Mobile Phones & National Educational Technology Agencies, Sachet Publishing & the Khan Academy:

What's happening with educational technology use in developing countries

*Excerpts from the World Bank’s EduTech blog (Volume VI)*

Michael Trucano
The World Bank
2015
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http://blogs.worldbank.org/edutech
Top World Bank EduTech blog posts of 2014
by Michael Trucano
#1: originally published on Monday, 5 January 2015

Since 2009, the World Bank's EduTech blog has attempted to "explore issues related to the use of information and communications technologies (ICTs) to benefit education in developing countries".

While the 30+ posts in 2014 spanned a wide range of topics, a few themes emerged again and again. The emerging relevance and use of mobile phones (in various ways and to various ends) in the education sector continued to be a regular area of discussion, as were efforts to collect (more, better) data to help us understand what is actually happening around the world related to technology use in education, with a specific interest in circumstances and contexts found in middle and low income 'developing' countries.

While technology use is typically considered a characteristic of more 'advanced' countries and education systems, the EduTech blog deliberately sought in 2014 to complicate this belief and bias a bit by looking at efforts specifically meant to be relevant (and which were in some cases indigenous) to some of the 'least advanced' places in the world.

Before getting on to this year's 'top ten' list, a few reminders (which might be familiar to some of you who have read the earlier annual EduTech blog round-ups: I've copied some of this verbatim):

- Posts on the EduTech blog are not meant to be exhaustive in their consideration of a given topic, but rather to point to interesting developments and pose some related questions that might be of interest.
- These blog posts should not be mistaken for peer-reviewed research or World Bank policy papers (although some of the content may later find its way into such publications). The views expressed on the EduTech blog are those of the author(s) alone, and not those of the World Bank. (In other words: Blame the guy who wrote them, and not his bosses or institution, for anything you find inaccurate or disagreeable here.)
• The blog itself is animated by a belief that, by 'thinking aloud in public', we can try (in an admittedly very modest but hopefully useful way) to open up conversations about various themes to wider audiences, sharing emerging thinking and discussions on topics that often have been, and regrettably often remain, discussed largely 'behind closed doors' within small circles of people and institutions.

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OK, now on to the ...

**Top World Bank EduTech Blog Posts of 2014**

10. **Ten observations about 1-to-1 educational computing efforts around the world**
So-called '1-to-1 computing in education' has been around for about 25 years now, but in 2014 this phenomenon decidedly hit the global mainstream, as many education systems around the world (and not only in 'rich' countries) provided students, for better or worse, with their own personal computing devices (whether laptops or tablets). This short post (together with a companion piece, *1-to-1 Educational Computing -- A report from Korea*) tries to take stock of some of the emerging trends common to many such efforts. *Questions to ask (and not to ask) when your president tells you to buy 100k (or a million) tablets for students* offers some related guidance to policymakers in charge of such efforts.

9. **The Development and Evolution of National Educational Technology Agencies Over Time**
In most countries around the world, a single institution is core to the implementation of national initiatives related to the use of new technologies ('ICTs') in education. This post, together with a companion piece that examines some of the key factors behind the founding of such organizations (*Why Establish a National Educational Technology Agency?*), investigates this understudied phenomenon, and how such institutions help transform related policies into on-the-ground realities.

8. **Using mobile phones in data collection: Opportunities, issues and challenges**
A set of three linked posts look at emerging lessons from the use of a technology increasingly available nearly everywhere -- the mobile phone -- to collect and disseminate data key to the administrative functions of many education systems. In addition to a general overview, follow-on posts look at a specific effort around *Using mobile phones to collect data in the education sector in Uganda* before concluding with *Using mobile phones in data collection: Some questions to consider*.

extra: A post which generated some of the least traffic on the site over the course of the year, but which appeared to resonate strongly with a niche audience, was *A short note to the new philanthropist looking to support education and technology initiatives in the developing world*. Also of potential interest: *Big Data in Education in 2025: A Thought Experiment* considers a
theme that was more pronounced on the blog in 2014 and which echoes throughout many of the posts during the year: that of privacy.

7. **Sachet educational publishing in a digital and mobile world**
   This post is the latest in a series on the EduTech blog over recent years that examines changes in the textbook industry and markets for teacher and learning materials as education systems increasingly 'go digital'. How might related business models evolve, especially given the increased proliferation of small, personal mobile devices?

6. **How many schools are connected to the Internet?**
   This post, as well as related ones on *Collecting data about educational technology use in *all* countries in the world* and *Surveying ICT use in education in Asia*, looks at initiatives to quantify and document what is actually happening with technology use in schools around the world, such as those considered in *Checking in with Portugal’s big projects to support technology use in education* as well as the efforts examined in a post about *Two new rigorous evaluations of technology use in education*.

5. **Education & Technology in an Age of Pandemics (revisited)**
   This posts re-works and updates an earlier one from 2009 which looks at educational technology efforts in areas afflicted by disease epidemics, such as SARS and what was then widely referred to as the 'swine flu', in light of the Ebola crisis in West Africa. In places facing severe educational challenges, especially those in real (and not rhetorical) 'crisis', are considerations of technology use in the education sector less relevant than in highly developed countries ... or might they in some cases actually be more important?

4. **Evaluating the Khan Academy**
   Perhaps no single educational technology effort in the world today reaches more learners, has greater exposure, or has catalyzed more passionate discussion across national borders than the Khan Academy. Born out of, and largely originally focused on, educational contexts within the United States (and outside of schools), the Khan Academy's reach and impact is rapidly expanding into middle and low income countries, and into formal classroom environments as well. This post, as well as related ones on *Contextualizing lessons from the use of the Khan Academy* and *Translating and implementing the Khan Academy in Brazil*, explores some of what is known, and what isn't, that might be of relevance and interest to policymakers in such places.

3. **A 'mobile first' approach to educational technology**
   A speech at the 2014 Mobile World Congress argues that many educational technology efforts might do well to think first about how users would access and interact with their content and services on their own personal mobile devices, instead of trying to port over what they have already developed for PCs and laptops. This is a follow-up of sorts to a post that goes *In search of the ideal educational technology device for developing countries* and which finds that, for many people, this device may well be a mobile phone.
Many teachers around the world suffer as a result of poorly-functioning systems to pay the salaries they are due. Given the related difficulties and challenges in many countries, might *Paying teacher salaries with mobile phones* be worth considering?

2. **Bad practices in mobile learning**

The most popular post ever on the EduTech blog identifies a number of *worst practices related to technology use in education*. In 2014 this post was updated and reconsidered, drawing on *What we are learning about reading on mobile phones and devices in developing countries* and other efforts and experiences which utilize the increasingly inexpensive, ubiquitous and power connected personal computer devices that are found in the pockets and pocketbooks of teachers and learners alike. Even if we don't always know exactly what we *should* be doing, we might do well at least to avoid the things that we know probably won't work.

1. **Promising uses of technology in education in poor, rural and isolated communities around the world**

By far the most read, widely-circulated and (arguably) influential EduTech blog post in highlights a number of experiences attempting to use information and communication technologies in some of the most difficult educational environments around the world. Drawing on a post from 2013 which identifies *10 principles to consider when introducing ICTs into remote, low-income educational environments*, this post summarizes and points to a number of specific projects, including ones considered in posts from earlier in the year such as *A model for educational technology development from ... Afghanistan?*, *Bollywood Karaoke and Same Language Subtitling to Promote Literacy*, *Interactive Educational Television in the Amazon* and *Promoting literacy with mobile phones in rural Papua New Guinea* (which was, for what it's worth, the second most read blog post of the year).

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What's ahead for the EduTech blog in 2015? Based on some of the current activities that I am working on, I expect there will be some posts looking at the 'maker movement' (and some of the tools commonly associated with 'making': e.g. Raspberry Pi, Arduino and 3D printers); discussions of education, technology and 'innovation' (whatever that word may mean – it seems to mean different things to different people, and sometimes doesn't really seem to mean anything much at all), including efforts to promote 'coding' in schools; specific attention to national educational technology policies (an area in which the World Bank does a fair amount of work); and many more posts highlighting emerging research and, especially, specific education-related projects in developing countries utilizing new technologies that you may not have heard about (but will hopefully find interesting).

Feel free to continue to send in information and materials that you might think of interest. While I welcome the connections that *blogging* and *tweeting* enable (indeed, that's one of the reasons I engage on social media), the volume of stuff I
receive makes it difficult to always respond in a timely fashion. (and: Just because you send me (e.g.) a report about your project or results from your research doesn't mean I'll write about it here. I will read it, though!)

Thanks, as always, for reading the EduTech blog, and have a Happy New Year!

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For those interested in such things:

- More background and context on the World Bank's EduTech blog
- A list of the top EduTech blog posts of all time can be found here

Note: The image at the top of this post of a man using a slide rule (“by my calculations ... it’s time for another annual round-up!”) comes from Southern Methodist University, Central University Libraries, DeGolyer Library via The Commons on Flickr. As with all images that have been made available for use through The Commons, the file contains no known copyright restrictions.
In two weeks I'll visit BETT, the London-based event which is sometimes referred to as the 'world's biggest educational technology trade show'. While I don't know if it is in fact the 'biggest' (ISTE's annual event is huge as well), nor how one calculates magnitude in such cases, there is no doubt that it is indeed really, really, big.

I attend BETT most years for a number of reasons. Doing so provides me with a chance to see all of the new cool gadgets and applications in one place. It is pretty easy to schedule meetings packed into a few days with lots of groups and people who are also at BETT; 'back home' it would take months to coordinate such meetings.

Conveniently, BETT takes place immediately after the Education World Forum, where scores of education ministers gather together each year to share experiences about challenges and successes related to education in their countries. This 'convenience' is actually no coincidence: Many ministerial delegations, especially those from middle and low income countries, stay on to tour the exhibition halls at BETT, to see the 'latest and greatest' and be (presumably in some cases) wined and dined by various vendors hoping to build relationships and do some business. While I skip the 'hospitality' stuff (not really my scene), I typically find it very educational to attach myself to, and rotate between, a few ministerial delegations each year as they tour the BETT exhibition spaces. Doing so offers me some exposure and insight into what such groups are interested (and not interested) in, and provides me with a 'fly-on-the-wall' view into the various sales pitches that are made to these sorts of government officials by companies eager to ring in the new year with some big contracts – as well as how such officials respond to such marketing.

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Just as I find the questions that educational officials ask of vendors when they tour the BETT exhibition spaces to be revealing in many ways, I am often intrigued by the related questions that many of these companies then pose to me.

As a result of my work at the World Bank helping to advise on issues at the intersection of technology use and education in middle- and low-income countries...
and emerging markets around the world, I am, for example, asked from time to
time by companies sets of questions that can be summarized as follows:

What would be the 'ideal' educational technology device for use in schools,
and by teachers and students, in developing countries?

In 2014 the presumed form factor for this device appears to be a tablet – in past
years it was assumed to be a laptop, and before that, a PC. (Who knows what it will
be five years from now – perhaps something 'wearable'? Or will the device that
everyone continues to say isn't suited for use in the education – the mobile phone –
end up winning?)

One the reasons that I maintain the EduTech blog is to share information publicly
that in the past would perhaps have been circulated to and among small groups of
people. I concede that not many people may actually care how I answer such a
question (most of those sorts of folks who have found their way to this blog post
here have presumably already clicked over to something more interesting: the
latest gossip from the Premier League or Bollywood, for example, or perhaps an
email from their spouse). For those that might care, here are:

Some quick thoughts on
the 'ideal' educational technology device for developing countries

My initial response when asked this sort of question about the 'ideal' device for use
in education in middle and low income countries is usually that this is the wrong
question to ask. Or, maybe not the wrong question, but certainly not one of
the first questions you should be asking if you are interested in helping to address
many of the challenges faced by learners, teachers and education systems around
the world.

If one were to identify one 'worst practice' in the educational technology field, it
perhaps would be, based on lots and lots of easily identifiable past disasters, to lead
with a technology 'solution' to 'solve' a problem that you don’t really understand,
especially in an environment or context you don’t really understand. (A previous
EduTech blog post labelled this as: Dump hardware in schools, hope for magic to
happen.) As challenging as the development of new technology devices is, the
greater challenge in education is almost always on the 'human' side. Education, and
the educational or learning process, is in large part about people, and about people
helping and connecting with other people.

That said, as both skilled and expert carpenters will tell you (teachers and students
will too!), your tools are important.

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The organizations asking me this sort of technology-centric question (and the
people who may wish to fund them) often concede that, indeed, all of this 'other
stuff' is really important. But, because their job is to sell, design and/or make new
devices, I find that they are often not terribly interested in comments like “the best technology is often the one you already have, know how to use and can afford”. We understand all of this, they might – and do! – say (although whether or not they actually do understand is perhaps another question ....). And then they ask:

Leaving aside for now the ‘stuff related to human capacity development and educational content’, what are the top five challenges related to the use of ICTs in education in developing countries that we, as the designers and makers of devices, should consider?

While I am not sure if these are indeed the ‘top’ five, here is a list of some of the most acute and important related challenges that I mention when asked this question:

1. affordability
2. accessibility
3. connectivity
4. electricity
5. usability

In a little more detail:

1. **Affordability**

   Perhaps the most obvious challenge relates to cost. It is no coincidence that significant buzz and excitement is generated by gadgets destined for use in learning that are advertised as ‘low cost’ – and the lower the cost, the better! That said, it is worth noting that buying a ‘low cost’ device doesn’t guarantee that whatever is being done with such a device is, in fact, ‘low cost’ (nor, in fact, that whatever is being done has any educational value, but that’s another issue). Indeed, buying lots of ‘cheap’ devices can sometimes prove very expensive! Nevertheless: If people can’t afford the devices in the first place, nothing is going to happen.

2. **Accessibility**

   One thing that high prices can do is ensure that the devices remain inaccessible to the people who could make good use of them – even when people buy them. The phenomenon of new computers remaining unpacked in boxes because they are too valuable to risk damaging has long been a cliché among those who work in this area. In my experience, however, it remains widespread in many places, as does its corollary – the locked computer lab. Your ideal device is not only one you can afford, then, but also one that you have access to when you need it to help support learning! For device makers happen to make the initial sale, surely one of the best advertisements for your next device is the fact that people are using your current and past devices?
3. Connectivity

Increasingly, it is not only the functionality of devices, and the content on them, that provide value to students and teachers. These devices also, and importantly, derive value from the connections – between people, to content and applications in other places – that they enable. Connectivity has of course been a key component of the value of ICT devices sold into the education market since the dawn of the World Wide Web. As more and more people and places and institutions and content are connected to the Internet and mobile networks, and thus to each other, network effects become increasingly important. A connected device used in places where there is no or limited/unreliable connectivity loses a lot of its potential utility. While schools in some countries are equipped with more broadband capacity than entire countries in Africa in the not too distant past, many communities remain largely unconnected. Many others are chronically underconnected. While important efforts are being made in this regard, connectivity remains a really big issue.

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These first three challenges are all very real and undeniably important – but things are, thankfully, improving in all of these regards. Improvements are perhaps not happening as quickly as many may like, of course, and, more importantly, not as quickly as might be needed, but things are improving. Progress related to the other two challenges I have listed here is, in my estimation, being made less quickly.

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4. Electricity

For a while now, in many places around the world the so-called ‘digital divide’ has been as much about access to reliable power as it is about access to ICT. While progress is being made in this area, in some instances, as more widespread access to affordable reliable power comes online, one result is that there is a greater demand for such power (and so the cycle continues ...). Companies targeting markets where affordable reliable electricity is a very real issue would do well as a default way of thinking to design devices with this reality in mind. One of the (many) reasons that mobile phones have spread so rapidly around the world is that, at least until the smartphone era, they have been able to function for quite a long time on a single charge. Because typical phones, especially low end phones, do not require a lot of power, homegrown charging solutions have been viable to help keep them (more or less) working. As ‘smart’ devices proliferate, drawing more and more power, hyperlocal means to keep them charged may become increasingly strained. (As more and more content and applications move to the ‘cloud’, the power demands on larger-scale infrastructure increase in new ways as well.)

It is also important to note that such homegrown solutions have developed in response to clear, specific needs and demands in communities. In most places in the world that I visit, including some of the remotest – and I have visited a lot of such places! – you can somehow find a way to charge your phone. (You can also
often find a way to buy a Coke, even if there is no access to potable water, but that is another discussion.) It may be because someone has an extra battery. It may be because there is a solar charger available, and that will suit your device’s requirements. It may be because some entrepreneur has hooked up a car battery or portable generator and charges a few rupees or kuai or francs to help keep your device, well, charged.

It is also, I think, because many users have quickly found such devices to be so useful that they have created demand for services to keep them charged. The contrast with laptops and computers used in many schools in poor communities is perhaps instructive. While it is true that such gadgets have considerably larger electricity demands, it is in my experience also the case that many of the people with responsibility for such devices have not gone out of their way to seek solutions that might provide sufficient power, because they haven’t been convinced of the utility in doing so. Better to spend time, attention and scarce funds – and scarce power! – on things that are considered to have more immediate value, they say!

5. Usability

One challenge that I see discussed much less than the other four listed here relates to usability. This is, in many cases, a much more difficult nut to crack. Over the past few years, there has been a flood of low cost technology into many schools in poor communities around the world. The low cost nature of such technology is often a good thing, of course. That said, a lot of gadgets of this sort are little more than junk. Some of this is because the devices themselves are of low quality. Some of them, however, are ‘junk’ because they are incredibly difficult to use because of their poor user interfaces. Still other, more expensive, better designed, higher end gadgets are difficult to use because they were designed for other use cases or usage scenarios, by other groups of people, in other circumstances, for different purposes. It perhaps shouldn’t be too surprising that devices designed in places like Mountain View (or Tampere or Tokyo, Cambridge or Suwon) aren’t always as usable for folks in, for example, rural, low income Asian or African communities as they are in communities where the designers themselves live.

Now, it is true that much progress has been made in this regard over the past decade, as momentum around things like design thinking builds and especially as so-called developing markets are seen as potential areas of revenue growth for the companies which design and make these devices. That said, whenever I hear stories about things like (e.g.) disproportionate numbers of e-reader devices introduced into a community breaking because people had been told to keep them very clean that numerous folks, as a result, decided to regularly wash them in a local stream, I am reminded that many of the designers of devices being used today by learners in developing countries don’t have a good handle on the way such devices may be used in practice in such places. No doubt, as markets grow, many of the device designers in the ‘Global North’ will increasingly take such contexts, and users, into consideration, and this will presumably result in some real progress. However, I don’t wonder if many of the real usability challenges won’t be overcome by people living and working in such environments themselves, or at least who...
come from such places (and whose families may still live there), who are
themselves users of the devices they help design, and the applications that run on
them.

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Ok, so those are some quick thoughts in responses to questions related to the
development of the ‘ideal educational technology device for developing countries’. I
am not sure if they are of interest or use to the types of folks who ask me related
questions. Whether they are or not, I would offer the opinion that the views and
‘insights’ of folks like me may in the end be of limited value. If you really want good
answers to these sorts of questions, you should ask the people themselves to whom
you hope to sell such devices.

Better yet: **Work with them (observe them, talk with them, hire them, fund
them) as part of your design process.**

You may also be interested in:
- Educational technology and innovation at the edges
- Education & Technology in Africa: Creating Takers ... or Makers?

Note: The image used at the top of this blog post (“you have some important choices to make on
which path to choose ...”) comes from Wikipedian Tolukra via Wikimedia Commons. It was made
available under the Creative Commons CC0 1.0 Universal Public Domain Dedication.
A model for educational technology development from … Afghanistan?
by Michael Trucano
#3: originally published on Friday, 17 January 2014

In response to a recent EduTech blog post on “the ‘ideal’ educational technology devices for developing countries”, I received numerous responses that effectively said: “We already know what this ideal device is: the mobile phone”. While the use of mobile phones in education is a regular topic explored on this blog, and the mobile phone is a device that I regularly recommend that ministries of education consider when planning for technology use in schools more than they currently do (in my experience few education authorities do consider utilizing phones as tools for learning in any real way), I would not go so far as to say that it is the ‘ideal’ device for use in educational settings in developing countries. Context is always king.

It may be true that, in many cases, the ‘best device is the one you already have, know how to use and can afford’. In some contexts, mobile phones conform to this definition quite well (although many school systems around the world do continue to ban or severely limit their use on school property). Depending on the context and usage scenario, others do too, including the two that I used to compose the first draft of this blog post: a ballpoint pen and a notepad (the old fashioned kind with actual paper, not the one that comes bundled with Microsoft Windows).

Because I often prominently highlight the potential of mobile phones to be used in educational contexts in developing countries in the course of my work at the World Bank, I am often asked for specific examples of this use. Here’s a rather interesting one that you may not have heard much about:

Over the past few years, I have been pitched project ideas countless (scores? hundreds?) of times by people who cite market research on the total number of mobile phones in a given population in a particular developing country as a justification for developing mobile apps in a given sector. Fair enough, I have even done this on occasion myself: I recently came across a presentation of mine from 2010, for example, where I quoted from a UN report that maintained that there was greater access to cell phones than toilets in India. That said, all too often the same people then go on to propose the development of (or demonstrate an app already developed) which can only be used only by the small percentage of small percentage of people who possess a smart phone.
Vendor/developer: You need a smart phone to use our content (or service). That is the only way it can be fully experienced.

Potential customer: OK, what you have developed sounds very interesting. We won’t use it, though, because we can’t – we don’t have smart phones. Some day we undoubtedly will, but today we just have our old low end feature phones. Do you have anything that works on them?

There is a compelling school of thought that, in certain cases, innovation results as a response to scarcity. Those familiar with the current context for education and schooling in places in many challenging environments around the world – in ‘fragile’ states, for example, in conflict zones and refugee settlements, in very poor and/or remote communities – are well aware of how scarcities and constraints of various types can compel folks to look for creative solutions, utilizing or ‘hacking’ what they already know and have, in ways that other people have perhaps not considered – nor needed to consider.

While there have been important and significant gains in education in Afghanistan over the past decade, the education system there is still characterized by many such scarcities and constraints. There aren’t enough qualified instructors. There aren’t enough schools. There aren’t enough textbooks and other learning resources in local languages. Disproportionate numbers of girls are not in school, and there can be quite severe constraints on women’s freedom to seek employment outside the home (including as teachers). For these (and of course many other) reasons, a lot of international donor agencies provide assistance to the education sector in the country.

Recognizing the difficulties and limitations to attempting to work in schools in Afghanistan if they wanted to reach out to some of the most difficult-to-reach communities of potential learners, the folks at Paiwastoon (who had previously been involved with a piloting of the One Laptop Per Child initiative in the country) looked around and asked themselves: What’s widely available outside of schools that might support learning? What can deliver audio, video, quizzes and mini games for low literate users? Their answer: mobile phones. Not high end mobile phones, nor the lowest end models with only black and white displays, but rather the inexpensive, non-‘cutting edge’ devices from firms like Nokia that one sees throughout the so-called ‘developing world’ which have a color screen and a memory card slot. Because Paiwastoon is a tech firm (there aren’t many of them in Afghanistan, but there are a few -- the World Bank is actually helping to support the emergence of many more), the folks there looked for some sort of application that could be run on low end phones that could provide educational content and activities to learners in their homes. Because there is not a deep, rich local talent pool of either programmers or designers of educational content creators on which they could draw, they decided that, whatever technology solution was deployed, it had to be very *easy* for people to develop content for it. Given the vagaries (and expense) of being online in Kabul (let alone the rest of the country!), they needed something that could be developed and used off-line; many of the available and popular tools for mobile app development rely in some way on connectivity, whether to something in the cloud or even only to applications running a local web
After locating and trying out lots of development tools, they came across eXe, a freely available open source authoring application to assist teachers and academics in the publishing of web content without the need to become proficient in things like HTML. eXe is just one example of the curious (and powerful) global evolution of many open source technology tools that are eventually utilized in hyperlocal, very challenging environments in developing countries. It was first developed in New Zealand for use in tertiary education there. It has since spread to and been adapted by the Ministry of Education in Spain, as well to education communities in Germany and Italy. The popular WikiEducator site, which is probably well known to many readers of the EduTech blog, was originally an experiment of sorts to explore the hosting of OER content developed by the eXe community.

Paiwastoon developed a mobile app for feature phones and plug-ins to extend eXe to develop content to be viewed using the app. This was the sort of bootstrapped, highly iterative (prototype --> test --> improve --> test ...) application development that is typical of many such efforts in developing countries where local developers are also local users and who fund their efforts creatively, receive small amounts of funds in fits and starts. The result has been Ustad Mobile, which is essentially the mobile app player of eXe. In the words of Paiwastoon's Mike Dawson, by not requiring the use of smart phones and other ‘high end’ technology devices (although people can use such things if they wish), "this tool enables us to escape the shiny device trap", developing education content locally, with development done by low-skilled local staff, in accordance with local resource constraints. More concretely,

The Ustad Mobile ('mobile teacher') Literacy mLearning project emerged out of recognition that the ideal vehicle to make literacy education software widely and inexpensively available to the people of Afghanistan wasn’t the computer — it was the mobile phone, the only ICT device available at an affordable price to the majority of Afghans, including those who are non-literate and living far from urban centers.

With a grant from the U.S. State Department, Paiwastoon developed Ustad Mobile Literacy, an application that runs offline on the simple feature phones available in small mobile shops and bazaars throughout the country. In less than a year, Paiwastoon adapted the entire national literacy curriculum — from the first letter of the alphabet through grade 3 literacy and numeracy, in both Dari and Pashto. It can be installed as easily as a dictionary or any other simple app on any phone with a memory card.

Ustad Mobile Literacy has been approved by the Ministry of Education and is now being used by literacy classes of adult women and Afghan National Army recruits in Kabul. It takes users from the first letter of the alphabet through grade 3 literacy and numeracy and includes hours of narrated instruction, reading comprehension exercises, quizzes, educational games, and video clips for visual learners.
This application is not intended to replace actual teachers, but rather to add value to their work. However, if no instructor is available, Ustad Mobile provides the opportunity for learning on the user’s schedule, which can be especially beneficial to Afghan women.

The built-in metrics functionality of Ustad Mobile enables reporting of a user’s learning time and quiz scores over bluetooth to her or his teacher’s phone. With an additional basic monthly data package (costing around 5.00 USD), a teacher’s phone can easily transmit statistics from remote project sites to a secure online database, enabling real-time monitoring of education and training projects from anywhere in the world.

My point here, in excerpting from the Ustad Mobile literacy project web site, and indeed in discussing this particular application and group, isn’t meant as an ‘endorsement’ of a specific particular product, tool, initiative or organization. As the fellow at the World Bank who focuses on the use of educational technologies of all sorts in low and middle income countries around the world, I am not in the business of ‘endorsing’ such things, and I am well aware of the folly of trying to advocate for the use of *one* particular gadget or piece of software. I have never been to Afghanistan, and so can’t vouch for the efficacy (or lack of efficacy) of what is discussed here in practice.

Rather, it is to highlight the approach taken by one particular group, in one particular place, operating within a certain set of constraints, to help expand learning opportunities to people who may not otherwise have access to them. The project does seem to embody a number of the principles to consider when introducing ICTs into remote, low-income educational environments previously discussed on the EduTech blog, which is one of the reasons I am discussing it here. Is this sort of thing *the* answer to educational challenges in challenging environments like those found in Afghanistan? Certainly not. That said, the story of the development of Ustad Mobile does highlight one potentially useful way that local groups in such places – and folks further afield who might like to help such groups – might seek to go about seeking answers to such challenges using new (and ‘old’) technologies. Where such groups are successful, their efforts will most likely provide only a few pieces of a much larger, still (much too) incomplete puzzle. But such contributions are undeniably important, and potentially quite valuable.

Might it be possible to export this – the tool, the model, the approach – to other places? I don’t know. To my knowledge (and I am admittedly outside my area of competence here), there aren’t many ‘technology exports’ from Afghanistan to the rest of the world. Might this be one?

You might also be interested in the following posts from the EduTech blog:
- Educational technology and innovation at the edges
- 10 principles to consider when introducing ICTs into remote, low-income educational environments
• Why we need more (not fewer) ICT4D pilot projects in education
• A different approach to scaling up educational technology initiatives
• In search of the ideal educational technology device for developing countries
... and, more generally, posts on the use mobile phones in education

Note: The image used at the top of this blog post of new things being built as part of the World Bank’s Strengthening Higher Education Program (“building new things in Afghanistan”) is (c) Sandra Calligaro / Taimani Films / World Bank. It comes via the World Bank Photo Collection on Flickr and is used according to the terms of its Creative Commons Attribution-NonCommercial-NoDerivs 2.0 Generic (CC BY-NC-ND 2.0) license.
Each January, about 85 government ministers or so -- together with some members of their staffs, leaders of the education departments in international organizations, large NGOs and multinational companies, and other 'high level decision makers' -- gather in London to speak informally about topics of common interest during the Education World Forum, which bills itself as the 'world’s largest gathering of education and skills ministers'. It’s a rather unique and impressive collection of people with the power to make decisions affecting hundreds of millions of students and teachers around the world. This annual meeting was previously called the 'Learning and Technology World Forum'; despite dropping the word 'technology' from its official title a few years ago, talk of tech was inescapable during this year’s Forum, whether onstage or in the hallways. If I were asked to identify three general themes that permeated discussions throughout this year's three-day event, they would be 'technology', 'systems' and 'data'.

For many groups, the Education World Forum offers a high profile venue to announce new initiatives, launch new publications, and present findings from recent research. My boss at the World Bank, Elizabeth King, for example, officially launched a new ‘SABER’ education data technology tool during her keynote speech on the second day ("When it comes to learning, education systems matter"). While the links between these three themes were perhaps not always explicit in Beth’s speech, the important role that new technologies will play in helping education systems to collect and analyze key data about the health of the education system, especially as pertains to whether or not students are learning (and, if so, how), was echoed and amplified by many of the other speakers in both EWF plenary sessions and related side events.

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While the Forum has become increasingly open over the years, embracing the use of social media throughout much of the agenda, for example, and quickly making available on YouTube key speeches and presentations, the off-the-record ministerial exchange sessions that happen on the second day are, as per the EWF social media policy, meant to be a largely Twitter-free zone. The hope is that, if/when/where given space to ask the 'dumb' questions of their peers, and freed from having
it reported that someone, in response, provided some 'dumb' answers, Forum participants might feel comfortable enough to have what turn out to be some rather smart conversations about topics for which they had not been prepped, and about which no formal position papers had been prepared back home.

At one of the informal Forum ministerial exchange sessions a few years ago, rather exasperated that much of the conversation was concentrated on discussions of the lowest costs that various countries had paid for student laptops, I posed the following scenario, and question, as a sort of 'thought experiment':

*Let's assume that, by 2025, *all* hardware and software costs related to the use of information and communication technologies to support learning were zero.*

*How might this change the way you consider the use of ICTs to support the goals of your education system?*

*If we removed considerations of cost from the equation, how might we conceive of the use of technologies in education? Would our approach then be consistent with our approach today?*

Many times I find that what is 'urgent' at a particular moment in time can crowd out consideration of what is truly important. In posing this thought experiment, my hope was to challenge folks to consider their current approaches to the use of technology, and the related challenges, over a longer period of time.

With that experience in mind, and given all of the talk about 'systems', 'data' and 'technology' at this year's Education World Forum, an additional thought experiment comes to mind:

*Let's assume that, by 2025, and for better or for worse, the use of digital technologies across all aspects of your education system will be pervasive.*

*Let's also assume that, by 2025, most of the technical constraints and costs you are mentioning today related to the collection of 'data' of all sorts in your education system will effectively fall to zero, because this data collection will be a natural by-product of the widespread use of technology in the lives of your students, teachers, administrators, and the communities in which they live.*

*What would you do then?*  
*What would be your key related concerns, priorities and opportunities?*  
*Where would you, should you, be directing your resources and energies?*

*If this future is inevitable* (I am not saying that it is, or that this future is a good or bad thing, just that such a scenario is plausible -- these are the parameters of the 'thought experiment'), *what are the important related things you need to be thinking about and doing *today* that we are *not* talking about right now, because we are discussing more immediately 'urgent' issues and priorities?*
Partisan ideological debates define (some would use stronger words, like 'plague', perhaps, or 'paralyze') academic and policy discussions about education in much of the world. One of the featured speakers at this year's Education World Forum (as in many past years) was the OECD's Andreas Schleicher, who rather famously likes to conclude many of his presentations about the latest PISA results by saying that, "without data, you are just another person with an opinion." Initiatives that rigorously collect learning- and policy-relevant data so as to inform more evidence-based decision making in the education sector offer the potential to steer at least some of the related discussions away from philosophical discussions of what 'should' work, based on whatever learning and organizational theories predominate in a particular place, to what appears to work (and not work) in practice. (Whether or not such initiatives can help with the politics that permeates education decision making in most countries is perhaps another issue ...)

International assessment schemes, surveys, benchmarking efforts and analytical tools (examples include things like PISA, TIMMS, PIRLS, TALIS, the World Bank's SABER program) are really still in their infancy, and evolving. While undeniably useful in various contexts, viewing them collectively underscores that fact that we really still don't have all that much useful hard data, whether at a macro or system level or at the micro level of an individual learner or teacher, about what works best, and what doesn't, in various contexts. We certainly have more data to help in this regard than we did twenty (or even five) years ago, of course! But we still have a long way to go. Spend some time poking around what is probably the world's most comprehensive repository of globally comparable education data, the World Bank's EdStats database, for example, and you'll find troves of data of many sorts that simply were not collected and made easily available to large numbers of people a generation ago. Useful stuff, to be sure. But viewed from another perspective, what is available through data repositories like EdStats only underscores how much data we still don't have.

One of the reasons for this is that it is often quite expensive to collect such data. As someone who has commissioned many data collections efforts around the world related to ICT use in education, and as someone who has advised on countless others, I have firsthand experience with just how expensive such efforts can be. However, as more of the actions, activities, and communications taking place inside and outside of schools are enabled or mediated through the use of information and communication technologies, one result may be a massive (and passive) collection of huge amounts of data (and metadata) that was previously not possible without incurring high costs, as such data collection required dedicated actions (surveys and interviews, high stakes standardized tests, classroom observations) by lots of trained people. If/when this eventually occurs, huge waves of data will wash through and across our education systems, increasingly quickly and in ways unimaginable only a few years ago.

What will education systems need to do to be able to take advantage of these waves of 'big data'? Who can use these data, and for what purposes? What won't we need to do that we currently do today -- and might we need to
As with other uses of digital technologies to benefit learning, we should perhaps not be too surprised if those best able to benefit from the coming data explosion in education are those already considered 'the best' -- the best education systems (with the best data scientists), the best schools, the best teachers, the best students, and the best communities (and, it is perhaps worth noting, perhaps the 'best' companies too). If a sort of Matthew Effect of Big Data in Education may soon be upon us, what should we be doing now to prepare to help ensure learning for all students, and not just those who already enjoy the greatest advantages?

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Having access to lots of data is one thing. Being able to make sense of so-called Big Data is quite another. As the cost of collecting certain types of data approaches zero, and costs of storing these data fall precipitously, what will be the costs of analyzing these data -- and are we prepared to pay these costs? As we go from a period of time marked by data scarcity in education to (at least in some regards) data abundance, one hopes that the quotation above from Andreas Schleicher will not be modified to read, "with too much data, you may be just another overwhelmed person with a poorly developed opinion".

In emails following up on a number of discussions that took place at this year's Education World Forum, a number of people asked me if I had seen news reports about a study by researchers at Princeton that, as a result of epidemiological modeling of online social network dynamics, predicted "a rapid decline in Facebook activity in the next few years". Before too long, a number of folks took issue with this conclusion. (A data scientist at Facebook even put up a rather cheeky blog post using "the same robust methodology featured in the paper" to conclude that "Princeton may be in danger of disappearing entirely"). My point in mentioning this here is not to debate the merits of one particular paper (there are other places for that sort of thing), but rather to highlight the fact that any impending era of 'big data in education' will open up education systems to all sorts of new opportunities for analysis and action -- and potentially to all sorts of abuses as well.

In my experience, the education sector is far from a leader on issues related to so-called 'big data'. Related laws, cultural mores and public debates are in their infancy, especially in the middle and low income countries where I work, where there is a real Wild West quality to much of this stuff. To the extent that anyone is 'in charge' in such places on issues related to big data, I am often struck by the notion that it might in practice be many of the vendors selling and maintaining various information systems through which such data travel.

In 2014 the most pressing concerns of many education policymakers related to the use of technology in schools may (regrettably) be, 'what tablet should we buy?'
This is no doubt a rather challenging question currently confronting many education systems around the world. As complicated as this question may appear today, however, one expects that, however it is answered, and however much this answer costs, and whatever the result, much more challenging follow-on questions (and much bigger related costs) loom not too far in the future.

You may also be interested in the following EduTech blog posts:

- Who owns the content and data produced in schools?
- The Matthew Effect in Educational Technology
- Education & Technology in 2025: A Thought Experiment
- A number of efforts are underway to help collect more (and better) data related to ICT use in education across the world, and to share these data widely. Here's an old post about these efforts, as well as initial results from a number of them.
- The Education World Forum (which then carried a different name) was actually the subject of the second-ever post on the World Bank's EduTech blog (for what it's worth, the first one was on 'big changes at OLPC').

Note: The image used at the top of this blog post of an orangutan in contemplative thought in a Moscow zoo ("all this talk of petabytes and exabytes is making me confused .... and hungry") comes from the Wikipedian Dmitry Rozhkov via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
While I have not seen any research evidence to support this particular contention, I have been in a number of presentations over the years about the 'Finnish success in education' in which the fact that Finnish children watch cartoons with subtitles is mentioned as a contributing factor to their literacy development. Even if there are no peer-reviewed journal articles about the impact of this practice in Finland (if anyone knows of any, please do feel free to send them along!) or many other places (subtitling on television has of course been a common practice in many countries of the world for quite some time), there is some pretty compelling evidence from a little initiative in India that has been reaching big audiences for over a decade that this sort of thing can make a small but meaningful difference in the lives of many illiterate and low literate people. Sometimes innovation is the result of doing something 'old' in a 'new' place (often with a slight twist).

Back in November, PlanetRead was awarded the first-ever 'International Prize' as part of the new U.S. Library of Congress Literacy Awards [disclosure: I am a member of the advisory board for these awards] in recognition of its pioneering work in the practice of Same Language Subtitling (SLS), "the idea of subtitling the lyrics of existing film songs (or music videos) on TV, in the 'same' language that they are sung in. Call it Karaoke on Bollywood for mass reading! A deceptively simple innovation, SLS is already delivering regular and inescapable reading practice to 150 million weak-readers in India."

One notable characteristic of each of the three inaugural winners of the Library of Congress Literacy Awards is that they largely work outside of traditional 'educational' institutions as part of their efforts to promote reading. In the case of Reach Out and Read, this means connecting with parents and young children in pediatric exam rooms. 826 National supports store front writing and tutoring centers in local communities. PlanetRead focuses its outreach on a place where, like or not, many people spend a lot of their free time: watching television. Brij Kothari, the founder of PlanetRead, joked during the awards ceremonies at the Library of Congress, some people might say that TV is the enemy of reading, to which we reply: embrace the enemy!
Kothari notes that many of those folks who are not considered 'illiterate' in official statistics are in fact not actually that literate either, as they can not read something meaningful. Drawing on official figures from India (for specific citations, please watch the speech, view the related PowerPoint file and/or the browse research section of the PlanetRead web site), he notes that, after five years of school, 53% of Indian students are unable to read. This means that there are actually three types of people: the 273m people in India who are illiterate, and two sub-groups of people who are officially considered literate: the 311m who can read 30+ words a minute, together with 467m 'weak readers'. It is estimated that there are currently 750m TV viewers (in 150m households) across India. Given these figures, it is clear that many of the people who watch TV in India are weak readers. Same Language Subtitling, where "what you hear is what you read", is one mechanism to provide approximately 200m weak readers with reading practice for about 30 minutes a week. The cost of giving this sort of reading practice to one person for his or her entire life is estimated by PlanetRead is about US$1. Research by PlanetRead has done things like eye-tracking of viewers who watch normal or subtitled TV (the eyes of people who watch subtitled TV tend to focus to a much greater extent on the area of the screen where the subtitles), investigated the extent to which SLS-exposed youth and adults read newspapers, and has looked at the ability of people exposed to SLS to write five words (or to write one's address). The results are intriguing, and quite promising. (PlanetRead includes links to a number of research articles on its web site, including a briefing note from the 'What Works' Clearinghouse of the U.S Department of Education's Institute of Education Sciences.)

As Professor Kothari explained in his acceptance speech on behalf of PlanetRead at the Library of Congress, "this is a solution that will travel, that can travel, because every culture around the world today watches some form of songs in their own language." It is simple to do. It is low cost. It also, he maintains, has a good synergy with the missions of public broadcasters.

Is SLS *the* answer to our literacy challenges? No, of course not. Same Language Subtitling alone can not help overcome the myriad daunting challenges around the world that inhibit the development of functional literacy skills. *But it can help.* It can reach a lot of people. *It is cheap.* And, for many donors and foundations around the world looking to make a meaningful impact *at scale* as a result of their grants and loans and charitable developmental assistance in various parts of the world: It is probably worth a serious look. It is not *the* solution. *But it might be part of one.*

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**ANNOUNCEMENT:** The nomination period for the 2014 U.S. Library of Congress Literacy Awards are now open, and include a special US$50,000 International Prize to be awarded to an organization or national entity based in a country outside the United States that has made a significant and measurable contribution to increasing literacy levels. The deadline for nominations is 31 March 2014. More information, including the nominations forms, is available on the Library of Congress web site.
Side note: Over the course of a decade or so, the World Bank's infoDev program, where I worked for a number of years, made small grants to scores of groups in developing countries around the world which sought to use information and communication technologies in innovative ways in pursuit of a variety of developmental objectives. PlanetRead received one of these grants (by way of full disclosure, I'll note that, while I have been involved with all of these funding groups in various ways, I was not involved in the specific decisions to award this initial infoDev grant to PlanetRead, nor the small World Bank Development Marketplace grant nor a larger grant as part of USAID's All Children Reading competition that PlanetRead subsequently received).

In retrospect, one component of these infoDev grants that appears rather noteworthy was their requirement that grantees support multi-year data collection and analysis of impact related to their efforts. Some of the groups receiving these grants did great things, some failed. The mandate for multi-year monitoring and evaluation (which infoDev explicitly funded, as part of its grants) of the activities of the organizations that received these grant monies (mostly small NGOs just getting started) removed an acute dilemma facing many NGOs who are perpetuallystarved for funds. When the choice is between funding a longitudinal study over multiple years of the impact of your work and covering your operating expenses now, for most leaders of such groups, it should not be too surprising that *now* wins. When you don't know where your funds are going to come from six to nine months from now, does it make sense to budget for multi-year evaluations of your programs? That said, if you don't have multi-year evaluations demonstrating the impact of your programs, it can be quite difficult to secure larger monies of the sort necessary to 'scale up' your programs should they be deemed, according to some criteria, to be 'successful'. There is perhaps a model here for donor groups, aid agencies, charitable organizations and foundations who are wishing to catalyze 'innovative' practices and activities that can be sustained and expanded over time...

