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ICT Update

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CTA

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Ghanaian farmers use an audio computer for agricultural information

Mathematics education in **South Africa** via cell phones and the web

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ICT Update

ICT Update issue 58, February 2011

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Teaching with technology

Children living in remote areas often have to travel long distances to get to their nearest school. When they get there, classrooms can be crowded and facilities outdated. Courses for adults who want to improve their basic education or learn more about specific subjects, such as new farming techniques or business development, are sometimes only found in the larger towns and cities. Even if a course is affordable, travel and accommodation expenses while attending can be prohibitive. However, using ICTs to deliver these courses can reduce the cost of study and offer greater educational opportunities to people in rural communities.

The Talking Book solves a problem that limits so many ICT projects

Local telecentres give students the chance to follow online courses, even if the training institute is based in other countries. Teachers can use chat applications to lead real-time discussions, and students can exchange experiences in web forums. Video conferencing is also increasingly popular, simulating the classroom environment and allowing interaction between participants.

Radio and television are useful too, for presenting educational programmes. But adults who already lead busy lives can easily miss the programmes, or cannot attend the distance learning courses at the appointed times. Many of them would prefer a flexible study routine, with access to the training material as and when they need it.

The Mobile Learning for Mathematics project provides on-demand learning for students. Run by Nokia, the project uses web and mobile applications to deliver mathematics exercises and theory to cell phones. Teachers can apply the same content in the classroom and students can follow up by taking short tests on their phones. Students receive immediate feedback and can compare their scores with other learners around the country or even elsewhere in the world.

The project team experienced a number of challenges while developing educational content for cell phones. They had to keep each lesson short, for example, to fit the small display, and ensure that the data was compatible to work with a variety of phone types and over multiple cellular networks.

Preparation

The NGO, Literacy Bridge, encountered similar problems when testing a range of equipment in Ghana. No single piece of technology was suitable for their literacy and agricultural education projects, so they built their own device. The Talking Book is a small audio computer, about the size of a portable radio that can record and play back lessons on any subject.

The main advantage of the Talking Book is that the audio can be in any language. An organisation, therefore, can produce content to suit the people who will use it, and the material can even come from experts within the community.

For example, users can record agricultural advice from local farmers who have already tackled a specific problem. Other producers can listen later, when convenient, either in a group using a loudspeaker, or individually with earphones. The audio file can also be copied to other devices and distributed to neighbouring communities.

The Talking Book can run for many hours on locally available zinc-carbon batteries, which solves a problem that limits so many ICT projects: access to a reliable power source. But electricity is steadily reaching remote areas, and internet coverage is spreading too. In response, another Ghanaian initiative, the Ghana Schools Project, provides training courses for rural communities to introduce them to the technology so that they will be able to take advantage of it when it arrives in their area.

In the meantime, there is no single technological solution that serves all learners and suits all types of training courses. However, ensuring that people in rural communities have the same access to education as those in the urban centres is an aim of many governments and organisations. They can all learn a lot from the experiences of those pioneering the use of ICTs in this field. ■

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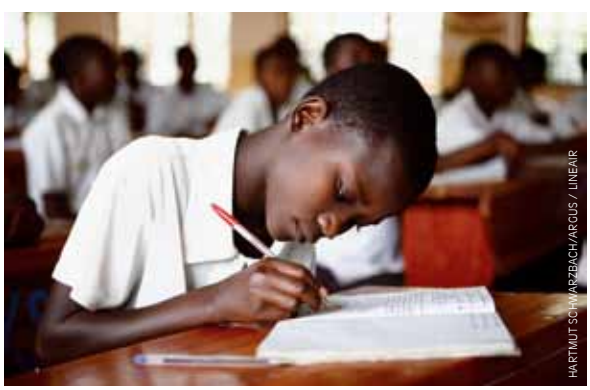
All-inclusive education

Increased investment in education is essential to give everyone equal access to education, whether they live in a rural area or in the capital city. The only way to achieve this under current conditions, is to use ICTs. Technology makes the distance between remote communities and urban centres negligible.

We cannot, however, rely on governments alone to provide the necessary investment. We have to involve all sectors: businesses, civil society, universities, NGOs and international organisations. We need a synergy of action in all these fields to speed up the process of delivering education to everyone.

Since the majority of people in ACP countries are farmers, or rely on farming for their livelihoods, there cannot be effective development without improving agricultural skills



HARTMUT SCHWARZBACH/ARGUS / LINEAIR

Cell phones are ideal tools for communication, and communication is an essential part of learning.

One perceived disadvantage of e-learning is that learners cannot interact with other students or their trainers. Students find it helpful to work together with a trainer and fellow students — to ask questions, clarify points and discuss problems. For a long time, people ignored the collaborative aspect of e-learning, and that was a major disadvantage. But collaboration is now well-developed in most distance learning platforms. Students can get to know their trainers and can communicate with them almost as if they have face-to-face contact.

Cost was also previously considered to be a barrier to e-learning. But computers, cell phones and even broadband internet connections are becoming affordable for many more institutions and even individuals. E-learning can often be cheaper for students when compared to the expense of travelling regularly to attend training courses.

Institutions too can reduce costs by sharing resources. The Global Development Learning Network (GDLN), a World Bank initiative, encourages this kind of cooperation. There are more than 120 institutions involved in the network, with 18 operating in ACP countries.

At the moment, however, too many educational institutions see themselves as rivals in the same market, competing to attract the greatest number of course participants. But their priority should be to provide students with every opportunity to develop their skills. That means sharing resources, and ICTs provide the perfect means to do that.

If, for example, three institutions each attract only five students for one particular course, it is unlikely to be cost-effective for them to run that course for so few students. It is the students then, who would lose the most. But if those three institutions worked together to share resources and costs, then all 15 students could benefit from the course.

The other problem related to cost, is the availability of a reliable electricity supply, which is a major concern for many rural communities. Schools and universities often have to rely on generators for electricity, and fuel is expensive and its supply can be unpredictable. But nowadays, more communities have access to electricity and the supply is increasingly consistent. Through these developments, it is now possible to say that it is cost-effective to deliver training using ICTs.

