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TURNING ON MOBILE LEARNING

IN AFRICA and the MIDDLE EAST

> Illustrative Initiatives
and Policy Implications



POLICY
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ABOUT THE SERIES

This paper is part of the UNESCO Working Paper Series on Mobile Learning. The Series seeks to better understand how mobile technologies can be used to improve educational access, equity and quality around the world. It comprises fourteen individual papers that will be published throughout 2012.

The Series is divided into two broad subsets: six papers examine mobile learning initiatives and their policy implications, and six papers examine how mobile technologies can support teachers and improve their practice.

Within the two subsets there are five geographical divisions: Africa and the Middle East, Asia, Europe, Latin America, and North America. Each subset also contains a 'Global Themes' paper that synthesizes central findings from the five regional papers.

Two additional 'Issues' papers round out the Series. One paper highlights characteristics shared by successful mobile learning initiatives and identifies supportive policies. A separate paper discusses how mobile technologies are likely to impact education in the future.

As a whole, the Series provides a current snapshot of mobile learning efforts around the world. Collectively and individually, the papers consolidate lessons learned in different regions to provide policy-makers, educators and other stakeholders with a valuable tool for leveraging mobile technology to enhance learning, both now and in the future.

UNESCO has plans to add additional titles to the Series after 2012. The Organization hopes that these resources will help diverse audiences better understand the educational potential of mobile technologies.

To access existing and forthcoming titles in the Series, please see:
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This report identifies three different types of mobile learning developments in Africa and the Middle East (AME). First, the region is host to a number of project-based interventions, many of which are small-scale, exploratory pilot projects. Second, recent social movements in AME have been enabled by the extensive use of mobile phones and social media. Third, consumers have appropriated mobile phones for a variety of individual, personalized uses. Each of these strands have aspects of ‘learning’ embedded within them, either as an explicit objective or as an unintended consequence. Project-based interventions focus on the role of mobile phones in supporting the delivery of services in a variety of sectors and fields, including education, health, agriculture, food security, disaster management and active citizenship. Together these developments are reflective of the nascent emergence of mobility as a cornerstone of society in the twenty-first century.

The mobile learning value proposition, albeit underdeveloped, purports to extend the reach of learning opportunities to remote areas, thereby supporting the expansion of educational access. Mobile learning also enables an improvement in the quality of education by opening up new avenues for informal, personalized and situated learning. In addition, mobile learning can potentially promote social equity by allowing marginalized groups access to decision-making. This evolving value proposition offers an opportunity to leverage the ubiquity of mobile phones in addressing the systemic crisis in education in the region. UNESCO reports that the prospect of meeting the Education for All (EFA) goals by 2015 in Africa and the Middle East is highly unlikely. Nevertheless, this review of mobile learning projects includes cases that demonstrate the potential of mobile phones to support five of the six EFA goals. The review did not find evidence of mobile phones supporting access to universal primary education (UPE) – EFA Goal 2 – probably because the majority of initiatives are focused on secondary-school students, university students and adult learners. The projects identified in this paper revealed new forms of learning, including the emergence of new literacies and genres among young people in South Africa. This review also found that mobile phones have played a catalytic role in the social movements that arose in North Africa and the Middle East in 2011. Arguably, the Arab Spring ranks among the most significant informal mobile learning phenomena in 2011. Thousands of youth used social media – accessed via their mobile phones – as a space for self-identification, self-assertion, contestation and mobilization around democracy, human rights and civil liberties. This review also uncovered evidence of the ways in which young people in the region are defining their identities through the integration of mobile phones in their daily lives (Shah and Jansen, 2011; UNICEF, 2011).

This paper highlights a range of policy implications in the face of a rapidly evolving mobile learning environment. It recognizes that existing information and communications technology (ICT) in education policies in AME rarely address mobile learning, which reflects a significant policy vacuum. However, some institutions and projects have developed acceptable and fair use policies at a local level. The paper recognizes the challenges faced by policy-makers in light of the dearth of research, empirical evidence and underlying theory development on mobile learning in the AME region at this stage. While acknowledging the unreliable nature of existing information, this paper considers research findings from the small but growing number of studies and reports available on mobile learning in the region.

BACKGROUND AND METHODOLOGY

The AME region covers a diverse and complex range of communities, cultures, languages, histories and education systems, both within countries and across national boundaries. This region comprises the forty-eight countries in sub-Saharan Africa (SSA), including the recently established South Sudan, and the twenty-one countries in the Middle East and North Africa (MENA) region, including Palestine. The latter are sometimes referred to as the Arab States in this paper.

Education systems in the region face endemic crises under the influence of widespread poverty, inequality and political regimes that range from dictatorships to democracies. Historically and particularly over the past decade, the region has been beset with war, revolution, rebellion, famine and natural disasters, all of which take their toll on national education systems. Over the past two decades a wide range of initiatives have tried to address ways in which ICT can play an enabling and systemic role in resolving this crisis in education.

Because of the rapid growth in access to mobile phones around the world and in the AME region in particular, much attention has been given to the potential of mobile learning to improve teaching, learning and institutional efficiencies and to enable national education system transformation. The purpose of this review is to consider how mobile phones have been integrated into education systems in the region, and to identify policy recommendations to support the development of mobile learning in the future.

This paper provides an illustrative overview of mobile learning initiatives implemented in the AME region between 2006 and 2011. Only initiatives that used mobile phones, either alone or in combination with other technologies, were included in this review. While the emphasis is on the education sector, significant attempts at harnessing mobile phones in support of service delivery in sectors such as health care, banking, disaster management and agriculture are also briefly discussed in the context of the generalized emergence of a mobile society.