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To the many regular readers of the EduTech blog for whom the calendar is now turning:  
Happy Chinese (and Korean, and Vietnamese, and Mongolian ...) New Year!

You may also be interested in the following EduTech blog posts:

- **ICTs and Literacy** (the old fashioned kind)
- **10 principles to consider when introducing ICTs into remote, low-income educational environments**
- **Interactive Radio Instruction: A Successful Permanent Pilot Project?**

*Note*: The image used at the top of this blog post of a multigenerational group about to practice their Bollywood karaoke ("I'd like to teach the world to read, in perfect harmony...") is (c) PlanetRead. It
comes via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
According to **figures** from the UNESCO Institute for Statistics, "Countries will need an extra 1.6 million teachers to achieve universal primary education by 2015 and 3.3 million by 2030". The **2013/4 Global Monitoring Report** provides a useful discussion of the consequences of this deficit, as well as some strategies for overcoming it. There are, unfortunately, no 'quick fix' solutions here. We didn't get ourselves into this mess overnight, and we won't get out of it overnight either. While longer term efforts tackle this challenge in multiple ways over time, recruiting new teachers and upgrading the skills of others, it is probably also useful to ask:

**How do you teach children in places where there are no teachers?**

Many proposed answers to this include some consideration of the use of information and communication technologies. Some groups have offered that it may be most efficacious to simply introduce technologies that help enable students to teach themselves, bypassing teachers altogether. That is certainly one approach, but one with, to date, a rather checkered history of success in many instances (although **not all**), and one that is consistent with a worry that teacher union officials have expressed to me many times over the years: that many of their members fear that they are being, or will be, replaced by new technologies. Rhetoric from certain politicians (I'll refrain from adding a link or three here, but a few minutes with your favorite search engine should help you locate a number of them yourself) and projections from some ministry of finance officials (informed, one suspects, in some cases by data from the marketing departments of certain technology firms) do little to alleviate such concerns. In some cases, the introduction of new technologies undeniably *does* replace certain specific functions or roles that teachers currently perform, or have performed in the past (especially related to what are essentially clerical or administrative functions -- this replacement is presumably not always such a bad thing). In my experience, introducing new technologies in schools actually makes the role and function of teachers **more** central and critical, but that is perhaps a topic for another blog post.

Faced with severe, in some cases quite extreme, deficits of qualified teachers, especially in remote communities and in subjects like mathematics, science and
foreign languages, many countries are in engaged in long term efforts to recruit and train more teachers and upgrade the skills and content masteries of 'low-skilled' teachers already in their system. They are exploring how ICTs can be leveraged to help in these efforts. Where there are pressing needs *now* for teachers that can not be met through conventional approaches or according to the traditional timelines dictated by the capacity and effectiveness of their teacher training institutes, there are looking to see how technologies can help reach students today in schools without qualified teachers -- or in some cases, without any teachers at all.

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Amazonas is the largest state in Brazil by area (approximately 4.5 times bigger than Germany). It is characterized by huge logistical challenges -- the state takes its name from the rather large and famous river which dominates its geography. There are 6100 rural/riverside communities across Amazonas, and outside the capital city of Manaus, which is home to about half of the state's 3.8m residents, transport is mainly by air or river. International audiences may know Manaus best as the site of the famous Teatro Manaus opera house and as one of the host cities for the 2014 World Cup. Many education folks perhaps know the region best for its innovative approaches to trying to provide quality education to students despite these great logistical challenges.

While Amazonas does fairly well by Brazilian standards on common measures of educational performance (as measured by a PISA-like test that is administered regularly to students across the country), its education system is characterized by low completion rates (50% at age 16, compared with Brazilian average of 69%) and high numbers of overage students in a total student population of 864,000. While in aggregate there are equal numbers of students in state and municipal (i.e. local) schools across Amazonas, this varies considerably by age cohort: about 75% of the state's 400,000 elementary school students are in municipal schools, while 100% of its high schools are state-run. 39,000 students live in rural areas. Last week a presentation and discussion at the the Inter-American Development Bank (from which the facts and figures related in this blog post are largely drawn; the full video is available online) on Using Interactive Technology in Amazonas focused on a US$150m IDB project that is exploring answers to the following challenges in Amazonas as part of the Program to Accelerate Educational Progress in Amazonas State (PADEAM) project:

- How to provide quality education services to rural communities?
- How to build better bridges from middle school (with a student population of almost 300,000) to high school (where currently only 166,000 students are being educated)?
- How to deploy teachers to remote areas?
  (A traditional approach in rural communities in Brazil has been to deploy so-called 'itinerant teachers', who move from school to school.)

For a very comprehensive look at these issues, I would recommend that you watch the comprehensive presentation from the IDB's Marcelo Pérez Alfaro, which is
available in full on the IDB web site. For those in a hurry, I'll attempt to summarize the main points here (and offer some quick comments along the way).

The Amazonas Media Center model

Through the Amazonas Media Center (or Centro de Mídias do Amazonas), education officials in the state are promoting the widespread use of interactive educational television as they seek to provide answers to these questions. Under this program - which utilizes satellite television in the service of what is essentially multi-point videoconferencing (and thus 'interactive') -- classes are taught remotely by teachers in Manaus and beamed to students in schools in rural communities, who are supported by a professional face-to-face tutor in their classrooms. One lesson is typically shared by multiple municipal schools simultaneously. These municipal schools serve as elementary schools in the morning, and then older students come to school in the afternoon for the educational TV offerings. Each class is mediated by an onsite tutor, who coordinates the questions and answers, provides further explanations and directions, and helps support the equipment to ensure that the experience is as 'interactive' as possible. Students have access to textbooks and other educational resources (both paper-based and via the Internet). Students in these settings follow the same curriculum as other schools across the state, but on a block schedule, whereby (e.g.) students have three consecutive weeks of mathematics, then four weeks of biology, followed by three weeks of English, etc. instead of studying multiple subjects simultaneously as in a 'typical' school. The goal, as much as possible, is to replicate the traditional classroom experience and not to provide poor, rural communities with what many people there (rightly or wrongly) consider to be the 'inferior' form of education represented by 'distance education', a term explicitly not used with regard to this project in Amazonas. (Side note: In many places around the world, the term 'distance education' is very specifically and narrowly defined, both legally and within educational bureaucracies, and programs associated with this term, many of which evolved out of correspondence school models, operate within specific processes related to things like licensing, credentialing, qualifications, etc. In other places with broader definitions of 'distance education', what is being done in Amazonas would probably be labelled as such.)

Some quick history

This initiative was born out of an effort that began in 2002 in Amazonas to train unqualified teachers (Proformar) in rural areas that led to a teaching certificate. Based on the success of that initiative, and its model, planning for this project began in earnest in 2004. In 2007 it started in high school classrooms, and in 2009 it was expanded to middle schools. Here are some quick figures related to the reach of the project:

2007: 10k students, 260 classrooms, 200 schools, serving 334 communities
2013: 38k students, 1809 classrooms, 400 schools, serving 2400 communities

All of this has been done using existing municipal facilities (schools), which underwent minor refurbishment.
Educational television in Brazil

There are quite similar interactive education television initiatives in the states of Bahia, Pará, Sao Paulo and Ceará which focus only on teacher training. In many ways, circumstances in Amazonas are similar in many ways with those in Pará, which has largely decided, in contrast to the Amazonas approach, to deploy itinerant teachers. Bahia and Sao Paulo are more developed states and, generally speaking, don't have the same teacher-related challenges as those found in either Amazonas or Pará.) The World Bank also supports somewhat similar educational television initiatives in the Brazilian states of Rio Grande do Sul and Piauí.

According to a recent story in the Washington Post, "When asked what they most like to do in their spare time, 85 percent of Brazilians answered “watch television.” Not everyone is watching telenovelas and futebol all the time, however.

Brazil has a long and rich traditional in using educational television going back almost five decades and utilizes TV to provide access to government information and services across a number of social sectors, especially to benefit the poor (here's a related World Bank study, [pdf]). A number of efforts related to education are affiliated with universities; others are maintained by state governments like São Paulo. Many international observers may be familiar with Telecurso, a distance basic education program launched by the Roberto Marinho Foundation (a group closely linked with Brazil’s Globo media conglomerate) which is essentially a television program which targets Brazil’s school-age population, as well as young people and adults who did not finish school at the standard age. Telecurso utilizes what it calls the Telessala Methodology, which enables companies, foundations, ministries of education, and other institutions to use this program in place of traditional supplementary courses. According to a related presentation at the World Bank last fall, Telecurso has to date been implemented in approximately 32 thousand classrooms, trained 40 thousand teachers, and reached 1.5 million students across the country, notably as part of massive projects in the states of Acre, Pernambuco, and Rio de Janeiro.

Educational television in other countries

There are many other examples around the world of the wide scale use of education television, of course. The technical sophistication and infrastructure of the educational television efforts in Brazil recall for me what I have observed, for example, in Korea, but it is not only in 'highly developed' countries where educational television has taken hold. In the Western hemisphere, there are educational television efforts in places like Uruguay (Canal Ceibal) and, most notably, Mexico's long-standing Telesecundaria project (which has been much studied and which has been exported to other countries in the region) are perhaps worth mentioning. China has a long history of using educational television for a variety of purposes, including teacher training [pdf], as does India (EduTech blog readers with a long memory may well recall India’s pioneering Satellite Instructional Television Experiment in the 1970s).
Going forward

Under the IDB project, there are plans to expand coverage to 1500 additional communities and 560 more schools, eventually reaching 15,000 more students. It is not easy to deploy satellite antennas in these rural, riverine, remote communities in the Amazon -- this is a big challenge for expansion (the deployment model, for what it's worth, is to expand river basin by river basin, all communities in a row, down the river in turn). There are currently about 10,000 video hours of instructional classes covering seven years of instruction that the project will also help better assess, tag and archive in a more systematic manner. A rigorous evaluation agenda has been proposed, looking at both project impact (on academic performance, on things like drop out and repetition rates, at a variety of socioeconomic measures) and process (the 'how to', the documentation and analysis of which, I find, is often neglected in efforts of this sort). There is very little substantive, rigorous research about this stuff in environments and contexts like those found in Amazonas, and the IDB can (hopefully!) make a huge contribution to our collective global knowledgebase -- while of course helping education officials in Amazonas educate thousands of children along the way.

In the future, there are plans being considered to use the facilities to offer supplemental tutoring and to expand into 'regular' urban schools, especially where there are insufficient teachers for 'difficult' subjects (e.g. chemistry, foreign languages). In a nod to the origins of the effort in Amazonas, the infrastructure may once again be used to support teacher training activities as well. These (and other) activities may help to make better use of the large sunk costs of the existing technical and physical infrastructure that makes the project possible.

Concluding comments

Given the (natural, and appropriate) desire to make better use of the large sunk costs in technical and physical infrastructure that have enabled interactive education television in Amazonas, there is, one presumes, great potential for the municipal schools to evolve into after-hours, multi-purpose media centers, points of presence for outreach on community health issues, for example, or as part of other civic outreach activities (e.g. a gathering point to watch election debates) or even, potentially, used to show movies in the evening (and perhaps the occasional futebol match as well) as a mechanism for partial cost recovery. Listening to Marcelo's excellent presentation on the Amazonas model going forward, I was struck by potential comparisons with the Learning Hub models being explored by groups like Coursera and other partners, which aim to provide physical spaces where those interested in learning can access the Internet and online courses (like MOOCs), aided by local in-person facilitators. In Amazonas (and other Brazilian states) the physical infrastructure is there, the connectivity is there, the public spaces are available, and there are already trained tutors who can facilitate learning activities utilizing a variety of technologies. This might be another potential application model of relevance when considering after hours use of the school facilities being utilized by the interactive television project in the afternoons.
In an age where discussions of educational technology use increasing revolve around which tablets to buy, and which apps to utilize, the interactive educational television project in Amazonas is a reminder of the continued relevance of a variety of 'old' technologies as well, and the pedagogical models that accompany them. The teacher-at-a-distance, tutor in the classroom model at the heart of the interactive television model in use in Amazonas for me recalls certain characteristics of interactive radio instruction. The Amazonas project is explicitly meant to replicate the traditional classroom experience in the state, but, in Brazil and around the world, it is perhaps worth noting that many folks are not terribly happy with the 'traditional' classroom experience, and are, among other things, looking to utilize new technologies to help mold, shape and determine this experience in new (sometimes radically new) ways. No matter what one's opinions on such things may be, it is hard to imagine that many 'traditional' classroom experiences won't be changing in the coming years as a result of the continued diffusion of new (and old) technologies. The Amazonas project is occurring alongside national and state efforts across Brazil to improve Internet connectivity to schools and to introduce more and more technology devices into classrooms. How might the Amazonas project, and similar projects in other Brazilian states, as more connectivity of various sorts is available on the desks and tablets in classrooms and more and more digital learning resources are made available (Khan Academy content, for example, has now been translated by a Brazilian foundation to enable use by students across the country)? Only time will tell. But something also tells me that the answers to this question may resonate far beyond the rural communities that line the shores of the Amazon.

Note: The presentation on Using Interactive Technology in Amazonas at the Inter-American Development Bank was part of a regular speaker series supported by members of the mEducation Alliance (in which the World Bank participates, as part of its efforts exploring new directions in 'mobile learning'). Those interested in future events in this series which take place both in person and online, may wish to consult the mEducation Alliance web site. (As in this case -- school-based satellite television, which some people may consider the very definition of 'immobile education' -- discussion topics are not restricted to those only related directly to 'mobile education' or 'mobile learning'.)

You may also be interested in the following EduTech blog posts:
- Surveying ICT use in education in Brazil
- 10 principles to consider when introducing ICTs into remote, low-income educational environments
- What Sesame Street Can Teach the World Bank
- Bollywood Karaoke and Same Language Subtitling to Promote Literacy
- Searching for India's Hole in the Wall
- Interactive Radio Instruction: A Successful Permanent Pilot Project?
- Education and Technology in an Age of Pandemics
- Television for a change (revolution in a box)

Note: The image used at the top of this blog post of an aerial view of the Amazon rainforest not far from Manaus, the capital of Amazonas state ("a road map -- er, river map -- for the expansion of
educational opportunities in rural Brazil?" comes from Neil Palmer of the CIAT International Center for Tropical Agriculture via Flickr and Wikimedia Commons. It is used according to the terms of its Creative Commons Attribution-Share Alike 2.0 Generic license.
Paying teacher salaries with mobile phones
by Michael Trucano
#7: originally published on Friday, 21 February 2014

I often find that a sure way to
generate rather heated
discussions in many quarters is to
bring up the topic of teacher
salaries. They're too low! or:
They're too high! They should be
linked to [insert some sort of
'performance indicator']! or:
Attempts to link them to [insert
name of a performance indicator]
are misguided (and perhaps even
dangerous)!

I'll leave it to others more
informed and expert than I am to
weigh in on such (often quite contentious) debates. However one might approach
such discussions, and whatever conclusions one might draw from them, there isn't
a lot of debate about one issue related to teacher salaries that has been well
documented, and widely (and rightly) deplored.

Many teachers around the world suffer as a result of poorly-functioning systems to
pay the salaries they are due. This is especially problematic, and
notable, given that teacher salaries have for many decades constituted huge
percentages of the overall education budgets in many countries. As a World Bank
publication from a few years ago (Teachers for Rural Schools: Experiences in
Lesotho, Malawi, Mozambique, Tanzania, and Uganda) laments, "Teachers in
remote schools are [compared with their colleagues in more urban areas] more
likely to be the direct victims of administrative failures, which undermine teacher
morale and damage the system. One frequently mentioned administrative failure is
the delay in paying teachers’ salaries and allowances." An 'administrative failure' of
this sort can have many causes. Even where sufficient budget exists to pay
teachers, flawed teacher salary systems, poor internal controls, logistical challenges
related to transport, and corruption can conspire to ensure that in many places,
especially in rural areas in poor countries, teacher salaries are sometimes paid only
infrequently, often with great delay. The results of this can be devastating for
education systems -- to say nothing of the impact on individual teachers, schools,
students and local communities.

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Back when I worked with the World Bank’s infoDev program, one of my
responsibilities was to serve as a point person on 'mobile money' issues, briefing
groups on emerging lessons and experiences from nascent activities to use mobile phones to transfer money from one person to another. I left infoDev in 2008, just as activities in this regard were really starting to heat up (Kenya's M-Pesa program, the best known 'mobile money success story', launched in 2007), but continued to meet semi-regularly with folks -- colleagues from the World Bank and other international donor agencies, government officials, NGOs and foundations, businesspeople, researchers -- who were interested in exploring how new mobile payment options might be used in inventive ways to help address some longstanding developmental challenges. (Those totally new to the topic may benefit from watching this short video from CGAP, which demonstrates how mobile money activities look in practice.) Most of these conversations, as it happens, included considerations of how money transfers via mobile phones might be used to ensure that teachers got paid, in full and on time. As I prepare for a trip next week to the Mobile World Congress in Barcelona, I realize haven't fielded one substantive information request related to this topic in the past three years.

Up until about 2010, I met quite often with groups who were looking for creative ways to help address the 'paying salaries to teachers in rural areas challenge' and who had seized on the idea of taking advantage of the increasing ubiquity of mobile phones in such areas to help fashion some sort of 'solution'. In the last three years, however, the volume around these sorts of discussions in many quarters has almost died out. Part of this might be explained by the fact that there are now many 'experts' on mobile money issues, people much more expert and well informed than I am about related issues, and so I simply might be 'out of the loop'. (Back in the 'early days' of work on this topic, I could never shake the nagging feeling that the reason that I was approached by so many groups for related information and advice was at least partially a result of the 'in the valley of the blind, the one-eyed man is king' phenomenon.) That said, given that a regular part of my daily work at the World Bank is to field questions related to the use of new technologies in education in all sorts of ways around the world, and that a lot of my job isn't so much about in providing answers, but about helping people formulate better questions, the fact that this question seems no longer to be a topic of much discussion makes me wonder:

Whatever happened to the idea of paying teacher salaries with mobile phones?

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The basic case for why some education systems might want to look at ways to pay teachers (or at least some teachers) via digital payments utilizing mobile phones can be laid out pretty easily. Some commonly mentioned elements of this case include:

1. **Business as usual isn't working**
   Especially in places where teachers are paid in cash, and this cash has to travel large distances (and through many hands) before it eventual reaches teachers, current payment systems may be slow, inefficient, and open to various abuses.
2. Reach
One of the challenges in paying teachers, especially in poor, remote and/or rural communities, is that the teachers themselves may not have bank accounts -- and, if they did, they may be near where banks are located. While banks may be far away, for increasing numbers of teachers in such circumstances, mobile phones may be (literally) less than an arm's length away, and mobile connectivity is increasingly being rolled out, even to some of the most remote regions of countries. (Even where a given signal may not reach a teacher's village, odds are that she would have to walk or ride a much shorter distance to get on a mobile network than to reach a place where she could receive her salary in person.)

3. The technology is here -- as are some useful business and regulatory models
Multiple examples from around the world, from Kenya to Pakistan, from Paraguay to the Philippines, have demonstrated that 'mobile money' is possible.

4. Speed
When doing some work last year in Papua New Guinea, I was told of cases where teachers had to travel one week each way to reach the place where they could collect their salary ... which was paid every two weeks. (The effect on teacher absenteeism in such circumstances should be pretty easy to calculate; it doesn't matter how good your teacher is if she isn't in the classroom.) Mobile money transfer, in contrast, can take place more quickly than it the time necessary to turn on one's phone.

5. Efficiency
Current systems for paying teacher salaries in many countries are very labor intensive and involve complicated and expansive logistical networks of human and physical infrastructure to ensure that money -- in the end, typically in the form of cash -- reaches its intended recipients. Under mobile money payment scenarios, there may well be opportunities to realize great efficiencies through by-passing certain component parts of the existing salary payment infrastructure, relying instead on existing, quite reliable mobile phone networks.

6. Tracking and transparency
With teacher salaries representing up to 90% of recurrent education budgets in some countries, the amounts of money involved can be huge, which makes it especially important to know where it’s going (and if it has reached its destination). Transferring these monies on a regular basis brings with it special challenges related to tracking and reporting. With so much money is involved, the electronic audit trails created as a result of mobile money transfers can be useful in this regard.

7. Corruption
Corruption is an endemic problem in many education systems. One example of this in many places is the persistent and pernicious phenomenon of 'envelope theft', where one's pay packet is a little thinner than it should be because some of the bills meant to be there have 'mysteriously' gone missing. (A technical term for this in
the research literature is 'leakage' [pdf]. Unlike what might happen with water pipes as a result of faulty design, missing elements of teacher pay packets tend to 'leak' not onto the ground, but into the hands and pockets of someone else -- usually a superior.) Cut out the middlemen, transferring money directly to a teacher's mobile phone, and the opportunities for envelope theft dissipate.

That said, there are many undeniable obstacles standing in the way as well. A few of the common ones I hear voiced include (I'll note parenthetically that some may be more valid, or more challenging, than others):

1. **Inertia (traditional practices, traditional thinking)**
   Whenever something new is considered -- or even when for some reasons when something new is *not* considered -- one shouldn't downplay the fact that change is uncomfortable. The easiest thing to do tomorrow is usually what was done yesterday.

2. **Entrenched interests**
   The fact that teachers in poor, remote communities may not benefit from existing mechanisms that should provide them with their full pay in a regular timely manner doesn't mean that other groups don't benefit from existing arrangements. Those who benefit from 'leakage' in the system are one obvious example here -- less obvious, but in some cases even more difficult to dislodge, are the institutional and bureaucratic interests (power over decision making, larger budgets, more jobs, and opportunities for patronage) that can advocate against consideration of mobile payment options for teachers.

3. **Trust**
   In systems where teachers already don't trust that they will be paid on time, and in full, it can be difficult to convince them that *they* can instead be paid directly, and the proof of this is a text message that arrives, as if by magic, in their phone's in-
box*. When presented with plans to begin paying them via mobile money, teachers, and the unions which represent them, may well wonder where the 'catch' is. This is especially true in places where mobile money is novel, and not commonly used in broader society. (In some contexts, it is interesting to note that people may not trust 'banks' as well -- but do, by virtue of prepaying for mobile phone credits, appear to trust their mobile phone provider.)

On a related note:

4. Security/fraud
Mechanisms may not be in place to prevent theft and fraud -- or to detect where/when it is occurring, and how. Where it has been detected, an inadequate legal framework or law enforcement capacity may exist.

5. Regulations
Existing laws and regulations may preclude the payment of teacher salaries through transfers of mobile money.

6. Insufficient infrastructure
The fact that mobile payment systems offer an opportunity to 'leapfrog' (to adopt the term almost reflexively invoked whenever discussions of the potential of mobile phones for communities in developing countries come up) over existing infrastructure deficits (e.g. there are no payment offices or banks nearby) does not mean that no infrastructure is required. Teachers need to have mobile phones. The need access to affordable mobile networks. While incredible advances have been made in these regards over the last decade, these are still very real challenges for teachers in many remote communities. But progress continues to be made. (It is perhaps also still worth noting to those unfamiliar with mobile money schemes that this can, and does, work on low end mobile phones using text messages -- in other words, this isn't something that requires the latest high end smart phones.)

7. Teachers don't have bank accounts, and so there is no way to pay them electronically
This indeed a potential obstacle. That said, an important impetus behind the rise of mobile money in many places has been an interest in helping to 'bank the unbanked', to use mobile phones to help increase access to financial services for the poor in inventive ways (e.g. linking a subscriber's SIM card and a 'virtual mobile wallet', in turn linked to a bank account).

8. Cash is king
What good is it if teachers receive their money via mobile payments if there are no local merchants who accept mobile money, and there are no convenient ways to convert mobile money into cash?

9. No local mobile banking or payment provider (or only one, or too many)
Where there are no local organizations that can facilitate mobile money activities, it goes without saying that such activities are not possible. Interestingly, I have also been told that the existence of such groups can be an obstacle as well. There is
only one mobile money provider in our country, a government official once said to me. If we go that route, we risk that this company becomes too powerful. You must remember that teachers represent the largest single group of public sector employees in our country. If they become clients of this company, and this company achieves the economies of scale necessary to make this happen, there is the danger of monopoly. Another government official told me that the problem was that they had more than one mobile money provider, and that they didn't know how to choose between the different options.

10. No demand
No one is interested in changing the way things are currently done, and there is no demand for mobile money services by teachers (or education systems, or international development partners).

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Despite these (and many other obstacles or challenges), the good news is that there are a few examples of where mobile payments are happening within education systems. Not many, but a few:

Last year, for example, there was a large pilot in the Democratic Republic of Congo in which tens of thousands of civil servants, thousands of them teachers, were paid via mobile money transfer. Bridge International Academies, which operates in low-cost private schools in Sub-Saharan Africa (including Kenya), utilizes mobile payments extensively. Pilot mobile money schemes to pay teachers were announced in Rwanda, but these ran into some hurdles. The English in Action program in Bangladesh (featured in an earlier EduTech blog post) utilizes mobile payments in support of teacher training activities [pdf]. Civil servants in Quezon City in the Philippines, including teachers, now benefit from mobile payments, and there is also a pilot program involving teachers in Bihar, India. Many other countries continue to consider similar initiatives.

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<th>side note: Dispelling a persistent myth</th>
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When planning for the early stages of a roll-out of mobile money services, a potential provider of these services may ask:

How do we reach a critical mass of consumers, enough so that we reach a 'tipping point' where mobile money goes from a niche to a mainstream service? If only there were a large group of consumers, all paid by the same employer, and we could enroll all of them in the service .... now *that* might be just the thing to make our business an early success!

I have had it told to me on numerous occasions that this indeed what happened in Kenya, and the fact that teachers were signed up en masse was a key to the acceptance and
adoption of M-Pesa. This is a great little factoid, one with a compelling logic and which lends itself well to brief asides during PowerPoint presentations and during Q&A periods at conferences. It is also not true, as Michael Joseph, the pioneering CEO of Safaricom who presided over the launch of M-Pesa, has stated.

The Quezon City program is happening with the support of USAID, which has been at the forefront of many activities around the world exploring the use of mobile money to pay teachers. Last year, for example, USAID began supports efforts of the Ministry of Education to pay rural teachers in Liberia utilizing mobile money. More notable, and expansive, have been similar efforts in Afghanistan.

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What might be the future for utilizing mobile phones, and mobile money, to pay teacher salaries? Early lessons and models from Afghanistan suggest that such schemes may be particularly relevant in post conflict environments. Groups like the GSMA, CGAP and USAID are invaluable sources of information and perspectives on emerging efforts to introduce and expand mobile money programs in many developing countries. Given its support for many specific programs to transfer monies to teachers using mobile phones, USAID may be especially well-placed to add to our collective knowledgebase about what works, and what doesn't, by helping to document how these programs operate, and by evaluating their impact. Some related analytical work from USAID cataloging the existing landscape of initiatives of this sort around the world and summarizing some of the related emerging insights, is due out later this year.

I'll be attending the Mobile World Congress in Barcelona next week and expect to hear about many other initiatives that have been operating largely 'under-the-radar' (at least for international audiences). Please feel free to add links to any notable programs or pieces of related research that I may have missed in the comments section below.

So, to return the question that kicked off this blog post:

Whatever happened to the idea, commonly discussed a few years ago, of paying teacher salaries with mobile phones?

Has this turned out to be a clever idea of little practical relevance in much of the 'real world' -- outside of a few special, outlier cases -- or was (is) it perhaps an idea (still) a little ahead of its time?
note: The image used at the top of this blog post of Der Bauernadvocat, a painting by the Dutch master Pieter Brueghel the Younger ("no worries, everything here and orderly and under control, all money is being accounted for in a clear and timely manner") comes via Wikimedia Commons and is in the public domain. The image of a smartphone on top of some money used later in the blog post ("tell me again how we squeeze this cash inside the handset?") comes from Intel Free Press via Flickr and Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 2.0 Generic license.
A 'mobile first' approach to educational technology
by Michael Trucano
#8: originally published on Friday, 28 February 2014

'Mobile devices' are increasingly to be found in schools, and utilized for learning purposes, around the world. In most cases, related discussions taking place in ministries of education focus on the use of portable tablets and small laptops as complements to, and extenders of, existing approaches to the use of technology to help meet a whole host of education and learning objectives. At the same time, mobile devices of many other sorts -- most notably the mobile phone -- are proliferating at a much greater rate in larger society. Linkages between the devices being used outside of schools, and the technology to be found within schools, are often quite tenuous, where they exist at all.

Policies and plans related to the use of our current generation of electronic mobile devices are sometimes considered in ways distant or divorced from the way that the previous generation of 'mobile devices' was used in education: books, notebooks, pencils. At other times, they are considered in exactly the same way, as if the new opportunities and affordances appearing as a result of technological advances are best considered as mere adjuncts to, or continuations of, some of the approaches and practices which have marked and defined what has happened in schools over the past one hundred years or so.

Is there really anything different (potentially) going on now, and if so, what might this be, and why (and how) might we care about this difference)?

I just returned from the Mobile World Congress in Barcelona, the world's largest exhibition and conference for the mobile industry, in which over 75,000 people representing mobile phone network operators, device manufacturers, technology providers, vendors and content owners from across the world gather to do business, announce new products and services, and discuss What's Next. In addition to walking through the acres of exhibition space, attending briefing
sessions and meetings on activities and developments all over the world, and
listening to lots of well-rehearsed marketing messages, the specific reason for my
attendance at this year's event was to make a speech at the MWC's
official ministerial programme, an event for senior government officials featuring
debates and knowledge sharing sessions on a variety of topics of related interest.
In case it might be of any interest to a wider audience (the ministerial programme
itself was a closed event, not open to the public), I present below my speech below.
One of the animating impulses behind the EduTech blog is to try, in a decidedly
small and modest way, to promote greater transparency and openness by sharing
some of the conversations and themes and perspectives that are being discussed
'behind closed doors' in various places in a more public forum. With that in mind …

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A 'mobile first' approach to educational technology

Thank you to the GSMA for including the World Bank, and me, in this important
session this morning on the first day of the Mobile World Congress as part of the
special 'ministerial programme'. And thank you all in advance for your attention
over the next nine minutes or so. I'll apologize in advance that I have no
PowerPoint or Keynote or Prezi presentation for you this morning. I'll do this speech
the old fashioned way: You'll have to find something more interesting to look at
than a set of bullet points projected onto the screen at the front of the room.
Whether that means looking up at me, or, more likely, down at your phones, is a
choice I leave for you to make yourselves.

Honorable ministers, distinguished guests, ladies and gentlemen: My name is Mike
Trucano. I work at the World Bank at the intersection of technology and education,
helping education systems and groups in middle and low income countries around
the world explore new approaches to old challenges related to education and
learning. I talk with education folks about technology and with technology folks
about education. I talk with government officials and NGOs and hackers and
educators and technologists and academics and companies and software developers
-- mostly in the so-called 'Global South', the countries outside the heavily
industrialized and 'highly developed' countries of Europe, North America and East
Asia. I see a lot of interesting developments and 'innovations' along the way
(including some things that are truly innovative, and many other things simply
labelled as such). I try to listen much more than I talk. And I try to pay special
attention to listen for what I am not hearing.

While researchers and politicians -- and perhaps even a few of my World Bank
colleagues and those of you in the room -- may disagree about which related policy
levers to pull, when, and about the impact of various specific measures and
activities, and about the relative and absolute costs of such things, I expect no one
here would deny the centrality of education to success and economic development
in today's world, and to tomorrow's.
From the perspective of 2014, the global education community has much to celebrate. As my World Bank colleague (and boss) Elizabeth King noted in her recent speech at the Education World Forum, "the developing world has tripled the average years of schooling of an adult in just two generations, and in the past 15 years the ratio of girls to boys in primary and secondary education rose from 84 to 96 percent." That said, there is much left to do less than a year until the target date for achieving the Millennium Development Gals, including Education For All, by 2015. As Beth notes, "We must focus not only on school attendance and average years of schooling but on learning, learning for all. Why? Because people start learning before we enter school and continue to learn after we leave school. And because schooling has not always resulted in learning. Despite significant progress in reducing the number of children not in school—57 million children today as compared with over 105 million at the turn of the millennium—learning levels even for basic skills are alarmingly poor. An estimated 250 million children around the world are unable to read and do math, even after spending three or more years in the classroom. And the greatest learning gaps are among children who live in extreme poverty, in slums and remote areas, in fragile and conflict-affected environments, children from ethnic minorities and lower castes, and children who have disabilities. These are the very children for whom we hope education could pave a way out of poverty and deprivation."

For many if not most of these children and learners, business as usual is still not working -- or not working quickly enough. Business unusual is then perhaps worth considering ... which brings us to the topic of this morning's workshop on mobile learning.

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From subsequent speakers and discussants, I expect you'll hear about some exciting new, and perhaps not so new, developments and examples in the field of 'mobile education'. I'll leave it to the folks who follow to talk about such specifics (and, for those of you currently more absorbed by the screens of your own mobile devices than in my speech here, I'll direct you to numerous related posts on the World Bank's EduTech blog).

Instead, I want to begin the morning by asking:

**What does 'mobile' mean in the context of education, and why should we care?**

First, I would like to note that mobility depends on one's perspective.

From the perspective of the observer, a mobile device appears to move from place to place, carried along by its user.

From the perspective of the user, however, a mobile device is a constant, for better or worse virtually locked into space and place (in one's hand, in one's purse, in one's pocket), while it is the world around her that constantly changes.
Does the device, and the user to which it is (almost seemingly umbilically) attached, move through the world ... or does the world move around it, and them?

In asking this question, I don't mean to refer to (or lament) the self-absorption of a gadget obsessed young person, or generation, or society. Like it or not, the phenomenon of a young person intensely considering the small screen of her own device, focused more on the world as mediated through a small LCD screen than on the 'real' world taking place around her, increasingly marks communities all around the world, rich and poor, 'developed' and 'under-developed'. Rather, I simply wish to observe that this device is, increasingly, always with you.

A famous cartoon from The New Yorker magazine is captioned, "On the internet no one knows you're a dog." That may well be true, but your phone knows who you are. Why is this important for the purposes of this discussion? Because learning is about more than just what happens in school. For many kids around the world -- and let's be honest here -- what happens in school isn't all that great, and so being personally connected to learning opportunities outside (in some cases, linked to school) can be especially powerful.

Building off the fact that mobile devices are increasingly ubiquitous, and affordable, and easy to operate (if not to use productively and successfully), 'mobile education' (or 'mobile learning'), is exciting for two primary reasons: it is personal, and it is connected. The World Bank's education strategy articulates an important shift from a desire to ensure 'education for all' (where all children go to school) to 'learning for all' (where people young and old are learning, both inside and outside of formal educational activities). Mobile devices – much more widely available and used outside of schools than inside them – are for many people exciting because they represent the potential for people to be always connected to learning opportunities.

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Of course, 'mobile learning' isn't *the* answer to the many complex, interrelated challenges we face in the education sector. *When it comes to education, technology isn't the answer*, despite what many advertisements (and vendors displaying their wares here at the Mobile World Congress) may promise. It has been billed as such for decades, and the graveyard of failed edtech programs is pretty crowded. More than one clever pundit has acidly noted that, given the paltry or hard to discern or attribute returns on investment to many educational technology initiatives in the past, *edtech is the real faith-based initiative in education*. That said, faith can be a pretty powerful thing, and a lack of rigorously obtained 'hard' data about the efficacy of educational technology investments has done little to dent enthusiasm and slow many such investments in many education systems around the world.

If previous approaches haven't worked in the past so well, might there be an approach to technology use in education in the future that might yield better results?
Or has the problem been simply that things have been changing too fast, 
or that we haven't had a sufficient level of saturation 
of affordable technology devices, 
and the content and services to which our devices connect us, 
to reach a necessary 'tipping point' at which our 'old' approaches will be successful?

Perhaps you have better, more considered answers to these sorts of questions than I do. (You probably have other questions as well -- I certainly do, but those can perhaps be better explored at another time and place!) For the sake of our purposes here, let me propose to you that, when considering large scale investments in technologies to benefit education, many countries may wish to consider a 'mobile first' approach. I say this here in an attempt to be deliberately provocative, while noting that, despite many (many!) large scale investments in laptops and tablets around the world, there is, to my knowledge, no education system in the world that is truly doing so. Many places may say that mobile is a big part of what they do now, and there is no denying that this is true. That said, one may wonder if, for example, simply porting content from traditional printed textbooks is really the result of a 'mobile first' approach, or if it is more along the lines of re-packaging and re-purposing old 'immobile' tools and resources so that you can carry them around with you. 'Mobile first' isn't about lining up a lot of shiny new tablets in neat rows in a dedicated multimedia room, basically substituting touchscreens for keyboards in a variant on the traditional 'school computer lab' model. It isn't about simply tacking on a 'mobile component' to a country's existing educational technology strategy.

My challenge to you this morning is that, when it comes to the promise and practice of 'mobile learning'-- to borrow a well-known marketing slogan -- you might wish to think different.

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After touring schools, principals have asked me what I think of their new technology set-up, which features rows of tablets neatly placed on neatly spaced desks, much like the looms and sewing machines one still encounters from time to time when visiting schools in some poor countries. (On more than one occasion, I have been in a room converted from the latter to the former.) Software companies and educational publishers stop by the World Bank to demo their wares and ask, what do you think about how we have porting our textbooks, or our desktop software programs, to become mobile apps?

All of that is (potentially) well and good, but this is in many ways a consequence of looking forward to tomorrow through yesterday's lenses.

Mobile is different -- or at least potentially so. For many people, it is different for what it is not. But focusing on the small screen size, the lack of a full size keyboard -- in other words, what it is not, or does not have -- isn't really terribly interesting. Instead of decrying its limitations, perhaps it might be more productive to build on, and build off, its particular affordances and strengths. It the fact that it is personal and connected.
At the World Bank, we monitor and support lots of worthy initiatives around the world -- mostly small ones, 'pilots', but some much bigger -- that attempt to iteratively improve things. Projects utilizing mobile devices to: Improve access to learning materials. Pay teachers. Provide exam results. Report on student absences collect data -- and make these data more openly and widely available. Do exam prep. Learn a foreign language. Etc. Etc. Etc. Many of these efforts (not all) can be seen as logical extensions of the way things have always been done, just with a new 'mobile component'. These sorts of activities are all certainly important and there can be little doubt that there is scope and need for much iterative improvement in some of the ways that education is practiced and delivered in many parts of the world. That said, there is, it should be noted, a big difference between iteration and true innovation -- especially the sort of discontinuous innovation that is necessary to help overcome many of the long-standing, seemingly intractable challenges facing the education systems in many poor countries (and perhaps those in many 'rich' countries as well). Simply doing what you have done before, but with a shiny new device, does not in and of itself make a practice or approach 'innovative'. A desire for real innovation in education, assisted or catalyzed or enabled in part through the use of new technologies, calls for reimagining not only how we do things, but what we want to do.

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A mobile device -- a phone or a laptop or a tablet or a 'phablet' or whatever you chose to call it, or whatever it will be called in the future, and whether you hold it or you wear it -- may be central to some considerations of business unusual. While meaning no offence to a lot of the companies here in force at the Mobile World Congress, I suspect that some of the most 'innovative' applications of technologies for learning won't emerge from the 'developed' countries of the OECD, but rather from the local 'hacking' of technologies originally designed for one context, so as to do something in different circumstances characterized by scarcity and constraint. What might this look like in the education sector? I am not sure. (If I were, I'd be out doing it myself, and not talking to you about it here this morning!) But developments in, for example, mobile banking services, where innovation has occurred not to meet the needs of consumers in the financial capitals of London, Tokyo, Frankfurft or New York, but rather to meet unmet needs of ordinary people in rural Kenya, and across the islands of the Philippines, may suggest that such a thing is possible.

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I suspect that there are many officials from ICT ministries and telecom authorities in the room today, as well as many private sector companies. You have important roles to play here, and there are plenty of opportunities for productive investments and partnerships. I note emerging cooperations in many countries, for example, exploring how universal service funds can be utilized to connect schools to broadband, and students to the devices that will enable them to utilize this new connectivity. There is potentially much scope for action, and innovation, here, to enable and catalyze innovative uses of mobile devices in the education sector.
I would caution you, however, not to simply invest in achieving yesterday's vision -- which, in the case of technology use in education, hasn't been all that successful, if we are honest with ourselves. Many countries today -- including those of some of you in the room this morning -- are currently or about to invest lots of money to help realize a traditional model of computer use in schools for the first time, while at the same time there is an installed infrastructure of mobile devices out there upon which you could, alternatively, build. There are undeniable challenges to adopting a 'mobile first' like this -- related to technology, related to equity, related to imagination. There is no denying that. (Usually the easy things have already been done!)

However, mobile education, and mobile learning, need not represent a business as usual approach to technology use in education. It is not the same. It's different. It's personal, and connected. And: It's coming, whether you like it or not. (A few years ago I did a quick survey and identified over fifty countries where mobile phones were banned in schools.) In fact, it's actually potentially already here. We are just choosing not to recognize it. No matter where I travel, I hear regular and consistent complaints that school are disconnected from the lives of learners outside of school. Mobile education and mobile learning can (potentially) help here.

So, when it comes to planning for technology use in education in 2014 and beyond, let's not drive by looking in the rear view mirror. Let's consider a 'mobile first' approach to technology in education. This means a personal, connected approach.

*It doesn't mean a 'mobile only' approach*, and it certainly *doesn't mean a 'technology first' approach to education* -- something that has disappointed us in the past, and presumably will continue to do so in the future. But it also means that (to slightly modify the metaphor invoked more than any other when discussing the impact of the diffusion of mobile phones across developing economies and societies around the world) that **we should take care not to "leap frog" in the wrong direction** -- especially if that direction is backwards, towards what we know doesn't work all that well.

Clearly, we’ve seen many positive results as a consequence of the launching of the Education For All movement almost 25 years ago, but much remains to be done. Basic education is the foundation for all long-term development progress and core to the World Bank’s mission of reducing poverty and promoting shared prosperity. We’re all committed to ensuring the world’s children get the quality education they need and deserve. Technology can play important roles in all of this, perhaps even some fundamental ones.

The best technology is the one you have, can afford, and know how to use. *And today, in much of the world, that's mobile.*
Thank you for your attention.

