4D technology: smart phones, smarter teaching

Jenny Leach, Co-Director, Teacher Education in Sub Saharan Africa (TESSA) Programme, Open University, United Kingdom

This address was given at the Distance Education and Teachers’ Training in Africa Conference, Johannesburg, August 2005 as part of the conference’s discussion of ‘The role of technology in teacher training in Africa’. I was asked to specifically focus on mobile devices as part of this debate.

Abstract
This paper explores the potential role of mobile digital devices for teacher education in Africa, through the findings of the Digital Education Enhancement Project (DEEP). Four themes emerging from this research are discussed: development, deep learning, democracy and dignity. The paper concludes that these themes set a strong research and development agenda for teacher education, particularly with respect to the way mobile technologies can support the educational challenges of the Millennium Development Goals.

Introduction

How are we going to overcome poverty?... perhaps the answer lies in our ability to replicate the best elements of our society, at all levels, and among all communities. Nelson Mandela, 2005.

The focus of my paper is the potential of mobile devices for teacher education in Africa and in particular the findings of the Digital Education Enhancement Project (DEEP).

Since we embarked on this project in 2001 there have been quite tremendous changes in both the forms and uses of new Information Communications Technologies (ICT). Changes that affect networks and activity globally. Changes that impact on the nature and work of communities locally. 77% of the world’s population, for instance, now lives within range of a mobile network. The United Nations recently announced a target to ensure that 50 people in every 100 have access to such a network by 2015.

In some respects Africa is at the forefront of such developments. Indeed as Minges (2001) has commented “the mobile communication sector has to qualify as one of Africa’s success stories”. In 2004 there was 150% subscriber growth in Africa. 75% of all telephones in Africa are now mobile: this year (2005) there are 8 mobile phones for every 100 people, up from 3 in 2001 (Economist, 2005). The African continent is also ahead of much of the world in the use of pre-paid phone cards as a form of electronic currency. Many Africans working overseas are now using this form of currency to transfer money to families back home, without incurring commission (Commission for Africa, 2005)

Within the business world in particular many innovative uses of mobile technologies now support rural and developing communities. In Bangladesh, for example, ‘telephone ladies’ make a living by renting out cell phones in their village ‘by the call’. Fisherman
in Zanzibar use mobile devices whilst they are at sea in order to check market prices. If prices are low locally, they sail to Dar Es Salaam for a better deal. In farming communities in Tanzania, where butchers cannot stock large amounts of meat because they have no electricity or cannot afford a refrigerator, shops habitually ran out of meat. Now customers use mobiles to place orders ahead of collection, enabling butchers to buy the right amount to satisfy customers’ needs and developing the entire supply chain (Commission for Africa, 2005).

Not only has there been a great leap in access to mobile networks and new kinds of communication and activities. In the last five years we have also begun to see a convergence in mobile devices. Cell phones, once used solely for making phone calls and sending SMS (short messages) are now frequently used as cameras, music players, for internet access – even for watching videos. Personal digital assistants (PDAs), once primarily used in the affluent business world are becoming increasingly affordable and facilitating an ever-growing range of applications. Almost by stealth, folk are beginning to carry mobile devices in their pockets that have the kind of computational power NASA used to put man on the moon.

Research shows that many of those living in the world’s poorest communities are willing to pay a far higher proportion of their income than their richer peers to own, or gain access to such technologies. And as these technologies become more widely used, so they are creating unthought-of transformations in African culture, infrastructure and politics. Studies show, for example, that when 20% of a population has the ability to exchange news and ideas through access to cell phones and text messaging, dictatorial or totalitarian regimes find it hard to retain power (Commission for Africa, 2005).

The Digital Education Enhancement Project and mobile technologies

Changes such as these can alert us to the possibility of other developments, possibilities that undermine many traditional assumptions about the forms that teacher education should take. The Digital Education Enhancement Project (DEEP) is investigating ways in which mobile devices in particular can improve teaching and learning in developing contexts (Leach et al, 2004). What we are doing, working with a range of partners in South Africa such as the University of Fort Hare, the NGO bridges.org and the Nelson Mandela Foundation, is to research what happens when teachers—mostly situated in rural and isolated schools—begin to use personal lap tops and powerful hand held computers. These mobile devices are equipped with e-books that support a range of professional activities including subject knowledge development, together with a wide range of classroom resources for use in the classroom.