This review is framed within a qualitative research methodology that focuses on the practice of mobile learning as it is developing. Qualitative research places emphasis on context-specific, real-world settings and seeks to illuminate how phenomena ‘unfold naturally’ (Patton, 1997). Because mobile learning is a nascent field in education, the conceptual frameworks and the evaluation and research methodologies related to mobile learning are incomplete and emergent (Traxler, 2009). The purpose of this paper is not to provide an all-inclusive review of mobile phone-enabled learning in AME, but rather to highlight the most salient projects, strategies and trends that may help inform future initiatives and policies in the region. Specifically, the review aims to:

1. Explore and make sense of the design of emerging mobile learning initiatives in the AME education sector
2. Uncover initiatives that illustrate how mobile learning can potentially facilitate the achievement of Education for All goals

3. Extrapolate implications for national policy development on mobile learning from the initiatives under review

The primary data gathering technique involved the desk review of secondary sources of data, including academic literature, research and evaluation reports, project reports, and blogs. In addition a number of informal interviews were conducted with randomly selected mobile learning project managers. Information was provided by John Traxler, Professor of Mobile Learning at the University of Wolverhampton; Steven Vosloo, Mobile Learning Specialist at UNESCO; Phumzile Mlambo-Ngcuka, who is currently reading for a Ph.D. in mobile learning at the University of Warwick; and Riitta Vänskä, Senior Manager of Mobile and Learning Solutions at Nokia's Sustainability Operations. The data gathered through these techniques were limited in their triangulation because they were confined to only two cursory data-gathering methods: informal interviews and literature reviews. The literature mainly comprised project implementation reports, a few academic papers and a limited number of project evaluation reports.

The information provided in this review has limited credibility and trustworthiness at this stage, as many of the project reports and documents available were descriptive, promotional and anecdotal in nature. This reflects the dearth of evidence-based research on mobile learning at the present time and the need to grow a body of evidence on a phenomenon that is still very much in its infancy in the AME region.

A number of relevant projects were identified and reviewed within the framework of reaching EFA targets. Two of these projects, which are particularly illustrative of the potential of mobile phones to facilitate EFA, have been described in more detail as case studies. The project listing does not claim completeness, nor does the mention of a project represent a statement by UNESCO regarding its status, credibility or success. The review attempts to cover a diversity of experiences across the region. However, a South African bias is apparent largely because there are many mobile learning projects concentrated in South Africa and because the researcher is also located in South Africa, which reinforces such a bias. Also, while this review has tried to obtain information that is as up-to-date as possible, project information may have changed by the time the paper is published.

CONTEXT FOR MOBILE LEARNING

For more than two decades, Africa and the Middle East have experienced a continuing, debilitating crisis in education, including limited access to educational opportunities and resources, a lack of highly qualified teachers, and low levels of literacy and basic education skills. Governments and educators have launched numerous ICT in education initiatives aimed at ameliorating these issues, to varying degrees of success. The onset and rapid growth of mobile phone access over the past five years potentially opens up new avenues for addressing the systemic educational challenges in the region.

EFA AND THE EDUCATION CRISIS IN AME

Education for All refers to the global movement to meet the educational needs of children, youth and adults around the world. In 2000, at a World Education Forum held in Dakar, Senegal, 1,100 representatives from governments, the private sector and civil society established six EFA goals to be reached by 2015. These include: (1) expanding access to early childhood care and education; (2) providing universal primary education; (3) promoting lifelong learning skills for young people and adults; (4) increasing adult literacy by 50%; (5) achieving gender equality in education; and (6) improving the quality of education for all learners. The sixth goal recognizes the central role played by teachers in strengthening education systems worldwide.

The recent *EFA Global Monitoring Report 2011* states that progress has been made in AME over the past five years in reaching UPE and gender equality in education. However, 28.9 million children of school-going age in SSA and 6.2 million in the Arab States were still not attending school in 2008. Together this made up more than half of the 67 million children out of school in the world that year. The report further states that of the 1.9 million qualified teachers needed to achieve EFA goals by 2015, more than half will be needed in the SSA region alone (UNESCO, 2011).

A snapshot of EFA progress in AME reveals a region in the throes of a systemic crisis in education, characterized by significant numbers of children who do not have access to UPE; severe shortages of motivated, experienced and qualified teachers; a dire lack of educational resources such as textbooks; and the absence of basic infrastructure such as toilets and clean running water in many educational institutions. Millions of children are emerging from primary school with reading, writing and numeracy skills far below expected levels; high levels of youth-unemployment continue unabated; and millions of adults in the region still lack functional literacy skills (UNESCO, 2011).

Other studies provide corroborating evidence. A recent study conducted by the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) investigated the level of education-resource poverty in fifteen African countries. The study found that on average, only 42% of Grade 6 learners in these countries had their own reading textbooks in 2007. SACMEQ placed acceptable levels of access to textbooks at 85%. Only Mauritius and

Swaziland had acceptable levels of provision for reading and mathematics textbooks in 2007. In Kenya, only 18% of Grade 6 learners had reading textbooks, and Tanzania scored as low as 3%. In South Africa, where a number of mobile learning initiatives focused on improving performance in mathematics have been launched, 36% of Grade 6 learners had math textbooks in 2007 (Hungu et al., 2011).

In contrast, in the MENA region the past two decades have witnessed dramatic advances in primary- and secondary-school enrolment, with a rise in tertiary-education enrolment as well. Many governments have increased public spending on education. For example, the 7% of gross domestic product (GDP) that Tunisia invests in the education sector puts the country near the top of global list in terms of financial effort. However, schools and universities are reportedly turning out graduates who lack the skills they need to succeed in labour markets, which are themselves challenged by economic mismanagement. As a result, the MENA region has high levels of education accompanied by mass unemployment. This is the region with the world's highest youth unemployment rate, where one in four young people are out of work. In Tunisia the youth unemployment rate is 31%; in Egypt it is 34%. Gender inequality in labour markets is another barrier to opportunity: unemployment rates for female youth are 50% higher on average than for males.

This situation has been exacerbated by the onset of a global economic crisis in 2008, as well as continuing wars, conflicts and natural disasters that have added enormous pressure to existing constraints in the region's education systems. The global financial crisis reportedly increased pressure on national budgets, undermining the efforts of many of the world's poorest countries to finance education plans. Seven of the eighteen low-income countries surveyed for the *EFA Global Monitoring Report 2011* cut education spending in 2009. These countries, the majority of which were in SSA, had a total of 3.7 million children out of school (UNESCO, 2011).

The challenge to improve educational access, quality and equity amidst the countervailing pressures of global competition, conflict and natural disasters has become extremely urgent. UNESCO (2011) concluded that as a result of these pressures a number of countries, including many in the AME region, are now at risk of not reaching the EFA goals by 2015.