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For what it's worth, I'll note here, by way of illustrating that I occasionally actually try to practice what I preach, that I composed this talk 100% on my mobile phone:
writing, researching, editing, rewriting, communicating and connecting to others. I did this in the middle of the night with my phone at my bedside, on the subway, on the plane, at halftime of a futsal match -- everywhere but at my desk in my office, where I am 'traditionally' meant to do this sort of thing. (Perhaps it shows?) Please feel free to add in any comments below, using whatever device is most convenient to you.

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You might also be interested in the following posts from the EduTech blog:

• In search of the ideal educational technology device for developing countries
• Educational technology and innovation at the edges
• 10 principles to consider when introducing ICTs into remote, low-income educational environments
• A different approach to scaling up educational technology initiatives
• A model for educational technology development from ... Afghanistan?

... and, more generally, posts on the use mobile phones in education

Note: The photographic image used at the top of this blog post of for different 'mobiles' ("mobiles moving about ... but to what end?") is from Davide Casali and comes via Wikimedia Commons. The picture is of four hanging sculptures (Sculture Inutili, or "useless machines") by the Italian artist Bruno Munari, who also did notable research related to tactile and kinesthetic learning. The image is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
Last year I spent some time in Papua New Guinea (or PNG, as it is often called), where the World Bank is supporting a number of development projects, and has activities in both the ICT and education sectors. For reasons historical (PNG became an independent nation only in 1975, breaking off from Australia), economic (Australia's is by far PNG's largest export market) and geographical (the PNG capital, Port Moresby, lies about 500 miles from Cairns, across the Coral Sea), Australia provides a large amount of support to the education sector in Papua New Guinea, and I was particularly interested in learning lessons from the experiences of AusAid, the (now former) Australian donor agency.

For those who haven't been there: PNG is a truly fascinating place. It is technically a middle income country because of its great mineral wealth but, according to the Australian government, "Despite positive economic growth rates in recent years, PNG's social indicators are among the worst in the Asia Pacific. Approximately 85 per cent of PNG's mainly rural population is poor and an estimated 18 per cent of people are extremely poor. Many lack access to basic services or transport. Poverty, unemployment and poor governance contribute to serious law and order problems."

Among other things, PNG faces vexing (and in some instances, rather unique) circumstances related to remoteness (overland travel is often difficult and communities can be very isolated from each other as a result; air travel is often the only way to get form one place to another: with a landmass approximately that of California, PNG has 562 airports -- more, for example, than China, India or the Philippines!) and language (PNG is considered the most linguistically diverse country in the world, with over 800 (!) languages spoken). The PNG education system faces a wide range of challenges as a result. PNG ranks only 156th on the Human Development Index and has a literacy rate of less than 60%. As an overview from the Australian government notes,
"These include poor access to schools, low student retention rates and issues in the quality of education. It is often hard for children to go to school, particularly in the rural areas, because of distance from villages to schools, lack of transport, and cost of school fees. There are not enough schools or classrooms to take in all school-aged children, and often the standard of school buildings is very poor. For those children who do go to school, retention rates are low. Teacher quality and lack of required teaching and educational materials are ongoing issues."

[For those who are interested, here is some general background on PNG from the World Bank, and from the part of the Australian Department of Foreign Affairs and Trade that used to be known as AusAid, a short report about World Bank activities to support education in PNG from last year and an overview of the World Bank education project called READ PNG.]

If you believe that innovation often comes about in response to tackling great challenges, sometimes in response to scarcities of various sorts, Papua New Guinea is perhaps one place to put that belief to the test.

Given the many great challenges facing PNG's education sector, its low current capacity to meet these challenges, and the fact that 'business as usual' is not working, while at the same time mobile phone use has been growing rapidly across society, might ICTs, and specifically mobile phones, offer new opportunities to help meet many long-standing, 'conventional' needs in perhaps 'unconventional' ways?

A small research project called SMS Story has been exploring answers to this question.

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Project overview
In the words of a very interesting impact assessment report [pdf] that was recently released (those pressed for time may just wish to make due with the executive summary [pdf]),

"The aim of the SMS Story research project was to determine if daily mobile phone text message stories and lesson plans would improve children’s reading in Papua New Guinea (PNG) elementary schools. [...] The stories and lesson plans were designed to introduce children to reading English and followed an underlying phonics and key word based methodology. Teachers in the trial received a cartoon poster explaining how to use the daily text messages and received a total of 100 text message stories and 100 related text message lessons for two academic terms. They did not receive any in-service training. Research was conducted in rural elementary schools in two provinces, Madang
and Simbu, and has involved a baseline reading assessment, mid-point lesson and classroom observations and an end-point reading assessment."

**Results and impact**

The project, which was funded by the Australian Government and designed and managed by Voluntary Services Overseas, in partnership with the PNG Department of Education, was implemented as a small controlled experiment utilizing the popular **Frontline SMS tool**.

Some key results observed include (I am quoting directly from the evaluation report):

- Children who did not receive the SMS Story were approximately twice as likely to be unable to read a single word of three sub-tests (decodable words, sight words and oral reading). In other words the intervention almost halved the number of children who could not read anything compared with the control schools.
- The research did not find a statistically significant improvement in reading comprehension and generally children showed low reading comprehension skills in both grades and little progression between grade 1 and 2.
- All participating schools had very few reading books, if any, available in the classroom.
- In the absence of reading materials and scripted lessons in elementary schools SMS Story provides a simple and cheap strategy for raising reading standards.

The evaluation also notes that:

- There remained a worryingly large number of children who scored zero on the tests, particularly in grade 1, even after the intervention.

As **Amanda Watson**, one of the researchers, commented in a recent interview about the project with Radio Australia, "I think the content was really important, because no one involved in this trial would suggest that schools shouldn't have books. We all would like to see more books in schools, but the reality is that in these schools there are very few books and so the content created a lot of enjoyment for both teachers and students."

In addition to whatever value the content itself offered, **Watson** noted another benefit: "the teachers were actually receiving materials and ideas and suggestions daily. So rather than perhaps being given a training manual a couple of years ago or having been given a guide at the start of the school year or something. The teachers actually received almost like a reminder to teach, a bit of a motivator to keep teaching and they received that every single day and we think that really helped them to realise that they're supposed to be teaching reading every single day, five days a week."

While most of the attention of developers and researchers excited by potential uses of mobile phones in education focus on the creation and usage of various 'mobile apps' on smartphones, lessons from SMS Story project remind us that, in some of
the most challenging environments in the world -- especially rural ones -- the existing infrastructure of low end phones offers opportunities for creative and innovative groups who wish to engage with teachers and learners in these communities. The results may not be 'transformational' on their own, and doing this sort of thing may not win any style points among the 'cool kids' in technology-saturated capital cities in much of the 'developed world' interested in the 'latest and greatest'. That said, the best technology is often the one you already have, know how to use, and can afford. In a rural school in Papua New Guinea today, that technology is usually a mobile phone. In many other similar communities around the world, it may be well.

Those who would like more information about the SMS Story project may wish to read the full report on the VSO web site and/or a related paper [pdf] published by the researchers involved.

You may also be interested in the following post from the EduTech blog, which draws on experiences and lessons from places like Papua New Guinea:

- 10 principles to consider when introducing ICTs into remote, low-income educational environments

Note: The image used at the top of this post of men from Koroboa in Papua New Guinea ("hey, my ears are ringing -- might that be the Ministry of Education calling with today's lesson?") comes from the Wikipedian Yves Picq via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
Last week saw a flurry of news reports in response to a single blog post about the well known One Laptop Per Child project. It's dead, proclaimed one news report as a result; it's not dead yet, countered another. Recalling Mark Twain's famous quotation, Wired chimed in to announce that Reports of One Laptop Per Child's death have been greatly exaggerated.

Whatever the status and future of the iconic initiative that has helped bring a few million green and white laptops to students in places like Uruguay, Peru and Rwanda, it is hard to argue that, ten years ago, when the idea was thrown out there, you heard a lot of people asking, 'Why would you do such a thing?' Ten years on, however, the idea of providing low cost computing devices like laptops and tablets to students is now (for better and/or for worse, depending on your perspective) part of the mainstream conversation in countries all around the world.

**What do we know about the impact and results of initiatives to provide computing devices to students in middle and low income countries around the world?**

Increasingly, we know a lot about the mechanics of how to (and how not to) roll out such projects. Especially in remote, poor communities, there are some potentially useful 'principles' that have been identified. Reports from Uruguay, for example, continue to emerge documenting and analyzing what has been happening under that country's pioneering Plan Ceibal to provide every student with her own free laptop computer.

Despite such efforts, there remains a dearth of rigorous impact evaluations utilizing randomized control trials (RCTs) that are consider a sort of 'gold standard' by many in the education research community. A working paper from the the Inter-American Development Bank (DB), *Technology and Child Development: Evidence from One Laptop per Child Program in Peru*, has been a notable exception to many of the research reports about educational technology initiatives in developing countries that have employed methodologies that haven't been particularly rigorous, and which have often focused on things like changes in attitudes, and perceptions of change, among groups which have been involved in various ways with such projects. There is nothing necessarily wrong with evaluations that make extensive use of things like self-reported data, of course, but the limitations of such efforts should be pretty clear as well. RCTs can be quite expensive, and difficult to
do, and, depending on the circumstances at hand, there may well be other research approaches that are more viable and useful. That said, by attempting to set up and assess the results from an RCT, the IDB working paper exploring some of the potential impacts of the OLPC project in Peru has been widely cited by many researchers with serious interests in this area, and has in many ways helped raise the bar for what is expected by many international funders interested in supporting other rigorous research efforts of this sort.

Released to little fanfare back in January, two new working papers from the IDB also draw on the Peruvian experience with educational technology to offer useful contributions to our collective knowledgebase about the impact of educational technology initiatives:

**Does Technology in Schools Affect Repetition, Dropout and Enrollment? Evidence from Peru**

January 2014: IDB-WP-477

Abstract: Many developing countries are allocating significant resources to expanding technology access in schools. Whether these investments will translate into measurable educational improvements remains an open question because of the limited evidence available. This paper contributes to filling that gap by exploiting a large-scale public program that increased computer and Internet access in secondary public schools in Peru. Rich longitudinal school-level data from 2001 to 2006 are used to implement a differences-in-differences framework. Results indicate no statistically significant effects of increasing technology access in schools on repetition, dropout and initial enrollment. Large sample sizes allow ruling out even modest effects.

**The Effects of Shared School Technology Access on Students’ Digital Skills in Peru**

January 2014: IDB-WP-476

Abstract: This paper analyzes the effects of increased shared computer access in secondary schools in Peru. Administrative data are used to identify, through propensity-score matching, two groups of schools with similar observable educational inputs but different intensity in computer access. Extensive primary data collected from the 202 matched schools are used to determine whether increased shared computer access at schools affects digital skills and academic achievement. Results suggest that small increases in shared computer access, one more computer per 40 students, can produce large increases in digital skills (0.3 standard deviations). No effects are found on test scores in Math and Language.

For those not familiar with the writing style and notation conventions of academic works of these sorts, these working papers may make for tough reading at times. In some cases, the papers may raise more questions than they perhaps answer, and the careful language with which conclusions are presented may frustrate policymakers looking for clear, unambiguous insight into what the 'impact' of various types of interventions may be. (The reality of work in this area is typically much
messier than what is portrayed in the marketing brochures produced by both vendors and governments alike.) That said, many people who make decisions about large scale investments into the use of ICTs in education would do well to take some time to read through the studies and familiarize themselves with the approaches and language which characterize reports and analysis resulting from the use of research methodologies which utilize randomized control trials.

While reasonable people can (and do!) argue about the correct place of RCTs within the toolkit of options related to evaluation available to researchers and policymakers, and the extent to which such things might be expected to make a difference in the way decisions are made in the 'real world', one expects that such approaches will be increasingly prominent inputs into our collective understanding of how educational technologies are being used in practice in a variety of ways and contexts around the world.

(Those wishing to learn more about such approaches, and how to better understand the research findings that follow, may wish to consider enrolling in, or auditing, the upcoming four-week 'MOOC' on "Evaluating Social Programs" being offered through edX by J-PAL, the group based at MIT which coordinates a global network of researchers who use randomized evaluations to answer critical policy questions in the fight against poverty.)

Two other IDB working papers related to technology use in education which utilize randomization are:

**Home Computers and Child Outcomes: Short-Term Impacts from a Randomized Experiment in Peru**
Dec 2012: IDB-WP-382
Abstract: This paper presents results from a randomized control trial in which approximately 1,000 OLPC XO laptops were provided for home use to children attending primary schools in Lima, Peru. The intervention increased access and use of home computers, with some substitution away from computer use outside the home. Beneficiaries were more likely to complete domestic chores but less likely to read books. Treatment children scored almost one standard deviation higher in a test of XO proficiency, though there were no effects on objective and self-reported skills for using a Windows-based PC and Internet. There were positive impacts on the Raven's Progressive Matrices test among children who did not have a home computer before the intervention, but no significant effects for the sample as a whole. Finally, there was little evidence for spillovers within schools, although close friends and classmates of laptop recipients did exhibit higher proficiency with the XO computer.

**Information Technology and Student Achievement: Evidence from a Randomized Experiment in Ecuador**
Jan 2011: IDB-WP-223
Abstract: This paper studies the effects of information and communication technologies (ICT) in the school environment on educational achievement. To quantify these effects, the impact is evaluated of a project run by the
municipality of Guayaquil, Ecuador, which provides computer-aided instruction in mathematics and language to students in primary schools. Using an experimental design, it is found that the program had a positive impact on mathematics test scores (about 0.30 of a standard deviation) and a negative but statistically insignificant effect on language test scores. The impact is heterogeneous and is much larger for those students at the top of the achievement distribution.

Taken together, this set of evaluations from the IDB effectively doubles the global set of rigorous impact evaluations related to the use of technology in education in developing countries which featured randomization that we had only a few years ago. (An upcoming blog post will highlight a second, even larger set of recent impact evaluations of this sort from the Rural Education Action Program at Stanford, which focuses on China.) The deliberate language in these papers, which is often characterized by the use of many qualifiers and couched in the argot of researchers, may frustrate those who struggle to see how such academic work can have real world policy implications. For others, the ambiguity of the results advanced and discussed within these papers may call into question investments of this sort. Such frustration and confusion need not always be such a bad thing. Indeed:

"To question computer use in schools is to ask what schools are for, why teachers teach certain content, how they should teach, and how children learn. Unsettling questions as these probe the uneasy silence in public debate of the new technology's use in schools, a silence that helps no one who is truly concerned over the schooling offered to the next generation."

This observation isn't contained in any of the IDB research papers highlighted here -- although it perhaps could have been. In fact, it comes from Larry Cuban's seminal book published in 1986, Teachers and Machines: The Classroom Use of Technology Since 1920. The quintet of rigorous impact evaluations released by the IDB over the past few years investigating the use and impact of computing technologies in the education sector in low income countries is for me an important marker that many groups are finally getting serious about attempting to learn from the massive recent investments in educational technologies around the world. Whereas such investments once were almost exclusively to be found in the 'rich' countries of the 'global north', large efforts of this sort are now happening almost everywhere -- including (e.g.) Andean communities of rural Peru. Hopefully the research base that is slowly accumulating as a result of papers such as these from the IDB will empower people with evidence that can inform discussions which attempt to break the 'uneasy silence' of which Cuban writes.

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Some notable IDB publications about education & technology:
- The Effects of Shared School Technology Access on Students’ Digital Skills in Peru (January 2014)
• Does Technology in Schools Affect Repetition, Dropout and Enrollment? Evidence from Peru (January 2014)
• Home Computers and Child Outcomes: Short-Term Impacts from a Randomized Experiment in Peru (December 2012)
• Technology and Child Development: Evidence from the One Laptop per Child Program (February 2012)
• Computers in Schools: Why Governments Should Do Their Homework (May 2011)
  (from Development Connections: Unveiling the Impact of New Information Technologies)
• One-to-One Laptop Programs in Latin America and the Caribbean (April 2011)
• Information Technology and Student Achievement: Evidence from a Randomized Experiment in Ecuador (January 2011)
• The One Laptop Per Child Initiative: A Framework for Latin America and the IDB (October 2006)

(Note: Some of the research efforts in Peru were funded under an IDB activity which has also supported research into the impact of the OLPC project in Honduras. Be on the lookout for an upcoming study from J-PAL about Technology and Education: The Impact of Computers in Honduran Schools.)

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You may also be interested in the following posts from the World Bank's EduTech blog:
• Next steps for Uruguay's Plan Ceibal
• ICT and rural education in China
• Let them eat laptops?*
• Evaluating One Laptop Per Child (OLPC) in Peru
• Learning from a randomized evaluation of OLPC in Peru
• Evaluating the evaluating of the Millennium Villages Project
• How do you evaluate a plan like Ceibal?
• Why are there so many poor evaluations of ICT use in education?
• The Use and Misuse of Computers in Education: Evidence from a Randomized Experiment in Colombia

(Note: The image used at the top of this blog post of three students at the Catholic University of Peru ("Look, right there, there it is: Impact! (I think ...)") comes from the World Bank Photo Collection on Flickr and is used according to the terms of its Creative Commons Attribution-NonCommercial-NoDerivs 2.0 Generic (CC BY-NC-ND 2.0) license.)
Using mobile phones in data collection: Opportunities, issues and challenges
by Michael Trucano
#11: originally published on Friday, 18 April 2014

The explosive growth in the availability of mobile phones in societies around the world – even in some of the poorest, most remote communities – is increasingly leading many groups to explore how these devices might be used effectively as part of large scale data collection efforts in many sectors, including education. Utilizing small, portable electronic computing devices to help collect data is not new, of course. For over two decades, laptop computers and personal digital assistants (PDAs) have featured in initiatives to (e.g.) collect census information, interview consumers of various goods and services and poll potential voters. That said, such efforts often faced constraints related to, among other things: costs; the relative novelty of such devices among key segments of the population; the need to provide device-specific user training; and difficulties in exchanging data between these devices and other components of a larger system for data collection. If, as it has been argued, the best technology is often the one you already have, know how to use, can maintain and can afford, for most of the world, the mobile phone fits these criteria quite well.

As of late 2013, rates of mobile phone penetration stood at 96% globally (128% in developed countries and 89% in developing countries). According to the International Telecommunications Union, “today there are almost as many almost as many mobile-cellular subscriptions as there are people in the world.”

Given their ubiquity, increasing functionalities, and decreasing related acquisition and operating costs, it is not surprising that mobile phones have been employed in a variety of ways to aid data collection efforts around the world. While many people may believe that such efforts require the use of a high-end (and expensive) smartphone, phones of all sorts have been deployed successful to different ends in different contexts.

Very simple, low-end ‘dumb phones’, for example, can utilize simple text messaging (or SMS) or voice to (e.g.) send out short queries by phone to a bank of phone numbers, prompting users to reply with a short response, which can be either predefined ('text 1 for yes, 2 for no’) or open-ended. Smartphones can be used in much more sophisticated ways by presenting rich media survey questions directly to respondents or to help guide the actions of an ‘enumerator’ (someone who administers a survey in person) by presenting a user-friendly interface to help an enumerator input and transmit data in structured ways. Such phones may also
contain help files and training aids for the enumerators. In between the high and low end, ‘feature phones’ (a catch-all category of sorts for phones which can do more than make basic voice calls and send and received text messages, but do not have the advanced functionality of smart phones) can make use of simple graphical forms (e.g) on screen as prompts for questions, and can store/transmit structured data as a result of responses.

Data input or captured into phones may be transmitted or shared in many ways (including SMS, MMS, USSD, Bluetooth, wireless Internet, or the exchange of physical memory cards). Where mobile connectivity is not available, data can be stored on the phone and transmitted later once a phone is within sufficient range of a cell tower.

How and why might mobile phones be useful in large-scale data collection efforts, and what comparative advantages might their use have when compared to other options?

A number of attributes and characteristics of mobile phone use in such activities (as well as the use of other small, low-cost portable devices such as tablets, especially where such devices can be connected to mobile and wireless networks) may lead them to be considered, especially when compared with the use of more traditional, paper-based survey instruments:

**Speed**: Collecting data through the use of a mobile phone can greatly speed up the data collection process. Where network availability allows for near-instantaneous transmission of data to a central coordinating group, the reduced amount of time that elapses between local data collection and delivery can save weeks or even months of time in the overall data collection process. In addition, an early warning system of sorts can be established, allowing survey coordinators to quickly identify potential problems with data collection efforts and (potentially) correct them in almost real time.

**Accuracy**: Digital data capture at the source can greatly reduce transcription errors, and data transmission over mobile networks may ensure that no data are lost ‘in transit’. Capture and transmission of data digitally may also ensure that it is easier to store and access them at later dates, should this be required.

**Ubiquity, familiarity and convenience**: Enumerators and survey respondents may, at a general level, already be quite comfortable using a mobile phone (and indeed may be using their own personal device), even if they have not used it specifically as part of data collection efforts. Such devices may be widely available already in target populations, who may be accustomed to their use in a variety of contexts.

**Training**: Because people may already know how to use the devices for many purposes, less technical training may be necessary in some circumstances. In addition, on smart phones, and to a lesser extent with feature phones, help files
and on-screen prompts may provide useful relevant supporting documentation and guidance that may reinforce messages from training that does occur, and potentially obviate the need for some sorts of training altogether.

**Low power**: Compared with devices such as laptops, mobile phones may be much easier to keep charged, as they require much less power and because many fast, low-cost charging options may be available in local communities because people are already utilizing such devices extensively for other purposes as part of their daily lives.

**Combining with other data**: Depending on the functionality of the phone used, textual data captured via mobile phone can be combined with data in other formats such as photographic images, audio, and video, as a way to substantiate the information provided by text. If a building being surveyed is noted as ‘damaged’, for example, an accompanying picture can provide further documentation. In addition, GPS or geo-locationary data can be passively collected and transmitted along with survey data. This can be used to help map the location of hospitals or schools, or to offer ‘proof’ that an enumerator actually visited a place that she has claimed to visit.

**Low cost**: All of these characteristics and affordances may mean that data collection enabled through the use of mobile phones can be done at substantially lower costs than is possible via traditional means.

It is worth noting that, in some circumstances, the comparison between data collection via traditional means and enabled through the use of mobile phones may be a false one. Indeed, in addition to improving the efficiency of data collection efforts when compared with traditional, largely paper-based practices, mobile data collection may also offer options for data collection that simply aren’t feasible, or even possible, using other tools or methods.

**Issues and Challenges**

While data collection via mobile phones may offer particular advantages when compared with traditional survey and data collection efforts, this is not to imply that such efforts are not without challenges or difficulties. Some common notable issues and challenges include those related to:

**Technology**: What technology should we use? What are the minimally viable specifications required for the devices used in mobile data collection efforts? What software applications are available, and what are their related advantages and disadvantages? These are often the first questions that many groups contemplating extending or complementing existing data collection efforts through the use of mobile phones often ask. While questions such as these will (or should) inevitably be posed at some point during the planning process, leading with them is typically a mistake. It is important that choices around a specific technology or device not define the initial scope or conception of the extent to which mobile data collection efforts might be beneficial and possible. No one technology may do everything that
is required. Where one tool may appear to be a perfect fit for what is required, it may not work at the necessary scale. Vendors or partners may propose use of certain technologies or devices which may not be well suited for the specific data needs and/or data collection and sharing processes of the sponsoring group. Deciding which tools to use, and which partnerships to develop, may be critical pieces of the puzzle. First, however, it important to have a larger picture in place of what the objectives of a particular data collection might be, as well the relevant local context (including key stakeholder groups). Once that has been established, technology-related decisions can be made in the service of both higher order goals and on-the-ground realities.

**Training:** While in some instances less training and explicit instruction may be required, because the tool being used (a mobile phone) is familiar to respondents and enumerators alike, in some circumstances additional technology-related training and support may still be required. The adoption of user-centered design principles and techniques can help in some circumstances to avoid the need for certain types of training. (If, for example, an interface is easy or even ‘intuitive’ to understand, users may not need to spend much time figuring it out.) That said, depending on the nature of the survey process and the methods of data transmission, additional training may well be required.

**Cost:** The costs of designing survey instruments delivered digitally may be considerably higher when constructing traditional paper-based questionnaires. In addition, new back-end technology infrastructure may need to be procured and put into place. Where it is not possible for enumerators to utilize their personal phones (whether because such use is not customary or permitted, because existing phones have insufficient functionality or because mechanisms for covering or reimbursing related data transmission costs are not in place), devices may need to be purchased and distributed (and potentially collected once they have served their purpose). Air time may need to be purchased. (More than a few data collection efforts by mobile phone to ‘benefit charities’ have foundered because sponsoring groups have wrongly assumed that mobile operators would be quick to donate free airtime ‘for a good cause’). Whether or not these costs in aggregate are cheaper than the way things are traditionally done or not – and they often are! – sponsoring groups may have difficulty estimating and budgeting for such costs on the front end, especially the first time they engage in efforts of this sort.

**Data security:** Digital collection and transmission of data as part of large scale survey efforts carries with it numerous potential risks and challenges related to data security and privacy that are often fundamentally different than those posed as a result of traditional paper-based survey efforts. If stored on devices, data can potentially be stolen or improperly accessed – the same holds true during data transmission. The use of encryption at both the device level and during transmission can greatly mitigate such risks, but the use of digital data security tools, protocols, and good practices, as well as related regulatory frameworks, laws and guidelines governing the use of such tools, may not be known widely known – or in some places, even be at hand. Where third party vendors or tools are utilized during the mobile data collection process – something that is usually the case –
care needs to be taken to ensure that ownership, possession and utilization of data collected and transmitted are clearly articulated. Sufficient mechanisms need to be in place to audit related arrangements and agreements, and to ensure that penalties for non-compliance are clear and enforceable.

**Speed of change**: If mobile data collection efforts are expected to be repeated over time (for example, as a part of yearly census or annual planning activities), it should be expected that some of the enabling technologies may themselves change – as might the good practice guidelines and regulations related to their use. In some circumstances, this sort of change may even occur during the course of a specific data collection process itself! Technological change often outpaces the ability of planners and policy makers to anticipate and respond to these changes. Those involved in planning for and implementing mobile data collection activities would do well to keep this in mind, and should be prepared to monitor and respond to such changes over time. Planners should try to avoid making a ‘big bet’ on an unproven technology (especially one based on a closed or proprietary standard) or on single vendor, and should always consider how they may most effectively exit and transition from specific relationships, tools and standards.

My next post will examine how these opportunities, issues and challenges play out at a practical level, using examples from mobile data collection efforts in the education sector in Uganda.

This is the first of three related blog posts looking at the use of mobile phones in data collection efforts:

- **Using mobile phones in data collection: Opportunities, issues and challenges**
- **Using mobile phones to collect data in the education sector in Uganda**
- **Using mobile phones in data collection: Some questions to consider (to be published on 25 April)**

*Note: The image used at the top of this blog post of a chameleon running in the Namib desert of Namibia (“there are lots to ways to collect data while mobile”) comes from the Wikipedian Yathin S Krishnappa via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.*
Using mobile phones to collect data in the education sector in Uganda
by Michael Trucano
#12: originally published on Tuesday, 22 April 2014

Much has been made of the potential use of mobile phones to help collect, verify and disseminate information quickly, widely and cheaply in support of activities in the education sector.

What do we know about how such use looks in practice, and what are we learning from emerging efforts in this area?

At an event last month at the World Bank, my colleagues Sukhdeep Brar and Gaurav Relhan shared some lessons from a few recent and on-going education activities in Uganda, providing some potentially quite useful insights for those seeking answers this question. The full video for this event, as well as the PowerPoint file presented, is available online. For those of you who are pressed for time, or are just not sure if clicking those links is worth the effort, here is a quick synopsis of what was shared and discussed.

First, though, some quick context about Uganda: As a recent World Bank Snapshot of Uganda’s Health and Education Services, relates:

"Not every African country has translated impressive rates of economic growth into rapid poverty reduction. Uganda, however, has made simultaneous progress on both these critical fronts. After a brief slowdown, the recovering economy is projected to grow by a worthy 6.5 percent in 2014. And extreme poverty has fallen by more than half over the past two decades, from 56 percent in 1992 to 24 percent in 2010, surpassing the first Millennium Development Goal on poverty reduction well ahead of 2015, the target year.

Alongside these encouraging trends, more children now survive their fifth birthdays in Uganda, and are enrolled in primary school. Yet the prospects of this new generation are not as good as they should be today. Only 54 percent of all children in Grade 3 can read, and just over half of those enrolled in school actually complete the primary level.

Mothers remain at high risk of untimely death due to complications of childbirth and a lack of skilled care, and an estimated 40 infants still die out of every 1,000 births. [...] While there has been much progress, Uganda’s
education and health services — which together account for a quarter of the national expenditure — are delivering less than satisfactory results. To reach its national aspiration of becoming a middle-income country as articulated in the country’s Vision 2040, Uganda needs to make a concerted effort to improve the quality of these key public services, so that the current generation can grow into a healthy and educated work force."

Within the education sector, the challenges are not only at the early childhood development and primary education. The Uganda Post Primary Education and Training Program (UPPET), has been working to improve access to post-primary education; improve the quality of post-primary education and training; and improve efficiency in the delivery of post primary education; in support of the government’s policy for free universal (lower) secondary education (USE).

Among other activities, the US$150m UPPET project included a very large (~US$92m) civil works component, which has financed school construction (and re-construction and expansion) and supplied ~ US$37m of textbooks and science kits. Supervising such a large civil works component, and ensuring that information about this activity was shared as widely and transparently as possible, presented a number of challenges. Over 650 schools were involved across the country. The project featured decentralized school-based contracting, and so there were lots of small contracts awarded to small companies which did not have a lot of capacity to provide rigorous regular reporting. Over time it became increasingly apparent that a large number of textbooks being supplied were not being used, for a variety of reasons, including (from an infrastructure perspective) a lack of libraries and insufficient storage space at schools. The project worked through used existing government structures, which resulted in delays of the sort that easily be imagined when multiple levels of a bureaucracy are involved in efforts of this sort.

The project team had a keen interest in promoting transparency around the use of project funds for a number of reasons, including: to put pressure on government; to put pressure on contractors; and to help to separate the fact from fiction where rumors circulated about the use (or misuse) of public funds. One thing that was done in this regard was to take out ads in newspapers sharing the status of work at each individual school. (The use of newspapers in this way in Uganda is rather well-known, indeed famous, in international development circles, even if it has at times been perhaps misunderstood) This use of newspapers was very effective for spreading awareness ... but it was also very expensive (unsustainably so). Given the increasingly widespread dispersion of things like mobile phones, computers and the Internet in communities in Uganda, the team began exploring how ICTs might be used to help in this process with things like monitoring the progress of construction; providing pictures to help assess the quality of goods and services procured; monitoring the frequency of visits to construction sites by supervisors and government officials; and generating awareness and enabling feedback from project beneficiaries on the use of learning materials supplied under this project. (For many regular readers of the EduTech blog, this context, and these goals, may recall somewhat similar efforts in the Philippines under the CheckMySchool initiative.)
Although there were strong mechanisms in place for project supervision, monitoring and evaluation, the Ministry of Education struggled to receive timely reports from (e.g.) the technical supervisory firms and feedback from schools on the status and challenges impeding implementation of various project components. Under UPPET, a smart phone and web-based ICT platform for monitoring progress and making information quickly accessible was implemented. Key features of this effort (which utilized the open source 'Taarifa' tool) have included the capability to plot reports geo-spatially in real-time (using things like Google Maps, here's an example); integration with SMS; and the ability to quickly alert officials with related oversight and responsibility to emerging issues, like e.g. construction delays an individual school, or supervision visits that are past due).

"U-report", a free mobile SMS-based tool developed by UNICEF Uganda, was also used to promote information sharing collect stakeholder feedback about the status of the delivery and utilization of the learning materials provided to 1500+ schools as part of the UPPET project. (For what it's worth, UNICEF's Innovation Team has been at the cutting edge of piloting lots of, well, quite innovative uses of technology, especially related to the use of mobile phones, in developing country contexts, and has for many folks -- including me -- been one of the best examples of how groups within a large, international institution can remain nimble and develop/implement locally relevant technology tools as part of solutions to help address many longstanding developmental challenges.) U-report, which was already in widespread use for other purposes, has over 150,000 users across Uganda who participate in free SMS polls on various topics. In this case, so-called 'u-reporters' were polled to share feedback on what was actually happening (or not happening) with the textbooks and science kits in individual schools. While information received via U-report was a good deal 'fuzzier' (less detailed, less 'scientifically representative') than that provided via the Taarifa tool, it was quite helpful in identifying problem areas in project implementation that could then be further investigated.

A number of valuable lessons were learned during the course of these efforts in Uganda:

On the technology front, the general lesson learned (or re-learned, or reinforced) was to "first identify issues to be addressed, then identify the
technology". (This is a lesson to which the EduTech blog regularly returns!) Other key related lessons (see the related PowerPoint file if you would like these presented in a concise, bullet point format) were to identify appropriate technology tools that can be adapted to address specific needs and to acknowledge that technology is only a tool, and so has various limitations. In addition, in the case of Uganda, the adoption of these specific technology tools was greatly enabled given widespread access to mobile networks, and improving access to the Internet.

On the institutional level, ownership from government was seen as a necessary pre-condition to make all of the happen effectively. Identifying and supporting focal people with the capacity and incentive to manage and analyze the data generated through the use of these ICT tools, and to coordinate necessary responses, was of critical importance. Adapting the use of the tools to meet the readiness of government to make the sorts of data generated under the project public, while at the same time 'pushing the envelope' a bit (transparency is not only an end goal, but a process as well), was also quite important.

On the implementation side, local technical expertise was seen as absolutely essential. Anticipating, investigating and incorporating the use of these sorts of ICT tools into projects at the design stage was seen to yield both the best results, and to help ensure that the tools were used as optimally as possible during the course of the project. While the financial costs to introduce and utilize these tools were modest (especially since these tools were already in widespread use in other contexts), it was important that they were figured into project costs. The fact that the use of these tools was complementary to, and integrated within, larger monitoring and evaluation frameworks, processes and activities was very important, as was the orientation to use the tools not merely just to collect (more) data, but to drive responses to help remediate specific implementation problems quickly.

For more complete information on the use of mobile phones as part of the data collection process under this education project in Uganda, you are welcome to view the related video of the fascinating presentation by Sukhdeep Brar and Gaurav Relhan, and the subsequent Q&A session, that I have attempted to summarize here.

This is the second of three related blog posts looking at the use of mobile phones in data collection efforts:

- Using mobile phones in data collection: Opportunities, issues and challenges
- Using mobile phones to collect data in the education sector in Uganda
- Using mobile phones in data collection: Some questions to consider (to be published on 25 April)

Note: The image used at the top of this blog post of a hummingbird ("one way to collect data of a certain sort while mobile") comes from the Wikipedian Jerzy Strzelecki via Wikimedia Commons and is
used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license. The screen shot of the school mapping tool is adapted from the ugandaschools.net web site.
Using mobile phones in data collection: Some questions to consider
by Michael Trucano
#13: originally published on Friday, 25 April 2014

Recent posts on the EduTech blog have explored some of the general opportunities, issues and challenges that are common to many efforts to use mobile phones as part of data collection efforts and have identified some of the key lessons as a result of projects which have used mobile phones to collect data in the education sector in Uganda.

Even where there is common agreement on the potential utility of deploying mobile phones as part of a particular data collection effort, as well as a consensus understanding about relevant challenges that may complicate such an effort, decision makers may still be unsure about how to start their related planning efforts – or how best to change course once such efforts are underway.

In many instances, an intriguing proposal by a vendor of a particular product or service may help instigate initial considerations to use mobile phones as part of data collection efforts; news reports and information sharing between key practitioner groups may as well. Whatever catalyzes consideration of the use of mobile phones as aids in data collection efforts – in some cases it may simply be a general dissatisfaction with the status quo – here are some general questions that may be worth asking:

What are the high level goals of the data collection effort being considered?
If a sponsoring group does not have a clear idea of the goals and objectives of a particular data collection effort, it won’t matter what technology is chosen to help make it happen. If you are pointed at the wrong target, introducing a new technology can help get you there faster. While the opportunities to collect data in new ways using mobile devices – more quickly, more cheaply, through processes that are ‘innovative’ – can be very enticing, it is important to remember that whatever technologies are chosen are just means to an end, not an end in themselves. Before deciding on a particular technology ‘solution’, it is best first to have a clear understanding of the ‘problem’.

To what extent can mobile data collection efforts be handled ‘in-house’ and to what extent will they need to be outsourced to others?
Initial mobile data collection efforts may often be planned and implemented to a greater or lesser extent by groups external to existing related data collection processes. The reasons for this can be quite understandable: The technical knowledge and competence in the use of new mobile technologies for such purposes may be considered (rightly or wrongly) outside the competence of many ‘traditional actors’. This is especially the case when such efforts are in their early or pilot stages. As such efforts become more widespread, costly and strategic, however, care should be taken to ensure that, at a minimum, sufficient competency exists within the sponsoring organization so that staff can plan, direct and evaluate the efficacy of such efforts, even if mobile data collection efforts themselves are largely implemented by third parties.

Is there sufficient local capacity to plan, implement and sustain mobile data collection efforts?
Whoever is responsible for the planning and implementation of mobile data collection efforts in their initial stages and iterations, over time it may be important that such actions are increasingly led and implemented by local groups, whether such groups come from the public or private sectors, from civil society or academia. Indeed, the sustainability of such efforts over time may well depend on the development and existence of supporting ecosystems of local actors and expertise.

How will new systems to collect data using mobile devices integrate with existing legacy information systems and processes?
Care should be taken to ensure that the results of mobile data collection efforts can be absorbed into existing information management systems. Where such efforts and systems are incompatible with each other, the operation of essentially parallel systems and processes may be expedient in the short run, but costly and inefficient over the longer term. The introduction of mobile data collection efforts may contribute to exposing deficiencies in existing information systems and act as a catalyst for the upgrading of legacy systems. Efforts to better integrate the tools and processes that characterize and enable mobile data collection activities, as well as the data that are generated as a result of such activities, are often best considered as part of larger, more holistic planning processes related to the collection, sharing, analysis, and storage of related data more broadly.

Who are the key stakeholders and partners who will need to be engaged during the course of this mobile data collection effort – and what are the key components of this engagement?
Efforts to collect data through the use of mobile phones may require that new partnerships with other groups – some of which may be ‘non-traditional partners’ – be established and strengthened. At the same time, the nature of partnerships and interactions with existing stakeholder groups may change as well. Sponsoring groups would do well to map out the universe of key stakeholder groups, attempt to analyze and predict the potential impact of mobile data collection efforts on such groups, and plan accordingly.

How can data security be assured and data privacy be protected when utilizing mobile devices?
Collecting, sharing, and storing data in digital formats brings with it a whole set of new challenges and opportunities that are in many ways far beyond those which characterize paper-based survey efforts. Data security issues may well be more acute, and the potential consequences of inattention more immediate (and potentially profound). Where data reside on connected devices, such data may be insecure in ways that (e.g.) boxes of completed paper questionnaires are not. This is true whether or not devices such as mobile phones are used as tools in this process, but some aspects of the nature and characteristics of the use of mobile phones for such purposes are worth specific consideration. Because of the potential to link individual data points with both geographic location (as a result of GPS) and individual people (given that data may, for example, be attributed to specific phones at specific times of day), the potential implications related to privacy may well warrant special attention. In addition, the sponsoring organization would do well to ensure that it retains (for example) usage rights (if not full ownership) of the data collected and to consider, at each stage of the data collection and sharing process: Who has the rights the data collected, and what might they do (and not do) with them?

There are certainly many more questions that can, and should, be asked. But this short list might provide a good place to start.

The answers may change over time and according to circumstance. Indeed, it is expected that the answers to these sorts of questions will often change, given the variety of policy and research objectives that mobile data collection may assist, local contexts and constraints, and the speed at which the underlying technologies, end user devices, related governing legal frameworks and social norms may evolve in the coming years.

**Four related observations**

Together with this initial set of questions, groups contemplating utilizing mobile phones as part of their data collection efforts may do well to consider the following short additional observations:

**Piloting and iteration can be critical components for success**

A ‘big bang’ approach, where mobile devices are deployed quickly at scale as critical tools in large scale data collection efforts, may be bold – but foolhardy. The German military strategist Helmuth von Moltke is meant to have observed that “no battle plans survives contact with the enemy”. Veterans of early large-scale deployments of mobile devices as part of data collection efforts often say something similar. Piloting and testing various technology tools in local environments can be invaluable in deciding which course to take – as well as which corrections to make to initial plans. They can also be critical components in user-centered design processes which may help better target data collection efforts to the needs and usage contexts of various important stakeholder groups critical to mobile data collection efforts, from those surveyed to the enumerators to various support personnel to the eventual analyzers and consumers of the data collected.
Mobile phones can not only be useful in the collection of data – but can aid in their broad dissemination as well

While much of the focus on the potential use of mobile phones in large scale survey efforts relates to their utility in data collection, such devices can also enable the wider and quicker dissemination of the results of such data collection efforts – as well as the data themselves. The broad availability of mobile phones across societies can help to amplify messages from some groups whose collective voices may not have been widely heard in the past. It is important to note that mobile phones can not only be useful tools to collect data more quickly, but to share them more quickly and widely as well. Indeed, mobile phones are often considered key tools as part of citizen engagement and transparency efforts in a number of places around the world. Many data collection efforts suffer as a result of an inherent misalignment of incentives between those who supply data and those who benefit from the collection and use of data. Where mobile phones are used, the tools of data collection are at the same time potential vectors for the dissemination of such data (in individual and aggregate form), the analyses of such data and the decisions made as a result of such analyses. This means that data can not only flow more easily ‘up’ into the system (as is typically the case in large scale data collection efforts), but back down and across the system as well.

Costs associated with mobile data collection efforts may change over time – in both directions

Budgeting for the costs of mobile data collection efforts can be quite challenging where such efforts are new to a particular context or environment. As more experience is gained, such costing exercises may become easier and more predictable in some instances. At the same time, however, changes in technologies, and the related changes in the business models that both enable and are enabled by such technologies, can result in certain individual cost components varying widely over time. It is a consensus opinion that most technology and device costs drop over time. However, the costs of complying with related guidelines and regulations may move in the opposite direction as technologies become more settled and as lawmakers and regulators ‘catch up’. Where data collection efforts are locked into specific vendors, the potential for prices to rise can be considerable. One example is the potential impact of reliance on bulk SMS rates for the transmission of data by one mobile operator. Where such rates rise – as has been in the case in some countries where anti-spam measures have led to precipitous increases in the wholesale SMS rates -- the business model of mobile data collection efforts may need to be quickly and seriously reconsidered.

