficult for users in Africa to identify what is most appropriate for their needs. Moreover, even where teachers may have access to the internet, the bandwidth connectivity is usually so low that download times can preclude use of much of what is available (for a specifically low bandwidth solution, see Africa Bookcase <http://www.africabookcase.org/>). In this context, it is remarkable that few donors have yet sought to identify and bundle appropriate and relevant multimedia software for educational use in Africa on CDs (although see UNESCO's *ICT training kit and digital library for African Educators*; note also WorldSpace Afristar's satellite downloading of content <http://www.worldspace.com/>, and for an example of its use to support distance learning at telecentres across Africa see [http://www.wougnet.org/Support/WSRP/sdl\\_telecenters.html](http://www.wougnet.org/Support/WSRP/sdl_telecenters.html)). There needs to be a fundamental shift in priorities, from the present emphasis on putting hardware into educational establishments to the creation of appropriate content and software relevant to the needs of the many different education curricula in Africa.

##### 5. *The need for real partnerships*

The complexity of the processes needed to deliver the above principles makes it increasingly important for ICT for teacher training initiatives to benefit from the potential that partnerships between governments, the private sector, civil society, academic institutions and global organisations can provide. At present, and particularly following the WSIS meeting in Geneva in December 2003, there is considerable interest in delivering educational ICT initiatives across Africa. African governments are eager to use ICTs so that they are at the forefront of technological change; donors and international agencies are eager to provide resources to help 'Bridge the Digital Divide'; the private sector is keen to invest where companies see potential market growth possibilities in the future; academics are interested in sharing the results of their research on the subject; and civil society organisations are willing to help facilitate delivery of schemes on the ground. However, this multiplicity of interest means that there is frequent duplication of effort, lessons are not sufficiently learnt and shared, and there is a wasteful lack of co-ordination in the activities that actually take place. There are many examples of small-scale initiatives, embarked on with the best will in the world, but that only benefit a few people for a short while. If all those involved, would truly work together for the interests of the poor and marginalised in Africa, rather than primarily for their own agendas and targets, it would be possible to achieve very much more than has heretofore been achieved. This is particularly true with respect to the field of teacher training, where ambitious supply-led and externally driven schemes are currently being discussed at a pan-African level, with far too little thought being paid to the ways in which they can be integrated into existing and on-going initiatives in specific countries.

*6. The need to build sustainability into programmes from their inception*

A final principle that cannot be stressed enough, is the need for sustainability to be built into the conceptualisation of programmes from the very beginning. Across the world, even in affluent countries, schools have difficulty in finding sufficient funds to renew computers, to pay for internet connectivity, to cover the costs of maintenance, to purchase new generations of software, and to pay for consumable expenditure on paper and ink. If external agencies were not involved in providing computers, be they new or refurbished, for

educational establishments across Africa, it is doubtful whether more than a tiny proportion of existing initiatives would have been funded. Ministries of Education in Africa are resource poor, with almost all of their resources being needed to pay for teachers' salaries. When decisions are made as to the desirability of introducing new technologies into the classroom, real cost calculations need to be made, that take into consideration the long-term running, maintenance and replacement costs of such initiatives, and how they will be paid for.

### **Applying the principles in African contexts: towards a framework for the use of ICT in teacher training**

The above account has emphasised the challenges that exist in seeking to implement ICT for teacher training initiatives in Africa. However, the benefits of overcoming these challenges are enormous. This final section outlines a framework whereby these principles can be delivered practically in Africa. For such programmes to be successful, they have to be tailored to the local needs and particularities of specific countries and scales of implementation, but the following elements would seem to be essential in order to overcome many of the problems highlighted earlier.

#### *1. Strategic leadership.*

For any ICT for teacher training programme to be successful, it needs to be owned at a national level by the Government as a whole and led by the relevant Ministry of Education. The precise mechanisms through which teacher training and curriculum development are delivered vary across Africa, and it is therefore not desirable for an over-prescriptive formula to be applied to such a process. Two of the most damaging features of current initiatives to implement ICT for teacher training programmes in Africa are the duplication of effort and the lack of integration in many ongoing activities. People in different parts of a single Ministry can be unaware of what their colleagues elsewhere are doing. Presidential initiatives can cut completely across the ongoing work of a Ministry of Education, and offers of hardware and software to educational institutions from the private sector, donors or civil society organisation are hard to turn down. A small, focused team therefore needs to

have the overall leadership of the ICT for teacher training strategy, and the willingness and power to decline offers of assistance from well intentioned, but misplaced, supply-driven initiatives. The capacity of some African Ministries of Education is undoubtedly weak in this field, but given their overall responsibility for teacher training in most African countries, they would seem to be the most logical places for such teams to be located. Civil Society organisations and donors can have a core role to play here in helping to train relevant government officials in the skills necessary to take on such tasks and responsibilities.