During the scoping phase of the project in 2001 the ubiquity of the mobile was evident even in the most rural schools in South Africa. Teachers told us they would walk for many miles in order to recharge their cell phones, so valued was this mode of contact with the world beyond their remote village communities. So although the majority of the DEEP teachers had no experience of computers prior to the project, it is perhaps not surprising that they felt comfortable in learning how to use hand held devices.

Details of the project findings can be found in the report ‘Deep impact: an investigation of the use of information and communication technologies for teacher education in the
global south’ (Leach, 2005) published by the Department for International Development (DFID) who were the funders of the original research study. The study shows that:

- Development of basic computer skills was largely unproblematic both for teachers and their pupils;
- ICT use enhanced teachers’ professional knowledge and capability by: extending subject knowledge; enabling planning and preparation for teaching to be more efficient; developing the range of teachers’ existing pedagogic practices;
- Every teacher introduced ICT into planned lessons with their classes and there was wide ranging evidence of positive outcomes;
- There was no significant correlation between teachers’ prior use of ICT and the ICT-enhanced classroom practices they developed during the programme;
- Students used ICT to carry out a range of literacy, numeracy and scientific activities; students showed high levels of motivation in using ICT both within and out of lessons; a range of achievements, including improvements in literacy and science learning, were reported by teachers, school principals, parents – and students themselves.

Increase in school attendance was also evident in both country contexts. Teachers, together with parents, governors, school principals and community members reported that the use of mobile technologies had positive effects on areas central to Universal Primary Education (UPE), including attendance, motivation and the quality of student learning.

4D Technologies

I’d like to bring out four themes that emerge from this work and will illustrate these with brief examples of how teachers and their pupils are using these mobile devices in the classroom. These themes are:

- Development
- Deep learning
- Democracy
- Dignity

**Development**

This first theme highlights

- the use of technologies to support the Millennium Development Goals - universal basic education, access to ICT, and gender equality
- use of technologies that are forward looking and which build on the latest knowledge and research

We have come to see technologies as central to the educational development task of achieving the Millennium Development Goals (http://www.millenniumcampaign.org). These ambitious targets are clear - not just about getting children into school, but also about raising educational quality and redressing gender disparities. There is also much ambition in the literature to meet these challenges through the appropriate use of ICT (e.g. Marker et al, 2001). DEEP provides evidence of some of the rich opportunities that mobile technologies afford rural schools and their communities – enabling them to leap
frog the developmental stages that Europe and North America have gone through in ICT use. Mobile devices offer teachers any place, any time access to electronic communication, professional knowledge and resources. They don’t require costly security solutions, or the kind of complex infrastructures that are such a challenge for rural schools.

Three quarters of the original teacher DEEP participants are mature women. The majority have become teacher leaders and role models within their local communities, confident in using ICT to support effective teaching and learning, particularly in the areas of science, literacy, communication skills and numeracy.

**Deep Learning**

The second theme is deep learning. It emphasises:
- deepening understanding rather than syllabus coverage
- access to a range of new learning opportunities and new resources
- new possibilities for peer and group learning

One of the problems of our educational systems is that for too many teachers and learners, ‘coverage’ is everything - with only a single opportunity to learn something new. Yet we know that learners need time to articulate and revisit new ideas as well as to work with others on activities that develop depth of understanding. Learning doesn’t happen in a logical sequence. One advantage of giving teachers and their pupils more power through technology is the opportunity it provides them to engage in more in depth learning - alone and in collaboration with others.

Here for instance we see DEEP teachers planning a quadratting activity in groups, using hand held cameras and excel spreadsheets to carry out specialised scientific tasks. This activity is preparing them for trying out a range of similar activities with their pupils using cameras, note taking tools, calculators and a range of software including voice recorders.
Two of the DEEP teachers developed this story writing activity with a large class of boisterous eleven years olds. It enabled their pupils to collaborate on a product of the highest quality, that has also become a permanent resource for younger pupils and adults facing reading difficulties.