Certain groups may be threatened by mobile data collection efforts

One challenge to many groups, especially government agencies, which sponsor and implement large scale data collection efforts is that they may have developed significant internal competencies and expertise in the implementation of survey efforts the ‘old fashioned way’. Indeed, institutional structures and bureaucratic processes may have developed which, while (perhaps) useful to the way things were done in the past, may be impediments to doing something different in the future. While it may be useful to the system and process as a whole that, for example, fewer people need to be involved in transporting and transcribing paper-
based questionnaires, as well as in processing related paperwork, the livelihoods of individual people and viability of existing institutional structures may be called into question as a result of some of the increased efficiencies that can potentially be realized as a result of mobile data collection efforts. Where the potential for disruption to existing processes, implementing organizations and stakeholder groups is high, care should be taken to anticipate and mitigate potential opposition. In addition, where the dissemination of data and related information and analyses as a result of the use of mobile phones results in greater transparency around a particular topic or subject, certain groups may organize themselves to impede or inhibit related activities. Such things are not unique to the use of mobile phones in data collection efforts, of course, nor to the introduction of new technology-enabled processes more broadly – but they can profoundly impact the potential success of such efforts.

This is the third of three related blog posts looking at the use of mobile phones in data collection efforts:

- Using mobile phones in data collection: Opportunities, issues and challenges
- Using mobile phones to collect data in the education sector in Uganda
- Using mobile phones in data collection: Some questions to consider

Note: The image used at the top of this blog post of the science library of Upper Lusatia in Görlitz, Germany ("as you move through the data, new questions might present themselves") is © Ralf Roletschek / roletschek.de. It comes via Wikimedia Commons and is used according to the terms of Creative Commons Attribution 3.0 Unported license. (It is also made available for re-use under the copyleft Free Art License).
Checking in with Portugal's big projects to support technology use in education

by Michael Trucano
#14: originally published on Tuesday, 29 April 2014

As part of my job at the World Bank helping to advise governments on what works, and what doesn't, related to the use of new technologies in education around the world, especially in middle- and low-income countries, I spend a fair amount of time trying to track down information about projects -- sometimes quite large in scale and invariably described as 'innovative' in some way -- that were announced with much fanfare which received a great deal of press attention, but about which very little information is subsequently made widely available.

Most of these projects prominently featured some new type of technology gear, whether low cost laptops for students or new ways to connect people in remote places to the Internet or low-power e-reader devices. Other projects featured new software (English learning apps for phones! Free science curricula for teachers! A learning management system that enables personalized learning!). A sub-set of these projects -- the really ambitious and 'visionary' ones -- combined both hardware and software, and a variety of services to support their introduction and use.

I do this follow up for two very basic reasons:

(1) I am generally interested in learning from these sorts of projects, wherever they may be happening; and

(2) I am asked about them a lot.

These conversations generally go one of two ways:

"Whatever happened to that project in [fill in country name] -- how are things going there these days?"
"Things are proceeding [well / not so well], and a bit more slowly than originally envisioned. Here's what you need to know ..."

or, alternatively:

"Can you give me an update on the exciting stuff that is happening with computers in schools in ____?"
"You mean the ____ project? Actually, that never actually happened."
"No, that's not true, I read that ---"
"Yes, you probably did read that. You may well have heard about it during a presentation by [insert name of vendor] as well. But I assure you: I talk regularly with [the ministry of education / companies / NGOs / researchers] there: Nothing actually happened there related to this stuff in the past, and nothing is happening there related to this stuff now. Will something happen there in the future? Undoubtedly something will ... perhaps even something as potentially 'transformative' as was promised ... although whether it happens in the way it was originally marketed or advertised: Your guess is as good as mine."

In retrospect, the rather short half-life of an unfortunate number of such aborted projects can largely be measured not by things actually implemented 'on the ground', but rather by PowerPoint presentations and press releases. (A rather charitable characterization of what happened in some such cases, but one that is not always or necessarily more accurate, might be that people were 'overly optimistic' or that someone or some group 'was simply ahead of her/their time'. Technology folks sometimes just dismiss such efforts as 'vaporware'.)

When it comes to educational technology projects, most of the press attention tends to come when new initiatives of these sorts are announced, with some momentum continuing on for awhile in the early days of a project, especially when, for example, kids get new tablets for the first time, an occasion that presents a nice, and ready-made, photo opportunity (not that such things are ever conceived of as photo opportunities, of course!). Then, often: Silence.

Projects that do get implemented, and last for awhile, tend eventually to be crowded out of the popular consciousness by the latest and greatest new (new!) thing -- and, when it comes to the use of technology in education, one thing can be certain:

There is always a next new (new!) thing.

(In addition to lots of press attention, the well-known One Laptop Per Child project was the subject of many papers and presentations from academics in the early days that were largely speculative -- e.g. here's what could happen -- and theoretical -- e.g. here's a pedagogical approach whose time has come. Only recently have we started to see more deliberative, rigorous academic work looking at actual implementation models, and what has happened as a result.)

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For me, the most interesting part of the use of technology in education isn't the planning for it (although I spend a lot of time helping people who do that sort of thing) nor the evaluation of the impact of such use (I spend a lot of time on that stuff as well).

The most interesting part is implementation -- because it's so messy; because a fidelity to certain theoretical constructs and models often comes into rude collision with reality; because that's where you really *learn* about what works, and what
doesn't, and what impact the whole enterprise may be having. How are kids, and teachers, actually using the stuff? What unexpected problems are people having -- and how are they being addressed? What is changing or happening that is interesting or surprising that wasn't part of the original plan, but which is potentially quite exciting?

One place where things have actually happened related to technology use in education, and where they continue to happen, at a rather large scale, is Portugal.

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Back in 2012, we had a small event here at the World Bank that attempted to share some of the lessons learned from recent Portuguese experiences in introducing new technologies into the education sector (see Around the World with Portugal's eEscola Project and Magellan Initiative). The U.S.-based Consortium for School Networking (CoSN) released a report last month as a follow-up to a study visit to Portugal in late 2013. While written from a North American perspective and for a North American audience, "Reinventing Learning in Portugal: An Ecosystem Approach" provides a useful lens through which an outsider, regardless which continent she calls home, can start to take stock of some of the high level lessons from the ongoing Portuguese experience.

(Side note: I would also be quite interested to read a companion report at some point that focuses on what went wrong in Portugal, and what changed as a result; I am a big believer in the power and value of learning from failure.)

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Countries interested in learning about the 'impact' of efforts to introduce and sustain the use of technologies to benefit education in Portugal might do well to understand the context of what has happened in Portugal, and the circumstances that may make it either unique, or a good comparator, to their own national circumstances.

A quick review of what's happened in Portugal:

As the CoSN report notes, "From 2008 to 2012, Portugal's eSchool initiative provided laptop computers and broadband access to 1.7 million elementary and secondary students, adults in training programs and educators; this means that 17% of the total population and 42% of the families throughout the country now have access to the Internet and the productivity and communication tools to participate in a global knowledge base and economy." The lion's share of the initial funding for this came from auctions of spectrum to enable mobile phone operators to offer 3G mobile services.

How did this come to pass?

Before addressing fundamental questions about the impact of what has been going on in Portugal as a result of the use of educational technologies on student outcomes -- I'll leave that for a future EduTech blog post once more compelling,
CoSN has identified a few "big 'take-aways'" from its study of what has happened in Portugal that, while formulated for policymakers in North America, should have pretty broad relevance most everywhere:

1. Policies and strategies promoting ICT use in schools and at home are integrated into a larger economic and social vision for change in Portugal.
2. Portugal adopted a comprehensive approach to transforming education by using ICT as a catalyst. This approach included hardware, software, teacher training, curriculum development and digital content in a holistic approach.
3. The Portuguese thought in terms of an ecosystem.
4. Public private partnerships are foundational to this strategy and key to the success of the Portugal program, particularly in terms of long term sustainability.

As in some other countries (Uruguay is an example that immediately comes to mind), the education system in Portugal was seen as a vector by which to introduce ICT tools and ICT-enabled products and services broadly across Portuguese society. In order to make this happen, Portugal "stressed a systemic approach, including improving school infrastructure, leveraging educational technology, working with government leaders, industry, and the community to build the synergy for school reform." From the very start, efforts and mechanisms to ensure sustainability were baked into all facets of the various large-scale educational technology initiatives. In other words: Project sustainability wasn't something that factored into plans once something had rolled out, but rather was a critical component for plans at all phases of planning and implementation. (In my experience, Portugal is a rather singular global example in this regard.)

Viewed from one perspective, might the size of the investments in Portugal, and the speed at which they occurred, have meant at a practical level that they were, perhaps, 'too big to fail', at least in the near term, and that this 'bigness' contributed to project sustainability in some way? That's a potentially interesting question. One reason some countries have considered and implemented 'big bang' approaches, where you spend a lot of money and do a lot of things very quickly, is because very large expenditures raise the stakes for failure to such an extent that sustainability quickly becomes a first order concern. Do a little bit here and there over time and you may end up spending the same amount -- do it all at once and *everyone* is watching, so there's nowhere to hide. A minister of education from another country which has pursued a 'big bang' approach to introducing technology in education at scale characterized her country's efforts as, "we've decided to jump off this big mountain, which means we can't afford not to land safely". I don't know to what extent this sort of sentiment was ever expressed in Portugal, or even to what extent it might be relevant in the Portuguese context, but I wouldn't be surprised if a similar sort of phenomenon may have been, at least in part, at hand.
CoSN has identified six critical factors that were key components of this push for sustainability in Portugal that were evident, and strategic, from the beginning:

1. Value Proposition for Key Stakeholders
2. Champions in the Ecosystem
3. Local Community Buy-in
4. Part of a Bigger Funding Vision
5. Information Technology Management
6. Professional Development

The report goes into short detail about each of these, so I won't discuss all of them here. Instead, I'll just highlight the importance and potential relevance of the first item for audiences in other countries.

One encounters frequent mention of the role of 'stakeholder engagement' in national educational technology policies (at least the good ones). Few places have taken as systematic an approach to identifying and building stakeholder engagement for national educational technology initiatives as the Portuguese have. At the heart of the 'Portuguese model' for stakeholder engagement is a public-private partnership, in which many private sector companies play key, indeed fundamental roles.

(My mention here of 'public-private partnership' is not meant to advocate that this is the only, or indeed even the 'best', model for organizing an education system to do the types of things that have been done in Portugal. I have had both critics denounce, and supporters celebrate, the Portuguese model as business-oriented. Rather, it is to note that this sort of thing lies at the heart of what has happened in Portugal, for better and for worse, and so, if you are interested what has happened there, and what hasn't, and why, acknowledging, understanding and exploring this model may provide you some insight.)

Many countries prominently feature the potential for 'public-private partnerships' as part of their national policies and plans related to educational technology. Few places, however, spend much time and effort explicitly trying to identify how to appeal to the self-interest of key stakeholder groups, and to maintain active and open dialogues with them continuously over time. This is often especially the case as relates to 'private sector partners', where outreach from government can tend to focus on rather narrow, procurement-related discussions. What did this mean in practice in Portugal? Media companies were cajoled and incentivized to create digital learning content as a way to help create conditions and habits that might stoke longer term demand for their other digital products and services. Connectivity providers were brought on board in part by appealing to their interest in stoking future demand for more, faster broadband, and the services that broadband might enable. In some countries such actions would meet with little resistance; in other countries, various groups may find such appeals to the calculated self-interest of private sector actors to be abhorrent. However groups in other countries might feel about such arrangements, there can be little doubt that they have been critical to the model for sustainability and shared financial responsibility across a wide
number of stakeholder groups and actors in Portugal. This is not meant to imply that the participation of the key private firms in Portugal was motivated only by their bottom lines. My impression has been that the rhetoric from many corporate partners about 'giving back' and their role in helping to develop the country's education sector is genuine. But, practically speaking, even where they are genuine, such sentiments can only go so far. Countries that identify 'public-private partnerships' as critical components of their efforts to sustain their national educational technology efforts but are later surprised when the appetite of firms to 'do good' wanes over time as they see little impact on their bottom lines might do well to reconsider their approach to 'public-private partnerships' -- and indeed might wish to question whether this sort of approach will work for them over the longer term if it is meant to be fuelled in important parts by corporate 'altruism'. One can believe in 'corporate social responsibility' (CSR) even while at the same time acknowledging that some (or even much) of what goes by that name in some places is little more than business development and marketing. CSR might help sustain a small project over the long term, or a large project over the short term, but when you are trying to sustain efforts at scale over time, things can get a little more complicated.

Members of the CoSN study delegation were struck by the level of national coordination that has characterized efforts to introduce and sustain large scale educational technology initiatives in Portugal, which in many cases stands in stark contrast to the proliferation of disjuncted, uncoordinated projects that characterizes, and indeed defines, the landscape of educational technology projects that have occurred across the United States and Canada over the past decades. Fair enough: Portugal is, after all, a small country of less than eleven million people with an approach to education that is far more centralized than the very decentralized approaches that characterize the various education systems in American states and Canadian provinces. While such coordination may not be possible (or even desired) in North America, there are many other countries for which this approach may both be feasible, and work well. Governments looking to utilize public-private partnerships to enable the types of large scale educational technology initiatives that have occurred in Portugal might also pay keen interest to lessons about how (and to what extent) the Ministry of Education and Ministry of Public Works, Transportation, and Communications worked with each other, and together with their 'private' partners, to ensure that, while implementation may have been industry-led, the strategic direction remained the responsibility of government.

Before concluding with a 'checklist for North American Policymakers' (which should be relevant for policymakers in other places as well), the CoSN report states that, from the beginning, the Portuguese "framed the initiative as one that transcends classrooms and students and highlighted the opportunities for communities and countries (or in the case of the U.S., states) to increase their position in an increasingly competitive digital world economy." In the opinion of the CoSN report, where other places seek to do something similar, "[t]he framing must create broad
excitement and mobilization in order to build the political will that will ultimately be essential for the success of the initiative."

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Going forward, it will be interesting to see how the Portuguese programs, and models, change over time, and what types of impact they will eventually on things like student outcomes, teacher satisfaction, the growth of the national IT industry, and economic development more broadly. Those sorts of things will only start to come into focus tomorrow, however; if you want a snapshot to help you better understand the state of things today, you could do worse than to start by reading the CoSN report. It's a free download. (I note that you have to provide your, or at least a, name and email address in order to access the direct link.)

You may also be interested in:
- Big educational laptop and tablet projects -- Ten countries to learn from
- Around the World with Portugal's eEscola Project and Magellan Initiative

Note: The image used at the top of this blog post of a door to a spiral staircase in the Cloister of John III at the Convent of Christ in Tomar, Portugal ("sometimes looking inside an unfamiliar place can provide you with a new perspective on what's happening outside as well") comes from the Portuguese Wikipedian Alvesgaspar via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
If you've ever been involved in discussions about current uses of technology in education -- and, given that you are currently reading a post on the World Bank's EduTech blog, it's probably safe to assume that you have -- you've probably noticed that, at some point in the back-and-forth, someone will inevitably be unable to resist talking about what's coming next. The history of technology use in education is, in part, a history of predictions about the use of technology in the future.

For the past few decades, many people around the world have almost instinctively looked toward Asia to get glimpses and insight into what the next wave of consumer technologies might look like and do, and how young people might use them. From the 'computer nerds' who frequented the Akihabara section of Tokyo in the 1980s to the young Filipinos whose affinity for SMS earned their country its designation as the 'texting capital of the world' around the turn of the century to today's designation of Indonesia as the 'social media capital of the world', the center of gravity for emerging uses of new technologies by young people has often been in the East. It is indeed no coincidence that the World Bank has co-sponsored an annual event bringing education policymakers to Seoul each fall to help discuss and plan for their country's potential uses of new technologies in schools in the future.

Of course, the stereotypically tech-savvy, mobile-phone wielding, hyper-connected youth in the big cities of East Asia, reviewing vocabulary on their smartphones while commuting on the subway or studying to the wee hours of the night on broadband connections at home, occupy one end of a very wide and diverse spectrum. Rural youth for whom the Internet is more aspiration than avocation and whose schools may not even have electricity, let alone a computer, or for whom 'computer time' means the two hours a month spent in a crowded school computer lab learning how to use a word processing program while waiting, waiting, waiting for their desperately slow Internet connection to bring up a single web page: Such young people and circumstances represent the reality of current technology use in education across Asia as well.
If we hypothesize that many future uses of technology in education might first appear in Asia, where might we want to look to get some first glimpses as what is likely to come to our own schools (wherever they may be)? If you want to know what a place might look like tomorrow, a good place to start might be by looking at what things look like there today. With that in mind:

*How and to what extent are countries across Asia currently utilizing information and communication technologies (ICTs) in their education systems?*

Two recent publications from UNESCO provide much useful data and documentation to help those trying to come up with possible answers to this question.

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**ICT in Education in Asia: a comparative analysis of ICT integration and e-readiness in schools across Asia** [pdf] is one of a series of reports emerging out of efforts led by the UNESCO Institute for Statistics (UIS) to gather internationally comparable data related to the use of information and communication technologies (ICTs) in education, which are supported by the World Bank and many other partner organizations support in various ways. The reports begins by noting that, "Policymakers widely accept that access to information and communication technology (ICT) in education can help individuals to compete in a global economy by creating a skilled work force and facilitating social mobility. They emphasise that ICT in education has a multiplier effect throughout the education system, by enhancing learning and providing students with new sets of skills; by reaching students with poor or no access (especially those in rural and remote regions); by facilitating and improving the training of teachers; and by minimising costs associated with the delivery of traditional instruction. [...] Beyond the rhetoric and of equal importance to policymakers are basic questions related to the measurement of ICT in education, its usage and potential outcomes."

It is to this end, to help measure and document what's currently observable related to technology use in education in education systems, that this UIS report was conceived and drafted. The report is meant to be rather wide-ranging in what it seeks to measure, and is informed by interests to document and analyze the 'digital divide' as well as to collect data that may be relevant as countries carry out activities in their formal education systems to help prepare young people to participate in the 'knowledge economy'. UIS does this through the distribution of standard questionnaires to national statistical agencies, consistent with the way it helps to gather globally comparable data on other topics. This report on Asia follows similar UIS publications on Latin America and the Caribbean and in five Arab states.

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It is perhaps important to note that much of what UIS has collected and presented here takes the form of a sort of basic, initial inventory: how many computers there are in schools; if and how fast schools are connected to the Internet; whether and the extent to which teachers have received ICT-related training; etc. Think of this effort as providing a sort of base level of information about the availability of ICT in
schools, how ICTs are being used, and the existence of some basic related policy
guidance. Before one investigates the 'impact' of technology use in education
(however one might wish to define it), it can be useful to have a sense of the
availability of technologies at a school level and some key aspects of the
environment which may contribute to (or impede) their use. Before one discusses
the current and future possibilities of ICT use, it can first be useful to have hard
data about their current availability.

The report begins with a useful discussion of a number of topics, noting and
commenting on significant disparities between countries related to things like
access to the Internet and the sheer number of computers to be found in schools. It
highlights the importance of the 'electricity divide', i.e. the fact that access to
computing resources and the Internet can often be as much about access to reliable
power as it is about access to broadband. Indeed, access to reliable electricity often
(but not always, as in the case of Kyrgyzstan) neatly corresponds with access to the
Internet in many places. The existence of "virtually universal fixed broadband
Internet connectivity in Australia, Brunei Darussalam, Hong Kong Special
Administrative Region of China, Japan, Malaysia, the Republic of Korea, Singapore
and Thailand" stands in stark contrast to current situations in countries such as
Cambodia, Bangladesh and Kyrgyzstan. The report provides useful documentation of
the learner-computer ratios across the continent, a basic metric which remains (for
better or for worse) one of the first datapoints that many policymakers look to, cite,
and benchmark against when considering investments in technology use in
education. Not surprisingly, these ratios are typically much higher in rural areas
than they are in urban areas, and range from over 500 learners per pupil at the
primary level in Nepal and 412 learners to computer in the Philippines down to
ratios of 17:1, 15:1 and 9:1 in Malaysia, Thailand and Hong Kong (China)
respectively. At the primary level in China, the learn-computer ratio stands at 14:1,
a density more than twice what one finds in rural primary schools in the country
(29:1). Such disparities exist in other regards as well. "In the Philippines and
Myanmar, [only] 2% of teachers are trained to use ICT, [and] no teachers in
Kyrgyzstan have been trained", contexts which are contrasted sharply from those in
places like Singapore, Thailand and Azerbaijan, where such rates stand at 100%,
88% and 73%.

The UIS report includes many reminders and caveats about the limitations of
certain definitions, and in trying to draw easy interpretations from various data. As
part of its discussion of relative access of boys vs. girls to ICTs in schools, it
cautions that, "while these data shed light on the extent that girls and boys who are
already enrolled in school have access to ICT in education, the data do not address
pre-existing gender disparities in general school enrolment." In its discussion of the
existence of teacher training related to ICTs, it notes that "there has been little or
no research on exactly how much teacher training is required, how often it should
take place, what kind of training is most appropriate and affordable, and what it
should cover to create a teaching workforce that is motivated to use ICT in the
classroom in the context of new curricula and new pedagogies."

Usefully, the report briefly considers ICT use and how it might relate to
international assessments like PISA and TIMMS. For the first time (that I am aware of) it presents public data about ICT use in education in Iran and Myanmar. While many of the sources cited will no doubt be familiar to many regular readers of the EduTech blog, the short bibliography may also be of interest.

While does not pretend to provide us with neat answers to many of the questions we have about ICT use in education across the continent, the UIS report does an admirable and useful job of providing hard, comparative data about the availability of ICT resources in schools in Asia in the aggregate, and thus provides policymakers with some insight into the potential readiness of their education systems to participate in the types of technology-enabled activities and practices which many people hope are at the heart of a 'transformation of teaching and learning' in the years ahead.

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Complementing the UIS report is a publication that appeared late last year from UNESCO's Asia & Pacific Regional Bureau for Education in Bangkok, which has long been a leader in collecting and sharing knowledge and perspectives about the use of technology in education. **ICT in education policy, infrastructure, and ODA status in selected ASEAN countries** (2013) is a successor of sorts to UNESCO groundbreaking 2003 *Metasurvey on the Use of Technologies in Education in Asia and the Pacific*, the first regional survey of its kind which explicitly investigated and presented data about what was happening across a number of middle and low income countries and which served as a rough template for similar efforts at infoDev in subsequent years which focused on Africa, the Caribbean and South Asia. This 2013 UNESCO report is more narrowly focused on current circumstances in countries of the ASEAN (Association of Southeast Asian Nations) region, and catalogs the current state of technology infrastructure and policies in part as a way to inform potential considerations of related overseas developmental assistance (ODA, i.e. 'foreign aid') going forward. The report pays special attention to activities supported by international development agencies, as well as other international and bilateral donors and partners, including those in the private sector and civil society. It offers useful synopses where and how 'ICT' is mentioned in policies documents and annotated lists of 'key actors' and notable programmes.

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This UNESCO report is really chock full of information, and you'll find much more synthesis here than analysis. This is not (necessarily) meant as a criticism. (If you want a quick overview of what's happening related to technology use in education in, say, Thailand, or Myanmar, or Vietnam, my first recommendation would be that you turn to the related chapter here.) Rather, it is to suggest that this publication is perhaps more usefully skimmed or use as a reference document than as something you would perhaps read from start to finish. (As with the UIS report, I did actually read this publication from beginning to end, but as my old boss used to joke, "we pay you to read these things so we don't have to; just tell us what we need to know!") Interestingly, and rather usefully, given the many similarities between countries within each grouping, the publication is divided into two sections. Part A looks at "ICT in Education Policies, Infrastructure and ODA in Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam", while part B examines "The Readiness of Advanced Technology in Education in Indonesia, Malaysia and Singapore." Compared with the other countries, the inclusion of small, rich Singapore may appear a bit anomalous, but such is the diversity of the ASEAN region, and examples from the small island state related to ICT use in education do exert a strong influence in many regards on policymakers in neighboring countries.

The specific focus on overseas development assistance is perhaps too narrow in some instances for audiences of people who don't work in that field, or who don't work with institutions like UNESCO, the World Bank, USAID, the Asian Development Bank, etc., or who (frankly) don't care terribly much about the actions of such institutions. That said, I expect that a good number of the people who regularly read the EduTech blog don't fall into one of these three categories! Related to this focus, the paper states that "relatively little ODA is dedicated to secondary education, teacher training and vocational training, or to the use of ICT in education. [...] With aid flow in education predominantly concerned with supporting access to quality primary education and the advancement of tertiary education, the integration of ICT into education is currently seen as a lesser priority and has not received substantial direct ODA funding." It goes on to conclude that, "unless advanced technologies can demonstrate the objective of increasing access to quality education, they may not fall in the scope of ODA funding. Thus, the development of [ODA] programmes to integrate advanced and experimental technologies into education is not being pursued in most ASEAN countries." This is indeed the challenge facing proponents of the expansion of the use of ICTs in education in many countries, not only in Southeast Asia. In my experience, I find (and I am not necessarily lamenting this fact) that there are increasingly fewer people in international donor agencies who are looking specifically to support technology use in education. Too many of such people have seen the results of ill-advised schemes that focused largely, if not exclusively, on the types of projects that exhibited many of the 'worst practices' that all too often characterize initiatives to introduce new technologies into education systems. As a practical matter, this has meant that, in many countries, the institutions which are the primary purveyors of overseas developmental assistance are now reflexively skeptical of many of the proposals pitched to them by countries which they support in other regards -- in many instances, even more so than was perhaps the case a decade ago. At the same time, many countries in the region (and elsewhere) are increasingly
interested in exploring the use of ICTs in education and more able, in many instances, to fund related activities themselves.

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By mapping out the policy environments, constellations of actors and key initiatives, as well as introducing mechanisms by which international comparable data can be collected and shared, these two publications from UNESCO provide policymakers in Asia with some basic foundational knowledge and data about what's happening, and what isn't, with regard to the use of ICTs in education in their countries and others in the region. Whether or not it is correct to look to Asia for inspiration related to the use of new technologies in education -- even if this is true today, it might not be tomorrow -- it is encouraging to see that we are starting to see the emergence of initiatives to collect and disseminate reliable data about this use. In many ways, the lack of reliable related data of almost any sort has led to a situation where investments in educational technologies in many countries -- in Asia as elsewhere -- can perhaps best be characterized as 'faith-based initiatives'. Even where policymakers are not taken with a general faith in technology, they may profess a faith in the potential of technology use in education. Investigations into the 'impact' of educational technologies often founder because there is insufficient knowledge about, and insufficient data related to, how ICTs are actually being used in education, and the context for this use. While we aren't yet where we need to be, as a result of these publications we have, in many cases for the first time, information and data upon which related evidence-based decisions can eventually be built. We still have a long way to go in this regard, but thankfully we are a bit further along the path in many countries than we were even a few years ago.

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This is one in an occasional series of blog posts on efforts to survey technology use in education in different parts of the world.

You may also be interested in the following posts from the World Bank EduTech blog:

- Surveying ICT use in education in five Arab countries
- Surveying ICT use in education in Latin America
- Surveying ICT use in education in Europe
- Surveying ICT use in education in Central and West Asia
- Surveying ICT use in education in Brazil
- ICT and rural education in China
- One-to-one computing in Latin America & the Caribbean
- Surveying ICT Use in Education in India and South Asia

- Surveying Mobile Learning Around the World (part one)
- Surveying Mobile Learning Around the World (part two)

- Comparing ICT use in education across countries
- How to measure technology use in education
- Broadband for schools?
In addition, you may be interested in a collection of key documents from international surveys of ICT use in education and a short chapter in a Work Bank publication documenting results from the piloting of its SABER initiative in East Asia focusing on information and communication technologies [pdf] that served as a sort of precursor to this work from UNESCO.

Note: The image at the top of this blog post of students using computers at the Institute of Asian Studies in Vietnam ("we're not all uniform in our use of ICTs") comes from Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license. The second image shows a view of Whimoon High School in Gangnam-gu, Seoul ("education Gangnam style -- literally!"); it also comes from Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
In the course of my job at the World Bank helping ministries of education in middle and low income countries think about, analyze, plan for, implement and evaluate issues, ideas and projects at the intersection of the worlds of technology and education, I spend a fair amount of time considering issues related to the digital publishing of educational materials. The World Bank has over the years funded the purchase of lots of textbooks around the world and we maintain active dialogues with scores of education ministries, helping to provide related advice and technical assistance.

In many countries, especially poor ones where disposable income is very low and where there is not an established culture of leisure reading, the educational publishing industry is sometimes largely indistinguishable from the publishing industry as a whole, and government purchases of textbooks (and/or government directives about which textbooks families or schools should purchase, where such things are not centrally procured) have huge, often determining influence on the direction of the publishing industry in general. In order to better understand how all of this impacts educational publishing, I talk regularly with lots of 'traditional' educational publishers, big and small, both international and local. I also talk a lot with technology companies who do things that look a lot like educational publishing to me, or who provide the tools and services to enable and support related activities.

Last year I participated in two fascinating events a few weeks apart, the EdTech Industry Summit in San Francisco and a symposium convened by the International Publishers Association (IPA) at the London Book Fair. (I was lucky enough to be at the IPA symposium this year as well.) At these meetings, the agendas and items discussed were largely the same, but were often approached from quite different perspectives. For the sake of argument here -- and I admit I am greatly oversimplifying things by making this characterization -- EdTech Summit participants were mainly 'tech companies', while the London Book Fair event was mainly attended by 'traditional publishers'. (I concede that such distinctions are
increasingly difficult, and less useful, to make as time goes on; in my opinion all publishers are technology companies these days, whether they self-identify as such or not and/or whether outsiders see them that way.)

At both events, a data point that was quoted quite often was that '1% of national education budgets around the world are devoted to the purchasing of textbooks and other learning materials'. While I have never been able to find this assertion supported by hard data, I have heard it expressed so many times over the years by people who work in or around the educational publishing industry that I have taken it as almost 'conventional wisdom'. Whether this figure is actually .5% or 2% or 4% (or whatever), what has struck me when in conversation with many vendors is that many traditional publishers have, in the face of the steady rise in many countries around the world of large scale purchases of laptops and tablets for students and teachers, worried that technology purchases are eating into traditional budgets for the purchases of textbooks.

As one traditional publisher put it to me at the London event in 2013, "we need to figure out how to protect this 1% so that it is not tapped to buy iPads". Contrast this with a statement made to me by an enthusiastic founder of an edtech start-up in San Francisco, who said that the goal of firms like his was to "eventually capture 20% of education budgets" by transforming the way education is delivered as a result of the use of new technologies. Whether or not such figures are accurate, they for me exemplify a difference in perspective and ambition that is consistent with many stereotypical characterizations of brash young tech entrepreneurs in their hoodies (and/or khakis) versus the tweedy old-school booksellers whose business model that I have been told on many occasions -- especially by those not that business -- was one for "dinosaurs".

(While conceding that the business models for selling books will have to change rather radically going forward, a concession to which no educational publisher I know would object in the age of e-readers and hypertext, of apps and APIs, I am fairly confident that extinction rates for edtech startups will remain much greater than that of book publishers for the foreseeable future, although in the end I wouldn't be too surprised if the most successful 'tech' firms doing business in this space end up buying up a lot of the 'publishers' -- some of whom will themselves be buying and merging with 'tech' firms along the way.)

If we accept the premise that educational publishing industry in the 'developed' countries of Europe and North America are being, and will continue to be, increasingly radically disrupted -- a contention with which I expect few people would disagree -- what might this mean for business models for educational publishing in less developed, 'poor' countries? Will the related business models from OECD contexts simply, and eventually, be transplanted to middle and low income countries? Or: Might some new business models for digital educational publishing emerge from less developed countries, based on specific local contexts and consumer demands in an increasingly digital -- and mobile -- age?

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The American sports figure Casey Stengel once advised, "Never make predictions, especially about the future." (The Danish physicist Niels Bohr, among others, is meant to have offered similar advice.) Attempting to peer into a crystal ball is often a rather fun exercise; it is also something that more often than not ends in disappointment (except, perhaps, for those who later delight in how silly and presumptuous the predictor, and his prediction, appear in hindsight). Lots of very smart people regularly hypothesize about the 'future of publishing', and those of you who are interested in such things and who have stayed with this blog post this far hoping for some related insight may well be better served by clicking on that link than in hoping to learn anything from what is presented below.

That said, another American, the science fiction writer Neal Stephenson, has observed that "the future is already here, it's just not evenly distributed." It is from countries like the Philippines and Pakistan and (especially) Kenya, and not the highly developed countries of the OECD, that many of the usage and business models that are defining the new era of 'mobile money' are emerging, for example. Might analogous sorts of business models be introduced, and tested, in such places -- in countries and contexts that face many challenge resource constraints but where mobile phones are increasingly ubiquitous -- that might provide insights into possible futures for educational publishing as well? I have no idea, but there are some emerging activities and long-standing contexts in so-called less developed countries that might be worth considering for a moment or two.

Consider, for example, the way that traditional textbooks are (in some circumstances) distributed, sold, paid for and 'consumed' in local markets in some poor countries. Textbooks themselves may be scarce and/or too expensive in such places. People still buy and use them, of course, but in ways that are perhaps rather different than what one might find in, say, Brisbane or Bologna. Instead, an entrepreneur may buy a textbook and rip it into many small pieces (individual chapters, for example, or individual problem sets or answer keys). These small pieces are then photocopied, divided and sold on as as-needed basis to students, one chapter or problem set at a time, in small increments for small amounts of money. Such activities are most likely illegal, of course. I am not advocating that this sort of activity is good or desirable or recommended (although if we are talking about OER content, intellectual property issues may not be so acute). I am just pointing out something I have seen happen in practice in many countries.

So-called sachet purchasing, where people buy just what they need and can afford, in small amounts (but no more!), is an established phenomenon in much of the so-called developing world. A classic example of this is someone buying not a box of many bars of soap at a supermarket, but rather an individual bar (or even part of a bar) of soap from a small corner store or a person standing in a market space. One sees examples of sachet purchasing to a much lesser extent in markets today for learning materials than one sees in markets for, say, personal cleaning supplies, but the concept is the same.

Bars of soap (like physical textbooks) are of course physical goods that need to be bought in places where buyers and sellers are in close physical proximity to each
other. You can't (to the best of my knowledge) digitize soap. You can certainly
digitize books, though. Indeed, lots of people do this! Once digitized, breaking them
into smaller pieces is a trivial task. They can now be delivered in very small pieces
over mobile networks. One persistent criticism of the use of mobile phones in
learning that I hear is that 'you can't read a whole book on a mobile phone, the
screen is only so big'. While reasonable people can perhaps disagree on this point,
there is much less disagreement about the utility of using mobile phones to read
and digest small amounts of text.

Now, many long-time observers of pronouncements about the future of the digital
economy will say that this sort of thing isn't new. Indeed, business models built on
the delivery of 'micro-content' were all the rage back in the early days of the
Internet. They foundered for many reasons, including the fact that mechanisms for
micro-payment were not robust enough or in widespread use. In a place like Kenya,
however, a widely-used, robust mechanism for micro-payment is literally in the
palm of people's hands. It just so happens that this mechanism is a service --
'mobile money' -- that happens on a mobile phone, the very same device to which
micro-content in digital formats can be delivered and viewed.

Now, you could also argue that people are not willing to pay for digital educational
content, especially with so much content available on the Internet for free. This is
certainly true .... although this 'truth' may be in some cases contingent on who you
are, and where you are. One of the most interesting findings to emerge from
the Nokia Life Tools initiative, an SMS-based information platform designed for
emerging markets that grew popular in places like India and Indonesia, was that
there were many people in such places who were willing to pay for access to small
amounts of educational content. In Finland and Europe, no one will pay for
educational content, we were told by people who managed that project at an event
at the World Bank last year, they expect it to be available for free on the Internet.
But, based on our experience, there are people in poor countries who will pay
for digital educational content, in small amounts, if it is relevant to them and
available when they need it, presented in ways that are easy to understand and
digest.

As part of an online "Twitterchat" organized by the London Book Fair earlier this
year, I was asked about this particular business model in some low-
income markets, and how it fit with existing business models of major publishers in
established markets. I responded that I didn't think it did -- but that it is
nevertheless a business model being explored by some of the small start-ups that
are emerging to serve local educational needs in some low-income markets.
Modular pieces of 'textbooks' are just one example of micro-digital educational
content -- quizzes and test prep materials may especially lend themselves with
delivery over mobile networks in small chunks. This is potentially quite relevant in
places where there are very high stakes exams, where families may already
be paying for related tutoring services (or would pay for, if only there were any
nearby that they could access) and where these exams reward knowledge retention
and regurgitation (as is so often, rather unfortunately the case in many education
systems around the world) -- just the type of things that short digital quizzes and
flashcards are (for better and for worse) well-positioned to reinforce.

(If I was asked to point people to markets where these sorts of business models are most likely to develop, I would suggest that they may look at places like Kenya, where the M-Pesa mobile payment platform is well established, where mobile phones are in widespread use, which have high stakes exams, and where there are the beginnings of a mobile edtech start-up scene.)

Will this sort of thing work? I have no idea. Even if the answer to this question is "yes", there are many challenges to overcome. Even where mobile payment systems exist, they are usually tied to one specific mobile network operator. Where network operators decide to offer various value-added services over their networks themselves, digital edtech start-ups may find themselves in a very difficult operating environment. The network operator can offer to buy the start-up for a very small amount of money -- and if the start-up refuses this advance, there may be little to (e.g.) prevent the operator itself offering this service (an especially acute danger in places where intellectual property theft may be common), or from providing preferential treatment to a competing product or service. I have seen business plans in markets without robust mobile money systems in place where start-ups have proposed being paid in airtime as a sort or ersatz currency, but this can often run afoot of the terms of use of a mobile network operator. Even where this is technically permissible, I would imagine that few mobile edtech start-ups are equipped to 'bank' large amounts of airtime, nor that easy, affordable mechanisms exist to re-sell or cash out so that this banked airtime can be converted into real money.

That said, if we are looking to places where innovative practices in the delivery of digital educational content may emerge, it might be worth spending some time considering how, where and under what circumstances such innovations may emerge from 'the edge', in places where we might least expect. The potential emergence of sachet educational publishing in an increasingly digital -- and mobile -- world is just one example of this.

You may also be interested in the following posts from the World Bank EduTech blog:

- Educational technology and innovation at the edges
- A model for educational technology development from ... Afghanistan?
- Investing in digital teaching and learning resources: Ten recommendations for policymakers
- A few myths and misconceptions about digital teaching and learning materials in Africa
- Calculating the costs of digital textbook initiatives in Africa
- Textbooks of the future: Will you be buying a product ... or a service?
- Textbook policies in an increasingly digital age
- Worst practice in ICT use in education

Note: The image used at the top of this blog post of two piles of lavender sachets ("I'll take one packet of Pythagorean Theorem and one packet of verb conjugations, please") comes from Julie
Lyn via Flickr and Wikimedia Commons and is used according to the terms of its Creative Commons Attribution 2.0 Generic license.
Over the past five years, there has perhaps been no educational technology initiative that has been more celebrated around the world than the Khan Academy. Born of efforts by one man to provide tutoring help for his niece at a distance, in 2006 the Khan Academy became an NGO providing short video tutorials on YouTube for students. It is now a multi-million dollar non-profit enterprise, reaching over ten million students a month in both after-school and in-school settings around the world with a combination of offerings, including over 100,000 exercise problems, over 5,000 short videos on YouTube, and an online 'personalized learning dashboard'. Large scale efforts to translate Khan Academy into scores of languages are underway, with over 1000 learning items currently available in eleven languages (including French, Xhosa, Bangla, Turkish, Urdu, Portuguese, Arabic and Spanish). Founder Sal Khan's related TED video ("Let's use video to reinvent education") has been viewed over three million times, and the Khan Academy has been the leading example cited in support of a movement to 'flip the classroom', with video lectures viewed at home while teachers assist students doing their 'homework' in class.

As efforts to distribute low cost computing devices and connectivity to schools pick up steam in developing countries around the world, many ministries of education are systematically thinking about the large scale use of digital educational content for the first time. Given that many countries have already spent, are spending, or soon plan to spend large amounts of money on computer hardware, they are often less willing or able to consider large scale purchases of digital learning materials -- at least until they get a better handle on what works, what doesn't and what they really need. In some cases this phenomenon is consistent with one of the ten 'worst practices' in ICT use in education which have been previously discussed on the EduTech blog: "Think about educational content only after you have rolled out your hardware". Whether or not considerations of digital learning materials are happening 'too early' or 'too late', it is of course encouraging that they are now happening within many ministries of education.
As arguably the world’s highest profile digital educational content offering in the world -- and free at that! -- with materials in scores of languages, it is perhaps not surprising that many ministries of education are proposing to use Khan Academy content in their schools.

The promise and potential for using materials from Khan Academy (and other groups as well) is often pretty clear. Less is known about the actual practice of using digital educational content in schools in middle and low income countries in systematic ways.

_What do we know about how Khan Academy is actually being used in practice, and how might this knowledge be useful or relevant to educational policymakers in developing countries?_

Researchers at SRI recently published the first rigorous study looking at how Khan Academy content is being used in formal educational settings as part of math instruction in the United States. Although Khan Academy originally developed as a supplemental aid in individual tutoring outside of school, it is now, in the words of SRI, "also working closely with schools to explore ways of transforming how instruction can be organized, delivered, and experienced by both students and teachers." Some of the findings from the SRI study, which was supported by the Gates Foundation, may offer important insights into potential implementation models of relevance to middle and low income country contexts -- as well as highlight where things may be a little more complicated than they may first appear. Dr. Robert Murphy, who helped lead the research team at SRI International’s well-known Center for Technology in Learning that produced the [Research on the Use of Khan Academy in Schools](#) report, stopped by the World Bank earlier this week to share some related key lessons and observations.

For what it’s worth, here are five things I took away from Murphy’s presentation and the subsequent Q&A session, as well as my reading of the excellent SRI study (I'll note here that these are some of *my* takeaways; I hope I have not misrepresented anything that is said in the report itself, or by Bob during his excellent talk):

1. **What you set out to study may not always be (exactly) what you find in practice**

   The SRI researchers expected to find one dominant usage model (the 'flipped classroom') and that teachers would be using the Khan Academy videos as a core curriculum resource. SRI found that a wide variety of usage models were in evidence in practice (and suspect that even more may be out there). The Khan
Academy is perhaps the leading global example offered in support of ‘flipping the classroom’, the pedagogical movement which seeks to capitalize on better access to computers and connectivity at home so that students watch lectures as their ‘homework’ on their computers instead of listening to a teacher lecture at school, and then work through their problem sets at school with the help of teacher. However, at least in the schools studied by SRI, there were no examples of this actually happening in practice. While most people associate the Khan Academies with videos, in the formal school settings studied it turned out that the instructional videos were not watched all that much -- it was the problem sets that were most widely used by teachers to provide students with productive opportunities to practice new skills introduced through traditional teacher lectures.