Farmers first

To take my country Senegal as an example, only approximately 30% of the population currently receives a reasonable level of education. That leaves a lot of people without any access to education. For real, effective development, we need to make that 100% of the population, or as close to it as possible. The Senegal Distance Learning Centre goes some way to address that imbalance, as we now train 3,000 people a year using e-learning methods.

The other 13 institutes in the African regional section of the GDLN, known as the Association of African Distance Learning Centres, reach another 30,000 people on the continent. The network concentrates on providing courses on issues such as health, decentralisation, anti-corruption and agriculture. Agriculture is especially important, as the majority of people in ACP countries live in rural areas, and since many of them are farmers or rely on farming for their livelihoods, there cannot be effective development without improving agricultural skills.

Cell phones will play an increasingly important role in bringing education to even the most remote communities, as they are perfect tools for communication. You can send direct messages, e-mails, have conversations or even send photos. And communication is essential for learning.

Cell phones are more accessible to people in rural communities than computers, especially while internet coverage is still poor in these areas. With cell phones, people can carry around the equivalent of several textbooks in their pockets. Delivering education in this way can give people the possibility to become more involved in the development of their communities.

I firmly believe that if we are to develop our countries further, we need to develop rural communities. If rural populations can have better access to information, they can make informed decisions that will improve their businesses and support their families. And using ICTs to deliver education will go a long way to achieving this. ■

Feature

Count on cell phones

A project in South Africa supports mathematics education in schools using the web, social networking and mobile apps to deliver learning material directly to students' cell phones. Teachers can also use the content in their classroom lessons.

Many governments in ACP countries have strived to improve the quality of education in their schools, and worked to ensure equality for all students. For South Africa, this meant replacing the old fragmented and racially segregated education system with a single government department that now implements a national curriculum for all public-funded schools. But the legacy of apartheid remains, and there are still significant differences in the quality of education received in the country's schools. The problem in South Africa is not so much one of access to a school, as one of access to a school that offers quality teaching and learning opportunities.

These differences are particularly stark in mathematics education, a priority subject and one that is compulsory for all South African secondary school students in grades 10 to 12 (from approximately age 16 and over). The policy, however, puts tremendous pressure on the education system to ensure that there are sufficient, well-qualified and capable teachers in the subject. Mathematics drop-out rates remain unacceptably high, with grade 12 pass rates well below national targets.

In 2008, the ImfundoYami / ImfundoYethu (our education, my education) project started to investigate ways to support formal education using mobile technology. The following year, a partnership of government departments and private companies, including Nokia and Nokia Siemens Network (NSN), adopted this idea and started a pilot project to test the use of cell phones in mathematics learning. The project team wanted to develop methods that would not be dependent on the involvement or competence of teachers.

After an initial pilot project, the provincial education departments selected 30 public schools from three different provinces to take part in an extended trial, which ran from January until December 2010. The selection was representative of many different types of schools in South Africa.

It included those that had been previously well-funded under the apartheid regime and others that hadn't; some were urban, others rural, some were specialist mathematics schools, while others had a minority of learners enrolled in mathematics. In these early stages of the project, however, all 30 schools were based in relatively affluent communities which could support the use of technology, in that they already had mobile network coverage (GPRS) and access to electricity. It was also important that the schools had at least one computer with internet access (for the teachers to use during the project), and that the schools' staff were interested and willing to be involved.

Multi-level help

The Nokia Mobile Learning for Mathematics project developed mathematics learning materials that were suitable for viewing on cell phones. It was sometimes a challenge, for example, to keep the information short for the small size of a cell phone display, which also meant that the resolution of graphics and mathematical symbols was limited.

The types of questions in the exercises and tests reflect these constraints. Multiple-choice was the dominant question type, but spot-the-error, and step-by-step questions (which show the first step in a multi-step procedure with students asked to select what the next step would be) were also developed. In this way the content was divided into small manageable components, even though the complete question contained many layers of detail.

Monitor support

The project uses social networking tools, such as the popular South African mobile chat platform, MXit, to allow groups to collaborate. Students need a cell phone that can access the internet, and many of them already use MXit to chat with friends.

To complement the cell phone content, the project team set up a dedicated website using Moodle (an open source application to develop online learning sites) to allow students and teachers to track progress and activities on the web. The site also allows teachers to set and monitor homework with little extra effort. The system makes it easy for teachers to see which students are having problems and identify areas that are causing difficulties.

Teachers receive a two-day orientation session, taught by project team members and teachers involved in the pilot. An e-learning co-ordinator or curriculum advisor from the local district education authority provides further support.

Nokia provided each school with a 'mobi-kit', comprising a lockable case containing ten cell phones, all of which can be charged simultaneously from a single electrical-point. Students who do not have their own cell phone, or are unable to borrow one at home, can at least have mobile access while at school. The teachers can also use the exercises and theory lessons in a classroom even if the students do not have cell phones, and

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JIRO OSE/REDUX/HH

The system makes it easy for teachers to see which students are having problems and identify areas that are causing difficulties

make use of the tests to set ad hoc exams.

Students participate by first downloading the MXit application onto their phones (if they don't have it already). This allows them to chat with their friends who are displayed as contacts within MXit. The students simply have to accept 'MoMaths' as one of their contacts. They can then choose to work through short theory sections, or answer questions from a database of approximately 10,000 questions, categorised by topic and degree of difficulty.

The students receive immediate feedback on multiple-choice practice exercises, and can compare results with classmates in their school or other participating schools nationally. They can see if their topic scores improve as they repeatedly practise the exercises and can opt to take a test choosing their level of skill – easy, medium, or difficult – to assess their performance on a particular topic, and compare this to other students' results.

Good results

In general, the project was well received by teachers and school principals. They valued the additional practice that it gave their students, the ability to monitor performance and give immediate feedback. The overriding concern from school staff was the lack of access to cell phones for some learners.

An evaluation of the project, however, noted that this was not a necessary condition for regular use of the service, as 27% of regular users reported borrowing a cell phone or using the mobi-kit phones. Conversely, having a cell phone did not necessarily result in regular use of the service, as 39% of learners who described themselves as not being regular users had their own cell phones.