ICT IN EDUCATION

To tackle these educational challenges, many attempts have been made to explore how the systemic integration of ICT can help alleviate the effects of the crisis. A wide range of educational ICT interventions initiated at institutional, provincial, national, regional and global levels focus on the enabling role of ICT in improving the quality of teaching and learning, expanding access to learning opportunities, promoting social equity in education, and building inclusive 'knowledge societies' across the AME region. On a global level, initiatives like World Links, launched by the World Bank, and the Global e-Schools and Communities Initiative (GeSCI) established by the United Nations ICT Task Force in 2003, provided support to local ICT in education initiatives. At the regional level, World Links, SchoolNet Africa, and the New Partnership for Africa's Development (NEPAD) e-Schools Initiative were instrumental in developing networks of electronically-supported learning (e-

learning) practitioners and policy-makers across the AME region. Perhaps one of the most significant projects that emerged from these efforts was the NEPAD e-Schools Demonstration Project, which was a formidable public-private partnership involving the pan-African e-Africa Commission and five consortia, each led by a major multinational company. The project rolled out 'end-to-end' ICT solutions, which included personal computer laboratories (PC labs) equipped with curriculum content, teacher training modules and technical support, in six schools per country across sixteen countries in Africa. At the national level, SchoolNet Namibia, Egypt's Smart School Network and the Jordan Education Initiative (JEI) were among the most prominent programmes. At the provincial level, notable initiatives included the Gauteng Online and Khanya projects in South Africa (Farrell and Isaacs, 2007; Farrell et al., 2007). Collectively, all of these initiatives involved significant financial, technological and human-capital investments, and worked to establish a global community of practice whose purpose was to catalyse a paradigm shift toward 'twenty-first century learning' and support the EFA goals at various levels throughout the region's education systems.

For many years, the focus of these investments was on making successive waves of new technologies work in resource-poor education environments. This emphasis tended to promote a techno-centric approach to education reform, as these attempts were viewed as layering new technologies on top of complex social problems at the school level. The dominant view seemed to be that ICT itself would catalyse the much-needed changes in the education system. During the late 1990s and early 2000s, ICT in education initiatives focused on establishing PC labs in schools and universities to enable improved teaching and learning in classroom settings, with an emphasis on solutions that were affordable, scalable and sustainable (Isaacs, 2005). Practitioners debated topics such as whether to use second-hand and refurbished PCs and open-source software, how to overcome technophobia among teachers, and how best to enable shifts toward twenty-first-century e-learning within resource-poor contexts in the AME region. Governments across the region successively adopted national ICT in education policies; donor and development agencies invested in the establishment of school networking organizations at the national level; and multistakeholder partnerships were forged between national governments, Ministries of Education, multinational private-sector organizations and non-governmental organizations (NGOs) in varying degrees. An array of pilot projects were launched involving PC labs in schools and university campuses. Rapid advances in ICT capability over the years, especially over the past decade, continually opened up new avenues for teaching and learning, which in turn demanded changes from practitioners and policy-makers in their approach to ICT integration. The traditional PC lab gave way to more flexible opportunities for synchronous, asynchronous and personalized learning through the emergence of desktop virtualization, the rise of social media, and the demand for 1:1 (one device per student) computing solutions. These developments were characterized by the decline in the price of devices to the extent that by the late 2000s, the debate on second-hand PCs disappeared from educational agendas. Initiatives such as the One Laptop per Child (OLPC) project in Rwanda and teacher laptop programmes in South Africa and Kenya were indicative of the shifts toward mobile learning that were taking place (Isaacs, 2011b).

The experience in AME during the 'pre-mobile' phase is rich in lessons about successes and perhaps more about failures in policy design and practical implementation, as initiatives from this period offer limited evidence of successful educational outcomes and even less evidence of progress toward EFA goals. The absence of large-scale roll-outs following the NEPAD e-Schools Demonstration Project, and the decline of the Khanya Project, Egypt's Smart School

Network, the JEl, SchoolNet Namibia, World Links and SchoolNet Africa illustrate how many ICT in education initiatives were unsustainable in spite of significant financial investments. It may be that these initiatives have become anachronistic due to a rapidly emerging mobile revolution that is beginning to change the rules of the game for educational ICT in the region.

PROLIFERATION OF MOBILE PHONES

Many educators believe that the AME region is poised for positive educational transformation due to the rapid and widespread uptake of mobile phones across the region over the last few years. The latest *African Mobile Observatory* report states that with 620 million mobile subscriptions as of September 2011, Africa has overtaken Latin America to become the second-largest mobile market in the world after Asia (GSMA and A.T. Kearney, 2011). Here Africa refers to the fifty-four countries of the African continent including South Sudan. Over the past ten years, the number of mobile subscriptions in Africa has grown at an average of 30% per year and is forecast to reach 735 million by the end of 2012. This compares with an estimated population of just over 1 billion in Africa. According to the latest *Mobile Africa Report*, by 2015 more people in Africa will have mobile-network access than electricity in their homes, with a predicted 'off-grid, on-Net' population of 138 million (Rao, 2011).

There are notable gender disparities in access to mobile subscriptions in AME. A study by Research ICT Africa (RIA) reveals that in Zambia, Senegal, Benin and Uganda, there are substantially more male mobile customers than female. This trend may be attributed to a combination of unequal distributions of income, restrictive social taboos and higher illiteracy rates among women. The inverse holds true in South Africa, Cameroon and Mozambique, where female mobile subscribers tend to outnumber male customers (Gillwald et al., 2010).

In the Middle East (excluding the North African countries) mobile penetration rates were expected to reach 93.9% in 2011 and 125.5% in 2015 (Cherrayil, 2010). Afghanistan and Iran are reportedly driving subscription growth in the region. Iran was the single biggest mobile market in 2010, with 66 million subscriptions, followed by Saudi Arabia with 42.9 million subscriptions. According to a survey conducted by Gallup, 87% of young Arabs aged 15 to 29 had access to mobile phones in 2010, an increase from 79% in 2009. In the Gulf Cooperation Council (GCC) countries like the United Arab Emirates (UAE) and Qatar, the mobile phone penetration rate is more than 100%. Even in poorer countries like Palestine and Yemen, a surge in mobile phone penetration is expected in the next few years due to a burgeoning youth market and the emergence of new telecommunications operators (Muttoo, 2011).

These developments have led to a host of exploratory attempts at using mobile phones in both formal and informal learning and open and distance learning (ODL) settings in the AME region. An increasing number of studies on mobile learning in recent years have lent credence to the widely held view that mobile phones open up new vistas for extending the scope, scale and quality of education (Mishra, 2011). This view is premised on the decline in the price of mobile handsets and usage costs, which makes mobile phones increasingly ubiquitous, especially in poorer communities; and on the highly flexible nature of mobile

phones, which facilitates the delivery and exchange of information and enables both peer learning and self-directed personalized learning (Traxler, 2009).