2. What you set out to do may not always be that possible (and this isn't always such a bad thing)

Originally this research was conceived of as an evaluation of the impact of Khan Academy. However, the SRI research on Khan Academy evolved over time into more of an implementation than an impact study. In a way typical of many Silicon Valley start-ups, Khan Academy staff were eager to iterate their product quickly, based in part on preliminary feedback they received from a variety of sources, including from users and from the researchers at SRI, and so doing something like a randomized control trial (RCT), considered the 'gold standard' evaluation technique in some quarters, was simply not practical. How do you evaluate something that is constantly evolving, and improving? This was a challenge faced by the SRI research team.

3. Implementation studies, as opposed to evaluation studies, should be considered more often by those wishing to learn from educational technology initiatives

I really like that this SRI study is an implementation, not evaluation, study. Where you introduce something that is so new, 'evaluating' the 'impact' right away isn't always that practical, especially where (as in the case of Khan Academy) what was being used changed a lot during the course of the period being studied (in part as a result of what the researchers were finding). In my experience, technology folks don't operate on the same timeline as researchers hoping to publicizing results from RCTs in peer reviewed journals -- if they learn something, they'll iterate immediately and change their product or service so that things potentially improve *today*. They can't (and won't) wait around for a year or two to see what made an impact and then start to redesign their product. This is a reality that more than a few of the RCTs of educational technology projects that I know are being discussed may eventually confront, especially where the projects being evaluated include
products or services that sit in the cloud and which can therefore be modified almost immediately by the vendor/developer where/when they think things can be improved in some way. This is not to advocate against RCTs, or impact evaluation studies, of technology use in education, but rather to say that we need to be careful that they are appropriate for the context and needs of the places that are being studied. Where groups are looking to fund impact evaluation studies of technology use in education (of whatever sort), I often suggest that they may want to consider funding some sort of related implementation study as well. The impact evaluation may not actually tell us anything, but even if it does, it may (depending on how it is set up) may tell us about yesterday’s product or service and not offer that much value for decision making going forward. Implementation studies are almost always useful, though, in getting at the reality of use cases and user needs. Doing both of these sorts of things, where feasible, may be something to consider, even if it means scaling back the evaluation part a bit.

4. Even in an age of technology-enabled personalized learning, teachers still remain ‘in charge’

Not all students are ‘independent learners’. While much is made of the potential for technology use to enable student-directed, personalized learning, in practice most students will need a lot of assistance in helping to develop the tools and skills to become more independent learners. (As a former teacher myself, this is consistent with my experience in the classroom as well.) While it is assumed that most usage of Khan Academy today is by users independently viewing the content and using the problem sets and analytical tools at home, this was not how things worked when Khan Academy content was used in schools studied by SRI. This is not to say that teachers and students studied by SRI did not find value in the Khan Academy content -- they clearly did. Rather, the usage models observed by SRI suggests that, in some teacher-directed environments (which school classrooms today around the world clearly are, for better or for worse), the use of tools meant to enable ‘personalized learning’ might in practice be used to *help teachers* better adapt what it is that they teach. In the schools studied, teachers for the most part did not take great advantage of many of the (increasingly robust) analytical tools that are offered by Khan Academy to monitor and assess student performance. This might be because they didn't understand them. It might be that they didn't find them of value. Or it might be that they felt that they had other assessment tools at their disposal (regular quizzes, tests, personal interactions with students) that they were trusted and with which they were more comfortable. It may be that many teachers didn't have their students watch the Khan Academy videos because they thought that they were already doing a decent job with their lectures and demonstrations. What they needed was not a replacement for lectures, but rather a bank of problem sets (and ways to provide students with immediate feedback and
support on their work), and so that is how the Khan Academy was used.

5. No digital educational content repositories are 'comprehensive', no experience entirely immersive

For many people scrolling through the vast store of mathematics materials on the Khan Academy site, it might appear at first glance that most 'everything' is covered. Over the past few years, Khan Academy has greatly built out its offerings, filling in content gaps and reorganizing the way some of the materials are presented and sequenced. Critics may argue about the utility and relevance of U.S. Common Core standards (there is no shortage of places on the Internet where you can find discussions on that topic, so I'll politely refer folks who like to engage in such discussions to other sites where they can post and argue about such things), but the standards have been of undeniable use in helping Khan Academy map out areas where additional content needed to be developed. In none of the schools studied by SRI was Khan Academy content the only mathematics instructional materials available, however. One challenge for teachers, and for students, was to figure out where, when and how other materials might be utilized as compared with Khan Academy content (and vice versa). Even in low income schools in the United States, there is typically no shortage of educational content available. It may not always be all that great. It may not all be coherent, consistent or aligned. But a lot of it is available. Even where digital education content (from Khan Academy or elsewhere) is pretty comprehensive in its treatment of a given topic and is designed in a very modular format, students may have specific questions that are better answered outside of the digital environment. To me, one of the great attributes of the Khan Academy videos is that they are so easy to rewind. Didn't understand something the first time? Just watch it again (and again and again, if need be -- you aren't bothering anyone else). That said, SRI found that it may often be easier, and more productive, for students to simply ask a question of their peers or teachers than to try to locate and then rewind their way through a video to find the moment of instruction or demonstration that may address their confusion. That is to say: Even where digital education content offerings are quite comprehensive and useful, they are only one piece of a larger whole. (This conclusion is rather obvious, but from time to time it may perhaps be worth re-stating -- especially in response to groups who propose investing only in a single, comprehensive, all-encompassing digital learning tool as part of efforts to 'transform' teaching and learning.)

The SRI research study into the use of Khan Academy is quite rich in detail and contains a lot of valuable food for thought. I recommend you read it, not only for its insights into Khan Academy (which, given its widespread use and prominence, is perhaps reason alone to read the study), but also because it offers larger insights in how education technology products and services are used (and not used) in actual
practice. There is no shortage of hype and nonsense about a lot of the products and 'solutions' being marketed to education systems around the world. There is also a lot of really good and useful stuff going on. Reading and reflecting on this SRI study may help you as you try to tell the difference.

This is the first in a short series of blog posts looking at various insights emerging from the development and use of the Khan Academy as a way of exploring a number of related larger issues.

Note: The image used at the top of this blog post of a man demonstrating chemical properties in front of an audience ("this is fascinating, but wouldn't it be better online?") comes via Wikimedia Commons and is in the public domain.
In most countries around the world, a single institution is core to the implementation of national initiatives related to the use of new technologies ('ICTs') in education. Whether we are talking about large scale rollouts of things like tablets or laptops, or educational computing efforts of the more 'traditional' variety, a single organization often serves as a focal point for many related efforts to introduce, support, maintain direct, coordinate, fund, manage and/or evaluate national efforts to utilize information and communications technologies (ICTs) in innovative -- and, if we are honest with ourselves, perhaps not so innovative -- ways in schools.

A few years ago, the World Bank, in partnership with the government of Korea, convened a meeting in Seoul to bring together the heads of many of these sorts of organizations to share experiences about what has worked, what hasn't, what people wish they had done differently, and what new challenges might lie ahead.

It turns out that this topic was of very immediate relevance in a number of countries which were considering starting up a 'national ICT/education agency', for lack of a better term, but were searching about for useful models and lessons that might help them in their efforts. We'll publish some related analytical work later this year, including a set of ten cases studies documenting efforts in this regard around the world.

As we finalize this work, and in case it might be of relevance to anyone, we thought it might be useful share some of the varied answers we are finding to a question that many countries have asked themselves in the recent past, and which many more countries are considering right now:

*Why, and how, might a country decide to establish a single organization dedicated to the use of ICTs in education?*

It is worth noting up front that many countries don't do this, of course. Some simply assign tasks to a special department or division within the ministry of education (or, in some cases, the telecom regulator or ministry of communications,
IT or ICT). For others, related responsibilities are diffused throughout the education system as a result of a series strategic decisions (as in the highly decentralized circumstance of the United States) or as the result of inattention or an inability to make related decisions (as in the case of the Philippines). In some countries, there simply hasn't been a need (yet), as few substantial investments have been made related to the use of ICTs in education. That said, where dedicated agencies exist, they are typically born as a result of one or more of the following factors:

1. **A big investment in educational technologies is coming**
   Many national agencies were formed explicitly to help oversee and/or implement a large project in the education sector to help build out ICT infrastructure (connectivity, computer labs, laptop deployments) in schools. This is perhaps the ‘classic’ example of why an institution of this sort is created, from Korea to Thailand, from Malaysia to Armenia to Uruguay. In some cases, many investments may have been made already, but, as such investments grow in size, scope and complexity, value is seen in having a single institution with primary responsibility for such activities to serve as a mechanism for taking stock of what has occurred and to help better coordinate activities going forward. Indonesia’s PUSTEKKOM and England’s Becta are examples of this.

2. **A new policy has been developed -- or needs to be**
   It is not uncommon for the creation of an agency to be an important part of a country’s ICT/education policy – especially where such a policy outlines a vision or imperative for large investments in educational technologies. As groups involved with the implementation of large scale ICT/education initiatives grow in competence and importance over time, they may come to assume a key role in helping to formulate a new policy (as was the case with EdNA in Australia).

3. **Existing institutions are not well placed to assume different or new risks and/or to promote innovative practices and approaches**
   In many countries, ministries of education are considered to quite conservative, bureaucratic institutions, strongly invested in the status quo. As such, they can be seen as ill-equipped to introduce new innovations within the system quickly and efficiently – and across the world, technology use in education is almost always seen as something that is by its very nature to be ‘innovative’. While government ministries, and especially the ministry of education, may be seen to be (if not explicitly designed to be) risk-averse, new institutions set up to help guide the roll out of new technologies in the sector can be explicitly conceived in order to take on such risk (as was the case with Plan Ceibal in Uruguay), as can new programs within existing institutions outside government (like what occurred with the creation of Schoolnet Thailand within NECTEC). These can be especially true, or important, related to the potential use of so-called **public-private partnerships** to help enable and guide a country’s ICT/education-related investments and activities (the Jordan Education Initiative has been a prominent example in this regard). Existing procurement guidelines can complicate attempts for the government to learn from what is happening in the market, and to communicate with companies active in this area. An agency can help coordinate and direct activities of vendors and private
groups at an arm’s length from the formal activities of government in ways that may not be possible, or appropriate, were the government itself to attempt to perform such a coordination function – one of the many ways, for example, that KERIS is useful to the Ministry of Education in Korea.

Related to this:

4. The necessary technical and business skills don’t exist within existing organizations (especially within government)
In many places, a number of the technical and business skills required by an ICT/education agency are not commonly found within existing government ministries. For a variety of reasons, it is thought that attracting people with such skills to work in government may be quite difficult. At a basic level, they may command higher salaries, and disrupt existing pay scales. Issues of ‘cultural fit’ can also arise. In addition, there may be caps on the hiring of civil servants that prevent the hiring of additional staff, even where the salary needs of technical staff can be accommodated. NaCET in Armenia, which initially included staff from other organizations with strong technical skills and ICT-related competencies, is one of many examples in this regard; KERIS in Korea is another.

5. A desire exists to ensure continuity over time
Large scale investments in technology use in education often serve very clear political purposes. Indeed, the unveiling of shiny new computer labs in schools, or the handing over of the latest laptops to students, can serve as strategic photo opportunities for politicians wishing to demonstrate that they both care about young people and are actively investing in their future. Is there a more potent symbol of the future, and of the fact that a politician is forward-looking, than investing in computers for schools? While the parties and individual politicians in power may come and go, investments in ICTs in education are typically seen to be long-term, and so assigning key related responsibilities to a dedicated organization that is not officially part of a government ministry (although it may well be linked to one or more ministries, closely or loosely) can be one way to ensure that such investments can be made and sustained over time. When a new party comes to power, it can then call on existing expertise and experience, and not have to start over from scratch. The Omar Dengo Foundation in Costa Rica is a good example of how an institution has served for a focal point for activity related to ICT use in education during periods of governmental change and transition.

6. There is a need for a focal point of, or hub for, activity related to ICT use in education
Where a lot of activity related to ICT use in education has already been underway for some time as a result of the activities of many different groups, both inside and outside of government, a dedicated agency can serve as a mechanism to help better coordinate the activities of these groups. In such cases, the agency can assume certain important roles to convene multiple actors, to amplify the individual voices of such groups when speaking with government, and to channel messages from government to stakeholder groups more efficiently. The Smart School program in Malaysia, Plan Ceibal in Uruguay and Becta in England are prominent
international examples of how an institution – or an organization within a larger institution – can play this role.

7. A country wishes to share its national experiences and expertise related to technology use in education with countries and institutions abroad -- and to learn from similar organizations as well

A national ICT/education agency can serve as an important mechanism to showcase what a country has accomplished. By sponsoring research and outreach activities, an agency can be an important tool for a government to burnish its global ‘brand’ as an innovator in the use of technology and education, and to help guide a country’s overseas development assistance in related areas. Plan Ceibal in Uruguay, for example, has served not only as the mechanism to provide free laptops to students in government schools, but has also organized workshops, conferences and study tours as a way to expose policymakers and practitioners in other countries to the innovative practices and programs that are being explored and implemented in that small South American country. The global symposium on ICT use in education, which KERIS hosts every year on behalf of the Korean Ministry of Education, in partnership with the World Bank, is another notable example of how a national ICT/education agency can play this role.

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Are there other answers to this question that we are missing? If so, please do let us know.

We'll share some works-in-progress from our upcoming publication on 'national ICT/education agencies' during the coming months.

Note: The image used at the top of this blog post of a rather chaotic traffic scene in Dhaka, Bangladesh ("OK, you go this way, we'll go that way ... no, wait a minute, that isn't working ... maybe we need some formal organization here ...") was originally uploaded to Flickr by~Pyb and comes via Wikimedia Commons. It is used according to the terms of its Creative Commons Attribution 2.0 Generic license.
The Development and Evolution of National Educational Technology Agencies Over Time
by Michael Trucano & Gavin Dykes
#19: originally published on Friday, 20 June 2014

As part of our work advising such groups over the years, we have observed that national ICT/education agencies -- the organizations found in many countries which serve as the focal groups coordinating large scale efforts to introduce, use and support new technologies in schools -- pass through a general ‘life-cycle’ over the course of their existence, with five semi-distinct stages of development.

Each stage may bring with it a new set of functional responsibilities and mandates, different staffing (including leadership) and budgeting requirements, and entail varied levels of oversight and relationships with other groups, causing organizational structures to adapt, and be adapted, over time.

This life-cycle hypothesis has been proposed as a simple tool to help people who play critical roles in the planning for large scale national educational technology initiatives to develop an understanding of how their organizations may compare with other organizations doing similar sorts of things in other parts of the world, and how they might expect that their organizations may evolve and change over time. Such an evolution can potentially have a profound impact on a variety of key decisions that policymakers may have to make related to funding, staffing, functions and coordination with a variety of key stakeholder groups over time. There is no right or wrong answer as to whether it is 'good' or 'bad' that a particular organization finds itself at one of these five identified stages. There also appears to be no hard and fast rule about how long individual institutions may stay at a particular stage in the life cycle. Some organizations may move quickly from one stage to another, others may stay in a particular stage for many years, even (potentially) decades. Most organizations observed around the world, especially those in middle and low income countries, find themselves today somewhere between the stages of 'childhood' and 'adolescence', with a heavy focus on the technology itself (buying it, rolling it out, supporting and maintaining it) and less of a focus on trying to integrate the technology into standard or transformed teaching and learning practices. While it is worth noting that this technology focus is not necessarily bad (or good) -- judgments of this sort are presumably more useful when made relative to certain specific contexts, and not in the abstract -- it is usually true that this focus is a direct consequence of the views of policy makers about how technology can and should be used in education.
Stage 1. Starting (‘birth’)
When initially conceived, ICT/education agencies often have a narrow set of responsibilities, typically related to the roll-out of computers and/or Internet connectivity to schools. Alternatively, they may be set up to perform a specific function (e.g. research, overseeing pilot activities) for which an existing (typically governmental) structure is poorly positioned.

Some related key considerations for policy makers to consider during the first stage of life of a national ICT/education agency may include:

- What sort of key enabling legislation or policy may need to be enacted to give a national ICT/education agency its mandate – and to communicate this mandate with a larger community of stakeholder organizations active in the sector?
- How should such an organization be funded – and staffed?
- Why isn't this being done within an existing institution – is it, for example, to be able to take greater risks, have greater freedom of action, enable connections to key stakeholder groups, access different funding sources, or is this more a matter of bureaucratic convenience?

Stage 2. Expanding (‘childhood’)
As an agency gets better at its work, and as its activities roll out at greater scale, it may increase both its budget and staff. It still does what it did before – it just does more of it.

Some related key considerations for policy makers to consider during this third stage of life of a national ICT/education agency may include:

- How can the processes and procedures introduced during the early activities of the agency be formalized, so that the institution can become increasingly cost-effective and impactful as it grows?
How can an agency find – and retain – key personnel once the start-up phase of the institution has largely ended?

Stage 3. Evolving (‘adolescence’)
Over time, an ICT/education agency often assumes additional responsibilities beyond its original mandate. This occurs because its ‘success’ in achieving its original mandate naturally surfaces new needs (e.g. once all schools have computers, some group needs to make sure that there is educational content to run on them), because new opportunities arise and/or because existing responsibilities are absorbed into formal government programs and structures and, as a functioning existing institution, it is considered well placed to pursue other objectives.

Some related key considerations for policy makers to consider during this third stage of life of a national ICT/education agency may include:
- As an agency enters a new phase of its life, might new leadership be necessary to help direct its evolution?
- If an organization is outside of government, does it make sense to bring many of its key responsibilities and functions within government, now that an initial period of trial and error has largely ended? Conversely: If a program is housed within government, does it make sense that it be ‘spun out’ to another institution – or to be constituted as its own separate institution?
- If initial special funding sources and mechanisms have run out, how should such an agency be funded going forward?

Stage 4. Sustaining (‘adulthood’ and ‘middle age’)
Where an ICT/education agency becomes ‘embedded’ into the system and is seen as ‘core’ to the delivery of certain essential activities or services over time, with a (reasonably) secure medium- to long-term budget horizon, much of its activities and processes can become more bureaucratized and serve largely to sustain existing programs. Given the pace of technological change, it will continue to assume new responsibilities and mandates, but its structure and defining characteristics remain largely un-changed. KERIS in Korea is a very prominent example of an institution that is seen to have ‘grown up’ in this way; the Omar Dengo Foundation in Costa Rica is another.

Some related key considerations for policy makers to consider during this fourth stage of life of a national ICT/education agency may include:
- How can a national ICT/education agency remain a locus for innovation and experimentation, given that it is responsibility for a rather set of on-going, legacy activities?
- How can a national ICT/education agency develop deeper links with key stakeholder groups – and incubate new initiatives and processes that might one day be spun-out as separate programs or organizations on their own?
- To what extent can – or should – a national ICT/education agency play a more proactive role in helping to inform and influence policy decisions related to ICT use in education across the country?
Stage 5. Ending ('retirement')
Where the goals of an ICT/education agency have been thought to have been met, and/or where other organizations are thought to be able to more effectively and efficiently absorb an agency’s responsibilities, it may be disbanded or shut down. Becta in the UK and EdNA in Australia are perhaps the two best known global examples of this occurring. Whether this is the result of a conscious process (‘mission accomplished’), the ‘failure’ of an agency to accomplish its mandate, or simply changing circumstances, the end result is the same.

Some related key considerations for policy makers to consider may include:

- What are the agency’s key assets, and how can they live on past the closing of a national ICT/education agency?
- What institutions can assume the key roles previously performed by a national ICT/education agency that are still deemed important to ensure that similar (or better) levels of impact are achieved?
- What are the key messages that the government wishes to convey related to the closing of the agency?

This is one in an occasional series of posts excerpting draft analytical work related to national ICT/education agencies that will be published by the World Bank later this year. Please do let us know where we are missing something important -- or where we may have gotten something wrong! The chart that is used to illustrate the life cycle of national ICT/education agencies is decidedly a work-in-progress. While we think it is a potentially useful visual aid, we are not yet convinced that it helps tell the type of story that may be most useful to policymakers. Any related feedback you might have would be well heard on our end.

Note: The image used at the top of this blog post of a vintage bicycle from 1869 housed in the Département des Cycles au Musée d’Art et d’Industrie de Saint-Étienne ("a different sort of life cycle") comes from Wikipedian Hélène Rival via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license.
Promising uses of technology in education in poor, rural and isolated communities around the world
by Michael Trucano
#20: originally published on Tuesday, 22 July 2014

One persistent challenge for educational policymakers and planners related to the potential use of informational and communication technologies (ICTs) in remote, low income communities around the world is that most products, services, usage models, expertise, and research related to ICT use in education come from high-income contexts and environments.

One consequence is that technology-enabled 'solutions' are imported and 'made to fit' into what are often much more challenging environments. When they don't work, or where they are too expensive to be replicated at any scale, this is taken as 'evidence' that ICT use in education in such places is irrelevant -- and possibly irresponsible.

That said, lessons are being learned as a result of emerging practices, both good and bad, in the use of ICTs in education in low resource, poor, rural and isolated communities in Africa, Asia, Latin America and the Pacific that may be useful to help guide the planning and implementation of educational technology initiatives in such environments. (It may even turn out that the technological innovations that emerge from such places many have a wider relevance .... but that is a topic for another discussion.)

Products like the BRCK (a connectivity device designed and prototyped in Nairobi, Kenya by many of the people behind Ushahidi to better address user needs in places where electricity and internet connections are, for lack of a better word, ‘problematic’) and MobiStation (a solar-powered 'classroom in a suitcase' which features a projector and lots of off-line educational content developed by UNICEF Uganda) remain notable exceptions to the lamentable reality that, for the most part, ‘solutions’ touted for use in schools in e.g. rural Africa, or in isolated communities in the Andes, are designed elsewhere, with little understanding of the practical day-to-day realities and contexts in which such technologies are to be used. Many people who have lived and worked in such environments are quite familiar with well-meaning but comparatively high cost efforts often informed more by the marketing imperatives embedded in many corporate social responsibility efforts than by notions of cost-effectiveness and sustainability over time or the results of user-centered design exercises.
Some principles or approaches to consider when planning to introduce ICTs into remote, low-income educational environments might include:

1. The best technology is the one you already have, know how to use, and can afford (in most cases, this is increasingly the mobile phone)
2. Start down and out, and then move up and in (if you want to eventually work in difficult places at scale, *start* working there first, don't just go where things are most likely to work)
3. Treat teachers like the problem ... and they will be
4. It’s the content, not the container (don’t focus on devices, but rather on what actions these devices enable – and make sure not to be diverted by various related myths and misconceptions)
5. If you are pointed in the wrong direction, technology may help you get there more quickly
6. Anticipate, and mitigate, Matthew Effects (people who are already privileged in many ways are more likely to benefit first, and most, from new technologies)
7. To succeed in doing something difficult, you may first need to fail (and learn from this failure)
8. Put sustainability first
9. We know a lot about worst practices -- we should make sure we don’t repeat them
10. ____ (there are many more such principles to consider, of course, so #10 is left blank as an acknowledgement of this fact – and that we still have much to learn)

While many groups have been and are engaged in efforts to invent, identify and/or develop the ideal educational technology device for developing countries (the tablet currently seems to be a particularly popular form factor, supplanting the laptop in the popular consciousness), and as challenging as the development of new technology devices can be, the greater challenge in education is almost always on the ‘human’ side. Education, and the educational or learning process, is after all a human endeavor, and it is on the ‘messy human stuff’ (as one very smart technology guy in Silicon Valley once put it to me; to adopt his language, I think he was confusing a bug with a feature) that many efforts fail.

The ‘digital divide’, which was once primarily thought of in terms of access to technology, and increasingly as a function of access to reliable power (indeed, the digital divide in much of the world closely aligns with the ‘electricity divide’), is now understood as well to be about the skills and abilities of people to benefit from access to technology (the so-called ‘second digital divide’).

The World Bank’s EduTech blog exists in part to help investigate and document emerging applications of educational technologies in middle and low income
countries, and to share these with audiences who, for whatever reason, may not otherwise come across them in the course of their daily lives but who might nonetheless find them interesting or relevant to their own circumstances in some way. Some related practices and initiatives which are notable in various ways include:

**Using ‘old’ technologies (like radio and television) in new ways**
While most of the attention, and pretty much all of the hype, around the use of technologies in education focuses on the latest shiny gadgets, in many places ‘old’ technologies like radio and television are still in widespread use – although often with slight twists. Under Interactive Radio Instruction, radio broadcasts are used to prompt specific actions by teachers and students in the classroom. The use of Interactive Educational Television in places like the Amazon helps remote schools with situations where you have many students but no teachers. Same Language Subtitling of Bollywood movies help promote the acquisition of reading skills to millions of ‘low literate’ people in India.

**Sharing one device with lots of people**
While much press attention is paid to projects that promise things like ‘one educational tablet for every student’, it is not only in the case of communal technologies like radio and television where the benefits of using one device can reach many learners at once. As part of some projects, classrooms of up to 50 students can each ‘operate’ a single computer independently, as long as they each have their own mouse. Such efforts are enabled where technologies are available to help transform simple projectors into low-cost versions of digital whiteboards. The Hole in the Wall project in India demonstrates how placing shared computing facilities outdoors in slum communities can bring about lots of interesting benefits to children outside of formal schooling.

**Caching on-line content for offline use**
In places where Internet connectivity is sporadic, unreliable or intermittent, innovative approaches to caching and distributing digital content can enable off-line access to vast numbers of online resources in ways that can simulate on-line environments. The emergence of low cost e-readers is enabling groups to distribute vast amount of books in digital formats to students who read them on small, purpose-built reading devices.

**Promoting literacy and learning, and supporting teachers, with mobile phones**
In remote communities where teachers may face daunting challenges related to isolation of peers and a lack of resources (including textbooks and other teaching materials), mobile phones are helping support teachers in small but meaningful ways by providing access to education content (as in Tanzania) and regular prompts and tips on how to utilize this content (as in Papua New Guinea). In Pakistan, students are sent short quizzes via SMS to their mobile phones to help them (and their families) gauge how well they are understanding topics being discussed in class.
**Using low cost video to support peer learning and support**

The increased availability of very low cost video cameras (including those in mobile phones) can provide opportunities for reflection and peer support for teachers who may have received little (if any) training on pedagogical approaches to delivering their curricula. In Indonesia, for example, teachers take short videos of their peers and then jointly review and discuss pedagogical approaches and particularly difficult topics to teach in informal, low stakes ways as part of their professional development.

**Developing content and tools locally**

In places where learners do not speak one of the major international languages for which lots of educational content already exist in digital formats, the capacity to produce such content locally -- in local languages, in line with local curricula -- is often constrained by the fact that there simply is not sufficient indigenous know-how to create and distribute educational content easily in digital formats. Efforts in Afghanistan show that there are approaches that can work in such environments, especially where they utilize the technologies with which people are already familiar (e.g. low end mobile phones) in ways that simple to use and very user-friendly.

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These sorts of practices and projects are just the tip of the iceberg, of course. In and of themselves, certainly none of them provides a silver bullet solution to address all the challenges confronting educators and learners in remote, low income, low resource communities. That said, and as the short list above hopefully suggests, there are a lot of encouraging developments around the world – sometimes (depending on one’s perspective) pioneered by the most unlikely people doing the most unlikely things in the most unlikely places (although quite a few of them, it should be said, are seeking to do things with a very likely device: the mobile phone).

While monitoring and sharing what people are doing can be quite useful, such basic information is even more valuable when its accompanied by efforts to evaluate what results such efforts are (or purport to be) having. While the people and groups pioneering educational technology initiatives targeting populations and communities all over the world have until recently had to rely as much on instinct and 'learning by doing’ than on an established knowledgebase informed by rigorously collected evidence, impact evaluations from Latin America to Africa to Asia are slowly emerging to help lessen the characterization that many efforts are, if we are honest about it, largely faith-based initiatives. (Along the way, researchers, policymakers and practitioners are asking some important questions about the practical relevance of such impact studies for those who make related decisions, and for those who carry them out, beyond the narrow, sometimes rather insular academic audiences who publish in and read the scholarly journals).

We clearly do not have all the answers about how to do this stuff. But hopefully we are at least getting better at asking the right questions.
*Note:* The image used at the top of this blog post of people and things being parachuted in from other places ("don’t worry: your solution (salvation?) has finally arrived!") comes via [Wikimedia Commons](https://commons.wikimedia.org) and is in the public domain.
I get contacted from time to time by 'new' philanthropists looking to do something positive and productive with their wealth. Usually this is someone who has made a lot of money in the technology industry and who is now starting her or his own family foundation.

Chronologically speaking, many of these people are closer to what one would consider the age at which someone starts a career than the age at which one 'retires'. In other words: They are often rather young.

Based on my (admittedly limited) experience, many of these sorts of folks are often firm believers in the value of education (even if they themselves dropped out of formal schooling early to focus on writing code), in the transformative potential of technology (something which has profoundly and positively impacted their lives personally, offering them opportunities and riches they could never have dreamed of) and in the desire to do something globally (the person may be an immigrant her/himself, be married to an immigrant, have worked with lots of people from different countries or cultures, and/or just have done a lot of international travel).

Last year, for example, I was contacted by someone (writing on behalf of someone else) who wished to (I am slightly paraphrasing here) "explore innovative ways that technology can be harnessed to help overcome longstanding challenges in education around the world". (As for how such folks find me, they usually say: I stumbled across the EduTech blog.)

Given that I have been approached a number of times in a similar sort of way quite recently, and that I serve on a number of externally advisory boards where this sort of thing is discussed, I thought I’d share this scenario here, as well as little bit about some of the things I sometimes say in response, in case it might be of interest to anyone else:

*Let’s say I had the equivalent of a few million U.S. dollars available to do something innovative at the intersection of education and technology somewhere in the 'developing world'.*
If it works out, a lot more money could potentially be used to support activities further, and more systematically, over a longer period of time.

If it doesn't work out -- well, that would not be great, of course, but I am willing to take some risks.

I want to be innovative, and would really like to do something that no one else is doing.

What should my new foundation do, and how should we do it?

I must confess that, whenever I am asked these sorts of questions, I find it to be a rather exciting, and perhaps even a little terrifying, scenario. (Often times such adjectives are not mutually exclusive!) When presented with a blank canvas of this sort, where and how does one start to paint?

Before jumping right into specifics (or, more often, during occasional lulls in conversations that typically drill down quickly into quite technical discussions of specific examples, educational challenges and technologies which are discussed regularly on the EduTech blog), I often try to offer a few general observations. These may or may not always be relevant to the new philanthropist, but I figure, why not use the opportunity to fling a number of things at the wall and see what sticks? For what it's worth, here are a few of them:

1. It's useful to know the 'established players' -- but one of your strengths is that you are not 'established'

At a place like the World Bank (and other UN agencies and international development institutions), we can do certain things in certain ways -- but there are certain things we are decidedly not well suited to do (even if, it must be said, at times we do actually try to do them). Alleviating and eventually ending extreme poverty and promoting shared prosperity are the twin goals of the World Bank, and we largely pursue them through traditional, established means, working with national governments around the world, and increasingly with many other partners from civil society and (often via the IFC) with the corporate sector as well. Knowing about how institutions such as mine work (and don't work) can be useful, as we might eventually be part of the means by which whatever you support can be replicated and 'scaled' beyond what your philanthropic monies, as substantial as they may be, can fund. We could also, potentially, be a strategic partner in whatever it is you are seeking to do. We have a lot of deep technical expertise and experience within our institution that you might be able to tap into as you go about doing whatever you eventually plan to do. We might be able to help connect you to people, to organizations, to places, and to challenges that you may not already know.

Even where we don't have concrete answers about how to pursue a specific objective, we can probably share with you lots of hard won lessons about approaches that have been tried in the past and have failed -- sometimes
miserably, and expensively. (It might also be worth looking at some of the things we do, and how we do them, if you think we ourselves are part of the problem!)

2. Do something different, something that no one else is doing. Be different.
In starting your new foundation or NGO, you are unconstrained by institutional legacies, bureaucratic processes and mindsets and political constraints. Many 'traditional' institutions are inhibited by inertial forces of various kinds. Your power and ability to do something isn't only a function of how much money you have, but also (potentially) to the freedom you have to disrupt the status quo -- hopefully, in ways that are useful and beneficial ('disruption' in and of itself is not a virtue).

3. If you are really willing to 'be innovative' and treat some of your funds as 'risk capital', make sure you put into place processes that allow you to take on risk.
It is great that you are willing to take some risks. If you have a board, make sure you build it with people who are also interested in taking some risks. Be prepared to 'fail' -- and to learn from this failure. It is important to take some time to try to learn from the failures of others as well. Of course, just because something was tried before and didn't work doesn't mean it isn't worth trying again. Maybe the time wasn't right, or the approach was wrong, or the implementation was poor. That said, it is also possible that things failed for very simple and understandable reasons, and that, no matter how talented or brilliant you think you are or how much money you have, if you try to do something similar you'll fail as well. Whatever the case, it may be worth considering some of Neal Stephenson's thoughts on 'Innovation Starvation':

"Today's belief in ineluctable certainty is the true innovation-killer of our age. In this environment, the best an audacious manager can do is to develop small improvements to existing systems -- climbing the hill, as it were, toward a local maximum, trimming fat, eking out the occasional tiny innovation—like city planners painting bicycle lanes on the streets as a gesture toward solving our energy problems. Any strategy that involves crossing a valley—accepting short-term losses to reach a higher hill in the distance -- will soon be brought to a halt by the demands of a system that celebrates short-term gains and tolerates stagnation, but condemns anything else as failure. In short, a world where big stuff can never get done."

4. There is no substitute for seeing for yourself.
If you live in wealthy locales like Hunt's Point (Atherton or Knightsbridge, Rosedale or Gangnam) and have worked most of your professional life in technology or financial centers like Mountain View (Redmond or Waterloo, The City or Seoul), you might want to spend some time meeting some of the people in 'developing countries' you intend to 'help' and in learning about the environments in which they live. Even if you believe in an increasingly hyper-connected world where technology is meant to make geography 'obsolete', there is still no substitute for hands-on experience and talking with people face-to-face.
(If, after traveling to 'foreign places' around the world you decide to support causes and efforts closer to home, that's great too. That said, I recognize that, like a good portion of people in places like Silicon Valley, you may have originally grown up somewhere else.)

You may wish to make some small initial grants to worthy organizations active in areas and places that you think may be worth supporting as a way to learn about specific circumstances and challenges. Consider this as a way to educate yourself, and to meet people and organizations you can trust, before you make some substantial commitments. Before you start doing something radically unconventional, you may wish to do a few conventional things as a way to 'get your feet wet'.

5. If it turns out in the end that you aren't looking to do something totally different, there are plenty of places and ways to channel your money to worthy ends.
There are lots of interesting, passionate people doing useful things with new technologies in education in poor communities around the world -- including people who come from and live in such places themselves. It may be more impactful (and cheaper) just to identify and support such people directly than to set up your own organization to try to replicate what such folks are already doing. (This is perhaps easier said than done, of course, but who said this stuff would be easy?)

6. Do you really have a blank canvas on which to paint? I suspect there are already a number of light tracings that might be worth using as rough guides.
You say you are willing to consider 'anything'. Is this really true? Do you have a belief in public education and traditional education institutions, or do you reflexively mistrust them and want to bypass them entirely? Do you have specific geographic interests? (‘India’, for example, is good ... but it is after all a rather big place.) Do you have particular interests in helping children or students or teachers or mothers or girls, or is it in promoting certain concepts, ideas or philosophies (literacy, openness and/or transparency, creativity and 'making', entrepreneurship, etc.)? Belief and commitment will be as important to your philanthropic endeavors as your money if you truly want to make a positive impact with whatever it is you end up doing.

7. If you try to do something that is linked in some way to how you made your money or to your current business interests, your intentions (no matter how noble) may be considered suspect.
Just because you want to help other people and give away some of your wealth, not everyone will immediately welcome all of your actions. In fact, some people may be immediately and instinctively suspicious, for a variety of reasons. You may not agree with such people, but you should be aware that perceptions can be as important as reality, and can have very real consequences for the initiatives and causes you support. (Of course, if you are seeking to further your business
interests through your philanthropic efforts, that is your right -- but don't expect everyone to line up to congratulate you on your 'charitable' efforts!)

8. Please keep in touch and let me know how you're doing, and what you're learning along the way.
I'd be happy to share some of what you learn with others. Good luck!

In sharing these perspectives here, I don't pretend that I have many singular insights or much novel advice. I'd be most happy to hear how others might respond to this sort of challenge -- and/or where I might be getting things wrong – so that I can offer better advice when I get inquiries of this sort. For those of you in the Northern Hemisphere: Enjoy the rest of your summer!

Note: The image at the top of the page of Croesus, the wealthy King of ancient Lydia ("I have some important decisions in front of me") comes from a painting by the French Baroque artist Claude Vignon via Wikimedia Commons and is in the public domain.
The World Bank's EduTech blog explores issues related to the use of information and communication technologies (computers, laptops, tablets, the Internet, ...) to benefit education in middle and low income countries around the world. While I tend to view, with a fair degree of skepticism, many of the statistics which purport to document just how many people have visited a particular web site, it seems that the EduTech blog was recently visited by its one millionth reader. When viewing the mass of blog posts in their entirety, together with our visitor logs and other relevant data, it is quite clear that BY FAR the single most popular post remains one I did over four years ago on 'worst practice in ICT use in education'. What was relevant back in 2010 appears still to be quite relevant today.

(This isn't always the case: If memory serves, I quickly drafted and published that particular blog post because I was having trouble completing one 'Exploring the Use of Second Life in Education' -- I'm guessing that the half-life for *that* one, had it even been finalized and published, would have been pretty short!)

Recent news articles -- whether reporting that the one tablet per child project in Thailand 'has been scrapped' or the decision of the school district in Hoboken, New Jersey (USA) to 'throw away all its laptops' -- suggest that debris continues to pile up on the landscape of 'failed' attempts to use new technologies effectively in education in various ways. The Franco-Czech writer Milan Kundera has a short story called "Let the Old Dead Make Room for the Young Dead". Sometimes I feel like this title could be adapted for use in an introductory essay to a book documenting many of the unfortunate 'educational technology deployments' that have been irresistible fodder for politicians and headline writers alike (and clickbait for folks on Twitter) over the past decade.

And yet .... just because we continue to hear variations on a sadly familiar theme, I don't know that the best response is to admit defeat, throw up our hands, throw
everything away and go back to the 'good old days'. Learners would not be terribly
well served if educational planners in 2014 simply decided to emulate the impulses
and actions of Silesian weavers back in 1844 and smash all the machines in
reaction to the spread of new technologies. Attempting to stuff this particular genie
back in the bottle isn't only impractical: I would hazard a guess that it is well-nigh
impossible.

The recent article on the Hoboken experience labels it a 'failed experiment'.
Personally, I am not sure that this label fits in this particular case. In an
experiment, it seems to me that you are usually trying to learn something. This
rather large purchase of technology seems to me like yet another solution in search
of a problem that no one bothered to actually tried to define in any meaningful way.
I suspect that, at a fundamental level, the problem wasn't (really) with the
technology. In other words: It seems more like human failure to me.

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Side note: As a sort of experiment itself -- or maybe this is better
characterized as 'part experiment, part prank' -- I used to circulate an excerpt
from Wilbur Shramm's classic Bold Experiment: The Story of Educational
Technology in American Samoa, which examined lessons from a project that
began in the mid-1960s, but I would replace certain key words (the place, the
particular technology, the project name) with those of a high profile 'edtech
project du jour' somewhere in the world and share it with colleagues and see
if they suspected any foul play. I once actually, and rather embarrassingly,
fooled myself with this, as I almost forwarded on one of these doctored
excerpts to someone, thinking that it was actually a resource document about
a particular project under discussion.

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I was recently asked to adapt/update the EduTech list of worst practices in ICT
use in education so that it would be 'relevant for the new age of mobile learning'.
For those not familiar with the term, or who are confused by it, 'mobile
learning' usually refers to the use of small(er), hand(s)held technology devices that
learners can take with them -- think mobile phones, for example, or small tablets.
To be honest, I suspect the person making this request hadn't really fully
internalized lessons from that earlier list of worst practices, which were meant to
reflect many things that had been learned from educational technology initiatives of
all sorts. With that said, however, and in the spirit of giving people what they want,
here is a list of 'bad' practices in mobile learning, based on my familiarity with
many projects which fit into this category that have emerged in the past few years.

In the interest of trying to keep things new and fresh, I have tried to avoid simply
re-casting the more general list of worst practices related to technology use in
education (all of which I would maintain are still valid, as well as many of
the insightful examples and perspectives offered in the comments section to the
original blog post) with a small 'mobile twist'. Given the paucity of reliable data about actual mobile learning practices in middle and low income countries, to say nothing of evidence of impact, this list is a sort of first draft based on observing lots of people and groups doing, and trying to do, things in this area; talking with people who have advised, supported, criticized, evaluated or funded them; and with learners and teachers who have benefited from (or suffered as a result of using) related products and services.

I concede that what doesn't work today, and so might constitute a 'bad practice' now, might not be so in the future. (The Apple Newton flopped in its time, the iPad has been a runaway success since it was released.) Acknowledging the tentative or draft nature of this list, I have labelled these 'bad', not 'worst', practices. As with the previous list of 'worst practices', the criteria for inclusion in this somewhat idiosyncratic, non-comprehensive list aimed at educational policymakers and planners were that these practices have been observed in multiple initiatives and in multiple places, and seem to repeat over time with only slight variations. Specific names and places have been omitted (feel free to add them in yourself).

In no particular order, then, and with specific reference to common realities in middle and low income countries, here are some:

**Bad practices in mobile learning**

1. **Simply port over content or applications already developed for PCs**
   The impulse behind this common course of action is quite understandable. "We have already paid a lot to develop this stuff, and we think what we already have is pretty good." Just because something is understandable doesn't mean it is advisable, however. One still hears similar sentiments from certain educational publishers who consider the fact that they have made their materials available as PDFs means that their content has now been (magically?) transformed into 'digital textbooks', but the results of such 'porting' are usually quite underwhelming. This is not to recommend that all previous content simply be discarded or ignored. However, a mobile first approach to developing mobile learning products and services which approaches design and development afresh and aims to capitalize on the particular affordances offered by mobile devices may yield better results.