During the test period, there were more than 100,000 visits to the service, with students completing over 10,000 tests. Competency in mathematics rose by 14% in all levels – among those who were good at the subject previously as well as those who were less proficient. The evaluation found that two thirds of the teachers used the service, while about a quarter used it regularly. Many students, whose

Using cell phones for learning can be less expensive than computer-based schemes, and requires less teacher training time.

With the cell phone learning service, students can:

- Communicate, participate and interact whenever they have their cell phones
- Do homework and revision in a mobile social networking platform
- Carry a 'test-yourself and revision' to use when convenient
- Work on questions and exercises that fit with the school curriculum
- Work through short theory sections
- Answer questions from a database with more than 10,000 questions
- Choose their topic and degree of difficulty
- Receive immediate feedback on multiple-choice practice exercises
- Retry exercises repeatedly
- View and track their topic scores to see how they are improving
- Compare their performance with others in the community (classmates, local schools and other schools nationally)
- Chat with their friends about learning problems (and socially)
- Catch up on learning while travelling to and from school.


NOKIA

teachers did not use the service frequently, still used it independently.

Most teachers (79%) strongly agreed or agreed that the two-day teacher training equipped them with all they needed to know about the project. They reported this immediately after the training session, and reiterated the same views six months later.

The majority of teachers and principals in the case study schools indicated that they would like to continue using the service beyond the trial

This is significant, as research shows that teachers involved in schemes using computers to support learning and teaching often complain about a lack of adequate training. It also highlights a potential key difference between mobile technology and computer technology.

By the end of the second term of using the service, most teachers also agreed that the project had had a significant impact on their students' attitude to mathematics, as well as on their own roles as mathematics teachers. The majority of teachers and principals in the case study schools indicated that they would like to continue using the service beyond the trial. Slightly more than half of the case study schools indicated that they would be willing to buy a mobi-kit for school use.

Minimum expense

That such a short training course appears to be adequate for teachers is a strong advantage of the project, and of using cell phone technology in educational programmes. Other benefits include lower costs compared to computer-based schemes, using social networking applications that are already popular with young people, and constant accessibility. This is reflected by the fact that 82% of student use/participation occurred outside school hours and continued during weekends and holidays.

The project team has been careful to develop the system so that students can access the information as easily as possible. They have tried to ensure that it is compatible with multiple social networking and other mobile apps, and that it will work on a variety of cell phones and networks. Two network operators (MTN and CellC) are project partners and have paid for the data delivery costs during the project. The data delivery cost in South Africa is relatively low at approximately two Rand (20 Eurocents) per month with very active use.

Costs of implementation and data use would be one of the main constraints when expanding the project to other ACP countries. These expenses would have to be covered to make a similar project truly sustainable and available to as many students as possible. There are of course also several practical considerations remaining before the project can be expanded, especially if it is to be used to support learning in other subjects.

The big advantage of the mathematics system however, is that the content would not need any major adaptation. Mathematics has a near universal curriculum, and so investments in one country would only require slight changes for use in other countries.

Nokia has already started a similar pilot in Finland, and the early results of the South African trial have encouraged them to continue their work. The company is currently seeking to develop further partnerships, and is consulting with the Commonwealth of Learning, an intergovernmental distance learning organisation, to introduce the system to more schools in the next few years. ■

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Ready for new developments

As internet coverage expands throughout Ghana, a project helps schools make the best use of the web and helps rural communities adapt to the technology.

Case study

Internet coverage is spreading fast in Ghana. Several telecommunications companies are competing to develop services in the country, with many cell phone network providers developing their businesses to include wireless internet access throughout the country. These networks are expanding steadily into even the most remote communities.

As ICTs, and the internet in particular, gradually become part of everyday life for many Ghanaians, one project is helping schools and rural communities to take advantage of the new technology. The Ghana Schools Project (GSP) is a public-private sector partnership between Ghanaian company, Media Systems and Technology Limited, and the country's Ministry of Education.

Set up in 2008, the project uses ICTs to develop the skills of school students. It teaches them to use technology to complement their school studies, improve their general knowledge, and prepare them for future employment or promote their own businesses. Students learn to use basic offline computer programmes, both proprietary, such as Microsoft Office, and open source software.

GREENSHOOTS COMMUNICATIONS / ALAMY

The Ghana Schools Project develops technology skills in schools and rural communities.

The project is currently working in a primary school in the Volta region, in the south-east of the country. There are no telephone lines in the area, so the school accesses the internet through a wireless network. One volunteer is based at the school to help staff and students connect online and to show them how to use the internet for their work and study. Teachers are encouraged to conduct research into the subjects they teach, as well as use the technology to learn new teaching methods.

An integral part of the project is the Sister Schools Programme, which helps Ghanaian schools develop partnerships with schools elsewhere in the world. Teachers can also look for other schools to help their students exchange information with young people around the globe.

In addition, the project assists schools to get online and build their own websites on the Ghana Schools Project (GSP) portal, which they can use to promote their activities. Schools can give details of the courses they teach and facilities they provide to help parents decide to which school to send their children.

Many Ghanaian schools also teach the English national curriculum and provide English language training. By promoting these services internationally and throughout the Francophone countries of West Africa using the web, the schools can attract privately funded students to boost their annual income.

Showcasing businesses

GSP is also developing e-learning centres in rural communities to teach people the basics of using a computer and prepare them for when the web does become more widely available. The project starts with 'roadshows' in 2011, when the GSP team will travel to rural communities to introduce the technology and build awareness of the possibilities of ICTs, and the internet in particular. The team hopes to generate enough interest and demonstrate market viability to local businesses. Companies will then be encouraged to develop their services, and provide resources and support for e-learning centres in the communities.

Initially, the centres will be equipped with computers and CD-ROMs with copies of relevant websites that might be of use to rural communities. Visitors to the centres can learn how to search the web and use other offline programmes. GSP is particularly keen for farmers to become involved in e-learning to enable them to enhance their businesses. Farmers would be able to follow market prices, find new buyers, promote their products and learn to grow new crops. Traditional crafts producers can also find out how to export their products abroad.

Many of these businesses currently use cell phones to access market information, but as internet access gradually arrives in more communities, the project team feels it is important that people also learn to access the web using a computer. Rural entrepreneurs will be encouraged to develop methods of integrating mobile technology with online applications.