A MOBILE SOCIETY ON THE HORIZON

In the AME region, mobile learning projects have emerged in a number of sectors and fields. In the health care sector, for example, the Wired Mothers pilot project in Zanzibar, Tanzania, employs mobile phones to combat maternal and neonatal morbidity and mortality, by distributing information to mothers and health care workers assisting in child delivery. The project study compared 1,200 'wired' mothers with 1,200 'non-wired' pregnant women, from their first antenatal care to forty-two days after delivery, to assess the beneficial impact of mobile phones for maternal healthcare. Findings from this study will be available in August 2012 (Lund, 2010; Danida, 2011). In the banking sector, the M-Pesa project in Kenya is a Short Message Service (SMS)-based money transfer system that allows individuals to deposit, send and withdraw funds using their mobile phones. It has enabled the banking industry to reach previously inaccessible communities in rural areas. M-Pesa has grown rapidly and is widely viewed as a developing-world success story. By August 2009, about 7.7 million M-Pesa accounts had been registered in just over 2 years, which reflects approximately 38% of the adult population (Jack and Suri, 2010). In the agricultural sector, the Cocoa Link Initiative established by the Ghana Cocoa Board uses mobile phones to provide cocoa farmers with information about new farming practices, farm safety, crop disease prevention, post-harvest production and crop marketing. This project aims to reach more than 8,000 Ghanaian cocoa farmers and community members in 15 pilot communities, with the potential to reach more than 100,000 people over the first three years (World Cocoa Foundation, 2011). The project is still in its pilot phase, and findings on the project outcomes will be available in 2013. In the food security sector, Syria's Electronic Voucher System uses mobile phones to alleviate food insecurity among Iraqi refugee families in Damascus, by allowing them to receive food vouchers on their mobile phones that can be used in government-owned stores (Muttoo, 2011). Finally, in the media sector, Al Jazeera's Somalia Speaks project uses crowdsourcing and SMS to enable thousands of Somalis to express how armed conflict in Somalia has affected their lives. Within a few days, more than 4,000 text messages were received in response to the question 'How has the Somalia Conflict affected your life?' Responses were translated into English and plotted on a map. Of these, over 1,000 were translated from Somali into English by about 80 translators. The resulting map of Somali voices was published online and received over 25,000 page views. The project is an example of crisis mapping and real-time journalism using mobile technologies (Meier and Al Jazeera, 2012).

These examples demonstrate how mobile phones are enabling new forms of service delivery across many sectors of society. These types of projects suggest the emergence of a generalized 'mobile conception of society' (Traxler, 2009, p. 14). The growth of mobile learning in education forms part of this emerging phenomenon, in which personal mobile devices are increasing access to information and knowledge anywhere and anytime, and new forms of formal, informal and open and distance learning are appearing on the education horizon (Traxler, 2009).

MOBILE LEARNING INITIATIVES

A review of mobile learning projects in AME reveals the following characteristics of mobile learning in the region:

1. Projects are launched at all education levels and settings

The majority of the region's mobile learning projects focus on formal education in primary and secondary schools, with a high concentration of projects in South Africa, Kenya and Uganda. Most of these project use mobile phones to support the improved delivery of teaching and learning within classrooms, or to promote improved learner performance in ways that consider both formal classroom settings and informal learning environments. Examples include the BridgelT initiative in Tanzania, which provides teachers with access to digital video content for on-demand screening in class via mobile technologies, and Nokia's Mobile Mathematics (MoMath) project in South Africa, which will be presented as a case study at the end of this section (Trucano, 2009).

A number of projects have also emerged in higher education, such as the Dunia Moja project in South Africa, Tanzania and Uganda. Dunia Moja, which means 'One World' in Swahili, was an environmental education pilot project launched in 2009 as a collaboration between Stanford University in the United States and three universities in Africa. The project used mobile technologies to provide access to course materials; enable field research and assignments; and facilitate communication, interaction and knowledge-sharing between students and faculty in different countries (Stanford University, 2009). Additionally, a few projects have focused on providing basic education for adults, such as Egypt's Message Sent programme, a 2007 pilot project developed by World Education, Inc., that used mobile phones to increase literacy and numeracy skills among women in Egypt (NetSquared, 2010).

2. Projects are predominantly supply-side pilot initiatives

Many projects start out as pilots because they are explorative or experimental in their intent and design. Because mobile learning is a relatively new phenomenon, mobile learning projects are bound to take this form at the outset. With the rapid advances in mobile technologies, there are likely to be more mobile learning pilots in the foreseeable future.

The majority of mobile learning projects in AME were initiated by individuals or organizations backed by private corporations or donor agencies. These supply-side initiatives generally follow a predictable trajectory: an initial injection of funds and resources enables the project to be launched in a pilot phase; partnerships are established with additional stakeholders; monitoring and evaluation is occasionally included; project reports are produced, sometimes with recommendations for scaling up; promotional materials are distributed that suggest the pilot was successful; and after the pilot phase ends, resources are usually not available to sustain the project.

A few pilot projects have adopted an evolutionary design strategy that enables the project to expand over time. Examples include the Dr Math project in South Africa, a mobile-based mathematics tutoring programme that uses MXit, a free instant messaging application. The project aims to reach 1 million learners within the next five years, according to an announcement made in November 2011 at the World Innovation Summit for Education (WISE) conference in Doha, Qatar. The Yoza Cellphone Stories project in South Africa, which will be presented as a case study later in this paper, is also growing and has now produced nearly fifty mobile-based novels (m-novels), poems and plays. The MoMath project is one of the few projects that was designed from the beginning to include a large-scale roll-out over time.

Rarely are mobile learning projects initiated by governments in AME. However, government ministries and agencies in some countries are beginning to conceptualize programmes that incorporate mobile phones in education. In Mozambique, for example, the Ministry of Education has developed a Technology Plan for Education which involves the integration of mobile phones in pre-service teacher training across the country. Similarly, Uganda's National Examinations Board, in partnership with a local company, SMS Media, began to release exam results via SMS in 2010.

3. *Projects are generally small in scale*

All of the projects described in this review are small-scale relative to the population of students, teachers and institutions in a given country context. Some projects involve one class of around twenty learners and one teacher, whereas others reach up to eighty teachers and their students. For these larger projects it was found that having learners and teachers use their own phones meant that the projects could be more scalable compared to programmes that had to provide phones to learners and teachers. In the M4Girls project in South Africa, for example, which used mobile phones to develop the mathematics and technological skills of girls in Grade 10, phones were donated to the learners involved in the project. The project noted that this approach limited the ability to expand and include more learners.