2. **Introduce a totally new device to facilitate ‘mobile learning’**
   The allure of a new educational technology device is hard to ignore. That said, history has shown that purpose-built educational technology devices designed for specific educational purposes often fail to gain traction and find users -- and they can be very difficult to build! (There are exceptions to this, of course, with handheld graphing calculators being one prominent example. For the purpose of this discussion, ‘ruggedizing’ an existing tablet for use in schools does not make it ‘new’, it just means that a potentially useful feature or attribute has been added to an existing device.) **It is worth asking:** Is it more likely that a totally brand new device aimed at the education market will succeed, or might a more prudent course of action be to take advantage of the fact that there is already a base level of
technology available to your users upon which you can build? In other words: Is there really a need to develop a new, ideal educational technology device in order for mobile learning to take place, or can you build off what is already available in the market and in widespread use? A better principle to follow, especially when seeking to impact learners and teachers in low income communities, might be to develop for devices that your potential users already have, know how to use, and can afford.

3. Don’t spend time with your target user groups – assume you already understand their needs

What may well be considered a ‘good practice’ or an ‘appropriate solution’ for learners in schools in Silicon Valley or Helsinki, Cambridge or Seoul may not be so good or appropriate when transferred to educational contexts in (e.g.) rural Africa. Thinking you understand the needs of user groups unlike those with which you currently work can have some rather unfortunate consequences once your mobile learning product or service is actually available ‘on the ground’. It is just possible that many of the real usability challenges inhibiting the adoption of ‘mobile learning’ at scale in developing countries won’t be overcome by people or groups from other places -- no matter how brilliant or well-intentioned or successful they may have already been proven to be -- but rather by people living and working in such environments themselves, or at least who come from such places (and whose families may still live there), and/or who are themselves users of the mobile devices they help design or the learning applications that run on them.

Adopting user-centered design techniques or approaches can be quite helpful here. related to this, two additional ‘bad’ practices come to mind ...

4. Consider that all ‘mobile learners’ are ‘digital natives’

As the ‘digital native’ hypothesis (that all young people are somehow different than their elders because they instinctively ‘get’ technology) enters its second decade, this widely used term continues to exert a strong influence over many educational policymakers, educators and vendors alike. Quickly learning and demonstrating a mastery of the mechanics of a particular process or application on a mobile device (posting to Facebook, for example, or playing a video game one has never seen before) shouldn’t be confused with a mastery of how to successfully use such a device for learning. Design exclusively for the ‘digital native’ and you may well ignore the needs of many of learners, potentially needlessly confusing and complicating their efforts as they engage in ‘mobile learning’.

and ...

5. Discount the notion that a device will be used by more than one person

Around the world, mobile devices are often personal devices, owned and used by a single person. This is largely true ... except when it isn’t. While the notion that "regardless of social class, almost everyone [in Africa] has a mobile phone, or two or three", is conventional wisdom in some circles, data don’t support this contention. The phenomenon of shared use of mobile phones in developing countries has been long remarked upon and studied. Especially in school settings in developing countries, and within families, device sharing can be the norm, not the
exception. Mobile learning initiatives that don’t consider this scenario may stumble upon complications, small and large, as a result.

6. Target in-school ‘mobile learning’ exclusively
“We have a fantastic educational app that would be really valuable for use in schools in developing countries – how can we get this into schools in such places?” This is, in some communities, a common question (there are *lots* of makers of educational apps out there!). Even if the app itself would be quite useful it may be worth considering: Are schools really the best place for the app to be used, especially in cases where the app is meant to run on a mobile phone? After all, many education systems ban the use, or even possession, of mobile phones by students when in school altogether. Teachers may struggle with trying to control a class where each student’s attention is directed not at them, but rather at a small screen (on which a student may be texting or engaged in some other ‘undesirable activity’). Even where the mechanics of such supervision or oversight is possible, attempting to figure out how using a specific app corresponds to the particular curricular objective to be explored during a given class period can be quite difficult. Targeting learners outside of school hours, and off school property, might well be more practical.

7. Make it all about smart phones
When technology seers predict that, “in the future everyone will have a smart phone”, they may well be correct. However, most of today’s learners and teachers don’t live in the future. Develop content and applications exclusively for smart phones and you’ll miss the majority of potential users in developing countries who still have so-called ‘feature’ phones, simple ‘dumb’ phones … or who have no phones at all. *It is too difficult to develop for lower end phones*, companies may say, *as they don’t allow us to do everything we want to do.* Fair enough, that’s probably true. But if you want to reach a large market and hope to achieve broad scale and wide impact, developing for devices that people don’t have may not be the optimal course of action.

8. Plan for digital distribution of content to ‘connected’ mobile devices to be easy
Many groups believe that targeting mobile phones as a potentially relevant device to enable and facilitate various types of mobile learning activities in developing countries is compelling for many reasons. No argument there! That said, assuming that it will be easy to get content onto such devices because they *can* be connected (to mobile networks, to local wireless networks) can be complicated by the messy reality that what is true in the abstract might in fact be much more difficult once you get ‘on the ground’. Connectivity in general can be spotty. Data connections can be expensive – and, in an educational context who should pay for these costs, and how? Physical distribution of educational content onto mobile devices – as well as updating existing content and applications -- can certainly be done instead, but the logistics of planning for this can be nontrivial, and related costs can be considerable.
9. Assume that you need to do 'mobile learning'
Many groups planning for mobile learning initiatives are driven by a compulsion to “do something in the mobile learning space”. A recognition that ‘mobile learning is the future’, however, needn’t inexorably lead to the development of anything that is, in end effect, terribly useful. If your criterion for success is to ‘to something’, it’s is probably not too difficult to ‘succeed’. If the goal, on the other hand, is to do something to benefit teaching and learning practices, proposing a ‘mobile solution’ without understanding the problem that needs solving is a recipe for disappointment. It may well be, after all, that the ‘problem’ identified can be addressed through other, ‘non-mobile’ means.

10. ___
[#10 is left deliberately blank here, as an acknowledgement that there is still much we have to learn in this regard.]

There are no doubt lots more, but I'll end there. Please feel free to add you your own worst practices, or disagree with me, in the comments sections below, or send them on to me via email (form at right side of the page) or using Twitter (@trucano or @WBedutech).

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If you're interested in trying to get a handle on who is doing what in the area of 'mobile learning in developing countries', a recent paper sponsored by USAID and the mEducation Alliance, *Mobiles for Reading: A Landscape Research Review*, might be worth checking out. Topics related to 'mobile learning' feature regularly on the EduTech blog. Here are some others that might be of additional interest:

- A 'mobile first' approach to educational technology
- In search of the ideal educational technology device for developing countries
- Surveying Mobile Learning Around the World, part one & part two
- Mobile learning in developing countries in 2012: What's Happening?
- Mobile learning in developing countries in 2011: What's new, what's next?
- There are many others as well, including profiles of some notable individual initiatives.

*Note*: The image at the top of this blog post of a comically large phone in the city of Itu, Brazil's "capital of large things" ("something doesn't seem quite right with this particular implementation ...") is adapted from a photograph from the Wikipedian JetsonJones and comes via [Wikimedia Commons](https://commons.wikimedia.org). It is used according to the terms of its [Creative Commons Attribution-Share Alike 3.0 Unported license](https://creativecommons.org/licenses/by-sa/3.0/).
Based on my interactions with educational policymakers, and those who advise them, it seems to be a truth (almost) universally acknowledged that there is insufficient research into models of educational technology use, the impact of such use, and related costs. This is not to say that there is *no* useful research into the use of technology in education around the world, of course. Online tools like ERIC and SSRN can help you find some useful studies; the popular press and the blogosphere increasingly reference such work (sometimes even in ways where you can actually track down the referenced studies!); there are of course a lot of academic, industry and professional journals dedicated to the subject; and a healthy amount of 'grey' literature circulates informally (including stuff commissioned by companies that is never formally published). Firms also circulate 'white papers' touting the 'impact' of their products and services, something which I tend to place into its own separate category, given the commercial and marketing imperatives that often animate such work. That said, just because a lot of 'research' is produced doesn't mean that such research is helpful to meet the practical information demands of educational policymakers, planners and educators.

Even if you *are* of the opinion that there is indeed a lot of useful, policy- and practice-relevant research out there related to the use of technologies in education, the fact remains that most of our collective knowledgebase has been constructed as a result of studying and attempting to learn from experiences in 'highly developed' (OECD) countries. While there is always danger when trying to draw generalized lessons from a research study that examines a specific context, it would seem reasonable to me that the difficulties when looking to draw lessons from experiences in Quebec that might be relevant to Kansas or Canberra *pale in comparison* to those when trying to extend such lessons to policymakers making decisions which will affect students and teachers in places like Quito or Kampala -- let alone rural Cambodia.

Thankfully, there are a number of promising moves afoot which hope to direct more energy and resources to investigate issues and circumstances of relevance to those exploring the use of ICTs in education in middle and low income learning environments and contexts around the world. (As such efforts kick off, and especially as related studies emerge, we would hope to feature them on the
Until we start to see results from these sorts of efforts, however, the practical reality is that, in most cases, policymakers in middle and low income countries who wish to draw lessons 'from the research' in order to inform their policymaking related to potential educational technology initiatives will continue to try to contextualize results from research in higher income countries in the attempt to divine what lessons (if any) might be relevant to their own circumstances, even in places where contexts for use and typical use cases may be quite different.

A previous EduTech blog post, "Evaluating the Khan Academy", explores some of the lessons that have emerged as a result of research by SRI into the use of Khan Academy in a number of schools in Northern California. For those who don't know it: The Khan Academy is a widely known and much celebrated educational website which features thousands of short video tutorials on educational topics, as well as linked sets of over 100,000 practice problems and a 'personal learning dashboard'. Policymakers from a number of countries have approached the World Bank for specific advice and guidance on how they might make use of Khan Academy resources within their schools, and during the course of related conversations (some of which were catalyzed by a talk given by SRI's Robert Murphy at the World Bank earlier this year, which was discussed in a subsequent blog post) we have passed along and discussed the Research on the Use of Khan Academy in Schools published by SRI -- as well as a report that appeared a few months ago from EDC that looked at the use of Khan Academy in Chile. While individual lessons and insights drawn from an analysis of the use of Khan Academy content at sites examined in the SRI and EDC reports may or may not be more broadly generalizable to other contexts, examining the various usage models documented and explored in those studies may help raise *questions* that might be relevant to educators and policymakers who work in other contexts.

Indeed:

What are some useful questions that policymakers in middle and low income countries might ask as they attempt to contextualize insights from the use of the Khan Academy in California and Chile as part of their efforts to investigate and plan for the use of digital learning resources from the Khan Academy (and from other sources as well) within their own education systems?

For what it's worth, and in case presenting them here might be helpful to groups working on such efforts, here are some of the related questions that have surfaced during discussions of the SRI and EDC reports in which I have been involved. This list is not meant to be exhaustive or comprehensive -- and indeed there may well be other, more important, and even more fundamental, questions to ask in many places.

The intention here is not to imply that the Khan Academy is the 'right' or indeed 'best' choice for a given education system to consider (Khan Academy is one of the most prominent of untold numbers of digital learning tools, products and services of
potential relevance to education systems around the world – and of course there are lots of other ‘non-digital’ ways in which countries can spend scarce resources dedicated to teaching and learning!), but rather to enrich a number of ongoing discussions about the potential use of Khan Academy (and similar) content in education systems in a number of countries.

Ten (sets of) questions

1. Variety of usage models
One thing that is very clear from the SRI report is that the Khan Academy is being used in many different ways in different schools -- and sometimes even in different ways within the same school. The SRI study documents Khan Academy being used as a tool for additional practice; as remediation for students who are behind and as enrichment for those who are highly motivated or advanced; as well as to monitor student learning. Such uses are of course quite relevant and useful in schools and educational contexts in low and middle income countries as well. This flexibility in usage models is potentially quite valuable -- especially in schools and classrooms where you have highly capable, experienced teachers who can find the right usage model that works well with their students. That said, is this flexibility a good or bad thing in 'low capacity' education systems where teacher capacity and quality is a major concern, and where many educational planners experience challenges as they plan for many of the 'basics' (getting textbooks to schools, ensuring the correct number of desks, making sure that teachers are at work, etc.)?

2. Mechanical processes and procedures
One persistent criticism of the Khan Academy from some quarters is that it focuses on the mastery of various mechanical processes and procedures (e.g. factoring numbers, long division) at the expensive of developing an understanding of higher order concepts. Whether or not one agrees with such criticism, many policymakers in middle and low income may (rightly or wrongly) wonder about the relevance of such criticism to their own immediate circumstances. (You can find many related discussions quite easily on the Internet if you're interested in them -- some of them thoughtful, well informed and useful; some rather breathless; some quite ideological; still others vituperative and snarky -- so I’ll not attempt to address and consider them here.) For some education officials, it is precisely this emphasis on process and procedure that they find most alluring about the Khan Academy. Other policymakers may concede that a focus on the development of the mastery of various 'mechanical' processes is only one piece of a larger puzzle (and perhaps not even the most important piece), but look at the situations in classrooms in their countries' schools today, where very little learning is taking place and students (and indeed many teachers) struggle with things at very basic level, and wonder: In our circumstances, wouldn't helping our students with the development of some very basic mechanical processes and procedures be a step in the right direction -- and leave us in a much better shape than where we are today?

Some low income countries are considering using the Khan Academy not as a tool for students, but rather
to help teachers learn the content they are supposed to already know – and teach.

3. Teacher use of student learning data
Khan Academy has developed -- and continues to develop, at great expense -- an impressive set of tools so that teachers and students can monitor student progress through Khan Academy content. Despite the availability of easy-to-use 'dashboards' that can help teachers monitor student progress, however, the SRI study did not seem to find that a lot of teachers were actually using them. No matter how potentially useful they may be, should we expect that teachers in low capacity education systems will use such tools, especially given that access to, and familiarity with, digital technologies may be quite limited? Or: Will teachers in such circumstances perhaps actually use these sorts of monitoring tools *more*, given that they don't have other sources of formative assessment data?

4. Some key facilitating factors: Access to computers, longer class periods
The SRI reports note a number of key factors which seem to have facilitated the use of Khan Academy in the schools studied. Notable among these include the existence of 1-to-1 computing efforts in some schools, which helped facilitate access to the website and content, as well as the fact that some schools were able to utilize longer, extended blocks of time during the schedule of the school day. In most middle and low income countries, efforts to provide broad access to educational computing devices (especially those which are meant to enable so-called '1-to-1 computing', where each student has her own device) are still in their infancy. Reconfiguring the school day to be able to dedicate longer blocks of time dedicated to specific subjects in order to better accommodate the use of related Khan Academy content may simply not be practical in many educational settings in middle and low income countries -- especially those which are notably rigid in their approach to scheduling or where large numbers of students and limited numbers of classrooms made such changes very, very difficult. Absent the widespread availability of computers within schools for student use, and the potential to lengthen class periods so as to be able to make better use of computer resources to access Khan Academy content, what other facilitating factors might education systems wish to explore in order to ensure sufficient access to the Khan Academy?

A few years ago some educators created and posted to YouTube a combination parody/critique of a Khan Academy tutorial that looked at multiplying and dividing integers. The response to this parody video, which went vital in certain educational circles in the United States, was very interesting to follow. However one feels about this parody, and the response to it, there is no denying that it helped catalyze some useful and valuable discussions of pedagogical approaches to teaching certain concepts. It is
also perhaps interesting to note that, in response to the video and some of the related discussion, Khan Academy actually modified, and improved, the original video. *Given enough eyeballs, all bugs are shallow*, as they like to say in Silicon Valley. When I used to teach, I don't recall ever getting this sort of feedback on anything I ever taught, or the way I taught it.

5. Support structures for learning
The SRI study also makes note of a number of other important 'support structures for learning' that exist in the schools in Northern California that were studied. As difficult and challenged as the learning environments in under-resourced schools in poor communities in the United States may be, students in those schools still have access to educational content from a variety of sources (including textbooks), to teachers (who, no matter how well or poorly qualified, due show up to school in sufficient numbers, unlike in many other parts of the world), as well as to peers and parents who may be tapped to help explain and discuss various concepts being studied. The use, and utility, of the Khan Academy in such contexts may be quite different than in environments in low income countries where such support structures for learning may be *much weaker*, and in some cases *may not exist at all*. In environments where the Khan Academy is meant to be used in large part because of the absence of such support structures for learning, what steps might educational policymakers and educators consider in order to make the 'successful' use of the Khan Academy more likely? *More broadly*: What are the important things that need to be in place (human resources, technology, incentive structures, pedagogical practices, physical space, etc.) for tools like the Khan Academy to be introduced most productively, with the greatest impact?

6. The videos, and 'flipping the classroom'
The Khan Academy is held out as a prominent example of 'flipping the classroom', where students listen to lectures outside class (e.g. by viewing Khan Academy videos at home) and then do their 'homework' when in class, aided by their teachers (and their peers). Despite many assumptions that this is how Khan Academy is actually utilized within formal educational settings, the SRI study did not see much of this happening in practice, for a variety of reasons. Indeed, to a large extent teachers appeared to want to continue to teach as they had already done, and largely conceptualized the use of the Khan Academy as a complement to their traditional teaching methods. In other words: the Khan Academy video lectures were not used to replace the lectures of teachers, but were instead positioned as resources for students to consult and review after the traditional lecture was delivered. Is the flipped classroom model relevant in middle and low income countries, given existing pedagogical practices and norms, especially in places where access to connectivity and computers outside of schools is low?
In some important ways, the Khan Academy videos make transparent what was previously hidden. How did your child's teacher conduct today's lesson about, say, fractions? Unless you were physically in the classroom, it is rather difficult (if not impossible) to know. If you have access to the Internet, however, you can see exactly how this was addressed in the related Khan Academy video. (*And:* If you missed part of it or didn't understand something, no worries: Just re-wind and watch it again.) While Khan Academy content and pedagogical approaches may come in for legitimate criticism, is this compared to an ideal, or actual practice? We should perhaps be careful where we set the bar, and note that in different contexts, different expectations may be in order, at least in the near term. This is not to argue for mediocrity or mistakes, but rather to note the potential utility in critically analyzing things in comparison to not only what is considered *ideal* practice, but also to what is currently happening in classrooms around the world, especially in many of the ones that reasonable people would consider to be 'low performing'. This doesn't mean that the bar for analysis should be set low, but rather to observe that the bar may be set at different levels in different places right now, and what's immediately important for educational policymakers in many places is that approaches be found to raise the bar in ways that are useful and achievable -- even if they appear modest by the standards of 'highly developed' countries -- as part of a longer-term process of raising it to where it should eventually be placed.

7. Planning for content that changes
For better or worse, the content in printed textbooks does not change very often. Indeed, in many countries the same textbooks may be used for many years and are updated very infrequently (they may be in critically short supply as well). One potential advantage of digital learning resources, as made available through efforts like the Khan Academy, is that they can be updated much more frequently than printed materials. That said, in places without reliable connectivity, such advantages may be more theoretical than practical. In environments where connectivity is less of a challenge, teachers and education systems may be challenged to adapt to the emergence of new digital learning content that they have not already been exposed to, have not vetted and which has not been included as
part of official teacher professional development and training programs. This is especially true in 'low capacity' education systems where teachers are inexperienced, poorly trained and often struggle with mastery of the content they are supposed to deliver. How can education systems and educators plan for and take advantage of updates to digital learning content at a pace and schedule which is much faster than that which previously marked their use of printed textbooks?

8. Competency-based advancement and standardized tests

One virtue identified by many educational policymakers of tools like the Khan Academy is that they enable competency-based advancement, whereby students continue to study a particular concept or topic until they demonstrate a certain level of related mastery. This makes a lot of sense, especially in subjects where concepts explicitly build upon each other, as is quite often the case in mathematics. If you can't multiply single digit integers this month, you're probably going to have a tough time multiply two and three digit integers when you are asked to do so next month. Why move on to multiplying 55X77 when you haven't demonstrated that you can successfully multiply 5x7? In most classrooms, students move in lock step through the curriculum, with many students frustrated/bored because things are moving too fast, and many other students bored/frustrated because things are moving too slow. That said, in education systems that rely on high stakes end-of-year exams that cover the entirety of a given curriculum -- which is the reality in most middle and low income countries -- many students who utilize tools like the Khan Academy to advance through a given curriculum based on demonstrating various competencies and content mastery before moving on to the next topic may in the end be tested on material that they have never seen before. How can education systems which rely on standardized summative assessments utilize tools which promote competency-based advancement through the curriculum?

I once helped organize a study tour to an Asian country for a number of Western academics, including some well-known experts on the use of educational technologies. Many of these folks were rather appalled at the uses of technologies they observed in a few schools in a country which has been lauded for the strength of its education system. One such expert expressed to me her exasperation that technologies were not being used in ways that were 'transformative', in support of 'modern' pedagogical approaches, etc. Compared with schools in your country you may well be right, I responded, but I am not sure if that comparison is the operative one for many people here. Go to the classroom just down the hall where students and teachers are not using any technology at all and look at the pedagogical practices in evidence there. That may also be a useful point of comparison.
9. Who's teaching -- and how -- and does it make a difference?
The Matthew Effect in Educational Technology might not only be relevant to discussions about the use of technology tools and devices by students, but by teachers as well. What if the Khan Academy is meant to be used in classrooms with 'poor' teachers, but it is in classrooms overseen by the 'best' teachers that the use of the Khan Academy has the greatest impact? In other words: What do you do if the use of the Khan Academy is explicitly meant to address issues of low teacher quality, but it turns out that teacher quality is actually an important ingredient into the successful use of such tools and resources? The EDC study on the use of the Khan Academy in a few schools in Chile notes that such use "changes the ways and the degree to which students engage with and are engaged by the math content; it also changes the way teachers and students interact with each other." What if educational policymakers and educators -- and parents -- aren't comfortable with such changes?

10. ____
As with other 'lists of ten' that appear occasionally on the EduTech blog, #10 here is left intentionally blank, as an acknowledgement that there are many more useful questions which can be asked (including presumably some that we haven't yet been able to identify and formulate, but which will emerge as people learn more practical lessons as the result of implementing resources like the Khan Academy in learning environments in middle and low income countries). In my experience, posing the sorts of questions presented above typically leads to additional questions, along the way helping to bring to the surface issues that educational policymakers, planners and educators may not have anticipated. Feel free to raise other questions you might have as a result of reading the studies from SRI and EDC in the comments section below, using the email tool at the right side of this web page, or on Twitter (where we can be found @WBedutech; I'm at @trucano). Even if we don't have all the answers to how we will get to where we want to go, asking better questions will make it more likely that we are headed in the right direction.

Note: The image used at the top of this blog post of two middle school boys comparing what they have found ("at first glance things look the same, but upon further reflection there are some potentially important differences to consider") comes from Flickr user VA State Park Staff via Wikimedia Commons. The image was initially uploaded to Flickr and is used according to the terms of its Creative Commons Attribution 2.0 Generic (CC BY 2.0) license.
Each year on 8 September, groups around the world gather together to celebrate "International Literacy Day", which is meant to highlight the importance of reading, and of being able to read. In the words of UNESCO, the UN organization which sponsors International Literacy Day, "Literacy is one of the key elements needed to promote sustainable development, as it empowers people so that they can make the right decisions in the areas of economic growth, social development and environmental integration." As contentious as issues around education around the world can be at times, there is little debate about the fundamental importance of literacy to most human endeavors.

New technologies can play important roles in helping to enable efforts and activities to teach people to learn how to read -- and to provide people with access to reading materials. As part of its communications outreach on International Literacy Day this year, for example, UNESCO highlighted recent experiences in Senegal targeting illiterate girls and women, where it has found that "mobile phones, computers, internet and TV make literacy courses much more attractive for illiterate women."

The potential for mobile phones and other mobile devices like e-readers to aid in literacy efforts has been a recurrent theme explored on the EduTech blog. In so-called 'developing countries', books may be scarce and/or expensive in many communities -- and reading materials that *are* locally available may not be of great interest or relevance to many potential readers. The fact that increasing numbers of people in such communities are carrying small portable electronic devices with them at all times capable of displaying text, and which indeed can hold tens, even thousands of digital 'books', has not gone unnoticed by organizations seeking to increase literacy and promote reading.

Two recent publications -- *Reading in the Mobile Era* and *Mobiles for Reading: A Landscape Review* -- attempt to take stock of and learn from many of the leading efforts around the world in this regard.
Reading in the Mobile Era: A study of mobile reading in developing countries [pdf] is the result of a year-long study to "explain the habits, preferences and demographic profiles of mobile readers in seven developing countries. By painting a picture of how mobile reading is practiced today and by whom, it offers insights into how mobile technology can be leveraged to better facilitate reading in countries where literacy rates are low."

As part of this effort, Mark West, the lead author of the report for UNESCO, asks and attempts to answer a series of quite useful, quite practical questions:

- Who are the people reading on mobile phones in developing countries?
- Why are people reading on their mobile phones?
- What are mobile readers' attitudes towards reading?
- What are the reading habits of mobile readers?
- What do people want to read on their mobile phones?
- What are the barriers to mobile reading?
- What predicts intentions to read on mobile phones?

The report concludes by discussing a number of key related recommendations and their potential policy implications. The report contains a rich amount of detail, data and anecdote, and for those interested in the topic, Reading in a Mobile Era should be considered a 'must read'.

### Mobile Reading Survey: Key Findings

1. Mobile reading opens up new pathways to literacy for marginalized groups, particularly women and girls, and others who may not have access to paper books.

2. People use mobile devices to read to children, thereby supporting literacy acquisition and other forms of learning.

3. People seem to enjoy reading more and read more often when they use mobile devices to access text.

4. People read on mobile devices for identifiable reasons that can be promoted to encourage mobile reading.

5. Most mobile readers are young, yet people of various ages are capable of using mobile technology to access long-form reading material. More can be done to encourage older people to
use technology as a portal to text.

6. Current mobile readers tend to have completed more schooling than is typical.

7. There appears to be a demand for mobile reading platforms with text in local languages, level-appropriate text and text written by local authors.

from Reading in the Mobile Era, UNESCO 2014

Reading Without Books, a complementary publication due out soon, will analyze specific mobile reading initiatives around the world. Like Reading in a Mobile Era, it will emerge as a result of a partnership between UNESCO, Nokia and the Worldreader NGO (which has been featured on the EduTech blog previously and whose web site contains a section containing number of quite [pdf] useful [pdf] reports [pdf] documenting what it has been learning through its efforts to provide increased access to digital books to young readers, mostly in Africa, both using e-readers and mobile phones.)

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This is also the focus of a new study supported by USAID and the mEducation Alliance, a consortium of institutions (including the World Bank) which investigating and sharing emerging lessons and insights from efforts to use mobile phones and other small electronic devices as part of educational efforts in middle and low income countries.

Mobiles for Reading: A Landscape Review [pdf] looks at "44 existing projects incorporating the use of mobile technologies (broadly defined) to accelerate reading, particularly in developing countries .... focus[ing] primarily on the use of mobile ICTs designed to help children learn to read, practice reading (reading to learn), and acquire a broader range of learning skills that support a literate society." Researchers exploring these topics may be especially interested in annexes A and B, which contain a detailed list of the projects reviewed, and which to my understanding represents the most comprehensive such listing gathered to date. The analysis is quite usefully grounded in an understanding about what we know about reading, especially by children in developing countries, and the research literature that has emerged in the nascent field of information and communications technologies for development (ICT4D).

The report, whose lead author is Daniel A. Wagner of the University of Pennsylvania, concludes by noting that "the relatively recent advent of mobile technologies that have tremendous reach into all populations—young and old, urban and rural, rich and poor—across the globe provides a new opportunity to reimagine traditional forms of educational design and delivery."
Events

If you are looking for opportunities to connect with some of the key people active in exploring how mobile devices can be used to help promote reading, especially in low and middle income countries, there are a few events that you may wish to mark down on your calendar. The annual mEducation Alliance International Symposium will take place next month in Washington, DC. The third such annual gathering, this symposium has quickly established itself as one of the premier global gatherings for people leading 'mobile learning' efforts, especially those targeting readers in low and middle income countries, as well as for groups who might wish to fund such projects.

Another particularly notable annual event is UNESCO's Mobile Learning Week, which typically takes place in the first quarter of the year at UNESCO headquarters in Paris. Over the past few years, UNESCO has been leading an ambitious effort to share emerging knowledge about the use of mobile devices in education, and has sponsored a number of key related publications, including a number of regional surveys (which were the subject of a previous post on the EduTech blog, Surveying Mobile Learning Around the World (part one)) and guidance for policymakers related to key issues [pdf] and related policy implications [pdf].

EFF11, the next installment in the influential series of online 'debates' sponsored by Education Fast Forward, will bring together a virtual group of people on 17 September 2014 to talk about "Mobile learning for the Masses? Realistic expectations and success criteria". Professor Miguel Nussbaum, whose work on the One Mouse Per Child project was featured in a previous EduTech blog post, will kick off the debate.

Prizes

Over the past few years, a number of prizes have emerged to acknowledge and support the work of groups involved in literacy efforts around the world, increasing numbers of which are exploring innovative uses of mobile and digital technology devices. All Children Reading, an initiative of USAID, the Australian government and World Vision, sponsors a number of grants and prizes. In the latest competition round, it explicitly seeks "technology-based innovations that support improvements in reading skills" and, in cooperation with Big Ideas @Berkeley, it is now sponsoring a Mobiles for Reading prize. I am on the advisory board for the U.S. Library of Congress Literacy Awards. While this year's winners did not include any groups with a strong technology focus, last year's winner of the International Prize, PlanetRead (featured in an EduTech blog post, Bollywood Karaoke and Same Language Subtitling to Promote Literacy) certainly did. While at acknowledging that the primary mobile device for reading for many people will remain the printed book for at least a bit longer, I expect that, based on a number of strong applications over the past years, many of the contenders for future prizes will be ones which
feature the use of mobile electronic devices quite prominently. No doubt the soon-to-be-announced Global Learning XPrize will!

You may also be interested in the following posts from the EduTech blog:

- ICTs and Literacy (the old fashioned kind)
- Can you really teach someone to read with a computer alone?
- Mobile Phones and Literacy in Rural Communities
- How (not) to develop ICT literacy in students?
- What Sesame Street Can Teach the World Bank
- An update on the use of e-readers in Africa
- A few myths and misconceptions about digital teaching and learning materials in Africa
- Sachet educational publishing in a digital and mobile world
- Surveying Mobile Learning Around the World (part one)
- Surveying Mobile Learning Around the World (part two)
- Learning the Queen's English ... on your mobile phone?
- E-Reading in Africa
- Can eBooks replace printed books in Africa? An experiment

Note: The image at the top of this blog post of a girl jumping on the playground of a school in Guatemala City, Guatemala (“they tell me my generation is supposed to be able to 'leap frog'”) comes from World Bank Photo Collection on Flickr. The photo was taken by Maria Fleischmann / World Bank and is used according to the terms of its Attribution-NonCommercial-NoDerivs 2.0 Generic (CC BY-NC-ND 2.0) license.
MOOCs -- massively open online courses of the sort that can simultaneously enroll thousands, even tens of thousands, of learners simultaneously -- have been a hot topic of discussion for a few years now in both the worlds of education and 'international development' (and, for what it's worth, the subject of numerous related posts here on the World Bank's EduTech blog). Recent news that edX, one of the prominent MOOC platforms, is to start offering courses aimed at high school students suggests that the potential usefulness and impact of things like MOOCs may soon extend beyond the realm of higher education, out of which MOOCs originally emerged and where most related activity has occurred to date.

There is much (potentially) to be excited about here. Few would argue against having greater access to more learning opportunities, especially when those opportunities are offered for 'free', where there is latent unmet demand, and where the opportunities themselves are well constructed and offer real value for learners. As with MOOCs at the level of higher education, however, we perhaps shouldn't be too surprised if these new opportunities at the high school level are first seized upon *not* by some of the groups with the greatest learning needs -- for example, students in overcrowded, poorly resourced secondary schools in developing countries, or even students who would like a secondary education, but for a variety of reasons aren't able to receive one -- but rather by those best placed to take advantage of them. This has been largely been the case for initial adopters of MOOCs. (One of the first studies of this aspect of the 'MOOC Phenomenon', which looked at MOOCs from the University of Pennsylvania, found that students tended to be "young, well educated, and employed, with a majority from developed countries.""

As a practical matter, some of the first types of beneficiaries may, for example (and I am just speculating here), be homeschooling families in North America (while not necessarily comparatively 'rich' by local standards, such families need to be affluent enough to be able to afford to have one parent stay at home with the kids, and generally have pretty good Internet connectivity); international schools around the world (which can offer a broader range of courses to students interested in an 'American' education); and the families of 'foreign' students looking to apply to college in the United States (the edX course "COL101x: The Road to Selective..."
College Admissions” looks, at least to my eyes, tailor made for certain segments of the population of learners in places like China, Korea, Hong Kong, etc.). In other words, at least in the near term, a Matthew Effect in Educational Technology may be apparent, where those who are best placed to benefit from the introduction of a new technology tool or innovation are the ones who indeed benefit from it the most.

Longer term, though, it is possible to view this news about movement of a major MOOC platform into the area of secondary education as one further indication that we are getting further along from the 'front end of the e-learning wave' (of which MOOCs are but one part) to something that will eventually have a greater mass impact beyond what is happening now in the 'rich' countries of North America and the OECD.

Learning with new technologies has of course been around for many decades but, broadly speaking, has not (yet) had the 'transformational' impact that has long been promised. "Gradually, then suddenly" is how one of Ernest Hemingway's characters famously describes how he went bankrupt. Might this be how the large scale adoption of educational technologies will eventually happen as well in much of the world?

If so, one credible potential tipping point may be a 'black swan' event that could push all of this stuff into the mainstream, especially in places where it to date has been largely peripheral: some sort of major health-related scare. (For those unfamiliar with the term, which was popularized by Nicholas Taleb, a 'black swan' is a rare event that people don't anticipate but which has profound consequences). One of the first ever posts on the EduTech blog, Education & Technology in an Age of Pandemics, looked at some of what had been learned about how teachers and learners use new technologies to adapt when schools were closed in response to outbreaks involving the H1N1 influenza virus: the 'swine flu' that afflicted many in Mexico about six years ago; and an earlier outbreak of 'bird flu' in China. I have recently been fielding many calls as a result of the current outbreak of the Ebola virus in West Africa asking essentially, 'Can we do anything with technology to help our students while our schools are closed?', and so I thought it might be useful to revisit, and update, that earlier post, in case doing so might be a useful contribution to a number of related discussions are occurring.

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black swan

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Education & Technology in an Age of Pandemics (revisited)

For some people in other parts of the world, it was the picture of two top futbol teams playing in an empty Estadio Azteca (one of the world’s largest capacity stadiums) that made clear the severity of the swine flu outbreak that struck Mexico in 2009. While the sporting passions of the 100,000 missing spectators could presumably be satisfied by watching the game on TV, it was less clear how to immediately satisfy the learning needs of over seven million students who were sent home after their schools were ordered closed.

Many educational reformers have long held out hope that computers and other information and computer technologies (ICTs) can play crucial and integral roles in bringing about long-needed changes to education systems. Indeed, many see the introduction of ICTs in schools as a sort of 'Trojan horse', out of which educational reform and innovation can spring once inside the walls of the traditional (conservative) education establishment. While not denying the potentially transformational impact of ICT use to help meet a wide variety of educational objectives, history has shown that bringing about positive disruptive change isn't achieved by simply flooding schools with computers and related ICTs.

As a result of swine flu, many Mexican schools experienced quick, disruptive change of a different sort in 2009. In response, some policymakers started to ask: How might technology be relevant in cases like this? Given the status quo, they acknowledge that the use of technology in schools probably isn't enough to bring about systemic change. But: How might ICTs be useful, even transformational, when this status quo is severely disrupted by some other exogenous factor ... like a pandemic disease outbreak?

While it was certainly too soon to say anything about what type of answers the crisis in Mexico might provide to such a question (things were, as they say, rather 'fluid' at that point, with the future direction of the outbreak, and its impact, potentially evolving in different ways at a quick pace), there was another place to which some people looked for clues to possible answers. Like Mexico (through its Telesecundaria program), China has had a long history of using educational television for a variety (pdf) of purposes. And like Mexico, China had been faced only a few years before with another swift and large-scale disease outbreak that closed schools: SARS.

When the magnitude of the SARS epidemic became widely acknowledged, China Educational TV, through its 'Classroom on the Air' program, moved quickly to help fill some of the void. While perhaps not transformational, initiatives like Classroom on the Air did provide a large-scale, short-term substitute for students (and their parents) looking to continue their education while confined to their home during the outbreak.

As Robert Fox relates in his short paper on the SARS epidemic: Teachers’ experiences using ICTs, pockets of more transformational uses of ICT occurred in
Hong Kong, where computer use at home, and access to the Internet, was much more widespread than in the rest of China. But even where transformational uses of ICTs were employed successfully by some individual teachers, many more found that a reliance on ICT-centric teaching and learning styles left them frustrated, and less convinced of the value of ICTs in the education process than they had been before. Similarly, David Chan examines stories [pdf] of how education continued in Hong Kong during that period, including some cases where technology was used successfully (and not so successfully) that echo those explored by Fox.

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As rising incomes and affordable air travel continue to hasten the movement of hundreds of millions of people (and viruses) around the world more quickly than ever before, we will most likely see many more future outbreaks of disease that threaten and disruptive normal life. Students and education systems will unfortunately be on the front line of many such outbreaks, and it is in such circumstances that the usefulness, and potential transformative power, of ICTs in the teaching and learning process will perhaps be put to their real test. If such a public health event causes the large scale closure of schools in (e.g.) the U.S. or Canada -- places with so many middle class household's having broadband and so much structured coursework (not just content) now available online -- we could reach a tipping point of sorts where the large scale use of educational technologies not only complements traditional teaching and learning activities (which is currently the case), but rather enables or substitutes for face-to-face teaching and learning activities that can't take place because schools are closed. Other countries (e.g. in Europe) may not be that far behind, and in fact some hyper-connected countries (like Singapore, Korea or Estonia) may be ahead of many education systems in North America. But what about countries which are almost universally acknowledged to be 'behind' when it comes to technology use in education -- in many ways, in fact, far, far behind? To what extent, and how, might ICTs be relevant in such places -- to the extent that they might be relevant at all?

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Writing in The Guardian, Julia Gillard, the chair of the Global Partnership for Education, notes that, "In response to the growing threat of Ebola across west Africa, the governments of Nigeria, Liberia, Sierra Leone and Guinea have closed their schools. The closures are only temporary, but that could change if the spread of the virus continues and accelerates."

The voices of people attempting to put forth credible arguments that large scale investments in the use of educational technologies represent one of the best
possible uses of scarce funds available in many sub-Saharan African countries have been in a decided minority, drowned out in most cases by many more people questioning the relevance, impact and cost-effectiveness of such investments, especially given how thin the evidence base referenced by such voices typically is. This isn't to say that all such investments are a bad idea, of course -- far from it! (The EduTech blog exists in part to document such activities and try to draw lessons from them.) Lots of small scale (often pilot) examples exist which are promising, have shown promise, and have been welcomed by the people toward whom they have been directed. But there have been lots (and lots) of 'failed' projects as well.

When the deliberately provocative proposition, “This house believes that there is now nothing more important to education than access to the Internet”, was posed as part of this year's featured debate at eLearning Africa, the audience (which represented as large a collection of practitioners, researchers and policymakers knowledgeable about the state of the use of technology use in education across the continent, as well as the potential of this use, that you will ever find in one place) defeated the motion. Bill Gates, someone whose opinions and funds are as influential and sought after as pretty much anyone else's on these issues (people who do not agree with such opinions and the use of such funds nevertheless would have a hard time denying their importance and relevance within many decisionmaking processes), has famously disparaged some high profile efforts to broaden access to the Internet in many countries in the developing world', given many other pressing needs and approaches which have been demonstrated to yield a greater bang for an investor's or donor's or parent's buck.

Are these people wrong ... or right? Or: In what ways might they be wrong, or right?

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Returning to the words of Julia Gillard: "As we have learned from many nations in crisis, it is essential that education planners remain vigilant and flexible. Vigilant, to ensure that children are not kept away for too long from their learning, and flexible so they can adapt quickly and effectively to the unexpected. The stakes for anything less are much too high -- the time for considered action is now."

Writing in The Washington Post about the importance of the resilience of health care systems, Jim Yong Kim and Paul Farmer (respectively the president of the
World Bank Group and the Kolokotrones University Professor of Global Health and Social Medicine at Harvard; together they co-founded Partners in Health) note that the "Ebola crisis today is a reflection of long-standing and growing inequalities of access to basic health care.... A functioning health system can stop Ebola transmission and, we believe, save the lives of a majority of those who are afflicted." They then go on to add that, "A 1967 outbreak in Germany and Yugoslavia of Marburg hemorrhagic fever — a disease similar to Ebola — had a 23 percent fatality rate. Compare that with an 86 percent rate for cases across sub-Saharan Africa in the years since. The difference is that Germany and Yugoslavia had functioning health systems and the resources to treat patients effectively. The West African countries coping with Ebola today have neither." Together with Nkosazana Dlamini, the Chairperson of the African Union, Dr. Kim also writes in a separate article that "we are witnessing the results of our acceptance of the status quo. We will be able to stop Ebola in the coming weeks and months. But that is not the end of the story. Will we also build a strong enough health system to stop the next outbreak?"

As someone who knows next to nothing about public health issues beyond basic things like the importance of hand washing, of vaccines, etc., but who has worked with education systems in middle and low income countries for the past 15 years and is convinced of the importance of a 'systems approach' and trying to do something practical and positive about, access and quality issues in education, I was struck when I read the above passages by their potential applicability, if given a slight twist, to education systems in these same countries.

One of the major tests of the robustness and suitability of a system of any sort is how it responds to severe shocks. In places where (e.g.) Ebola has caused the large scale closing of schools, and students are unable to learn through other means, can we say that there are in fact education systems currently in place? There are systems of educational administration and bureaucracy still in place, to be sure, but if no one is actually learning, is there really a functioning education system of any sort?

*If we look at investments in things like Internet connectivity to schools, and more broadly to communities, as investments which can strengthen the resiliency of education systems to respond to large shocks of this sort, does that change the way we consider or prioritize such investments?*

I don't have any answers here -- but perhaps these questions are perhaps worth asking.

Returning to two questions asked earlier, and then adding a third:

- But what about countries which are almost universally acknowledged to be 'behind' when it comes to technology use in education -- in many ways, in fact, far, far behind?
- To what extent, and how, might ICTs be relevant in such places -- to the extent that they might be relevant at all?
• Is it possible that in fact ICTs may in some ways actually be *more* important, possibly even more critical to the potential resiliency of low-functioning education systems than they are for high performing ones?