## *2. Ownership and the involvement of stakeholders in the development of coherent strategies and implementation plans*

Strong leadership is insufficient by itself to ensure the success of ICT for teacher training programmes. It is crucial that the process of development of such a strategy must involve the relevant stakeholders and potential partners at an early stage. These would include at least representatives of the teachers themselves (such as Teachers Unions), those involved in teacher education, higher education institutions, the curriculum developers, and the providers of hardware and software. All need to understand the importance of developing a coherent and logical programme to be implemented in a staged fashion over a number of years. Far too often, supply-led external initiatives can put in place inappropriate systems that are then incompatible with the roll out of new initiatives.

## *3. Integration with overall national ICT strategies*

Many African governments are now shaping and seeking to implement national ICT policies and strategies (see Dandjinou, 2003, and [http://www.infopol.gov.mz/africa\\_conference](http://www.infopol.gov.mz/africa_conference)), but in many instances they have been led primarily by telecommunications interests, and have not paid sufficiently detailed attention to the real potential for ICT to deliver on development agendas. Furthermore, whilst policies may be in place, detailed implementation strategies have often not yet been developed (although for an exception see Mozambique). The key point to note in the present context is that education has sometimes been surprisingly ignored in the development of

such strategies, as was the case in early drafts of Kenya's emerging strategy in 2003. It is therefore of great importance that all such policies and strategies give a very high priority to education, and its use in and for teacher education needs to be prioritised within this overall approach.

#### *4. Shaping implementation strategies within the context of infrastructure provision.*

The level of infrastructure provision varies enormously across Africa (for coverage, see Mike Jensen's work at <http://www3.wn.apc.org/africa/>). This must be taken into consideration when developing programmes to use ICT in teacher training. What can be done in parts of South Africa, or in capital cities elsewhere, is very different from what is feasible across much of the continent. Indeed, the digital divide is very much expressing itself across Africa as a bandwidth divide. While good Broadband connectivity, for example, is now taken for granted in many of the richer countries of the world, and educational software is increasingly being developed to take advantage of this, such access to the internet is rare and expensive in Africa. Two-way satellite connectivity is indeed now available across most of Africa, but the costs of using this for educational purposes remain prohibitively high to be a sustainable choice for teacher training in the short- to medium-term (for a wider discussion of the use of satellites in education, see Vanbuel, 2004). Variability in infrastructure provision means in practice that blended solutions for the use of ICT in teacher training will need to be thought through carefully in specific national contexts so that teachers can have access to similar training in different media depending on the infrastructure available to them. A comprehensive ICT in teacher training programme will thus make optimal blended use of print, audio/radio, video, television, computers, the internet, peer-group face-to-face (f2f) contact, and more traditional forms of classroom based learning if it is to be successful. Many African countries already have an existing framework of teacher training colleges in place, and given limited connectivity and resources, it may often be most logical for the provision of computers and the use of the internet for teacher training to begin in these

institutions, with subsequent links being established to other educational institutions (for a Kenyan example, see [www.kenet.org](http://www.kenet.org)).

#### *5. Awareness raising workshops*

Despite the plethora of global initiatives aimed at introducing ICTs into education systems in Africa, there remains considerable misunderstanding across the continent about the real potential of ICTs to transform the processes of learning. It is crucial at an early stage in the development of strategies for the use of ICT in teacher training, for workshops to be run to provide hands on experience of the use of audio, video, the internet, CD ROMs, DVDs, and other new ICTs, so that administrators, heads of teacher training colleges, government officials and teachers' leaders can grasp the true significance of the transformations possible, and can thereby contribute effectively to the development of such strategies (for examples, see COL's work at <http://www.col.org>, and Imfundo's workshops in Ghana <http://imfundo.digitalbrain.com/imfundo/web/activities/Ghana/ghana8.htm>). Once sufficient people have participated in such workshops, some of them can themselves become trainers, thereby enabling the process to cascade downwards through the education system.