In schools, however, GSP will concentrate on computer technology. The small screen of a cell phone means it can only display a limited amount of information from a website, making it especially difficult to demonstrate the practical uses of the internet to a group of students. It is, for example, difficult to view a document with a mixture of text, diagrams and photos on a cell phone, especially the entry-level phones that most students would have.

GSP expects that employment and business opportunities for young people will improve once they are more familiar with the increasingly available technology, while improved access to the internet will help rural producers to boost their income and develop their local economy. To reach as many people as possible, the project hopes to extend its work into one or more secondary-level school in each district in the country, with the eventual aim of installing at least one computer in every school in Ghana. ■

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Lessons out loud

The Talking Book, a robust handheld audio computer, records locally produced agricultural and literacy information for Ghanaian farmers to play back in their own language.

Case study

In Ghana, the majority of the workforce are farmers, many of whom are small-scale producers. Agricultural extension officers visit these farmers to give them new information that will help to improve crop yield, increase their income and provide food security for their families. However, many rural communities might only have one visit from an extension expert a year. During these short visits, the farmers are flooded with valuable information, but those who are illiterate cannot read printed information, nor can they document what they hear. Even the knowledge of local experts can be difficult to record to make it available for others when they need it most.

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Literacy Bridge, a non-governmental organisation based in the US, wanted to investigate how local organisations could affordably use laptop computers, cell phones and digital audio recorders to improve the delivery of this kind of agricultural, health and educational information to rural areas. They tested a variety of equipment in communities in Ghana. The results were somewhat disappointing as each of the devices was found to have severe limitations. For example, radio broadcasts could not be shared or replayed on demand, and it was not cost-effective to use cell phones to provide access to teaching material covering a wide range of topics.

Over the course of 18 months, Literacy Bridge worked to solve the problems with volunteers and partners in several educational, health and agricultural organisations. They developed and tested prototypes with people in the communities to identify problems and areas of improvement. Partner organisations also tested the equipment in other African countries, and in Asia and Latin America.

The result was the Talking Book: a low-cost, digital audio computer designed to provide locally relevant information to improve health and income, and to help people develop their literacy skills.

Quick response

The Talking Book was designed to be durable and easy to use for people with little formal education and exposure to technology. There is no display, for example, which could be easily broken. Instead, the device plays audio instructions in the local language to guide users. They respond by pressing any of the ten buttons. For instance, pressing the right and left arrows navigates through categories such as livestock, fish farming, and health. Once the user has selected a category, it is easy to use the up and down

A long-term approach to improving access to information is by improving literacy rates

arrows to rotate through individual messages.

The device can be programmed to include learning exercises and quizzes to test the listener's understanding of the subject. Users can play, record and categorise audio recordings and copy those recordings directly to any other Talking Book with a USB cable, or via a computer. Recordings are stored on an internal microSD memory card, providing between 35 and 140 hours of audio. There is a built-in speaker for group listening, but power can be conserved using earphones. The device operates with rechargeable batteries, but for areas where grid electricity is not available, they also work with locally available zinc-carbon batteries. These batteries typically cost approximately US$ 0.40 and provide 12-15 hours of use.

One Talking Book currently costs US$35 and may be used to support a household or an existing group of farmers or women (particularly those dealing with health issues). Depending on the scale, level of sharing and design of the project, the per-person cost is between US$1.00 and $5.00, plus $0.50 to $1.00 in annual battery expenses. For this amount, organisations working with farmers can reach more people effectively. Farming cooperatives and communities can also purchase the devices to create their own audio libraries. Literacy Bridge expects the price of the Talking Book to fall substantially over the next two years, eventually becoming affordable for low-income families.

During a pilot study in Ving Ving, a village in the Upper West Region of Ghana, agricultural experts from Ghana's Ministry of Food and Agriculture recorded a series of lessons, including techniques for improving crop production. The community quickly saw the benefits of the new system. In a year when their neighbours had a 5% fall in crop production, the farmers using Talking Books saw an average increase of 48%. One farmer, Anthony Dery, was able to harvest over four times as much corn from a single plot compared to the nearby land he farmed at the same time using traditional practices learned from his grandparents.

An evaluation of the project showed that 91% of residents applied a new health or agricultural practice after using the Talking Book. After controlling for a variety of other factors, use of a Talking Book correlated to an increased production of 2.75 bags of goods per farm, valued at US $89. The project cost approximately US$1000, which included 21 Talking Books, batteries, staff fees for training and fuel, but the value of the additional crops produced in just one year was nearly $3000.

Constant learning

A longer-term approach to improving access to information is by improving literacy rates. A lack of exposure to reading early in life leads to a disadvantage in literacy-learning later. Children without a literate parent often have difficulties with reading and writing during primary education and even beyond. Children whose families can afford school fees, and who are able to attend classes, are often placed into overcrowded classrooms, all competing for one teacher's attention.

By using Talking Books, teachers with larger classes have given their students an opportunity to listen to their text books at their own pace and practise their pronunciation, vocabulary, and reading comprehension. Parents and children can also practise reading at home if they have access to a Talking Book.

Government education offices can provide recordings to match the curriculum lesson plans, but communities can also create their own content. When a teacher, parent or community member has created a recording, students can listen back to it, control the speed of playback, define specific key words, and skip ahead or backwards in a lesson.

Throughout the testing phase of the project, the Talking Books remained popular among school students during their literacy-learning exercises. They enjoyed listening to their voices and playing educational games over a sustained period, indicating that the novelty of the new technology was unlikely to decline quickly.

Literacy Bridge is continually developing the Talking Book and is keen to work with new partners, NGOs or government agencies around the world. Each new project provides an opportunity to further document experiences and gather reports of best practices and instructions in order to help others obtain the best use from the device.

The software for the Talking Books is open source, and therefore available for developers to add new features, develop applications and test the software to increase its reliability. Literacy Bridge keeps track of new audio content as it is developed for more Talking Book projects, and encourages partner organisations to share what they have created with each other. The organisation plans to work with other NGOs and institutions that develop or translate content, especially those who provide information and practical lessons in agriculture, health, and business. ■

Examples of agricultural messages used in the Ghana Talking Book pilot project

- Plant seeds in rows of raised soil. This method of sowing seeds produces greater crop yields than planting individual seeds in single mounds, as many farmers have done in the past.
- Use a criss-cross tilling pattern. Rows of raised soil effectively create gutters for run-off, which can ultimately wash away entire crops during rainy season downpours. A criss-cross tilling pattern ensures even watering and minimises run-off.
- Identify specific signs in diseased livestock so that sick animals can be separated from the herd.
- Keep livestock in a pen at night to collect the manure, which can be used as fertiliser.