HOW THE GIRAFFE GOT ITS LONG NECK
A TRADITIONAL AFRICAN STORY

Long, long ago the animals in Africa lived happily together. The giraffe had a short neck and short legs like any other animal. The earth was dry because it had not rained for a long time.

I am so hungry. The grass is dry.

Yes, look at the water holes. It is dry too.

Giraffe and rhino saw the juicy green leaves high up in the trees

I wish our necks were long enough to get to those juicy leaves.

I think we must ask the witch doctor for advice.
Such activities are highly motivating, whilst enabling the development of a wide range of key skills and understanding. They are in sharp contrast to the rigid, chalk-and-talk, teacher-dominated pedagogy that a recent study by Dembélé and Miaro- II (2003) suggests is the norm in so many African classrooms.

**Democracy**

The third theme is concerned with
- challenging the view that state of the art technologies are only for the wealthier parts of the world
- putting technology in the hands of those who need it the most - the poorest and most disadvantaged communities
- addressing traditional inequities of gender, age, socio-economic status & location

Our ambition within DEEP is to see powerful new learning technologies being used effectively by the people who need them the most – “the knowledge-poor, the unreached and those who have been ignored for too long”. (Dhanarajan, 2001). This project shows that in cost effectiveness terms small rural communities may in fact derive a much greater incremental benefit from modest ICT provision than richer schools saturated with resources (Cawthera, 2001, p.30). We have observed mobile devices being used for a range of unexpected activities. Photographs enable teachers to explain to parents, grandparents and school governors, many of whom are not literate, what their children are learning. A study of audio texts such as Martin Luther King’s ‘I have a dream’ speech, combined with use of the audio recorder enable pupils to develop confidence in public speaking.

**Dignity**

Among other conditions, dignity entails that:
- teachers have modern, professional tools
- their teaching toolkit should be comparable to that available to other professionals
- teachers have the respect of pupils, parents and the community

You might be surprised that I’m using the word dignity as an organising concept. Yet the DEEP team’s experience in many parts of the world is that all too often teachers are working in circumstances that are undignified. We have worked with teachers in Cairo who had to leave home at 2am in order to attend the professional development course. A teacher in the Eastern Cape talked to us about the daily grind of commuting to work (one-and-a-half hours each way) by train, ‘taxi’, thence on foot, only to face large classes with the minimal of resources: ‘Every day we arrive to write ‘the lesson for the day’ on the board. The next day we rub it out and start again. No work can be saved. They (the students) often can’t read my writing’. We never cease to be amazed at the commitment such teachers show in these most challenging circumstances. And this is as true in inner urban contexts as in rural Africa.

New forms of support through ICT can create professional opportunities that are modern, contemporary and appropriate for the 21st century teacher. Hand held devices
enable teachers to plan lessons with care, drawing on the latest resources and up to date subject knowledge, storing ideas for the future in electronic reusable templates. They can contact colleagues for advice by e-mail, arrange cluster group meeting by SMS, make electronic thesaurus, dictionary, encyclopaedias and rich web resources available to their pupils, exchange materials using the beam facility. One teacher told us of her pride as she used her hand held device to do some professional reading in the taxi on her long daily journey to school, “How wonderful!” she commented, “it’s now I can feel myself as a professional”.

Conclusion

These are our themes. They focus on teacher and pupil learning – not technologies. We believe they set a strong research and development agenda for teacher education that enable us to begin to really think creatively about the way mobile technologies can support the educational challenges of the Millennium Development Goals. Across the world, many internationally recognised institutions and groups drive the improvement of teacher education, attracting scholars, new research and ideas from every part of the globe. Few of these are situated in the developing world. Few are driven by the real agendas of the poor and the dispossessed. A task for teacher educators world wide is to create a new and imaginative architecture for partnership, discourse and debate that is truly international, that draws on wide ranging practices and scholarship, and which embraces the challenge of ICT. The form of that architecture, the role of individuals and institutions in creating and working together in this provides an agenda for the next stage of development.

References

The original address was illustrated by the videos of teachers and pupils working on the DEEP project together with some of their ICT products. These can be found at: http://www.open.ac.uk/deep