#### *6. Beginning with pre-service training*

In logistical terms it is generally much easier to begin with the provision of infrastructure (computers and internet access) in teacher training colleges, most of which already have electricity, than it is to provide such access scattered more widely across a country. Furthermore, most pre-service trainee teachers are also young, and more open to the use of new technologies than are many, but by no means all, older teachers. Computers and the internet can be used in a wealth of ways to enhance teacher education as part of a blended programme for the use of ICT across the pre-service curriculum (SITE, 2002). Considering both activities that can be undertaken within the colleges, and at a distance, and drawing on established examples of good practice elsewhere in the world (for example, UNESCO, 2002b; Yates and Bradley, 2000; Somekh and Davis, 1997), the following are

some of the ways in which such technologies can best be used in an African context:

i. Within African Teacher Training Colleges

- Acquisition of basic ICT skills;
- Self-paced learning through access to resources on servers, CDs, or where available, on-line;
- Group discussion of audio and video training materials available on videos, CDs, DVDs or even on-line;
- Filming of practice teaching sessions, followed by individual review and group discussion (as is currently taking place in some parts of rural China);
- Training in use of educational management information systems (EMIS);
- At a more advanced level, training in the development of Learning Management Systems (LMS) and Content Management Systems (CMS);
- Group development of learning resources shared collectively;
- Formative and summative assessment, which can also be undertaken at own pace; and
- Introduction to the use of ICT in support of young people with disabilities in the classroom (see Casely-Hayford and Lynch, 2004).

ii. At a distance during teaching practice

- Use of e-mail (and mobile telephony) to discuss issues encountered on teaching practice with tutor – to be done effectively this can require considerable amounts of tutorial support;
- Use of e-mail to share lesson plans, information, ideas and content with peers working elsewhere;
- Use of the internet as a personal support mechanism for people working in rural and isolated areas, enabling them to retain contact with communities and activities in their home regions.

Whilst e-mail is not yet widely available in Africa, particularly in rural areas, many towns across the continent are now beginning to gain increasingly reliable internet connectivity, and teachers are often to be found in the growing number of internet cafés that have blossomed. Mobile telephony may also well have potentials for teacher learning in Africa (see for example <http://www.m-learning.org>).

### *7. In-service training*

The use of new ICTs to support blended solutions to in-service training needs, can best be seen as a combination of the existing use of distance based methods of support to teachers, with elements of the use of ICTs discussed above in the context of pre-service training. In-service delivery of training for teachers varies considerably across Africa (see for example Lewin and Stuart, 2003), and it is important that any attempts to use new ICTs in support thereof should build on local practices and experiences. Nevertheless, the following uses of multimedia computers and the internet can be envisaged as being particularly important in the delivery of African in-service teacher training programmes in the future:

- Provision of in-service training resources in digital format at relevant centres, be they teacher training colleges, secondary schools, or district education offices;
- Use of self-testing, both formative and summative;
- Use of multimedia (video and audio) in discussions of classroom practice, both individually and in groups;
- Tutorial feedback and support at a distance; and
- Peer sharing of lesson plans, content and experiences through web-based fora or e-mail.

### *8. Sustainability through community-led agendas*

It is not possible to incorporate new ICTs in teacher education in Africa effectively and sustainably without community involvement. The commitment of the private sector, alongside governments and civil society organisations at a macro-scale in global initiatives is already one form of such participation. However, at a more local scale it is essential to secure community support for

such initiatives to ensure that they are appropriately designed, implemented, maintained and resourced. Moreover, the hardware and connectivity are too expensive at present for these initiatives to be self-sustaining without there being a commitment to their wider use by communities for gaining access to information relating to health, agricultural, enterprise, lifelong learning and governance issues. All too often, support is garnered from the international community for but one sector, be it health or education, with there being little attempt truly to integrate the programmes and initiatives. If such initiatives focused more on using ICTs to respond appropriately to the integrated needs of poor communities, rather than on supplying ready made technical solutions from elsewhere, they would be more likely to succeed and to be sustainable.