LITERACY BRIDGE

The Talking Book promotes local content creation, including messages from local experts and feedback from the listeners.

Digital class notes

The Educational Support Network in Zambia enables teachers to use ICTs to produce locally relevant digital lesson notes for distribution to other schools in the country.

Case study

Modern, culturally relevant textbooks are in short supply throughout Africa. In Zambia, for example, there are no specialised educational publishers, so textbooks have to be imported. This puts the cost beyond the reach of many government-funded schools who often have limited budgets. The small group of private schools that can afford to import textbooks face another problem: a lack of relevant examples and references that are recognisable to Zambian students, and which would capture their interest. The problem is less significant in subjects such as mathematics, biology and chemistry, which are fairly generic. But history, geography and political studies should be more closely linked to the local, national or regional setting in order to be accessible to students.

To address the problem of inappropriate – or non-existent – classroom materials, many teachers in Zambia produce their own detailed notes for their lessons. The notes tend to be handwritten since few teachers can afford to buy a computer for home use. Even if the school has an ICT lab, many older teachers, who did their teacher training before the local training colleges had access to the technology, are unable or reluctant to use a computer.

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The teachers, therefore, construct their lessons around their own notes, but because they are handwritten and personal to each teacher, they are often used only once. 'The notes and the textbooks are not updated,' explains Namakonde, a teacher at Roma Girls School in Lusaka Province, 'and this was reflected in the performance of pupils.' However, these notes can contain a wealth of useful information, including cultural references and links to local situations.

Adaptation

Recognising that the teachers' notes represented a unique national educational resource that had never previously been used, the not-for-profit organisation, One World Africa-Zambia, set up the Educational Support Network (ESNet) to develop educational material specific to the country's schools. A pilot phase of the project began in 2006, with eight secondary schools in four provinces in Zambia: Copperbelt, Central, Lusaka and Southern provinces.

The selected schools were all outside the capital city, Lusaka, had an available internet service provider in the area, and had the infrastructure and space to support the extra activities. For example, ESNet may have needed to install computers in teacher resource rooms rather than in the school ICT labs used by students, so that the teachers could work undisturbed.

ESNet initially trained 45 teachers from the eight schools to type and transcribe their handwritten notes using computer software. 'We selected four subjects: history, geography, civics and English literature,' explains Priscilla Jere, executive director of One World Africa-Zambia, 'so that teachers could utilise the information they already had.'

The typed documents were then e-mailed to a central editing centre where four volunteer teachers (specialists in the four chosen subjects) worked to standardise the text. The volunteers had also received advanced ICT training through ESNet in order to adapt the text to fit an agreed template and add graphs, diagrams, images and additional information from the internet. It takes between six to eight hours for a volunteer teacher to enhance each set of notes.

The edited notes were then peer-reviewed by the editing centre staff and submitted for final approval to a specially appointed quality control team. This team consisted of officials from the national Curriculum Development Centre, a standards officer from the country's Education Development Centre, head teachers, and staff from a publishing house. When approved, the notes were copied to CD-ROM and returned to the participating schools. The final documents were also published on the ESNet website.

Motivation

The biggest challenge for ESNet was maintaining a steady flow of digitised notes from teachers to the editing centre. One World Africa-Zambia had originally hoped to deal with 117 notes every three months, but this proved to be too ambitious. Zambian teachers have busy schedules and a strenuous workload, particularly during exam time. They simply do not have enough time to transcribe their notes during school hours. The project team, therefore, reduced the target to 48 notes per quarter, and after several meetings with teachers from the participating schools, they developed new ways to improve the efficiency of the process.

The teachers often had to transcribe their notes after hours, because during school time the computers were in constant use. One solution was to

Using existing informal teachers' notes, the ESNet initiative produces locally relevant teaching material.

ESNet has helped to develop a framework within which teachers have the skills to digitise, enhance, collate and share their previously informal notes.

persuade school principals to allow these teachers access to one specially designated computer, and allocate them extra time within school hours to transcribe their notes.

Maintaining internet connectivity was another issue. Several schools lost their internet connection because they were unable to pay their bills. Some schools tried to generate additional income by setting up an internet café on the premises. However, this was not successful in the long-term as neither the teachers nor the students possessed the business skills needed to sustain it. Other schools negotiated higher fees with their respective parent-teacher associations in the hope that the slight increase of US$2 per pupil each month could be used to pay for connectivity and computer maintenance.

Cooperation

ESNet has helped to develop a process to give teachers the skills to digitise, enhance, collate and share their previously informal notes. 'The performance at our school has risen to a much higher level,' says Namakonde. 'Our pupils now have access to up to date information.'

An evaluation of the project showed that 89% of participating teachers felt they had benefited from the new skills they had learned by being involved in the initiative. 'I produced my own teaching notes and sent them in for editing,' said one teacher. 'I now have detailed notes that I can use and share with other teachers who are not part of this project.'

The next step will be to create a self-sustaining online network of teachers. Those participating already share their ideas using the Dgroups platform. However, persistent connectivity challenges at the eight participating schools continue to inhibit any sustained discussions via the internet. As far as distribution of the documents is concerned, this has been solved by copying the content onto CD-ROMs and sending them to schools.