4. *Projects mostly used text-based communication*

Overall, the projects identified in this review mainly used lower-end mobile handsets rather than smartphones and relied on text-based communication to support learning, teaching and interaction. Text-based communication includes the use of SMS as well as mobile instant messaging. The latter has been more popular in South African projects, such as Yoza Cellphone Stories, MoMath and Dr Math, which primarily use MXit, a mostly text-based chat platform popular in South Africa. This emphasis on text-based engagement is not surprising, as in South Africa users are charged per megabyte of data downloaded. Downloading text is less costly than downloading images, which makes texting a more appealing form of communication. Because users generally accessed these projects using their own mobile phones and paid for the data plans themselves, downloading-cost considerations were especially important.

5. *Projects are usually implemented in urban environments*

While some projects have experimented with mobile learning in educational settings in rural areas, the majority of them are situated in urban environments. The CyberSmart Africa project in Senegal is one of the few exceptions. Based in an off-the-grid rural area, the project uses interactive whiteboards that operate on solar power to reach students in some of the poorest schools in the region. This initiative aims to help bring educational technologies to the roughly 20% of the world's population who are living without electricity (CyberSmart Africa, 2012).

6. *Few projects consider implications for national policy*

For the most part, the mobile learning projects reviewed were not designed to influence national policy development. While none of the projects consciously consider implications for national policy, some have made recommendations for national curriculum reform. For example, the Yoza Cellphone Stories project recommends that recognition and attention be given to the emerging literacies and genres that are being claimed and developed by the growing mobile generation (Walton, 2009). Other projects have developed fair use policies on mobile devices at the project or institutional levels. The Dr Math project in South Africa includes an acceptable use policy (AUP) for participants.

CASE STUDY: The MoMath project in South Africa

From a project-design perspective, many of the mobile learning initiatives have highlighted crucial challenges involved with organized mass roll-out and system-wide integration in formal educational settings. Because the MoMath project in South Africa comes closest to systematically working toward scalability and sustainability, its project design is considered in more detail as a case study.

The MoMath project commenced in 2007 after the President's Office of the South African Government approached Nokia about a mobile learning intervention to support math education. The project was collectively designed by representatives of Nokia and provincial officials from South Africa's Department of Education (DOE). The project uses mobile phones to provide students in Grade 10 with access to math content and support. The initial phase began with 260 learners in 3 provinces of South Africa who used their own mobile phones to access content, participate in competitions based on multiple-choice questions, and engage in peer support and interaction.

The math content is aligned with the country's national math curriculum and is approved by the DOE. The content is freely available to participating learners and to teachers who have received appropriate training to support the learners. More than 10,000 math exercises covering all aspects of the math syllabus are available to learners and teachers. The content is accessed via a low-cost proprietary chat platform hosted by a private company called MXit that is very popular among South African youth. Free access is also supported by South Africa's three local mobile network operators. Learners use the platform to complete math

exercises, take tests sent by their teachers and participate in competitions. Students receive reminders about their required work via SMS.

The project moved on to a second phase in 2010, after having expanded to reach 4,000 learners, 72 teachers and 30 schools in 3 provinces of South Africa. By the end of 2011 the project had reached 25,000 learners, 500 teachers and 172 schools in 4 provinces. Preliminary findings suggest that the educational objective of improving math performance is being reached. An evaluation of the project in 2010 revealed a 14% increase in mathematics competency, with 82% of learners using the MoMath application outside of school hours, during holidays and weekends (McCormack, 2010). A formal monitoring and evaluation report on the results and outcomes of this project will be available in 2012.

Several factors seem to contribute to MoMath's success. First, the project provides an educationally-rich service to learners and teachers that supports the national mathematics curriculum. Second, the project has a diverse partner ecosystem that includes official support from the DOE nationally and provincially, and the active involvement of DOE district officials, a local NGO, three major mobile network companies, Nokia, a local textbook publisher, and MXit, a chat platform company. Third, at the institutional level, the project enjoys active participation from teachers, learners and school management in all the schools where it is based. Fourth, the project has integrated independent monitoring and evaluation to encourage continuous improvements in project implementation. Finally, the project enables independent learning, with students using their mobile phones to engage in learning at their own pace, as well as teacher-facilitated and peer-supported learning via the mobile chat platform.

These factors, combined with the project's low cost and ease of use, bode well for MoMath's sustainability, scalability and replicability with other subjects. A partnership with the Commonwealth of Learning (COL), an intergovernmental organization dedicated to promoting and delivering open and distance education, plans to extend the project to three additional African countries (McKay, 2011).

SOCIAL MOVEMENTS IN AME GO MOBILE

Mobile phones play an important role in emerging social movements in AME. While this phenomenon is not directly related to mobile learning in formal education, it is worth mentioning in this review, as it illustrates the pervasive use of mobile phones among the region's youth and the potential of mobile technologies and social media to facilitate communication and collaboration on a massive scale.

Social movements are often spontaneous, informal, uncontrolled and collective in character, and tend to centre around social or political issues in order to effect social change. During 2011, mobile technologies were used to rally citizens against prevailing political regimes in AME, the USA, Europe and elsewhere. Notable examples include the Arab Spring, a pro-democracy movement that ignited in North Africa in January 2011, and the Occupy movement of international protests against economic and social inequalities, which began with the Occupy Wall Street protest in New York City and spread to 900 cities around the world in late 2011 (Adam, 2011). These movements arose out of the convergence of varied and complex economic, cultural, social and political factors. In countries across the MENA region, while the rising cost of living and widespread unemployment were contributory factors, the movements were explicitly political and have led to the toppling of regimes and the transformation of the region's political landscape.

Social media in the form of Facebook, Twitter and YouTube have invariably played an instrumental role in protest mobilization, although in some AME countries, such as Yemen and Libya, social media appears to have been used less frequently. Much of the evidence in recent months suggests that social media, predominantly accessed via mobile phones, have contributed significantly toward accelerating emergent protest movements in Egypt and Tunisia. Social media have given expression to a variety of community voices and have influenced public opinion in official spaces as events unfolded. These movements would probably still have occurred without Twitter and Facebook; nevertheless, the rapid evolution of digital technologies, and the influence they wield in all our lives, has undoubtedly created a platform for direct and proactive engagement of individuals and communities in ways society has never experienced before (Isaacs, 2011a).