## **Conclusions**

Africa has many educational needs, and the ambitious Millennium Development Goals for education are unlikely to be met unless there are some dramatic changes in policy and practice within the global community. Without well-trained, qualified and committed teachers it is impossible to deliver effectively functioning educational systems. This paper has therefore sought to explore the potential of ICTs in all their diversity to support teacher education systems in Africa. The use of ICTs is most definitely not a cheap solution for teacher education, but by facilitating the creation of new types of learning environment, by supporting distance based models of teacher training, and by opening up a wealth of new educational resources, it has a very significant role to play. To date, the emphasis of supply-led initiatives across the continent has been to provide teachers and pupils with so-called ICT skills, more often than not defined largely as the ability to use Microsoft Office packages, in the hope that this will mystically enable them to become better citizens and to gain information that will be of some use to them and the societies in which they live. This has frequently led to wasteful and inappropriate initiatives that have done little to enhance the learning experiences of the poor and the marginalised. The potential of new ICTs to change this situation, and to support appropriate and sustainable teacher training programmes is immense, but we have only just started to grapple with

these issues effectively. It is hoped that by laying out some general principles, and by illustrating key elements of a framework that could be adopted to implement such programmes, this paper will have done something to illustrate how new ICTs can indeed contribute to distance based solutions to the crisis in African education.

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### **References**

- Anderson, E.A. (ed.) (2002) *Improving schools through teacher development: case studies of the Aga Khan Foundation Projects in East Africa* (Lisse, The Netherlands, Swets and Zeitlinger).
- Anderson, T. and Elloumi, F. (2004) *Theory and practice of online learning* (Athabasca, Athabasca University)  
([http://cde.athabascau.ca/online\\_book](http://cde.athabascau.ca/online_book)) (cited, 6<sup>th</sup> March 2004)
- Bof, A.M. (2004) Distance learning for teacher training in Brazil, *International Review of Research in Open and Distance Learning*, 5(1),  
<http://www.irrodl.org/content/v5.1/bof.html>

- Brooks, J.G. and Brooks, M.G. (1999) *In Search of Understanding: The Case for Constructivist Classrooms*, Alexandria, VA: Association for Supervision and Curriculum Development, revised edition.
- Bruner, J. (1996) *The Culture of Education*, Cambridge, MA: Harvard University Press.
- Cabanatan, P.G. (2001) ICT trends in teacher training curricula: an Asia-Pacific perspective, paper presented during the Asia Pacific workshop on Educational Technology held in Tokyo, Japan, 4-11 September 2001 (<http://gauge.u-gakugei.ac.jp/apeid/apeid01/papers/cabanatan.htm>).
- Casley-Hayford, L. and Lynch, P. (2004) *A review of good practice in ICT and Special Educational Needs in Africa* (London, DFID, Imfundo) (also available at <http://imfundo.digitalbrain.com/imfundo/web/papers/sen/?verb=view>).
- Dandjinou, P. (2003) The status of e-strategies in Africa, paper delivered to the e-strategies for development in Africa conference held in Maputo, 1-4 September 2003 (paper available at [http://www.infopol.gov.mz/africa\\_conference/africa\\_conference\\_documents/presentations/index.html](http://www.infopol.gov.mz/africa_conference/africa_conference_documents/presentations/index.html)).
- DFID (2001) *Imfundo: Partnership for IT in Education inception report* (London, DFID).
- Gaskell, A. and Tait, A. (eds) (2003) *The future of open and distance learning. Proceedings of the 10<sup>th</sup> International Conference on Open and Distance Learning* (Cambridge, The Open University in the East of England).
- Grace, J. and Kenny, C. (2003) A short review of information and communication technologies and basic education in LDCs – what is useful, what is sustainable?, *International Journal of Educational Development*, 23, pp.627-636.
- Hegarty, M., Phelan, A. and Kilbride, L. (eds) (1998) *Classrooms for distance teaching and learning: a blueprint* (Leuven, Leuven University Press).
- Jenkins, J., Lieberg, S. and Stieng, I.L. (eds) (1998) *Socrates-Mailbox: the Connected Teacher: using ICT in school for teachers in training* (Oslo, National Centre for Educational Resources).
- Kinyanjui, P. (2004) NEPAD initiatives in information and communications technologies and associated capacity building, paper presented to the All