Increasing the number of computers in the participating schools is also a top priority. Three schools have already managed to purchase refurbished computers with ESNet's support. The project team is now looking for ways to provide the remaining five schools with more computers. In the long-term, this initiative will help to build up a pool of high quality, culturally relevant teaching material that other secondary school teachers in Zambia can easily access and replicate for use in the classroom. ■

Related links

ESNet teacher notes
➜ http://esnet.oneworld.net/esnet/sections

One World Africa-Zambia
➜ http://africa.oneworld.net

Dgroups
➜ www.dgroups.org

Resources

Documents

Developing an e-learning strategy for public universities in Ghana
In this article from Educase Quarterly, Isaiah T Awidi points out that many African public-funded universities have not yet been able to take advantage of technology to develop online education. Focusing on Ghana, the author mentions that many universities in the country have developed networks and have sufficient equipment, including computers and other hardware. However, few institutions have so far managed to integrate the technology into their regular teaching processes. Most courses are still taught by face-to-face instruction with little electronic communication between students and teaching staff. Awidi stresses the need for universities to develop e-learning policies and systems if they are to increase enrolment in e-learning courses.
➜ **http://net.educause.edu/ir/library/pdf/EQM0828.pdf**

Provoking change: technology and education case studies from Samoa
Carmen Strigel, Ioana ChanMow and Ruby Va'a examine the many factors that influence the teaching and learning environment in schools, and consider the effectiveness of ICT in education initiatives in Samoa. The report, written for the Asian Development Bank, describes the country's education system and the general context in which the initiatives they studied took place. The paper gives an overview of how information and communication technology was used in each case, details the main activities and the type of equipment used, and includes an assessment of the Samoa's SchoolNet pilot project.
➜ **www.adb.org/Documents/Reports/Consultant/39035-REG/appendix9.pdf**


VIDIPHOTO /ANP

E-learning makes use of communications technology to provide students with training in and out of the classroom.

Web resources

Guide to measuring ICT in education
This manual, produced by the UNESCO Institute for Statistics, describes standardised concepts and indicators for measuring ICT in education. By using the guide, researchers can present their findings and data in a consistent manner to ease interpretation and comparison between studies and projects. The guide provides definitions of key concepts, detailed measurement specifications and explains how to interpret the various indicators. The new standards should help policymakers to assess the use of ICTs in education and aid them in the development of effective policies to improve the use of communications technology in schools and universities.
➜ **www.uis.unesco.org/template/pdf/cscl/ICT/ICT_Guide_EN.pdf**

mLearning Africa
Regularly updated with stories from news sources, academic research and project reports, the mLearning Africa website has become a valuable resource for anyone interested in using cell phones for education — m-learning. The site, supported by the Shuttleworth Foundation and the Meraka Institute, has followed developments in the sector since 2003. The articles are divided into categories including discussion papers, presentations, projects and reports, and strategy papers. There is also extensive coverage of academic research in the field with many papers available for download as pdf files. The site's developers also encourage contributions from other sites using cell phones to deliver educational projects. Follow the link for more details:
➜ **http://mlearningafrica.net**

Distance learning in developing countries
With many years experience in the field, Professor Stewart Marshall has developed this website for anyone interested in how ICTs can be used for distance education. It focuses on open educational resources, open source software, web 2.0 applications, such as blogs, wikis, social networking, social bookmarking and other social software. It also considers hardware possibilities for online schools, including wireless communication. The site is intended for teachers of distance learning courses and researchers in online education, but would also be especially useful for students looking for online training and online degree courses.
➜ **http://members.tripod.com/stewart_marshall/index.html**

Projects

ICT BITES
ICT-Based In-Service Teacher Education for Secondary School Teachers in Tanzania (ICT BITES) was set up to deal with the shortage of qualified teachers in the Eastern African nation. Supported by the Ministry of Education and Vocational Training in Tanzania and the Swedish programme for ICT in developing regions, the project focuses on providing in-service courses to improve the skills of teachers who have already had at least a few weeks of formal teacher training. One of the main goals of the project is to 'exploit the interactive potential of ICT in the provision of modern education theory and practice via distance education programmes'. To do this, the project uses the e-learning platform Moodle, to enable interaction between the tutors and students, for student group work, and for assignments and assessments.
➜ **http://sites.google.com/site/ictbites/**

eGranary
The eGranary project reproduces millions of multimedia documents and websites in a digital library that it is available for free to educational institutions in developing countries that have no, or limited access to the internet. More than 300 educational establishments subscribe to the project. The information is copied to a high capacity hard drive from which students and teachers have instant access through a local area network. Since its set-up in 2001, the eGranary library has now acquired more than 14 million educational resources stored on a two terabyte hard drive.
➜ **www.widernet.org/egranary**

Global Development Learning Network
Set up by the World Bank to promote cooperation between educational establishments working in development issues, the network now includes more than 120 institutions in over 80 countries. Eighteen affiliates are in ACP countries with 14 of them in Africa. Other associated organisations include the Asian Institute of Management, the Ethiopian Civil Service College, the Islamic Development Bank, and Pontifícia Universidad Católica of Peru. GDLN learning specialists in these organisations develop customised distance training courses, delivered using a variety of ICTs and covering a wide range of issues including agriculture. The network also organises courses and conferences for staff of government ministries, universities and community groups and for individuals.
➜ **www.gdln.org**

Info management for development

While ICTs are becoming more available to rural communities in ACP countries, the technology is still beyond many individual farmers. However, NGO field staff and extension officers often have better access to internet and computers and are therefore able to follow e-learning courses to complement their work.


JORGEN SCHYTTE / LINEAIR

IMARK distance learning modules include courses on web 2.0 for development and using ICTs to build networks and online communities.

The information management resource kit (IMARK) is supported by FAO, CIRAD, APC and CTA, and was developed to provide e-learning modules on agricultural information management. It promotes web 2.0 skills, networking techniques and digitising methods for the development of e-libraries.

Getting started
Visit the website: www.imarkgroup.org and click on the link 'new learner' in the left hand margin to register. Complete the form with your name, e-mail address, country, and the name of your organisation and its web address (if available). Choose a username and a password then click 'submit'. You will then receive an e-mail confirming your username and password.

Modules
All IMARK modules have been designed for learners to follow at their own pace. They are available free online or, if you have limited access to the internet you can request the module as a CD-ROM (also free).

Log in with your username and password to view the 'my IMARK' page, and click on 'select new module'. You can then choose from the modules below. Just click on the button to select your preferred language to start.

For more information about each module, such as content, the suggested target audience and additional resources, click on the 'module description' link.

Digital libraries, repositories and documents
Currently available in English only.
'The module covers the processes relevant to the creation and management of digital libraries and repositories, including digital file formats, metadata management, database management and the preservation of digital information.'
They consist of 40 lessons, each taking 25 to 45 minutes to complete, and add up to a total of around 24 hours of learning.