The Arab Spring arguably ranks among the most significant informal mobile learning phenomena in 2011 because of the way thousands of youth used social media, accessed via their mobile phones, as a space for expression, self-identification, self-assertion, contestation and mobilization around human rights, democratic ideals and civil liberties. Social media also played an essential role in shaping the stories of these uprisings, as growing numbers of young people used social media platforms to share their experiences and make their voices heard. From a mobile learning perspective, this phenomenon enabled people to share knowledge about their individual and collective social, historical and cultural conditions, and to forge collaborative peer networks enabled by new media. The Arab Spring took the world by surprise, which suggests the need for practitioners and policy-makers to be mindful of how the social, economic, cultural and political structure of society may be altered under the influence of rapidly advancing mobile technologies.

Outside of conscious interventions and collective social movements, mobile phone users across the region are engaging with mobile spaces in new ways. A recent survey of 25,876 South African youth conducted by the United Nations Children’s Fund (UNICEF) investigated the nature and extent of young people’s use of the MXit chat platform, specifically focusing on how MXit supports identity-formation and self-directed learning among South African youth. The survey revealed that 30% of MXit users admitted to spending most of their after-school time socializing on the platform (UNICEF, 2011). A recent three-year study on ‘digital natives’ in the developing world, including in the AME region, further illustrated how mobile technologies and social media form an integral part of the lives of young people, and how these technologies are appropriated in varying contexts to give expression to people’s aspirations for social change (Stumpel, 2011).

ANALYSIS OF MOBILE LEARNING INITIATIVES

The limited, albeit growing, number of mobile learning projects in the AME region confirms that the formal integration of mobile learning in education systems is very much in its infancy. This contrasts with the rapid expansion and integration of mobile phones in people's daily lives, which have laid the foundation for social movements in many countries.

When considered together, the region's mobile learning projects and social movements, and the independent, individualized ways in which users are appropriating mobile technologies, suggest that mobile learning is disrupting and transforming traditional paradigms of learning, teaching and education delivery and, more broadly, the organization of the economy and society as a whole. In the education sector, mobile learning opens up new opportunities for improving access, quality and equity in education and for restructuring educational management and administrative efficiencies.

The following sections compare and analyse mobile learning initiatives in the region in terms of their capacity to help countries achieve EFA goals, their tendency to enable new pedagogies and modes of learning, and their potential to increase the efficiency of education systems.

EDUCATION FOR ALL GOALS

Underscoring the six EFA goals are the broad objectives of expanding access to education, improving the quality of learning and promoting equity in education. Mobile learning initiatives in AME have demonstrated how each of the EFA goals, with the possible exception of Goal 2, can be supported by mobile learning. The following sections describe each of the EFA goals in turn and provide relevant examples of mobile learning projects that support these goals.

GOAL 1: Early childhood care and education

The first EFA goal calls for the expansion and improvement of comprehensive early childhood care and education, especially for the world's most vulnerable and disadvantaged children. The Pesinet project in Mali aims to improve early childhood care by increasing access to health care services for children. Pesinet is an international non-profit organization that delivers simple preventative care in countries with limited medical resources. In Mali the organization established a project that uses mobile phones to support early detection of childhood illnesses, improved medical record-keeping, and increased access to health care for 600 children in the capital city of Bamako. Families pay a small monthly fee to enrol children in the programme, which covers medical examinations and half the cost of

medications needed to treat a sick child. Community health workers test children weekly for symptoms of illness and enter the results into custom-designed mobile phones. Data is sent to an online database, which doctors review to alert health workers if treatment is needed. Initial successes of the pilot project have led to its expansion to reach 2,000 beneficiaries in one district in Bamako. Because early childhood care is measured by maternal health as well as child mortality rates, the project has also launched a pregnancy follow-up service for maternal healthcare. Pesinet has also developed processes to enable the project to be implemented on a broader scale. The organization has already identified fifty additional sites in Mali for further implementation and is planning to expand the project to other SSA countries as well (Pesinet, 2012).

GOAL 2: Universal primary education

The second EFA goal calls for UPE. Theoretically, mobile phones open up learning opportunities for children of school-going age, especially those who are not in school. Mobile learning does not require students to be physically present in a classroom in order to learn about the subjects that are taught in schools, nor does it require fixed times for learners to be available in a classroom to be taught by teachers. Because mobile phones are accessible to communities in remote areas, they also extend the reach of mobile-enabled educational resources (Valk et al., 2010).

In spite of the potential of mobile learning to help achieve UPE, research for this review found little evidence of the use of mobile phones to expand access to formal primary schooling for children who are not in school. UPE remains a significant challenge in the AME region, which had more than 30 million children of school-going age not attending school in 2008 (UNESCO, 2011). This situation opens up the opportunity for creative attempts at exploring how mobile phones can support the achievement of EFA Goal 2 and extend access to quality primary education. These attempts cannot be focused only on the traditional methods of education delivery but should instead include initiatives to incorporate mobile phones in ODL programmes. A theoretical case was made for enhancing access to primary education for nomadic children in Nigeria through ODL opportunities enabled by mobile phones (Aderinoye et al., 2007). Similarly, efforts to provide open schooling, such as those led by the Commonwealth of Learning and its partners, offer new ideas for integrating mobile phones into ODL delivery in open schools. Even though these efforts focus on secondary education, the concepts and strategies involved may have applications in primary education as well (Mishra, 2011).

GOAL 3: Lifelong learning

The third EFA goal focuses on ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programmes. UNICEF and Tostan, an NGO in West Africa that implements human rights-based community empowerment programmes, have collaborated to launch the Jokko Initiative in Senegal. Jokko means 'communication' in Wolof, a regional language in Senegal (RapidSMS, n.d.). The project uses SMS to support literacy skills development and information sharing in local languages among youth and adults, especially women, in villages across the country. A free text-based platform, called the RapidSMS Community Forum, allows users to communicate

quickly and easily with a network of people by sending a text message to a single number. Mobile phones are employed as social mobilization tools to help to build consensus around local development initiatives via the virtual SMS forum. In addition, the programme includes an adult literacy component that uses mobile phones as pedagogical tools to teach and reinforce literacy. An independent evaluation of the initiative revealed that while the number of text messages sent per week increased tenfold, use of the SMS community forum declined after classes ended. Literacy test scores improved after additional training in using SMS and the community forum (Beltramo and Levine, 2010). While the results of the literacy component were mixed, overall project outcomes suggest that mobile learning can enhance participatory decision-making among youth and adults.