- Africa Ministers' Conference on Open and Distance Learning, Cape Town, February 2004, ([http://www.africaodl.org/conference/paper\\_kinyanjui.htm](http://www.africaodl.org/conference/paper_kinyanjui.htm)) (unpaginated).
- Kunje, D., Lewin, K. and Stuart, J. (2003) *Primary teacher education in Malawi: insights into practice and policy. Multi-site Teacher Education Research Project (MUSTER) Country Report Three* (London, DFID, Education Research Paper, No. 49d).
- Lewin, K.M. and Stuart, J.S. (2003) *Researching teacher education: new perspectives on practice, performance and policy. Multi-Site Teacher Education Research Project (MUSTER) synthesis report* (London, DFID, Education Research Paper, No. 49a).
- Monk, M. (1999) *In-service for teacher development in sub-Saharan Africa: a review of literature published between 1983-1997* (London, DFID, Education Research Paper, No.30).
- Ng, Ho-ming and Chow, Ping-yan (1999) School-Based Teacher Development in Guangzhou, China, *International Studies in Educational Administration*, 27(2)
- OECD (2000) *Learning to bridge the digital divide* (Paris, OECD, Centre for Educational Research and Innovation, National Centre on Adult Literacy)
- Perraton, H (2000a) Teaching the Teachers (London, DFID) (Imfundo KnowledgeBank Paper 5) (<http://imfundo.digitalbrain.com/imfundo/web/teach/kb5/?verb=view>) (cited, 4<sup>th</sup> May 2004).
- Perraton, H. (2000b) *Open and distance learning in the developing world*, (London and New York, Routledge).
- Rumble, G. (2001) E-education: whose benefits, whose costs, inaugural lecture, The Open University ([http://www.iec.ac.uk/resources/e\\_education\\_costs.pdf](http://www.iec.ac.uk/resources/e_education_costs.pdf)).
- Selinger, M. (2004) The cultural and pedagogical implications of global elearning, *Cambridge Journal of Education*, 34(2), 213-229.
- Selinger, M. and Pearson, J. (1999) *Telematics in Education: Trends and Issues*, Oxford: Eslevier.

- Selinger, M. and Wynn, J. (eds) (2001) *Educational Technology and the Impact on Teaching and Learning: Proceedings of an International Research Forum at BETT 2000*, Abingdon: RM.
- Shrestha, G. (2000) *Utilization of information and communications technology for education in Africa*, (Addis Ababa, UNESCO International Institute for Capacity Building in Africa).
- SITE (Society for Information Technology and Teacher Education) (2002) *SITE position paper: statement of basic principles and suggested actions ('Ames White Paper')*  
(<http://www.aace.org/site/SITEstatement.htm>) (cited 4<sup>th</sup> May 2004).
- Somekh B. and Davis N.E. (eds) (1997) *Using IT effectively in teaching and learning: studies in pre-service and in-service teacher education* (London and New York, Routledge).
- SRI (2001) *World Links for Development: accomplishments and challenges Monitoring and Evaluation Report Year 2: 1999-2000*  
(<http://www.worldbank.org/worldlinks/english/html/sri-year2.html>).
- UN (2004) *UN Millennium Development Goals*  
<http://www.un.org/millenniumgoals/> (cited 4<sup>th</sup> May 2004).
- UNESCO (2002a) *EFA Global Monitoring Report, 2002: is the world on track?* (Paris, UNESCO)  
[http://www.unesco.org/education/efa/monitoring/monitoring\\_2002.shtml](http://www.unesco.org/education/efa/monitoring/monitoring_2002.shtml)  
(cited, 4th May 2004).
- UNESCO (2002b) *Information and Communication Technologies in teacher education: a planning guide* (Paris, UNESCO)  
(<http://unesdoc.unesco.org/images/0012/001295/129533e.pdf>) (cited, 4<sup>th</sup> May 2004).
- UNESCO (2003) *EFA Global Monitoring Report 2003/4* (Paris, UNESCO)  
([http://portal.unesco.org/education/en/ev.php-URL\\_ID=23023&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/education/en/ev.php-URL_ID=23023&URL_DO=DO_TOPIC&URL_SECTION=201.html))  
(cited 4<sup>th</sup> May 2004).
- UNESCO (No Date) *ICT training kit and digital library for African Educators* (Paris, UNESCO) CD-ROM.

- Vanbuel, M. (2004) *Improving access to education via satellites in Africa: a primer* (London, DFID, Imfundo) (also available at <http://imfundo.digitalbrain.com/imfundo/web/tech/primer/?verb=view>).
- Yates, C. and Bradley, J. (eds) (2000) *Basic education at a distance: world review of distance education and open learning*, Volume 2 (London, Routledge and Commonwealth of Learning).