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Reading Julia Gillard's words, I was immediately struck by the absence of any mention of the potential role or relevance of technology. (I concede that, as someone who works at the intersection of education and technology in middle and low income countries every day, I may well be biased in my perspective and interests here!) A recent article in Nigeria's Business Day Online offers some potential food for thought here. *Ebola: Holiday extensions expose Nigeria’s e-learning shortcomings* contends that "The suspension of academic activities following the extension of holidays for primary and secondary schools in Nigeria, aimed at containing the spread of the dreaded Ebola Virus Disease (EVD), has exposed the country’s technological inadequacy, especially in the area of e-learning....This inadequacy is as a result of the country’s weak and underdeveloped broadband infrastructure which is likely to constitute a major drawback to the nationwide adoption of online services, such as e-learning, information portals, and so on....Stakeholders in the education and technology sectors say only a robust national electronic learning strategy anchored on technology can curtail the impact of the disease on the education curriculum, with particular reference to primary and secondary schools in the country."

Let's acknowledge that there is no shortage of rhetoric and advocacy emerging from tech companies and pundits -- groups and people which don't represent totally disinterested parties! -- related to the importance of Internet and computers for learners in Africa. Some folks may thus (possibly) detect in statements such as those reproduced above undercurrents of opportunistic lobbying by certain groups for investments benefiting their own particular longstanding special interests. That said, however one feels about the propriety of such comments in the face of the ongoing Ebola public health crisis, it is nonetheless hard to fully discount or deny the potential relevance of such views.

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Whether or not you believe that the Internet increasingly represents a sort of 'dial tone for development', it is becoming increasingly hard to argue that the connectivity and connections it enables will be not increasingly critical to the functioning of (e.g.) education systems in the future, both internally and related to their interactions and interconnections with other 'systems'. Reasonable people may disagree about just how critical or important all of this may be *today*. Such disagreements may, at their heart, be as much about timeframes as anything. *What happens when external shocks to the system -- like we are seeing with the current Ebola outbreak in West Africa -- challenge our conceptions of such timeframes?*
Asking these sorts of questions isn't meant to imply that the (usually rather techno-centric) proposals (often linked to various corporate interests) which essentially advocate for 'build it and they will come' and 'just supply technology and wait for the magic to happen' approaches are the right ones. By no means! Asking such questions can -- hopefully -- help to orient considerations of the potential relevance of investments in new technologies, and access to these technologies, within larger discussions of strengthening education systems. It has been conventional wisdom for many that technology is increasingly a necessity in education systems in the richest countries, but remains a luxury for education systems in the poorest countries. What if, as a thought experiment of sorts, we turn that conventional wisdom on its head, 'challenge the acceptance of the status quo" and view the picture from a different perspective, especially when considering the potential relevance of investments in new technologies for the resiliency of an education system?

Note: The image used at the top of this blog post of a lady protecting herself (and her neighbors) during the 2009 outbreak of swine flu in Mexico ("consider this picture") comes from Edgar Antonio Villaseñor González. It was found via Wikimedia Commons after it was originally posted to Flickr and is used according to the terms of its Creative Commons Attribution-NonCommercial-NoDerivs 2.0 Generic (CC BY-NC-ND 2.0) license. It also ran at top of the original EduTech post from which this blog post was adapted, Education and Technology in an Age of Pandemics. The image of a black swan comes from the Wikipedian Mindaugus Urbonas via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 2.5 Generic license. The public health poster from the Alberta (Canada) provincial board of health circa 1918 warning of ‘epidemic influenza’ comes from Wikimedia Commons and is in the public domain. The image of schoolgirls in masks during the 1919 flu pandemic in Tokyo comes via Wikimedia Commons and is also in the public domain.
Questions to ask (and not to ask) when your president tells you to buy 100k (or a million) tablets for students
by Michael Trucano
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I once did some advisory work for a country’s finance ministry in advance of a national presidential election where the two leading candidates were both promising to buy lots of laptops for students if elected. The Minister of Finance wanted to be prepared to respond to what he considered to be a likely related request for lots (!) of money, whichever way the election turned out.

This was a bit strange for me, as I more typically help out ministries of education (or ministries of ICT) as they prepare projects for which they would be requesting funding (from the finance ministry and/or parliament). Instead of serving as a resource for the folks who prepare such funding proposals, my role in this case was instead to prep the folks who would get this funding request so that they would be better able to analyze and vet the request, whenever it inevitably arrived. (Within the World Bank, this is one of the roles I serve -- I had just never done this for a ministry of finance directly.)

While my governmental counterpart in this case was perhaps a bit out of the ordinary, this general scenario is one I see repeated in place after place. The devices themselves may change over time (first PCs, then laptops, now increasingly tablets, and soon [insert name of whatever comes next]), but this impulse to buy lots of shiny new devices and distribute them to schools (or directly to students or teachers or families) shows no sign of abating soon.

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Let's say that you're a senior advisor in the ministry of education and you get word that your country's president is about to announce a big new project to 'buy every student her own tablet computing device so that she can develop the 21st century skills necessary to compete for jobs in the global economy'. Perhaps the leader of your country just returned from visiting a European country and was impressed to see all of the devices in the school that she visited. Maybe she was won over by the compelling marketing pitch of a particular vendor. Perhaps she has heard that the leader of the opposition is planning on calling for this sort of initiative and she
wants to preemptively make it her own. Or maybe she just got her first iPad and was really impressed and has decided that everyone should have one of these things! (For what it's worth, these are all real life examples ... although I have deliberately mixed up the gender pronouns in at least one case.)

No matter the genesis of this newfound interest, you sense that, whatever you were working on last week/month/year will have to be put on hold, because your life is about to become

all
about

Tablets.

What should you do? **What do you need to know?** Has anyone else tried such a thing, and if so, what have they learned? **Whom do you need to contact for information/advice, and what sorts of questions should you ask them -- and ask yourself?**

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Having risen to the lofty heights of being a 'senior advisor to the minister of education', you will no doubt recognize right away that this is not just a technical challenge for the ministry technocrats to 'solve', but it is potentially a rather large political challenge for your minister as well. As a group, **education ministers around the world are not known for their long tenures in the job**, so simply labelling this a 'dumb idea' is probably not advisable (even if it is indeed a dumb idea!) if you, to say nothing of your minister, want to stay gainfully employed. Look at it only from a technical perspective, however, or only from a political point of view, and you may well miss some important elements of the big picture. Whether you think it is a dumb or smart idea, or if you have no instinctive opinion, you're probably well advised to bring yourself up to speed very quickly so that you can ground your eventual guidance in facts and wisdom from experience, in addition to doing the inevitable political calculations.

Because this type of scenario repeats itself with such frequency, I occasionally run a short related mock planning exercise as part of professional development courses for groups working in various parts of the world. (I used to set this in the fictional country of 'Laptopia', but in a sign of the times I will emigrate with this scenario over to 'Tabletia' beginning in 2015.) Even when embedded within the most stultifyingly boring training courses and when placed in the 'sleep slot' just after lunch, when the effects of food and ennui (and possibly jet lag) conspire to cause heads to droop, I find that conversation around this topic almost always energizes people and gets them talking. I also find that this scenario tends to crystallize people's thinking in useful ways, and brings out lots of great anecdotes and stories based on personal experiences.
For what it's worth, and in case this sort of discussion might be useful, here are:
- some useful questions that I have heard asked in such circumstances;
- some questions commonly asked that really aren't that useful; and
- some questions that probably should be asked, but which rarely are.

Some initial questions to ask (and not to ask) when your president tells you to buy 100k (or a million) tablets for students

What specs should we include in the tender for the tablets?

OK, I put this question first because it is quite often the first question I am asked in this sort of scenario -- and because I find that it is quite possibly the *worst* question to ask up front. As the saying goes, this is putting the cart before the horse. **How can you possibly know what it is you want to buy if you don't know what you would like to use it for, and how you see this use occurring in practice?** At some point this may well be an important question to ask (then again, it may not be, at least not in the way you might think), but it is never the right question to ask first. Getting hung up early on technical specs means you'll waste a lot of time arguing about technical 'solutions' before you have a good sense of the 'problem' that needs to be solved.

How much should we expect to pay for a tablet?

This is probably the second question I am typically asked in these circumstances. At
a general level, it is not such an inappropriate or 'bad' question, as the answers that you'll receive in response will enable you to do a rough, back-of-the-envelope calculation about the first-order financial feasibility of taking on a big 'tablet' project. If the answers are, say US$1000 per device, you'll probably be able to report back quickly that this simply isn't economically feasible. If the answer is, say, US$10 per device, you'll probably have identified some people whose information can't be trusted, and so you can quietly remove them from your group of advisors, as this sort of answer simply doesn't pass the 'sniff test'.

That said, there are two very important caveats here. Most importantly, and as noted when commenting on the first question above: Before you start considering how much something costs, it is first useful to decide on what it is you might use it for. In addition, it is important to note that the cost of an end user device is typically only a fraction (sometimes a small fraction) of the cost of a related initiative – at least if you want the project to have any tangible positive impact on teaching and learning practices and outcomes. Focus too early on just the cost of a device and you may end up narrowly fixating on the cost of the device to the exclusion of other, more important and larger costs (like the cost to get useful content on the devices, to train people who to use the devices for educational purposes, to maintain the devices, to ensure that there is sufficient power so that the devices can be used at all, etc.).

There is also a danger here of a ‘race to the bottom’, where you eventually end up paying even more for a ‘lifeline’ of some sort because you cut costs at the start. A common example of this is where negotiating with vendors to have the lowest cost tablet possible results in sacrificing needed functionality in the short run so that you can buy more tablets in total. The results may leave you with cheaper devices that are useful ornaments in campaign pictures, where students or teachers smile and hold their tablets in the air for the photographer but then find them of little practical value when getting down to the real business of teaching and learning. (This happened in one prominent laptops-for-teachers project.)

Here is an admittedly small, but hopefully illustrative example of this ‘danger’, specific to tablets: Some places are deciding *not* to buy keyboards with their tablets, thereby saving money up front, but are then having to go back and purchase external keyboards separately when they find that requiring students to type a lot using the onscreen virtual keyboard is not terribly practical.

So, while a general focus up front on costs is absolutely understandable and prudent, a narrow fixation on the cost of the device may cause you to miss the bigger picture.
On that note:

*What are the educational goals that we are trying to achieve, and how can this device, together with a set of complementary interventions, help us meet these goals?*

*Now *this* is a good question to ask!* In fact, if you can’t answer this one
satisfactorily, the other questions here are all beside the point. That said, this is a question that somehow is often (inexplicably, frustratingly, shockingly) not prominently considered up front in many places. Some related questions:

What are your existing educational delivery models, what are the pedagogical approaches and learning models that you hope to support – and how will these be impacted by the use of tablets?

Will they support or subvert traditional approaches and, if so, how, will this be a good or bad thing?

If the idea is that the use of tablets will be an important tool to help change things in important ways, is this effort part of a larger change or education reform process? And if not: Should it be?

(Perhaps the worst, most ‘missing-the-point’ question I am asked these days by educational planners related to the use of new technologies in schools is: Should we buy laptops or tablets? If you have already decided to buy tablets, presumably you have already somehow answered this question. Fair enough. You might want to revisit it as you attempt to answer these education-related questions here. Or you might leave the choice of device to a much later stage in your planning process.)

It is perhaps worth noting that there may be non-education goals which are important to many countries which embark on efforts of this sort. The education ministry may not care about such things all that much, and it is certainly doubtful that teachers and students do, or should (unless perhaps people in their families find employment as a result), but an important catalyst for initiatives of this sort in a number of countries has been a desire to help promote the development of local IT industries. If you are looking to kick start growth for local technology firms, having a large local buyer (like the education system) purchasing lots of IT equipment and related services can be quite useful. Whether or not this is actually a smart thing to do, and whether having the education system play an important role in this process is advisable, is a typically question debated more often by economists and politicians than it is by, say, educators. That said, the ministry of education can’t afford to ignore the reality that other interests may be at play here.

**What will all of this cost – and who will pay?**

More important than a narrow fixation on the costs of individual devices is a consideration of the full range of the types of costs that may be expected under an educational tablet initiative of this sort. As noted earlier, such costs typically comprise only a fraction of costs that will need to be incurred if a project of this sort is to be successful. In addition, it is important to note that there will be considerable costs over time related to ongoing support activities (replacement of damaged equipment, ongoing teacher professional development, revision of digital learning materials, monitoring and evaluation, etc.). Costs borne up front (capital expenditures) are usually treated differently than costs borne over time (operating expenditures).
They may be funded via different sources as well. One wrinkle here is that, in many instances, some (or possibly nearly all) of the money to fund these sorts of efforts, at least on the hardware side, may originate or come from a source outside traditional education sector budgets. A so-called Universal Service Fund, for example, something that exists in many countries around the world, may collect monies from telecom providers and deposit them into a fund that can be used to help support the extension of telecom services to places where they are not (yet) economically viable. Some countries are tapping these to do things like provide connectivity to schools and buy related computing equipment. In some countries, initial outlays for computer hardware for schools may be funded through other means outside the budget of education ministries (perhaps from a budget at the IT ministry or at some specialized agency created for this purpose). Schools may be asked to pay for cost directly (perhaps by utilizing funds extended to them in block grants). Teachers and students (and their families) may be expected to shoulder some of the costs (perhaps aided by special loan schemes or means-tested financing mechanisms). The private sector and groups in civil society may contribute in various ways as part of related public-private partnerships.

The point here is not only that there are lots of different types of costs that will be incurred, both initially and over time, and that a variety of actors may be involved in helping to meet various costs, in various ways. The complexity of the shared financing models that make such things possible may be challenging for education ministries to articulate up front, and to manage over time, and this potential complexity should be acknowledged from the start.

One question related to costs that I *rarely* hear voiced once initial cost estimates are made is: **What other things could we do with these monies, and would these things have a greater impact than spending it on a large educational tablet initiative?** The absence of this sort of basic cost-benefit analysis from early stage discussions of large educational tablet initiatives is a common characteristic of many projects of this sort around the world. In part this is perhaps due to the fact that, in some place, such considerations of trade-offs and opportunity costs may not be as fully embedded into budgeting and planning processes in the education sector as they should be when it comes to the consideration of technology use. It may also be due to the fact that, from the perspective of the education ministry, some of the related costs may appear initially to be covered by ‘free’ money, i.e. money from someone else’s budget.

In some parts of the world, up to 80-90% of education budgets are used to cover salaries for teachers. These large fixed costs leave very little room to pay for other things – especially large new educational technology efforts. This means that some education ministries may initially welcome efforts to pay for a large educational tablet initiative using funds from another source, as this is the only way that they may benefit from such monies. As with most things, however, the devil is in the details.

**Who are the other key stakeholders who needed to be consulted and**
involved?

Many groups typically play key roles in large scale educational technology initiatives, and efforts to introduce tablets into schools are no exception to this. The ministry of education may not have regular lines of communication with some of them – and may have contentious ones with others. The telecom authority, ministry of ICT, local education authorities, private sector technology firms and publishers, teachers unions and national parent-teacher associations, civil society groups – consultation and coordination with all of these groups (and others) may be necessary, indeed critical, if related planning process are to be useful and informed by the on-the-ground, practical realities of potential implementation models.

Reaching out to such groups early in a planning process for a large educational tablet initiative can be an important first step in building bridges between the ministry of education and other groups that will be necessary should the project move forward. Limiting discussion and consultation to groups within the ministry of education, while no doubt the easiest and most expeditious course of action, is typically ill-advised.

Who should lead the effort?

While initial advisory and planning efforts may be led by a small team of people, eventually the planning for, and the implementation of, a large educational tablet initiative will probably need to be formally embedded in some way within an organization so that it can be supported over time. Around the world there is no one model for how this works. In some cases these projects are institutionalized with an education ministry, in other cases within a ministry of ICT (or its functional equivalent). Even where a group within the education sector does not take the lead on the implementation of various component parts of an initiative of this sort (like buying the tablets and physically distributing them to schools), it should have a prominent seat at the table when related decisions are made.

One common model for this adopted by many countries is to set up a specialized agency, under the direction of the ministry of education (or ministry of ICT, or the prime minister’s office, or some combination of these groups), with day-today responsibility for planning and rollout of the initiative. The establishment of national ICT/education agencies is a common, but not universal, mechanism through which many countries answer this question.

How will we know if we are successful?

Even if you have a compelling vision, demonstrated needs, enough funds, a viable implementation plan and sufficient capacity to make all of this happen, this will not be enough. You will need a way to monitor and evaluate what you are doing over time. Is the plan being implemented? What is working, what isn’t, and what may need to change? What is the impact of all of this – and what types of impact to we care most about?
The easiest metrics for success to achieve are input-related: How many tablets have been distributed, how many students are using them, etc. Qualitative data about how people feel as a result of the program (Do students like it? Do teachers feel that students are learning more) are also easy to collect. A mechanism will need to be put in place to track progress against these sorts of metrics. More difficult, but much more important, are outcome measures related to things like the demonstrated impact on student learning, eventual employability, etc. Existing measures may or may not be sufficient to track such things. Coming up with such measures can be difficult, as can collecting data against them. There will no doubt be many fits and starts (and failures) along the way as you attempt to measure ‘success’, however it is defined. But having a clear vision for what ‘success’ might look like from the very beginning can be an important help guide the planning process, justify related funding requests, recruit partners and appeal to key stakeholder groups, help direct implementation efforts, and inform your early monitoring and evaluation efforts.

**How quickly can we get this done?**

The hoped for, indeed mandated, answer to this question is self-evident in many places: before the next election! From a political perspective, this question, and the answer to it, are no doubt of critical importance. From a planning and implementation perspective, when this is one of the first questions I hear asked, I always get a very bad feeling about the prospects for success. This is difficult stuff. It takes time. You will make lots of mistakes. Success may be as much about making these mistakes, and then recognizing and learning from them quickly so that you can make needed changes, as it will be about having a ‘perfect’ plan from the start.

In order to ‘get the ball rolling’, you may need to quickly implement some high profile small pilot projects in order to demonstrate early ‘success’. This is understandable (and indeed, in many cases, advisable, for a number of reasons), but be very careful about the lessons you draw from such pilot activities. What works well in the hot house environment of a small, carefully selected and tended to pilot project may not, indeed probably will not, work well at a larger scale. This is not to say that none of the lessons learned will be generalizable – some undoubtedly will be – but rather that great care should be taken to question many of the assumptions that are developed as result of successful small pilot projects before they become uncritically embedded within various planning processes and implementation models.

**What does research and experience say about what we should, and what we should not, do?**

You are not the first place to contemplate doing something like this. You certainly won’t be the last. Acquainting yourself with other efforts and projects around the world that have attempted to do similar things – what they did, how they did it, how much did it cost, what was the result – is highly advised. Learning from successful efforts in other places, as well as from pilot efforts within your own
country (which may have been led by NGOs or private sector groups), will be important. Just as importantly – in some cases, even more important! -- will be to learn from the failures of efforts in other places as well.

While the research base on educational technology efforts around the world is decidedly thin, at least when it comes to research conducted in ways that are truly rigorous, a lot of progress has been made in recent years in this regard, and you should be open to benefitting from such research efforts.

There are, sad to say, lots of demonstrated ‘worst practices’ out there that you would do well to avoid. You may be tempted to simply adopt an implementation model from somewhere else that seemed to have worked well. Be careful here: While some vendors may spin compelling tales of how easy it would be to simply take what they did in another country and bring it to yours, merely importing an implementation model from elsewhere and planting it in your education system may be a recipe for disaster. When it comes to introducing educational technologies into education systems, in putting new devices into schools and the hands of teachers and students, iterating based on what is learned in local contexts is almost always a better course of action than importing a model from elsewhere.

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Those are just a few of the questions I hear commonly asked, and not asked, in the very first stages of consideration of large new ‘educational tablet initiatives’. This list is (obviously) not comprehensive. There are lots more questions that are (and should be) asked in the early stages of considering projects of this sort, and many (many!) more that need to be considered if something like this is actually meant to go forward. But hopefully this short, idiosyncratic discussion of a few of the questions that commonly surface in such situations (as well as others that remain buried, or ignored) will be of use to people who might find themselves in the position of the mythical ‘senior advisor to the minister of education’ discussed in this piece. If you are one of those people, I wish you: Good luck!

You may also be interested in the following posts from the EduTech blog:

- Big educational laptop and tablet projects -- Ten countries to learn from
- Laptops for education: $10, $35, $100 and points in between (but not above!)
- Planning for an edtech RFP: Technical vs. functional specs
- Investing in digital teaching and learning resources: Ten recommendations for policymakers
- ICT & Education: Eleven Countries to Watch -- and Learn From
- Ten things about computer use in schools that you don't want to hear (but I'll say them anyway)
- Calculating the costs of digital textbook initiatives in Africa
- The Aakash, India's $35 (?) Tablet for Education
- An update on the use of e-readers in Africa
- Textbooks of the future: Will you be buying a product ... or a service?
- Why Establish a National Educational Technology Agency?
• The Development and Evolution of National Educational Technology Agencies Over Time
• 10 principles to consider when introducing ICTs into remote, low-income educational environments
• Worst practice in ICT use in education

Note: The image at the top of this blog post ("different sorts of tablets, for a different sort of education") comes from the Wikipedian BibleTalkTimeYOUTH via Wikimedia Commons and is used according to the terms of its Commons Attribution-Share Alike 3.0 Unported license. The second image of a pile of pills ("tablets of all shapes, sizes and colors ... but is this the right medicine?") comes from the Wikipedian ParentingPatch via Wikimedia Commons and is also used according to the terms of its Commons Attribution-Share Alike 3.0 Unported license.
Not too long ago I did some advisory work in a country considering the purchases of lots of educational tablets. Previously this country had funded lots of computer labs in schools, but they had experienced great difficulties in integrating these facilities into 'normal' teaching and learning activities. Buying devices as part of a '1-to-1 educational computing' initiative, it was felt, would get around many of the difficulties they had experienced with desktop computers in dedicated school computer labs. (I had my doubts about this.)

When observing a class, I noticed that all of the students had the same backpacks. "What's up with that?", I asked.

"Oh, it is very interesting," came the reply. "Those backpacks are purchased by the state for use by low income students. You can see from the fact that all of these backpacks are in the room that the children here are from very low socio-economic levels in society."

I then asked how many of the students had a phone in their backpack. All of them but one (who said he forgot his at home, someone else told me later it had been stolen) said that they did, and most students pulled them out to show me.

After asking a few follow-up questions about what they did with them (Facebook! And texting! were the two most common answers) and once class had resumed, I turned to my counterparts in government and observed that I also "found this all very interesting. You are going to buy lots of small computing devices for these students to use by spending public funds, in part because they are not using the devices that you purchased for them before. Despite the fact they are all poor enough to qualify to receive free government backpacks, all of their families have somehow found the money to buy them mobile phones, which they obviously all use quite heavily. Have you thought about taking advantage of this personal computing infrastructure that is already installed in the pockets and pocketbooks (or backpacks) of the students, and orienting some your investments for different purposes, like upgrading connectivity and/or spending more funds on content and/or training?"
This phenomenon, known as 'bring your own device' (BYOD) or 'bring your own technology (BYOT) in educational technology circles, was just one of many topics discussed and debated at the most recent Global Symposium on ICT Use in Education, which took place in the provincial Korean city of Gyeongju.

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Korea is in many ways a natural venue for these sorts of gatherings. It is the first country to 'graduate' from being the recipient of international donor funds to become a full-fledged donor in its own right. The story of the 'Korean Miracle' is a long and complicated one, but there is little disagreement that achievements related to technology, and in education, are key markers of this success.

It is in part for this reason that the World Bank, the Korean Ministry of Education and the Korea Education Research & Information Service (KERIS) have a close partnership exploring issues related to the use of information and communications technologies in education around the world. As part of this partnership, for the past eight years 60-80 senior education officials from around Asia and the rest of the world have gathered annually in Korea to share anecdotes (such as the one above) and discuss topics of common interest related to the use of new technologies in education.

Hosted by KERIS, Korea's world-renowned national educational technology agency, the Global Symposium on ICT Use in Education typically considers one topic of common interest and activity across a broad spectrum of countries, from the highly developed economies of East Asia and Europe to low income countries in Asia and Africa and all points in between. The event also serves to help orient the research agendas of a number of international groups with related interests to help better meet some of the most immediate and pressing related information and knowledge needs of educational policymakers.

This year's event in Gyeongju focused on "1-to-1 educational computing", the increasingly mainstream trend and interest in many countries to enable students access to their own personal ICT device. Usually this has meant a laptop, but more and more this is about tablets (and other devices) as well.

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It is perhaps worth noting that, while Korea itself was one of the first countries to introduce computers and the Internet into its schools at a large scale, it is, relatively speaking, not as far advanced when it comes to "1-to-1 educational computing" as many other places. In part this is a historical legacy of the fact that was early to introduce PCs into schools. In a country where access to computing devices in people's homes and in the pockets and pocketbooks of its young people is near ubiquitous, and which enjoys some of the fastest Internet connection speeds in the world, concerns about the 'digital divide' which animate many 1-to-1 educational computing programs in other countries simply aren't that pronounced in Korea.
Ladies Methodist College in Melbourne, Australia is considered by many to be the world's first 1-to-1 initiative. Begun in 1989, it was an outlier for many years (what is commonly thought to be the first 1-to-1 effort in the United States, at Cincinnati Country Day School, didn’t launch until seven years later). It wasn’t until after the turn of the century, when efforts like the Maine Learning Technology Initiative in the U.S. and then, partially inspired by the Maine example, bigger initiatives like the global One Laptop Per Child effort and pioneering national programs in countries like Uruguay kicked off and rolled out, that the reality of 1-to-1 computing became a higher-profile topic of discussion across many education systems.

Of course, the vast majority of students around the world aren’t yet online, and only a minority has regular access to computers in their schools. That said, there are, for better and/or for worse, few countries around the world that aren’t contemplating initiatives that are aimed, at some point in the future (perhaps in the distant future), at achieving a ratio of one computing device for each student in their schools. Whether or not the goal of a country like Mozambique, for example, of achieving "1-to-1" by 2026 is possible (or advisable), the fact that this goal has been articulated and set by many countries such as Mozambique is a signal of the potent symbolism and organizing power of this sort of goal in education systems around the world. In addition to numerous examples and lessons from Korean experience, presentations shared practical perspectives and insights from countries as diverse as Australia, Azerbaijan, Ethiopia, Ghana, India, Malaysia, the Philippines, Sri Lanka, South Africa, Spain, the United States, Uganda, Uzbekistan and Vietnam.

Discussions at this year’s global symposium made it clear that 1-to-1 educational computing efforts are no longer exclusively, or even largely, about only access to devices, and, through the devices, about access to learning materials and opportunities that were otherwise difficult to access. These sorts of initiatives remain about that, of course, but increasingly they are meant to address issues of education quality as well. While the balance between access and quality differs from place to place and over time, it is increasingly clear that, at the center of discussions about the relevance of 1-to-1 educational computing efforts to both access and quality are important, in many cases profound, issues related to equity.

There are many different operative definitions about what "1-to-1" means in practice in various parts of the world. I have always liked the definition adopted by the state of Maine, which calls for “a personal digital device, at the point of learning, as defined by the student.” While it is undeniable that many places are still largely concerned with the first component part of this definition (“a personal digital device”), the wisdom and power of the other two parts of this definition (“at the point of learning, as defined by the student”) are increasingly acknowledged as well, especially in places where initial deployments that were largely hardware-focused have evolved into efforts with a greater focus on enabling and supporting useful teaching and learning practices, in ways both mundane and transformative.
While some 'less developed' countries participating in the Korea event noted that, for them, "1-to-1" targets currently mean things like "one computer lab per school" or "one interactive whiteboard per classroom" (in some schools, it means that only one student is using a particular computer at a time), it is clear that these are waypoints on a journey that is meant to conclude, some day, with a definition that is more or less like what Maine articulated a decade ago.

Four years ago a small group of leaders of national and regional 1-to-1 educational computing efforts from around the world convened in Vienna in a first-of-its-kind meeting to share practical experiences about what was working, what wasn't, and how they hoped to move forward. Prior to that, 1-to-1 efforts were much less well networked across borders, and when connections did exist, they were often point to point (connecting Canada and Uruguay, for example, or the U.S. state of Maine with individual nations in the Caribbean). Since that time there has been an explosion not only of related rhetoric, but also of actual activity -- large-scale activity, and not only in the highly developed, post-industrial economies of the OECD. In some ways, the richness of experience and perspective shared at this year's global symposium was confirmation that, when it comes to providing students with their own personal learning devices, we are in some ways, at least from a global historical perspective, now at the end of the beginning.

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To help set the stage for the discussions that were to follow, I opened the first session at this year's global symposium by sharing a short series of general, broad observations about trends and lessons from 1-to-1 educational computing efforts around the world. In case they might be of any interest or utility to a wider audience, I'll share them in a follow-up post here on the EduTech blog.

You may also be interested in the following posts from the EduTech blog:
- Reports from the Global Symposium on ICT Use in Education from 2013, 2011 and 2010.
- Big educational laptop and tablet projects -- Ten countries to learn from
- Questions to ask (and not to ask) when your president tells you to buy 100k (or a million) tablets for students
- Evaluating One Laptop Per Child (OLPC) in Peru
- The Aakash, India's $35 (?) Tablet for Education
- Next steps for Uruguay's Plan Ceibal
- Observing Turkey's ambitious FATIH initiative to provide all students with tablets and connect all classrooms
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- Around the World with Portugal's eEscola Project and Magellan Initiative
- The Maine thing about 1-to-1 computing
- One-to-one computing in Latin America & the Caribbean
- Ten comments on 1-to-1 computing in education (2010)
- School computer labs: A bad idea?
• Laptops for education: $10, $35, $100 and points in between (but not above!)

*Note*: The image at the top of this blog post ("no, we are talking about 1-to-1 (educational computing), not (five) won to Juan (Mata)") is a mash-up of two different pictures. The first is of the Chelsea footballer Juan Mata; it comes from the Wikipedian Warrenfish via Wikimedia Commons and is licensed for use under the Creative Commons Attribution-Share Alike 3.0 Unported license. The second is of a Korean five won bank note. It comes from the Bank of Korea, was also found via Wikimedia Commons, and is used according to the terms of the official Guidelines for the Reproduction of Bank of Korea Notes and Coins.
Ten observations about 1-to-1 educational computing efforts around the world

by Michael Trucano

#28: originally published on Tuesday, 25 November 2014

This year's Global Symposium on ICT use in education in Gyeongju, Korea focused on "Transforming Education with 1:1 Computing: Learning from Practical Experiences in Providing Students with Their Own Individual Computing Devices".

Many countries are investing enormous amounts of resources and effort to increase the availability of information and communication technologies (ICTs) across their education systems. So-called "1-to-1 computing" initiatives are increasingly prominent as part of such efforts. In some places these are important components of larger educational reform processes that seek to enable and support teaching and learning processes in ways both mundane and profound, traditional and (to adopt a common related buzzword) transformative. In other places these are largely 'hardware dumps', dropping in lots of shiny new devices with little attention to how to integrate them into teaching and learning practices. Common to both circumstances is often an intense belief that 'change' of some sort is necessary if students are to be able to thrive in increasingly technology-saturated, and technology-determined, global economies and societies. While the vision behind many large-scale 1-to-1 educational computing projects may be rather hazy or muddled, they do represent potent symbols for change in many countries. Even if the end goals are not always clearly defined, these efforts are in part a reflection of the belief, as proclaimed by one participant at this year global symposium, that "the status quo is more dangerous than the unknown".

To help set the stage for the discussions that were to follow, I opened the first session at this year's global symposium on ICT use in education by sharing a short series of general, broad observations about trends and lessons from 1-to-1 educational computing efforts around the world. In case they might be of any interest or utility to a wider audience, I thought I would share them here on the EduTech blog. These comments are not meant to be comprehensive in scope, nor are they meant to be focused (like so much of the research and rhetoric around 1-to-1 easily available on the Internet) on the experiences and realities of what 1-to-1 currently looks like in 'highly developed' countries (especially the United States).

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I do not fear computers, I fear the lack of them
Trends and Lessons from 1-to-1 Educational Computing Efforts Around the World: Ten observations

1. "1-to-1" is increasingly part of mainstream discussions – and some places are going beyond "1-to-1"
No longer are discussions about 1-to-1 computing confined largely to education systems in OECD ('highly developed') countries. Argentina, Brazil, numerous island nations in the Caribbean, Georgia, Honduras, multiple states in India (that are themselves larger than many countries), Kenya, Mexico, Peru, Rwanda, Turkey, Uruguay ... these are just some of the middle and low income countries with substantial 1-to-1 projects, or plans for them. In some high income countries, we are talking about many-to-1 realities in some schools and communities, where access to an individual device at school is complemented (and in many cases, superseded by) access to mobile phones, personal computers, tablets, e-readers, video game consoles, connected televisions, etc. outside of school.

2. "1-to-1" is about more than just one type of device
Traditionally, 1-to-1 computing has largely been about 'laptop projects'. Today, while the ratio remains unchanged, the device in question may just as easily be a tablet -- and sometimes an e-reader or even a mobile phone. Thus, it is less about the affordances of a specific form factor (e.g. the laptop) than about a device being 'mobile' and belonging to an individual.

3. Procurement challenges are becoming very acute – and difficult, and controversial
As purchases of ICT-related equipment in schools get larger, they are also becoming much more complicated, and many governments have insufficient internal capacity to oversee and manage these well. Putting aside issues of fraud and malfeasance (which of course can be very real in certain jurisdictions, and are not to be discounted -- especially where watchdog groups don't have experience in knowing what to look for in what is a new area for government procurement in many countries), things like the bundling of hardware and educational content and related services; questions about whether you are even procuring a 'product' these days (or if it more rightly considered a 'service'); avoiding vendor lock-in (a real problem when looking to standardize purchases across an education system); ensuring sufficient competition in the market; and trying to evaluate different acquisition models (purchase, leasing, subscription) can challenge the ability of many education systems to write useful bidding documents, let alone evaluate the proposals from vendors they receive in response. Challenges related to 1-to-1 procurements in places as diverse as Kenya (a low income country), Thailand (middle income) and the Los Angeles Unified School District in the United States (high income) suggest that this issue is a general one around the world.

4. More devices are putting very real pressures on bandwidth
'1-to-1 devices' like laptops and tablets continue to drop in price and increase in functionality much more quickly than does the bandwidth available for use by such
devices. Network efforts suggest that, the more devices that are available, the
greater the value in networking them together, as well as in connecting these
devices to content that is being increasingly migrated to 'the cloud'. The
affordability and availability of sufficient bandwidth and Internet connectivity
represent a very real binding constraint on 1-to-1 educational computing efforts,
both related to the use of the devices within schools, as well as outside of school
(especially when connectivity is not available in homes or other public places).
Trends in some high income countries to allow teachers and students to bring their
own devices for use on school networks put further pressure on available
bandwidth. (In some advanced schools in high income communities where 1-to-1
efforts have rolled out, officials now talk of benchmarking and 'future proofing' their
networks so that they can accommodate two devices per student.)

5. Evaluation results are coming in, including from non-OECD countries
While it may be an uncomfortable and regrettable truth that few 1-to-1 educational
computing initiatives are the result of decisions that are 'evidence-based', it is
heartening to note that impact evaluation is being taken more seriously in more
and more places. Recent meta surveys of the evidence base related to edtech
initiatives in developing countries, supported by groups like the Inter-american
Development Bank and Dfid, the UK's international donor agency, as well as
evaluations of 1-to-1 efforts in countries like Peru and Uruguay, are hopefully the
leading edge of a trend that is just beginning to gain steam around the world.

6. Digital textbook initiatives are gaining momentum
As 1-to-1 educational computing efforts roll out, efforts to make available digital
teaching and learning materials are gaining momentum in many places as well --
albeit typically with some delay. Sometimes this is a result of a holistic vision, with
"content" and "container" considered as complementary component parts of a
larger educational reform process. Sometimes, if we are honest we ourselves, it is
the result of policymakers trying to figure out what to do with all the technology
they have purchased and distributed to schools which isn't being used all that
much, or all that productively.

7. A personal device ≠ personalized learning
Just because a student receives her own 'personal' device as part of a 1-to-1
computing initiative doesn't necessarily mean that she will be engaged in
'personalized learning'. (The same is true when students receive their own books,
of course.) 1-to-1 devices may enable, but assessment drives, 'personalized'
learning. While definitions of 'personalized learning' are quite varied, the ability for
students to receive individualized feedback, based on an action they have taken,
and to have some agency in what they do (use a search tool, choose different
variable in a virtual experiment, draw a picture, ask a question, etc.) offer the
potential for 1-to-1 devices to support more 'personalized' learning activities. But
this doesn't happen by magic, and simply leaving students to their own devices
does not mean that 'personalized learning' will happen just because they now have
their own laptop or tablet.
8. No data --> (much) more data
For the most part, we have very little data about what actually happens in a classroom. The processes of education, and of learning, are seen by many as a sort of 'black box' into which it is very difficult to gaze and tell what is actually happening inside, and how what is happening (or not happening) relates to what eventually emerges. As 1-to-1 education computing initiatives result in digital tools insinuating themselves more intimately, and to a greater extent, into teaching and learning practices, there is a potential to get partial and incomplete glimpses into this black box in ways not previously possible. Digital 'paper trails' and device-enabled data collection are vastly increasing the amount of data being collected about what teachers and students are doing (and seeing, and ignoring, and writing, and choosing). The data being generated and (to a lesser extent) collected are being not, for the most part, being used productively so far by educational planners, nor by teachers and learners themselves. Whether these data are in fact useful in helping to guide teaching and learning practices, and, more importantly, how we can make good use of them, are questions that many folks are trying to answer. That said, there is little question that things like 1-to-1 education computing efforts will help to bring about a transition from our current state of data poverty to one of greater data abundance -- for better and for worse.

On a related note:

9. Privacy is not (yet) on the agenda in most places
Movements in the education sector to provide and utilize personal devices, and to enable increasingly 'personalized learning', necessarily mean that more and more 'personal data' about individual students can potentially be, and are being, collected in increasingly huge amounts. To be sure, data privacy for students is a very real, and acute, and complex, issue for policymakers (and vendors) in North America, Australia, and much of Europe. That said, it is my experience that, in most education systems outside of the OECD, privacy is simply not on the agenda at all when it comes to discussions of, and plans for, large scale deployments of educational technologies.

In some places where educational and political cultures are, for lack of a better term, authoritarian, privacy is not on the agenda for consideration because it is pretty clear that little or no privacy related to student data is to be expected. In other places, is not on the agenda for consideration because it is simply not a topic that is traditionally considered within the education sector to a large or real degree. Different places will, and should, have different answers here, of course. That said, not considering the potential implications related to access to data, sharing of data, who owns what data, etc. is potentially especially problematic when it comes to education for a number of reasons. In the first place, we are talking about children, for whom data privacy issues in general are usually considered differently that those of adults. Children are (most everywhere) required to go to school for many years, and are subject to prevailing privacy practices and norms that exist within an education system, whether they like them or not. Given that children are, by definition, young, they will have to live with the consequences of their data being shared for much longer than would be the case for those of older generations.
In the absence of related laws and guidelines about data privacy issues as they relate to children, there exists a very real possibility that it may be the easiest course of action in many places to simply take the de facto practices that exist within education systems as a result of the widespread roll out and use of digital technologies and make them de jure policy and law. Given that the result may or may not be desirable, not asking related questions about data privacy issues as they may emerge as a result of large scale 1-to-1 educational computing initiatives may not be such a good idea.

It is also worth noting that, for education systems where equity is an important consideration (and this includes most countries in the world), detailed data are needed to be able to detect bias and discrimination and inequalities of opportunity. As a result, there are potentially fundamental tensions between issues of privacy and equity within education systems that will become more and more pressing as more and more personal data about students are collected as a result of going online using personal computing devices.

10. _____
I have left observation #10 blank here, as an acknowledgement of the incomplete, far-from-comprehensive nature of my brief comments here, and as an invitation for others to fill in this blank with reflections and comments based on their own experiences (and/or to challenge any of the things I have asserted in #'s 1-9).

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I'll conclude by making two brief points.

The first is that, in many places, 1-to-1 educational computing efforts are the latest answer to questions about how to close the so-called 'digital divide'. While this divide has traditionally been defined in terms of access to devices and connectivity, it is important to note that, in much of the world, it is also a function of access to sufficient reliable, affordable electricity as well. As access to hardware, mobile networks and the Internet increases, however, it is also becoming clear that a second digital divide is revealing itself, one that is even more important, and difficult to bridge, than the original one, separating those who are able to make good use of all of these devices, from those who can not.

The second is to challenge you to consider a sort of 'thought experiment': What if all students and teachers already had their own devices? What would we be talking about then? What is the vision for education and learning that we hope 1-to-1 educational computing initiatives will help us realize? If we don't have good answers to such questions, or at least good starts on the way to answering them, we may wish to reconsider many of our 1-to-1 educational computing efforts until we do.

We clearly do not have all the answers about how to do all of this stuff. But the good news is that we do have some. More than we used to. And hopefully we are at
least getting better at asking the right questions.

You may also be interested in the following posts from the EduTech blog:

- Big educational laptop and tablet projects -- Ten countries to learn from
- Questions to ask (and not to ask) when your president tells you to buy 100k (or a million) tablets for students
- Evaluating One Laptop Per Child (OLPC) in Peru
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- School computer labs: A bad idea?
- Laptops for education: $10, $35, $100 and points in between (but not above!)

Note: The image used at the top of this blog post of a child in front of a computer screen (“I do not fear computers, I fear the lack of them”) comes from the Wikipedian Nevit Dilmen via Wikimedia Commons and is used according to the terms of its Creative Commons Attribution-Share Alike 3.0 Unported license. (The caption, which may or may not be meant ironically here, is actually a quotation from the prolific science fiction author Isaac Asimov.)
As we near the halfway point of the second decade of the 21st century, it is difficult not to marvel at all of the new technologies that have insinuated their way into daily lives of increasing numbers of people around the world. An upcoming publication from the World Bank, the World Development Report for 2016, will explore the Internet's "impact on economic growth, on social and economic opportunity, and on the efficiency of public service delivery". The EduTech blog regularly features and comments on specific projects and research about how the Internet (as well as related technologies, technology platforms and technology-enabled approaches) is being utilized to benefit education in developing countries around the world (as well as some instances where it is having no benefit at all).

As insightful as lessons from efforts like those related to using mobile phones to promote literacy in Papua New Guinea or providing all students with their own laptops in Uruguay might be, however, it is worthwhile to take a step (or two, or twenty) back in an attempt to see the outlines of the big(ger) picture. While it is true that groups around the world continue to implement innovative solutions to simulate Internet connectivity in places where it still doesn't exist in schools (through the caching of content on local servers or portable drives, for example), this is almost always a stop-gap measure until something better comes along, namely: reliable, robust, fast, inexpensive connections to the Internet.