GOAL 4: Adult literacy

The fourth EFA goal calls for a 50% improvement in adult literacy rates, especially for women, by 2015, as well as equitable access to basic and continuing education for all adults. Project Alfabétisation de Base par Cellulaire (Basic Literacy through Mobile Phones, or ABC) in Niger is a mobile phone-based literacy and numeracy programme. The project is a collaborative initiative between Tufts University in the USA, the University of Oxford in the UK, and the Niger branch of Catholic Relief Services, an international humanitarian organization based in the USA. Project ABC uses multimedia phones pre-loaded with a digital curriculum in the local languages of Hausa and Zarma. The project incorporates a practical literacy component tied to obtaining market information via text messages. The literacy curriculum is taught by local facilitators trained by the Ministry of Education of Niger. Using very basic SMS messages, learners study functional literacy and numeracy for three hours per day.

Preliminary results from a randomized evaluation indicated that mobile phones have had a positive impact on participants' literacy skills. The learning model was designed around the context of women farmers, linking learning to livelihood and leveraging their interest to sell their products on the market to engage women in literacy training in their local languages. Seven months after the end of classes, average math test scores were still higher in 'ABC villages' than in villages that did not participate in the project, suggesting that the project's positive effects were sustained over time. Some of the project's success can be attributed to the effectiveness of mobile phones as a motivational and educational tool: the evaluation found that students in ABC villages used mobile phones in more active ways and showed a higher interest in education than their counterparts in other villages (Aker et al., 2011).

GOAL 5: Gender parity and equality

The fifth EFA goal focuses on achieving gender equality in education by 2015, with an emphasis on ensuring full and equal access to high-quality basic education for girls. The M4Girls project in South Africa is a pilot project designed to address performance disparities in mathematics between girls and boys in Grade 10 by targeting female learners from underserved communities. The project was developed through a partnership between Nokia, the South African DOE and the Mindset Network, a non-profit organization dedicated to sustainable poverty alleviation through technology-based education. M4Girls aims to

empower female students by providing learners with mobile phones and access to curriculum-aligned math content in the form of mobile games and videos.

The project's evaluation found that phones were mainly used to listen to music, access the internet and communicate with peers, all of which made learners feel more confident and technologically savvy. Positive attitudes toward using technology for learning, together with reports of high mobile phone usage by both educators and learners, indicate the potential of mobile learning to improve educational experiences. However the evaluation also found that there were no significant change in learners' attitudes about school as a direct result of the project (Mindset Network and Neil Butcher & Associates, 2009).

GOAL 6: Educational quality

The sixth EFA goal focuses on improving the quality of all aspects of education and ensuring that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills. To this end, the Dr Life Orientation and Life Skills (LOLS) project in South Africa uses mobile phones to provide advice and subject-support to learners and teachers of LOLS, a recognized subject in the South African school curriculum geared toward personal growth and social, intellectual and emotional development. LOLS topics include HIV/AIDS, drug abuse, child abuse and study skills. The Dr LOLS project includes more than 500 learners, many of whom reported that they gained technological and digital literacy skills related to mobile phone use and internet safety, as well as other life skills, through the programme. Participating teachers indicated in interviews that they learned more about the curriculum, improved their texting skills and overcame their fears of technology. Anecdotes highlight some of the challenges of delivering a culturally-sensitive subject like LOLS via a mobile text-based medium. A Ph.D. research project is currently dedicated to monitoring the learning process that is evolving within this initiative (CSIR, 2010).

NEW PEDAGOGIES AND MODES OF LEARNING

Mobile learning opens up new pedagogies and modes of learning, enabling education that is more situated within the authentic contexts of learners and hence contextually-relevant; more personalized and self-directed; more informal, that is, outside the parameters of formal curricula, assessments and classroom practices; and more flexible in terms of when and where it can take place (Sharples et al., 2007). Mobile learning also creates new modalities for peer learning and mentorship, and can facilitate more student-centred learning, in contrast to traditional pedagogical models based on the teacher transferring knowledge to learners. Mobile phones enable learners to access and manage vast, growing reservoirs of information in order to meet their individual learning goals. These are all features of twenty-first century education, which has been catalysed by the integration of ICT in education and further developed by the emergence of Web 2.0, social media and rapidly advancing mobile technologies.

This review of mobile learning initiatives and social movements in AME indicate that mobile phones are contributing to a paradigm shift in education. In some projects, such as MoMath

in South Africa, mobile learning supplements formal teaching and learning in classrooms. In others, mobile learning provides educational opportunities to people living in underserved and isolated communities who lack access to resources and teachers. There is also evidence that mobile learning has led to the creation of new literacies and genres that disrupt and transform traditional learning practices. South Africa's Yoza Cellphone Stories project, with its cognizance of the linguistic styles adopted by the region's youth, challenges conventional notions of linguistic competency and literacy. This project is explored in more detail in the case study below.

CASE STUDY: The Yoza Cellphone Stories project in South Africa

Previously called M4Lit, Yoza Cellphone Stories (Yoza) was initiated within the context of a 'book-poor' environment where 51% of South African households own no leisure books and only 7% of public schools have functional libraries. South Africa has low Programme for International Student Assessment (PISA) scores for reading, which reflects the absence of a strong reading and writing culture among young people, especially in poorer communities. In contrast, upwards of 90% of urban youth have access to mobile phones, 70% of which are estimated to be internet-enabled. The country also has a well-established mobile infrastructure in which costs for data transfer are low. Young people spend much of their time on their mobile phones, which has led educators in the region to explore the possibilities of mobile learning to improve and promote reading and writing among South African youth.

Yoza was initially established as a research project based on a commissioned teenage mystery m-novel called *Kontax*, which was written in English and translated into isiXhosa, a local African language. The m-novel was published episodically and was available for download onto mobile phones from a website. It was also released on a mobile chat platform called MXit, which is popular among South African teens. Teenagers from two historically disadvantaged townships in South Africa were selected for participation in the project. They downloaded *Kontax* for leisure reading from a mobile website using their own or shared mobile phones, and communicated with peers about the novel via an online social network. Readers could leave comments on chapters, vote in opinion polls and enter writing competitions.