Web 2.0 and social media for development
Available in English, French and Spanish.
'Describes a wide range of social media tools that enhance the ways in which information is created and published, and which provide the means to collaborate and share resources online. It also describes how to take advantage of those tools for more effective networking, collaboration and exchange of knowledge.'

Comprises two units with a total of 11 lessons.

Networking in support of development
Available in English only.
'This module describes how different ICTs in a country — local, national and international — fit together to provide a workable means of communication, and the issues that affect each level.'

Four lessons cover the topics: ICT as media; ICT's influence on the future; costs and effectiveness of the links in the ICT chain, and the impact of regulatory frameworks on ICT choices and costs.

Building electronic communities and networks
Available in English, French and Spanish. Arabic version available soon.
'Covers the approaches, methods and tools used to build electronic communities, and covers the various steps and procedures for developing and facilitating electronic communities.'
The module comprises 29 lessons, each taking between 15 to 90 minutes to complete. Total learning time is estimated at about 16 to 22 hours.

Investing in information for development
Available in English, French and Spanish.
This module was developed to support people involved with developing information management strategies.
Its six units cover: investing in information for development; information strategy; information access; information dissemination; organisation and management; evaluating an information project.

Digitisation and digital libraries
Available in English, French and Spanish. Arabic version available soon.
The lessons cover 'copyright issues, electronic formats for text and images, metadata and subject indexing, as well as a comprehensive overview of the creation and management of digital documents'.
Comprises six units and a total of 31 lessons.

Management of electronic documents
Available in English, French, Spanish, Chinese and Russian. Arabic version available soon.
'The module offers a series of lessons on electronic document management which introduce basic concepts and describe specific workflows and topics.'
Covers subjects including the variety of formats for electronic documents and images, production and management of electronic documents, and database management systems.

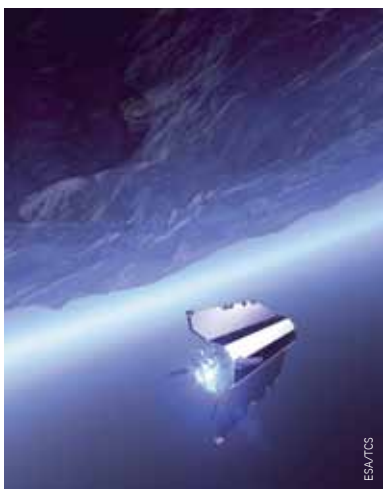
NOTE: You will need to have Flash Player 7 installed on your computer to view lessons, and Adobe Acrobat 4 or above to print files. ■

Explore the world of agricultural research

CGIAR, a partnership of agricultural research institutions worldwide, has published a new-look website showing hundreds of research projects carried out by the many cooperating organisations. The site provides a map highlighting the 120 countries where CGIAR researchers are working. Roll the mouse over a country to see the number of projects there, and click to find a full list with short introductions and links to full details. Alternatively, click the link below the map to view the complete list of projects, or sort them by country, research centre or one of 13 categories, including agriculture, market access, crops and livestock. There is a search function to find specific text from the site, and it is even possible to find projects based on their start and end date. The homepage also shows recently published papers and offers the possibility to subscribe to an RSS feed to stay updated with new additions to the site. Each project page gives the title of the research, an overview of the project, the countries involved, the participating organisations and scientists (including the name of the principal investigator) and links to any relevant external resources. The site developers have also made it easy to copy the html code to embed the map on another website. Researchers are still updating the information on the site, using it to promote their work and to look for further opportunities for collaboration.
http://ongoing-research.cgiar.org

Broadband internet via satellite

A company set up to provide fast broadband internet services to emerging markets has received sufficient funding to launch the first of eight satellites. The company, O3b, (other three billion) secured almost €900 million to develop the initial stages of the network that will need at least six satellites, but could expand to more than 20. The satellites will be in orbit 8,000 km above the equator, far lower than most other telecommunications satellites that can be as much as 36,000 km above the planet. The closer range will allow faster data transfer between the satellites and the system's eight ground stations. The ground stations can link to fibre networks to deliver internet traffic to subscribers. The African Development Bank is among the funders who hope the system will boost a rapid communications infrastructure to support businesses and education throughout Africa. O3b expects to launch the first satellite from French Guiana in 2013.
www.o3bnetworks.com



ICTs reaching rural areas

A recent report from the United Nations Conference on Trade and Development (UNCTAD) states that it is now easier than ever for people living in rural areas to access ICTs. 'Farmers, fishermen as well as entrepreneurs in urban areas are rapidly adopting mobile phones as a key tool to advance their commercial activities, and some poor people are finding new livelihoods on the back of this trend.'

The 170-plus page Information Economy Report 2010, entitled ICTs, Enterprises and Poverty Alleviation, notes that while technology and connectivity are becoming affordable for many more people, there is currently insufficient data to prove the effectiveness of ICTs in reducing poverty. UNCTAD calls for focused research in this area, and for organisations to make better use of the technology to provide rural communities with relevant and targeted information.

The organisation gives examples of how farmers are increasingly using cell phones to access information and coordinate activities with other participants of their local market supply chain. Mobile banking also gives rural communities extra security in their financial transactions, securing microfinance loans and more recently, insurance services.

Not only can ICTs influence people's current work, they can also give rural communities the opportunity to develop new businesses by providing services and products that previously did not exist.

Download the full document and executive summary at www.unctad.org/Templates/meeting.asp?intItemID=2068&lang=1&tm=19743

A map of banana resources


GOOS VAN DER VEEN/HH

Bananas are a major staple food for many people in Africa, and an important product for farmers throughout the continent. There is, however, very little information collected and distributed about this vital crop. Since 2008, several researchers and international organisations, including Bioversity and the International Institute for Tropical Agriculture, have been systematically mapping areas in sub-Saharan Africa where bananas grow. Experts working in the region have gathered details on climate, production techniques, banana types and common pests and diseases. They also noted the exact locations of banana cultivations with GPS technology to collate the data in a single map. The work continues, and to make it easier for others to collaborate and add information, the team has developed a web application. The Banana Open Access Platform uses 'crowdsourcing' to further build this unique geo-database.
For more information visit http://banana.mappr.info

Technology training in the Pacific


JORGEN SCHYTTE / LINEAIR

The Framework for Action on ICT for Development in the Pacific sets out guidelines for the use of ICTs in education, health, government and agriculture in the region. Many Pacific countries, however, do not have enough skilled staff to implement the new policies and meet the agreed outcomes. In order to train more people to use ICTs effectively, the Secretariat of the Pacific Community (SPC) signed a partnership agreement with the United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development (UN-APCICT).