On-the-ground, practical experiences with introducing and using new digital technologies in education systems around the world over the past two decades have led many to conclude that a 'second digital divide' has emerged, separating those with the skills and competencies to benefit from the use of these new technologies from those who are not benefitting, or not benefitting to the same extent. There can be little doubt that such a second divide exists, and that this divide, which is focused on the impact of technology use, may well be more difficult to bridge than the original 'digital divide', which related primarily to access to technology. While in the end we are rightly concerned with outcomes, and impacts, inputs still matter. With this in mind, and with full acknowledgement that connectivity is not an end in itself, but rather a means to a larger end, it might be worth asking:

*How many schools around the world are connected to the Internet?*
Until recently we had little hard (or even soft) data to help us answer what would appear, on its face, to be a rather simple question. Things are improving in this regard, however. As it stands today, your best source of insight in this regard is probably a document with the delightfully bureaucratic title, Final WSIS Targets Review: Achievements, Challenges and the Way Forward, that you may have missed when it appeared last June. In case it may be of interest (a former boss of mine used to say: We pay you to read this stuff so that we don't have to!), I thought I'd take a quick look at it here.

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First some quick background: Thirteen years ago the United Nations endorsed the holding of a World Summit on the Information Society ("WSIS") to explore what it might take for all countries and their citizens to participate in, and benefit from, the so-called 'digital revolution'. As a result, two such global meetings were held (one in Geneva in 2002, the other three years later in Tunis) and a process was put in place to help monitor a set of ten related general 'targets'. Progress against the second of these targets, which was eventually articulated as "Connect all secondary schools and primary schools with ICTs", has been measured in a few different ways, one of which relates to the "proportion of schools with Internet access, by type of access (broadband, narrowband)". (Officially, this is known as indicator 2.4, for those of you who are interested in such things.)

With that background out of the way, back to the question:

**How many schools around the world are connected to the Internet?**  
The general answer, according to the report from the Partnership on Measuring ICT for Development and the International Telecommunication Union, is that, when it comes to schools, "while Internet access has been universally achieved in the majority of European and other OCED countries, Internet connectivity is lagging behind in most developing countries. It remains under 10 per cent in some countries from all developing regions, including Latin America and the Caribbean, Asia and Africa.... Analysis has shown that while countries may have some success in building a computer infrastructure, connecting these devices to the Internet may lag behind."

In other words, a quick answer to this question might be:

*More than before, but still not enough -- and those that *are* connected need better connections.*

For those of you who find such an answer to be useful and interesting but rather unfulfilling (where are the numbers? the graphs?), the next section of this blog post is for you.
Sharp-eyed readers will note that these data are presented as percentages on a national level, and not in absolute numbers. Perhaps some enterprising student with time on her hands can convert these percentages into hard numbers by country, and then total up the figures to arrive at one number. One quick way to check the validity of this number would be to compare it to the total number of schools in the world ... although unfortunately there is no generally agreed-upon number of total schools in the world either. (This seems the sort of question that might feature in a case interview for a job at a management consulting firm. Perhaps this figure is buried within one of the Education For All Global Monitoring Reports?)

These data on school connectivity come from regional data collection initiatives led by the UNESCO Institute for Statistics (UIS) and done by various partners (past EduTech blog posts have looked at results from these sorts of efforts in the Arab States, Asia, Europe and Latin America). The UIS, which authored the section of the WSIS Targets Review that addresses school connectivity, is careful to note that, "The indicator measures the overall level of access to Internet in schools, not the intensity of use nor the actual amount of time that learners spend on the Internet for educational purposes." Indeed, just because a school is 'connected', this does mean that this connectivity is utilized, let alone utilized well, or used widely, or is sufficient. And: Even if all of these conditions are met, it may be the case that connectivity outside of school is as important, or even more important, for learning as what is available for students within schools. That said, however it is measured or judged, and whether or not you believe that, going forward, connectivity will...
provide the dial tone for education (or development), it is hard to argue that the absence of connectivity in schools is a good thing. The report concludes by offering some related policy recommendations. I present them here, in a slightly different order (and offer some short related italicized comments in parentheses):

- Strengthen existing electrical infrastructure. *(The 'digital divide' is often closely related to the 'electricity divide'. Improving access to the Internet may not be possible without first, or concurrently, addressing issues related to the reliability and availability of power.)*

- Recognise the potential of fixed broadband, WiMax, and mobile broadband (3G and 4G) Internet for equipping schools with high-speed Internet.
- In countries with difficult terrain, consider building a combination of wireless and satellite-based telecommunications with low-cost Very Small Aperture Terminal (VSAT) apparatus for downlink of data and images.
- Consider the use of both radios and televisions to connect schools in situations where more advanced forms of ICT are not feasible or available.
- Recognise the role of community media centres to play a role in extending the reach of ICT to pupils when ICTs are not available in schools.
- In countries where universal Internet service is not feasible, governments should promote the installation of public Internet facilities in rural areas. *(There is no *one way* to connect schools -- all relevant options should be considered. If Internet connectivity is simply not possible today, other forms of 'connecting' are still worth exploring in the interim.)*

- Establish partnerships with multiple levels of government and the private sector, particularly with telecommunications companies, to negotiate low cost access to Internet services. *(The education system can't do this alone, it probably needs help -- and perhaps some 'non-traditional' partners.)*

- Low cost computers are an effective strategy to rapidly increase the computer resources in a country, but this policy option should be weighed against other educational priorities. *(As any good economist will tell you, every decision comes with trade-offs -- whether you acknowledge them up front or not.)*

While better (faster / cheaper / more reliable) connectivity is certainly no 'magic bullet', more data about the extent to which schools are (and aren't) connected to the Internet does help outline the horizon of what might be possible. Some follow-on EduTech blog posts will try to unpack a few of the challenges associated with trying to measure access to, and use of, ICTs for teaching and learning around the world.
You may also be interested in the following posts from the EduTech blog:

- Broadband for schools?
- Comparing ICT use in education across countries
- Surveying ICT use in education in Asia
- Surveying ICT use in education in Europe
- Surveying ICT use in education in five Arab States
- Surveying ICT use in education in Latin America & the Caribbean
- Surveying ICT use in education in Brazil

Note: The vintage image used at the top of this blog post of a man connecting telegraph wires ("ALPAL-2? EASSy? SAm-1? WACS?") comes from Wikimedia Commons and is in the public domain. (The acronymic references in the caption are all major submarine cables.) The graphs used are all © 2014 ITU and come from the publication reviewed here, Final WSIS Targets Review: Achievements, Challenges and the Way Forward, produced by the Partnership on Measuring ICT for Development (in which the World Bank participates) from data gathered by the UNESCO Institute for Statistics.
What's the impact of technology use on education, and on learning?

This simple question is rather difficult to answer, for a number of reasons. The quick answer -- that 'it depends on how you are using it, and to what end' -- may be unsatisfying to many, but is nevertheless accurate. That said, before you attempt to assess impact, it can be rather helpful first to understand how technologies are being used (or not used) in actual practice. And before you can do this, it is useful to know what is actually available for use today, as well as some of the key factors which may influence this use. Being able to compare this state of affairs with those found in other countries around the world can help you put this knowledge into some comparative context. (Are we typical, or an outlier? Are we ahead, or behind?)

Back in December 2009, the UNESCO Institute for Statistics (UIS), the specialized agency within the UN system responsible for collecting data related to education (the World Bank's EdStats initiative is a close partner of the UIS in this regard) published a very useful Guide to Measuring Information and Communication Technologies (ICT) in Education [pdf] that has since been used to guide regional data collection efforts in much of the world.

(The EduTech blog has looked at results from a number of these efforts, including in Asia, the Arab states, and Latin America, as well as more generally about what these efforts tell us about the state of school connectivity around the world; a regional report from the UIS on ICT and education in Africa is due out in the first half of 2015.)

Building on these efforts, it is expected that the first comprehensive global initiative will commence next year to regularly collect basic data related to technology use in education in *all* countries, big *and* small, rich *and* poor.

What sort of data might be important to collect, and what can be collected in practice?
Are the existing set of 'indicators' put forward by the UIS relevant and useful, or should they be reduced/enlarged/amended, based on what has been learned as part of efforts to collect and analyze them in recent years?

To help explore such questions, the UIS brought together a 'technical advisory panel' comprising an acronymic soup of organizations (including ADEA, ALECSO, CETIC, European Schoolnet, ITU, KERIS, OECD, TAGI, UNESCO, World Bank) earlier this month to review lessons from the first set of regional data collection efforts and to provide comments on, and suggest possible changes to, a consolidated list of related ICT/education 'indicators' and related questionnaire [pdf]. A new global survey of technology use in education, meant to be part of the regular, on-going data collection efforts of UIS in the education sector coordinated through national statistical offices, is due to launch in September 2015.

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Much policymaking around technology use in education around the world exists in a sort of data-free zone. (Indeed, some argue that, given the lack of data upon which decisions can be made and justified, educational technology investments are the real 'faith-based initiative' in many education systems.) Even where there is an appetite for data-informed decisionmaking, limited data exist that have been rigorously collected, and most of these are from a limited set of countries. Insights are quite often drawn from, and extrapolations are made as a result of, small pilot projects and/or from OECD (i.e. 'highly-developed or 'industrialized') contexts and experiences. The related policy literature is replete with mentions of things like 'transformation' and 'disruption', although such formulations are often more theoretical and aspirational than grounded in observable, on-the-ground realities in schools. While there are a number of rigorous data and opinion gathering exercises of potential relevance to policymakers in higher income countries (PISA, efforts from the European Schoolnet, the Horizon Reports), there is a paucity of such activities explicitly designed to be relevant to so-called 'developing country' contexts, let alone offer the opportunity to draw comparisons across such countries. In addition, rich experiences from Latin America are, generally speaking, not well known outside of the region, and vice versa (the fact that the region comprises a large number of countries which speak the same language no doubt is a contributing factor here).

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In order to be relevant to key related policymaking discussions and exercises, we need data to inform answers to two different types of questions from policymakers: those that they currently, and commonly, ask; and those which they do not ask, but probably should. If we are to put in place an infrastructure to help answer such questions and to justify why we are proposing that different questions be asked, drawing on experiences that are truly global in scope, it would be useful to have systems and processes in place to collect observable, countable inventory-type data. Much more than this is needed, of course, but you have to start somewhere. When you can't answer the simple questions, many policymakers tend to discount
the value of what you suggest when discussing more complicated issues. And: If you can't put into place the processes, approaches and tools to count the easy stuff, what hope is there that you'll be able to collect data about and analyze things that are much more difficult?

Here is a(n unfortunately) common scenario:
A country buys a lot of computers. Despite large amounts of money being spent and lots of shiny new equipment arriving in schools, no measurable or observable 'impact' can be discerned as a result of all of this spending on new gadgets. One of the first things that many countries do in such a situation is to start making investments in digital educational content (something which of course should have been part of the initiative at the start, but better late than never). When devices + content does not seem to be making any impact, someone finally suggests, 'maybe we should help our teachers figure out how to use all of this stuff'.

When this happens, here are the five most common questions I hear educational policymakers and planners ask:

1. Do teachers need specific training related to ICT?
2. What/which teachers need to be trained? (by subject, gender, age, etc.)
3. How much training should they receive?
4. What should the training include?
5. Is there a recognized standard/certification we should use?

Whether or not these are indeed the questions that should be asked at this point (i.e. if these are the questions that get at things that are really important and impactful), these are the questions that, in my experience working in middle and low income countries, policymakers as a matter of practice typically ask. Faced with such queries, it is helpful to have data on hand which can help answer them, as well as serve as pathways to help ask better questions. If you have data that you feel are reliable, and which come from a wide variety of countries and developmental contexts around the world, the process is made a lot easier.

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When constructing data collection instruments and processes to help with this sort of thing, a number of dilemmas may need to be considered. To what extent, for example, should you seek to document what is already apparent versus introducing concepts or perspectives that might be useful for policymakers to consider? The act of observing, after all, may over time change what is being observed. If, as part of a global data collection effort, certain types of data are requested that policymakers in a given country have not traditionally considered important, nor tracked in a significant way, but which (for example) research and experiences in other countries suggest might be of keen potential policy relevance, might it be useful to include them as part of an effort of this sort? Perhaps. That said, those who do surveys for a living often say that overall data quality may decline as you ask for more and more data. Certain types of ICT/education data may not be easily (or inexpensively, or reliably) collected. Trying to serve three different objectives at
once -- advocacy vs. policy relevance vs. documentation -- may mean that you fail at all of them.

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If you believe it is important to, as the saying goes, 'measure what you treasure', it is important to remember not to simply treasure what it is that you can easily measure. Inventory-related measurement exercises (How many computers are there in schools? How many schools are connected, and at what speed? How much technology-related training do teachers get?) are important first steps, but these may well suggest more about potential access to tools for teaching and learning than about the quality or impact of such activities. When it comes to technology use in education, access-related indicators are useful, but data related to the actual frequency of such use (including 'time on task') are most likely much more important in the end for decisionmakers. Data about the nature of this use (something which may begin to go beyond issues and access and touch on issues related to quality) are potentially even more useful.

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Different processes and systems may be better at collecting data that may result in policy-relevant insights than others. Administrative surveys such as those overseen by UIS may be better at collecting access-related data, for example, while more involved, and expensive, survey activities like those supported by CETIC in Brazil may provide greater insight about frequency and nature of ICT use. While acknowledging the important caution repeated by statisticians and social scientists (but often not fully understood by policymakers or politicians) that 'correlation is not causation', it may still be useful to note that data about access to ICTs in schools, and the nature and frequency of the use of such tools, might be useful to consider as part of related policy discussions.

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With this context in mind, here are a few questions and comments related to the existing UIS survey instruments (the full list of ICT in education indicators is provided for your reference at the bottom of this blog post), to give you a sense of some of the related discussions that are occurring:

• *Given that the existing official global standard definition for 'broadband' is so low as to be of little practical utility for policymakers or relevance for schools, should the term even be used as part of global ICT/education data collection efforts?*

Broadband, for better or worse (mainly for worse, in my opinion), is currently officially defined at an international level as something representing a minimum download speed of 256kbps, a rate at which a single student on a school's 'broadband' connection may have difficulties easily watching a video on YouTube. Beyond issues related to definitions, there are all sorts of practical challenges when it comes to defining key measurable attributes of Internet connectivity in schools: Who can make use of this access, and to what end? Do we
care about both download *and* upload speeds? How do we account for caching and ‘overhead’ and bandwidth shaping? Do we try to collect data about speeds based only on what is available and observable today, or do we try to 'future-proof' the questionnaires, knowing that things will improve over time, and so include bands of access speeds that are today perhaps only relevant for schools in places like (e.g.) Korea and Singapore?

'Future-proofing' survey questions is not always as easy as it may seem, however:

- **If the idea is to collect data about what will be most relevant in the future, should we really be asking questions about the use of radio, as is done in the current survey instruments (ED1)?**

If you were to ask most education policymakers around the world about the technologies that they are most interested in, and will be spending the most money on going forward, very few of them might mention the use of 'radio' high on their list of priority areas for investment. Indeed, radio is not integral to the 'future of education' in most places ... but it might be very integral in a few of them, especially those impacted by acute crises. For example, the Ebola crisis has brought renewed discussions of the use of educational radio to reach children in places like Liberia, Sierra Leone and Guinea who have not been able to attend school for months as a result of the outbreak of that deadly disease. Such realities suggest that caution should be in order when deciding that certain technologies are 'no longer relevant'.

- **Given definitional challenges related to documenting 'computer-aided instruction' (CAI) and 'Internet-aided instruction' (IAI), two terms that related to existing indicators (ED22 and ED23 respectively), might it be better to omit related questions from the official questionnaires entirely?**

The more room there is for interpretation, the greater the likelihood that terms will be interpreted differently, especially across languages and cultures and education systems. Challenges related to explaining what (e.g.) exactly CAI and IAI are meant to represent, and how you can observe and count related activities so as to provide useful related data, may make such terms too problematic to utilize in data collection efforts such as these. Similar comments could perhaps also be made related to collecting data about the use of 'open education resources' (if you yourself don’t know what OERs are, or if you feel you do know but your definition differs in important ways from how others may understand the term, you'll probably question the utility of asking about them as part of global data collection efforts).

- **Are there key policy goals for which there are no relevant indicators that have been identified?**

If so, perhaps we should direct some of our attention to exploring how we might develop some of them. Some examples for potential consideration:
• Perhaps *the* frontier issue confronting educational policymakers in many highly developed countries today relates to data **privacy**. This is a topic that is inextricably linked with the use of ICTs and one for which there is no related indicator in the current framework.

• Another hot (and politically charged topic) of more immediate policy relevance to a larger number of countries around the world relates to the **filtering** of internet access in schools; this too is not addressed in the current indicator framework.

• Efforts like the 'Hour of Code' and the (re-)emergence of 'coding' as a high-profile topic of widespread instruction within a few education systems education systems (like England and Estonia, for example) has meant that policymakers in many countries are wondering whether a greater emphasis on computer programming and computer science makes sense within their education systems, and the extent to which related efforts are happening in other places.

• One educational goal given a lot of rhetorical attention in many policy documents related to the use of new technologies is that of promoting **personalized learning**. Definitions for, and understanding of, what this means in practice may vary widely (and in some cases may not be truly understood at all). One crude proxy by which this phenomenon has been measured in many places (and which is included in the UIS indicator list as indicators ED4 and ED4bis) is the learner-to-computer ratio, with the achievement of a "1-to-1" ratio signaling that 'personalized learning' as arrived. While such device-centric perspectives may have some utility, perhaps a better proxy for this sort of thing might be the existence within an education system of a unique identifier and log-in for each student, especially as more and more services and educational activities are mediated by digital devices and migrated to 'the cloud'. This sort of indicator may also be useful to the extent that it can serve as a proxy for the relative sophistication of an education system’s approach to using technology (this sort of thing is hard to do, and typically takes lots of effort and expenditure). In addition, it might **help indicate where privacy issues might be of increasing relevance and acuteness**.

• The existence of **high stakes, online summative (e.g. end-of-term) assessments** (like those that exist today in places like Lithuania, Georgia and Slovenia, and which are coming to the United States as the impact of testing related to the 'Common Core' is felt) is another potentially quite useful phenomenon to considering measuring. Indeed, I can perhaps think of no better indicator of where an education system will be making huge new investments related to technology use than in cases where new policies call (for better or worse) for the introduction of high stakes, online summative assessments. (This would also be something that would be pretty easy to measure.)

Not all policy-relevant questions can be answered with the help of data collected as part of administrative surveys of the sort overseen by the UIS, of course. Certain types of data will need to be collected by other means. The data that *are* collected will need to be regularly examined to see whether collecting them is really
in the end useful in any practical way, given the time and costs and disruptions involved. (Just because a question is potentially interesting doesn't mean we should spend a lot of effort trying to answer it!) That said, while they are only one part of a much larger puzzle, efforts like those being led by UIS to collect a set of globally comparable data related to the use of ICTs in education should be welcomed by policymakers, funders, and various stakeholder groups in the public, private and civil society sectors with an interest in related issues. Here at the World Bank, we expect that these data will (to cite just one use) form a core part of what we will be doing related to technology use in education under our SABER initiative, and we look forward to continuing to participate in this global effort as it unfolds.

Note: The image used at the top of this blog post of a man peering through a magnifying glass ("at least part of the picture is becoming a little more clear") is from a painting by the German Expressionist Lesser Ury; it comes via Wikimedia Commons and is in the public domain.

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UIS ICT in education indicators

**Infrastructure**
- EDR1 Proportion of schools with electricity
- ED1 Proportion of schools with a radio used for educational purposes
- ED2 Proportion of schools with a television used for educational purposes
- ED3 Proportion of schools with a telephone communication facility
- ED4 Learners-to-computer ratio in schools with computer-assisted instruction
- ED4bis Learners-to-computer ratio
- ED5 Proportion of schools with Internet access by type
- ED22 Proportion of schools with computer-assisted instruction
- ED23 Proportion of schools with Internet-assisted instruction
- ED24 Proportion of educational institutions owning licence for or subscribing to scientific digital libraries
- ED24bis Proportion of educational institutions owning licence for or subscribing to virtual experiment laboratories
- ED25 Ratio of learners-to-computer connected to Internet
- ED26 Average number of computers per educational institution
- ED27 Average number of computers connected to the Internet per educational institution
- ED28 Proportion of student-owned computers available for pedagogical purposes
- ED29 Proportion of all computers available for pedagogical purposes
- ED30 Proportion of all computers available for administrative purposes
- ED31 Proportion of schools with a website
- ED32 Proportion of schools with a website hosting students’ and teachers’ blog pages
- ED33 Proportion of educational institutions offering ICT-enabled distance education programmes

**Teaching staff development**
- ED8 Proportion of ICT-qualified teachers in primary and secondary schools
- ED34 Proportion of schools with ICT support services
ED35 Proportion of primary and secondary-school teachers trained via ICT-enabled distance education programmes
ED36 Proportion of primary and secondary-school teachers who teach basic computer skills (or computing)
ED37 Proportion of primary and secondary-school teachers who currently teach subject(s) using ICT facilities
ED38 Proportion of primary and secondary-school teachers trained to teach subject(s) using ICT facilities
ED39 Ratio of learners-to-teachers of basic computer skills (or computing)
ED40 Ratio of learners-to-teachers using ICT to teach

Usage
ED6 Proportion of learners who have access to the Internet at school
ED41 Proportion of learners entitled to use computer laboratories at school as a pedagogical aid
ED42 Proportion of educational institutions providing an email account to all teachers
ED43 Proportion of educational institutions providing an email account to all learners

Participation, skills and output
ED7 Proportion of learners (by gender) enrolled at the post-secondary non-tertiary and tertiary level in ICT-related fields
ED44 Proportion of learners enrolled in grades with ICT-assisted instruction
ED45 Proportion of learners enrolled in grades where basic computer skills (or computing) are currently taught
ED46 Proportion of learners (by gender) who graduated last academic year in ICT-related fields at the post-secondary non-tertiary and tertiary level
ED47 Proportion of learners (by gender) enrolled at the tertiary level in ICT-enabled distance education programmes
ED48 Proportion of learners who successfully completed a basic computer skills (or computing) course in the last academic year

Outcomes and Impact
ED49 Promotion rate of learners in grades receiving ICT-assisted instruction
ED50 Promotion rate of learners in grades not receiving ICT-assisted instruction
ED51 ICT-assisted instruction performance ratio

 Equity
ED52 Proportion of rural schools with ICT-assisted instruction
ED53 Number of female graduates per 1000 male graduates in ICT-related fields
Translating and implementing the Khan Academy in Brazil
by Michael Trucano

Last month saw the release of the latest annual *Survey of ICT use in Brazilian Schools*. Now in its fourth year, this initiative from Brazil's Center of Studies on Information and Communication Technologies (or CETIC, to use its acronym in Portuguese) is emerging as a model for how many other countries are considering conducting -- and funding -- regular data collection activities related to the increasing availability and use of various educational technologies within their education systems. The survey results, as well as a number of accompanying essays, are presented in one volume [pdf] in both Portuguese and English.

(Hint: If you're just looking for the data, start from the back of the report. And: Here's an earlier EduTech blog post about the first such survey effort in Brazil.)

In addition to offering a current 'snapshot' of what's happening in schools, now that four years of data have been collected related to a number of common themes, the survey finds that some trends are becoming apparent. One trend which will come as no surprise to those who know Brazil is that there are some significant variations in many data by region. (Whereas municipal Rio de Janiero is in many regards a leader in educational technology use in South America, for example, the practical reality of ICT use in schools in northern and northeastern Brazil is much different.)

*Some high level findings from this most recent survey:*

- Schools in urban areas have an average of 19 computers, serving an average of just over 650 students. Most of these are in administrative offices and dedicated computer labs. While classroom and mobile access are growing quickly, with 30% of teachers reporting that classrooms are now the main venue for computer use in their school, labs remain the main point of access to computing facilities overall. (For what it’s worth, almost half of Brazilian households report having a computer.)
- 95% percent of schools with computers are connected to the Internet (no word if any computer-less schools are connected!), although the speed of
these connections leaves more than a little to be desired: Only 39% of schools meet the minimum target of 2 Mbps for schools in Brazil.

- Almost half of public school teachers with their own laptops brought them to school, and most professional development related to technology use for teachers is a result of their own efforts (and thus not the result of government training programs).

For the first time, teachers were surveyed on the reasons behind their use of digital teaching and learning resources, and it appears that most of this use is self-motivated (i.e. a result of personal choice by teachers, and not something mandated, or necessarily even encouraged, by official education authorities). As the report states, "The ICT Education survey presents a scenario of relative autonomy for teachers in terms of educational content, given that the proportion of teachers that combine isolated contents such as images and texts is higher, surpassing access to video lectures and readymade presentations. The data indicate the importance of teacher initiative in the use of digital content in their teaching practices, as well as a concern for the demands of and benefits to students and colleagues. The reduced mention of institutionalized incentive – whether from the school administration or government authorities – indicates an important field for the development of public policies in the area."

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As public policies in this area continue to evolve across Brazil, the actions of a number of private foundations in supporting innovative uses of educational technologies are helping to suggest possible ways forward. A notable group in this regard is the Sao Paulo-based Fundação Lemann. Denis Mizne, who heads the Lemann Foundation (to use its English language name, which is how I'll refer to it here), stopped by the World Bank back in September and shared emerging lessons from initiatives supported by his foundation and partners to translate and implement the Khan Academy for use in Brazilian schools.

Support for the Khan Academy is one of a number of projects from the Lemann Foundation that are exploring innovative answers to the question, "How can we make sure we are making the best use of the short time available for instruction within schools in Brazil?"

I have transcribed my notes from the Mizne talk below, together with some short explanatory background as might be relevant, in case they might be of interest to a wider audience than just those who attended the related presentation in person at the World Bank.

Those who are unfamiliar with the Khan Academy may wish to visit its website or check out two related recent EduTech blog posts. My boss, Claudia Costin -- who used to be the secretary of education in Rio and who spearheaded the use of the popular Educopédia platform in schools there -- has also written about the use of Khan Academy in Brazil, noting among other facts that, as a result of the Lemann Foundation efforts, Khan Academy
content is now accessible to 70,000 students, 2,500 teachers, and several hundred schools in Brazil. (An additional 850,000 students across the country have used the materials since they were opened up in February to students and teachers outside of the schools involved in the official roll out.) On a somewhat related note, Jim Yong Kim, the head of the World Bank, has discussed what he has learned from Sal Khan.

What’s been happening with the Khan Academy in Brazil

Mizne noted that he has observed a widespread misunderstanding in Brazil of what Khan Academy offers, and what the Lemann Foundation has been supporting. Lemann wanted to introduce a tool to help teachers in Brazil make more informed (and thus hopefully better) decisions about how to help their students learn, and not just make available lots of additional content in Portuguese for students and teachers to access and use. There is, after all, no shortage of quality educational content available in Portuguese already. (When most people think of the Khan Academy, they think first, and often only, of the well-known instructional YouTube videos.)

At a basic level, it is true that the Lemann Foundation has been supporting the translation of thousands of Khan Academy educational videos into Portuguese. While this is perhaps its most visible activity, however, it is really only the tip of the iceberg of what Lemann has been doing, and enabling. More fundamentally, it has made the full Khan Academy platform – including not just the content (the videos, the problem sets, etc.), but also the enabling content management system and analytical tool – available in Portuguese for utilization in Brazilian schools.

It was the potential ‘intelligence’ that the Khan Academy platform might offer about what individual students are learning, and not learning, that was in many ways most attractive to the Lemann Foundation. Translating the Khan Academy videos, while certainly a valuable thing to do in and of itself, was in many ways a ‘price of admission’ for the Lemann Foundation here, enabling access to the underlying ‘intelligent’ platform that lies at the heart of what the Khan Academy helps to deliver to students and teachers. If you just copy the way something looks (i.e. translate something that already exists), Mizne noted, it is difficult to keep up with the changes that occur as individual content changes over time. If you adapt the entire platform, you can keep up with the inevitable changes that will occur (to individual content, to the sequencing of content, as a result of the development of new content) much more easily. This hypothesis has been born out in practice in Brazil, Mizne observed, as during the course of the translation process, and during the early stages of implementation, there were many more changes to source content by the folks at the Khan Academy than they had been expecting.

Translating a vast, rich educational resource like the Khan Academy for adoption and use across an education system where English is not the language of instruction was difficult, but Lemann Foundation funding has also meant that there is now a more robust process, and platform, to enable similar efforts in other countries and languages going forward. Groups translating and localizing the Khan
Academy platform for use in places like Mexico (Spanish), Turkey (Turkish) and West and Central Africa (French) are now benefitting from the related funding that the Lemann Foundation provided to the Khan Academy to help facilitate these processes in Brazil. So, while the original process of translation and localization of the Khan Academy in Brazil was difficult, it is now much easier -- in Brazil and more generally.

As difficult and expensive as the process of translation and adaptation of the Khan Academy tool has been in Brazil, Lemann recognizes that simply making a new tool and set of resources available for use by students and teachers will, most likely, not in and of itself bring about any significant changes to teaching and learning practices in classrooms. **Support for ongoing teacher professional development and support for teachers** has thus been fundamental to the Lemann Foundation’s efforts. Training programs for teachers to help them understand how to use Khan Academy resources as part of their teaching (and, just as importantly, where other resources or approaches may be more useful) has been a big focus, with particular attention to how teachers may wish to change some of their pedagogical practices as a result of the data that the Khan Academy platform makes available. Perhaps more important than the initial training efforts has been the ongoing monitoring and support for teachers that Lemann has supported, which includes the animation of various related online communities of practice for teachers to enable related peer support and guidance. There is a very active related community of practice for teachers on Facebook, for example. (For those who don’t know: Facebook is huge in Brazil, as is social media in general. My boss, who joined the World Bank in July to lead our efforts in the education sector, has over 68,000 (!) followers on Twitter, a legacy of her time as the secretary of education in Rio.)

**What’s been learned**

A lot of things are being learned as a result of the work of the Lemann Foundation with the Khan Academy in Brazil. Here are a few of them that Mizne highlighted:

*Many* **different usage models** are emerging related to the Khan Academy in schools in Brazil. (This is consistent with what is being observed in the United States as well.) This means that there are, as a practical matter, no simple ‘recipes’ for teachers to follow. The Foundation sees the Khan Academy as a tool for teachers to decide how best to use in their classrooms themselves; the Foundation’s role is then to provide training and support for teachers to help them make more informed decisions about how and where best to make use of the tool, and not to prescribe simple ‘solutions’ to problems that teachers themselves are best placed to diagnose and respond to.

The "flipped classroom", the much discussed approach often associated with the Khan Academy where students view lectures at home and do their ‘homework’ in class, with support of their teacher and peers, appears for now to be more useful as a concept and slogan to help advocate for the consideration of new pedagogical processes and tools than something observed in actual practice in Brazil. In reality, and in practical terms, what is being observed in Brazilian classrooms is that
student utilization of the Khan Academy means that students are able to move at their own pace through certain materials, while teachers are enabled to be more personal in their approach to how to help individual or groups of students with specific concepts and activities. In other words: Classrooms aren't being 'flipped', but students are now more free to move at their own speeds.

Lemann’s experience with the Khan Academy has exposed what it sees as a prevailing myth that has currency with many people, namely that "it is easy to identify who is doing well, and who isn't". According to this belief, a student who is ‘good at math’ is simply good at anything math-related, for example, whether ‘math’ entails (e.g.) understanding place value, making estimations, deciphering mathematical concepts and information presented graphically, or calculating the area or volume of shapes and objects. Based on data being generated by the Khan Academy platform in Brazil, however, it turns out that student and understanding performance varies across different mathematical concepts processes much more than many people commonly believe -- at least in Brazil. Just because a student quickly learns how to do something like multiplying fractions, for example, doesn’t mean that she will quickly learn how to do represent the same process using pictures, let alone understand something quite different within the same mathematics curriculum (like solving a word problem involving making change after a purchase). Armed with data that helps unpack all of this, teachers can then (hopefully) be better equipped to provide more differentiated support for students where it might be possible and appropriate.

Mizne related an interesting anecdote about a student in one of the pilot classrooms where the Khan Academy tool was being introduced, whom I’ll call ‘Mateus’. Mateus was the first student in Brazil to achieve a perfect score on all 23 concepts covered and assessed in a certain curricular area. One of the people helping to coordinate the Khan Academy implementation who happened to be visiting the city where Mateus lived stopped by his school to compliment his teacher on Mateus’s performance. The teacher responded, proud but a bit confused: "Now ... which student are you referring to?" The point here was not to criticize the individual teacher – large class sizes, student rotation, the tradition lecture-centric manner in which many classes are typically conducted, and the absence of daily formative assessment tools that would provide detailed insight into how individual students are performing can all contribute to making it difficult to know how a particular student is doing with her or her learning at a particular point in time. The point that Mizne was making was that, given all of these challenges, tools like those in the Khan Academy platform can potentially provide teachers with unique data personalized to an individual student to help them better track how well (or how poorly) particular students are doing long before a student sits for a formal test. In addition: Using the Khan Academy platform, teachers can actually drill down pretty deep, if they so choose. If a student doesn’t understand a concept – something that a dashboard on the Khan Academy platform can help to highlight -- a teacher can actually go back and see (e.g.) how many times a student viewed a video that attempted to explain and demonstrate the concept, if the student watched all of the video, if she watched all of it, if she stopped or rewound it, etc. Such knowledge can make it easier for teacher to do things like group students within a classroom of
Based on what is being observed in Brazil as part of the Khan Academy implementation, Mizne noted that, in practice, calling teachers for help is a last resort for many students, for a variety of reasons. Many would first prefer to review materials again themselves and/or ask their peers for help. Access to Khan Academy data can help teachers focus their time and efforts where they are needed the most, while students progress to a larger extent at their own pace, as a result of their demonstration of mastery of individual concepts, and follow the common practice today – ‘temporal promotion’ – whereby student all learn Concept A on Monday, then all move on to Concept B on Wednesday, etc., whether or not Concept A has been fully learned.

Criticisms and pushback

Mizne commented that, to date, there has been less resistance to their efforts to help introduce the Khan Academy in schools than they had been expecting. This is not to say that the process has been easy, of course, nor that there has been no resistance or criticism at all. One common criticism relates to the fact that technology is an integral part of this effort. This line of criticisms is not unique to the use of the Khan Academy, of course; there is no denying that many educational technology efforts have been expensive while yielding little impact, so skepticism in this regard isn’t only informed by simple anti-technology sentiments. Another criticism is related to a discomfort with the use of a non-indigenous tool, i.e. something developing in the United States and then imported into Brazilian schools. Some critics have lampooned the effort by saying things to the effect of, "oh, you think you’re going to solve everything with a bunch of YouTube videos". Mizne noted that, while the videos themselves can be quite useful, he sees them only being one piece of a larger set of things (the problem sets, personalized data dashboards to help monitor activity and progress, teacher professional development and ongoing support) that the Khan Academy effort in Brazil is trying to introduce and support. A more fundamental, and difficult, criticism relates to questions the pedagogical value of the way individual concepts are presented and discussed. (Is this actually good math?"") In this regard, Mizne notes that the Khan Academy content is regularly improving, and that the data which the platform generates help developers to better understand how to improve things – and that the developers are quite interested in and open to improving things.

Some challenges and recommendations going forward

Costs

Overall, Mizne observed that what the Lemann Foundation has supported is not cheap. That said, if you divide your investment costs across your entire user or beneficiary base, doing something like this can become quite inexpensive as you scale – provided, of course, that you do actually reach scale. There are a number of barriers to ‘scaling up’ successfully, however, and some challenges that only become acute as you reach a large scale.
Connectivity

In order to take full advantage of the Khan Academy platform, schools, teachers and students need to have robust, reliable, affordable connectivity. (An online platform with video: As far as bandwidth requirements go, there is nothing worse than that! When the Internet is down on a day when using the Khan Academy is planned, life for a teacher can be rather difficult, to say the least.) In 2013, 400 schools applied to be part of the official cohort of schools across Brazil participating in the Khan Academy roll out. Lemann did some independent testing of the actual connectivity situation in these schools and found that *none* of them met the minimum related requirements. (This may mean that the connectivity data reported in some places may be a bit, well, misleading .... In some cases, for example, connectivity may be largely reserved for use by school administrative purposes.) Even where connectivity is available in sufficient amounts, firewalls can really muck things up. The recent trend in Brazil is for tablets to be distributed, not laptops or PCs, and the user experience on tablets is not (yet) as good as it is on those more full-featured devices, with their keyboards and mice.

*side note:* The free, offline KAlite tool can be useful in environments where connectivity (and electricity) are spotty. The World Bank will be exploring the use of KAlite in education systems in at least two countries in 2015.

Mizne predicted that, inevitably, students and teachers in Brazil will get their own devices. They may not get them quickly, they may not get the same devices, they may not get them according to the same schedule, and there will be important equity issues that arise as a result. That said, devices will be there and available for use in schools. Access to reliable, affordable Internet connectivity, however, is not happening as quickly as access to devices is occurring, and prices are not going down as quickly either. To make full use of tools like the Khan Academy you need broadband, you need fiber — **better bandwidth is an area of critical need within the education system in Brazil.**

**Project management (the first month is especially critical!)**

Mizne observed that the **first month** of the roll out of the Khan Academy initiative within a school requires a *huge* effort. While teachers have been enthusiastic, there has been resistance to actually start using once teachers return to their classrooms from initial training sessions, and so a LOT of related support is required, even very basic support, both technical and pedagogical. If this is not provided at the start, even well-intentioned efforts that meet evident, tangible needs in practical ways can falter, for a whole host of reasons. The Lemann Foundation closely monitors general usage data day-by-data so that it can quickly identify where something might be wrong, investigating and providing related support immediately. It does not want to wait until problems are reported weeks or months later, by which time it might be quite difficult to get things re-started.

As adoption occurs within classrooms and more and more students actively use the
platform, a lot of effort and support is required to get teachers to access and utilize the individual data available about how each student is using the tool. The availability of such data is a new thing for teachers in Brazil, and it takes a while for them to internalize that it is available, and to figure out how and when to best utilize it to support their teaching.

Support for teachers

A common theme throughout Mizne’s talk was the importance of providing relevant, practical, just-in-time support for teachers. Adoption and success to date has largely been a function of teacher engagement, something which can perhaps be catalyzed as a result of initial training courses, but which is sustained and which grows over time as a result of access to related communities of practice and informal knowledge sharing about what works, and what doesn’t, between teachers.

Data privacy

Mizne stated that issues related to the confidentiality and privacy of student data will be a huge issue going forward in Brazil. The roll out of the Khan Academy platform in Brazil has helped to highlight what some of the nuanced complexities of some of the related issues are in practice, beyond some of the high level, sometimes theoretical issues and concerns that are commonly considered and debated. The absence of related frameworks for data protection, widely-disseminated ‘good practices’ and accompanying auditing and compliance mechanisms represent a real threat to the sustainability of online education efforts such as this going forward.

Evaluation frameworks

Mizne noted that there is a shortage of relevant, practical frameworks to understand and make use of individualized student data and efforts to evaluate efforts meant to promote ‘personalized learning’ of the sort that the Khan Academy is meant (in part) to help enable. In the absence of such frameworks, and related evaluation tools and approaches, some people may just simply say ‘the technology doesn’t work’ and advocate that everything return to the ‘ways things were done before’. If that decision is to be made, it should be made because it was demonstrated that things did not work, not because we are unable to tell if things worked or not.

Going forward, efforts like those of the Lemann Foundation in Brazil to support the roll out of the Khan Academy in schools in Brazil should yield many useful insights about what it takes to succeed, and how efforts might fail, related to the increasing use of new technologies to support teaching and learning around the world. An agreement is in place with the national ministry of education to support for the expansion of the program, and, as the fit within the formal education system is explored in greater detail, one expects that there will be regular debate about, and examination of, whether efforts should be directed primarily to impact students
within the formal education system, or whether it might make more sense to target students outside of school instead. While insights and lessons from project supporters and implementers will continue to be valuable, *so too will be independent assessments* of what’s been happening, and what impact this might be having. *Stay tuned.*

This is the third of three posts about the Khan Academy on the EduTech blog in 2014. You may also be interested in the others: *Evaluating the Khan Academy* and *Contextualizing lessons from the use of the Khan Academy.*

*Note:* The image used at the top of this blog post of Genghis (i.e. not Salman!) Khan and his Chinese envoys ("Khan has come to Brazil -- here's what's on offer") from a manuscript held in the Bibliothèque nationale de France comes via Wikimedia Commons and is in the public domain.
about the author

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Mike Trucano is the World Bank's Senior ICT and Education Policy Specialist, serving as the World Bank's focal point within the education sector on issues at the intersection of technology use and education. He leads the World Bank's related analytical work under its flagship Systems Approach for Better Education Results initiative as it relates to information and communication technologies (SABER-ICT). At a working level, Mike provides advice and support to education projects around the world supported by the World Bank seeking to utilize information and communication technologies in the education sector in various ways. Mike is also the principal contributor to the World Bank's widely read and influential EduTech blog (http://blogs.worldbank.org/edutech).

Mike is a frequent public speaker on the use of ICTs in education around the world, and on ICT use for development (ICT4D) purposes more broadly. He has helped organize a number of FAILFaires, exploring how can people and organizations can more openly talk about, and learn from, 'failed' projects and initiatives, in the hope that sharing lessons from 'failure' might make 'success' more likely in the future. As part of his official duties, he co-chairs the World Bank's internal cross-sectoral thematic group on ICT and education, which helps to maintain the organization's internal knowledgebase on related topics and sponsors numerous speakers and knowledge-sharing events each year.

Mike previously served as the ICT and Education Specialist at infoDev, the multi-donor 'knowledge shop' within the World bank's Global ICT Department, where he coordinated activities related to information and communications technologies and the Millennium Development Goals (MDGs), especially as they related to education. He also led infoDev's work exploring the use of various low-cost ICT devices and managed the program's mobile banking work. Prior to joining infoDev, Mike was a core member of the team that developed 'World Links', the pioneering program which, beginning in the late 1990s, introduced computers and the Internet into education systems in 22 countries around the world.

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Gavin Dykes is an independent education and technology advisor who works with governments, agencies, major corporations and institutions across the world on policy and strategy. His current roles include Senior Director of International Relations for the New Media Consortium, Fellow of Education Fast Forward and Programme Director for the Education World Forum. Following a successful first career as a civil engineer, Gavin spent 20 years developing Technical Vocational Education and Training. He was later seconded to the UK government to support development of technology and learning in schools in England, and also worked on innovative projects in further and higher education. His current and past roles in this regard include time spent as Associate Director of Futurelab and Associate Director of the Innovation Unit at the Department for Education & Skills. Gavin's key interest is in development of learning supported by technology to allow learners of all ages to enjoy education and realize their potential.
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