To help reach some of the targets described in the framework, the heads of agriculture and forestry services in the region met recently to discuss how they could make greater use of ICTs in their work. The services will be supported to develop websites for rural communities, link remote islands with telecentres and use social networking and traditional media to keep farmers informed, and allow people to share information and give feedback to government departments.
www.spc.int

The specialist need for ICTs

Two prominent researchers in the field of ICT for development have published articles recently urging funders and implementing organisations to maintain the involvement of experts in technology projects.

'ICTs should be mainstreamed into development. That's the current conventional wisdom. And it is wrong,' says Richard Heeks, a professor at the University of Manchester's Centre for Development Informatics, in a post on the centre's ICT4D blog.

Kentaro Toyama, a researcher in the School of Information at the University of California, Berkeley, echoed Heeks' thoughts in an article in the Boston Review. 'If you have a foundation of competent, well-intentioned people, then the appropriate technology can amplify their capacity and lead to amazing achievements.'

In his post, *Mainstreaming ICTs in development: the case against*, Heeks argues against the increasing trend for development organisations to introduce the use of ICTs throughout all of their projects. He cites the UK's Department for International Development (DFID), the Swiss Agency for Development and Cooperation (SDC) and Canada's International Development Research Centre (IDRC) as examples of organisations that have phased out specialist ICT for development programmes in the last few years in favour of integrating technology across all their focus areas. Such an approach, he says, will leave organisations without the vision to develop ICTs in the future and prevent them from building good practice in technology projects.

Toyama's article, *Can Technology End Poverty?*, points out that the broad uptake of technology is not in itself a measure of progress. 'Technology,' he says, 'is only a magnifier of human intent and capacity. It is not a substitute.'
For the full articles visit:
http://ict4dblog.wordpress.com/2010/10/30/mainstreaming-icts-in-development-the-case-against
www.bostonreview.net/BR35.6/toyama.php


JOERG BOETHLING / LINEAIR

80 % of the population in rural areas now have an available cell phone network, according to the International Telecommunication Union's (ITU) World in 2010 report.

5.3 billion, the estimated number of cell phone subscriptions throughout the world at the end of 2010, says the ITU report.

21 % of the population in developing countries are online. 71% in developed nations. Full ITU report at www.itu.int/ITU-D/ict/material/FactsFigures2010.pdf

Alex Twinomugisha
(alex.twinomugisha@gesci.org)
is Africa regional director of the Global e-Schools and Communities Initiative (www.gesci.org)

School support systems

GeSCI doesn't provide individual learners with equipment or training courses, but encourages countries to develop their own systems and institutions. What is the advantage of this approach?

➜ It is important that each country develops education policies that suit the local situation and that are tailored to the population's specific needs within the resources available. It is not our job to question or influence those policies but to provide advice, show ministries how ICTs can benefit their particular situation and help staff to develop the necessary skills to use the technology.

Sometimes we have to provide a reality check. For example, a government might want to provide broadband internet to every school, but if the country's infrastructure doesn't allow for that, we have to look at alternatives. Maybe they could distribute information by sending out CD-ROMs on a regular basis, or by using radio programmes.

It is important to realise that there is no single solution. You cannot decide to install computers in all schools if only a small percentage have access to electricity, for example. The teaching staff also needs to learn how to use the technology, and schools have to work out how to maintain the equipment in the long term. Every situation requires a different approach, and we work with the education ministries to determine the most practical solution in the given circumstances.

How can teachers benefit from e-learning?

➜ Teachers are essential to the introduction of ICTs in schools. They are the ones who will be able to use the resources from the internet and from mobile applications, and apply them in their lessons. The teachers will be the ones who bring the technology into the classroom and instruct students on how to make the best use of it.

E-learning is also important for developing teachers' professional skills. Many schools still rely on unqualified staff to teach students. These staff members can use online courses to gain extra qualifications. Meanwhile, students can lose out when teachers have to take time off to travel for professional development. Instead, teachers could use the internet and even cell phones to follow distance-learning courses.

We have to remember too, that ICTs can greatly improve the efficiency of the school administration services. Staff members have quicker access to records stored in a database, they spend less time completing handwritten reports, and education departments can receive regular updates via internet. In this way, the technology can help other school staff provide effective support for teachers.

JORGEN SCHYTTE / LINEAIR

What can rural communities do to improve their access to education?

➜ People in rural areas can try to make the ministries aware of their needs, and show that there is demand for particular services. Even if they don't meet government staff regularly, they can voice their opinions through NGOs working in the area, which can communicate their requests to the relevant department.

Meanwhile, governments have to remember to include people at all levels when developing new policies. The ministries have to consider the priorities of people in rural communities and ensure that they also have a place in any future plans.

Is technology likely to become an integral part of teaching in the future?

➜ Yes, I think it will. And since so many people now have access to cell phones, even in very remote areas, I think they will become very important to the learning process, not only in school but outside too. Cellular network providers and phone manufacturers have realised that there is a big market in cell phone services. They are making it increasingly easy, and affordable, for people to access information and educational applications. Students use these apps in their own time, for their own personal interest and for homework. The schools need to realise this, adapt to it and make use of this extra resource.

What kinds of technology are currently being developed to deliver e-learning more effectively?

➜ I don't think we need to worry too much about the technology anymore. Everything we need to bring education to schools and rural communities already exists. It's just a question of the time it takes until it becomes available to everyone.

Looking at it in the long term, I think the lines between the different types of technology will blur, and all devices will be able to access the same resources. The focus will be on the development of applications and services. Those students who like to work with others will have the tools to collaborate with people all over the world. Those who like to solve problems will have greater access to the information they need. We just have to make sure they all know how to use the new technology, and make the best of the opportunities available. ■