Researchers investigated the teenagers' response to the m-novel in relation to their mobile literacy practices, tracking the number of teenagers who read, exchanged and commented on the m-novel. In addition to its stated goal of studying mobile devices as complements or alternatives to print-based literature to increase youth literacy, the project also hoped to take advantage of the 'mobile-rich, book-poor' context in South Africa and similar developing countries to encourage the development of a local mobile phone publishing industry.

Some of the key research findings proposed that literacy development requires nurturing communities of practice as well as spaces where out-of-school and leisure reading and writing are encouraged. The research also argued that the textual forms associated with digital communications are not evidence of linguistic decline, even though they do not fit the traditional criteria of linguistic competency. Instead, researchers suggested that recognition be given to the new forms of literacy and new genres that appear to be emerging within the rapidly growing mobile communication space. They recommended that school curricula be broadened to include the dialogue-driven genres that youth already command, in

acknowledgement of the important role that mobile literacies play in the lives of young people (Walton, 2009).

Since its inception Yoza has evolved into an online library of m-novels, short stories, classic literature, and poetry written by local authors. By September 2011, thirty m-novels, five Shakespearean plays and eleven poems were available for download. Genres include teen issues, romance, sports, adventure, drama and poetry. In 2011 the project reported 300,000 completed reads of m-novels and poems, 40,000 comments, 145,000 unique site visitors, 69,000 MXit subscribers to Yoza, 5.4 million page views, 44,000 votes and 8,500 writing competition entries (Vosloo and McCann, 2011). These figures suggest significant uptake among the youth who were targeted. The project demonstrates the possibilities for fostering a reading and writing culture among youth in ways that recognize and embrace the unconventional forms and linguistic styles that are developing among young users.

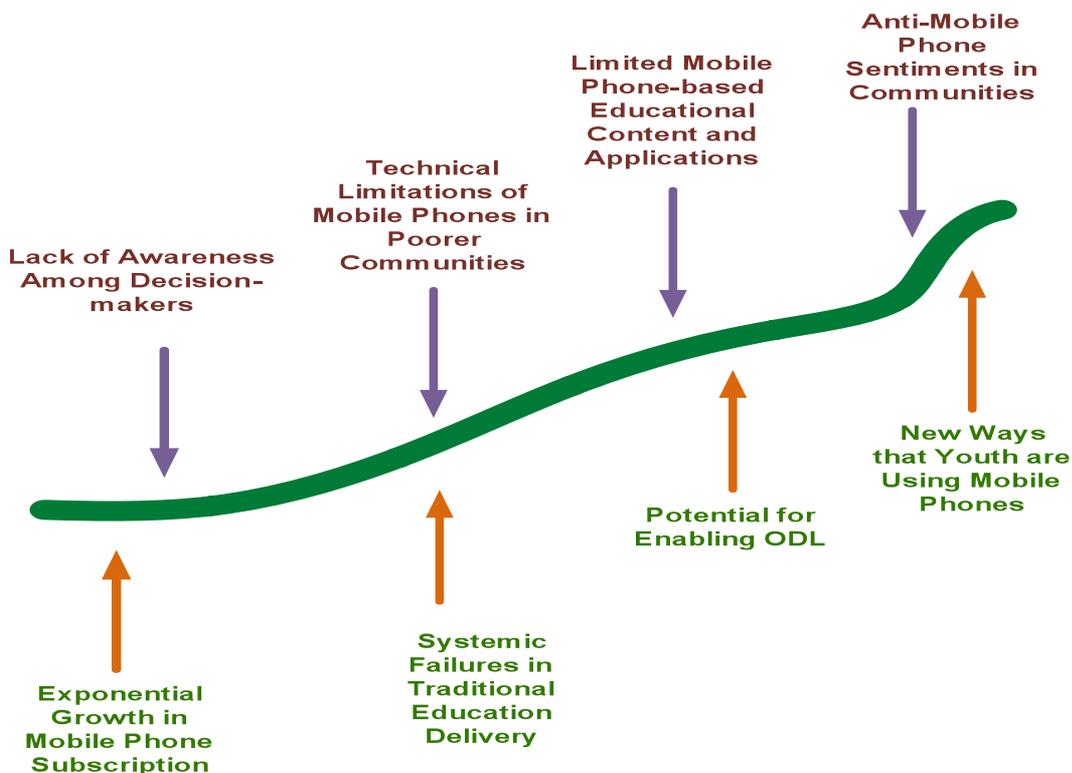
EFFICIENCY IN EDUCATION SYSTEMS

Ministries of Education in AME face capacity constraints and need support in improving their national management and administration systems (UNESCO, 2011). Mobile phones can play a supportive role in improving communication between various institutions and stakeholders involved in national education systems. In Uganda, for example, the National Examination Board began releasing exam results via SMS in 2010, and SMS results are now available for the Uganda Advanced Certificate of Education (UACE), the Uganda Certificate of Education (UCE) and the Primary Leaving Examinations (PLE). Students and parents can send an SMS query via their mobile phones and receive their results as a reply. This has reportedly become a popular service and students expect to be able to access their results like this every year. The service is offered in collaboration with a local company, SMS Media, and the SMS sender pays a small amount for each query. This project has enabled more efficient access to information about student performance (Ndiwalana, 2011). By improving communication between educational stakeholders, mobile phones can help make national Ministries of Education and their supporting organizations more efficient, effective and transparent.

FACTORS INFLUENCING MOBILE LEARNING

The following sections describe the primary drivers and barriers to mobile learning in the AME region, as illustrated in Figure 1.

Figure 1. Drivers and barriers to mobile learning in AME



DRIVERS

A number of factors have driven the development of mobile learning in AME. Chief among these is the exponential growth of mobile phone subscriptions in the region, mainly due to rapid advancements in mobile technologies and declining costs for mobile devices and data plans. Also, the gradual liberalization and deregulation of the telecommunications sector has led to massive private investment, which has supported further growth in the mobile phone industry. It is no coincidence that Ethiopia, one of the few countries that has not deregulated its telecommunications sector, has one of the lowest rates of mobile phone use in Africa.

Systemic failures in traditional education delivery are another driving factor in the development of mobile learning in AME. The demand to increase the scope, scale, quality and equity of education remains central to the global challenge of reaching EFA goals. The pressure to address endemic failures in the region's education systems provides an impetus for

exploring innovative approaches to education delivery. The near-ubiquitous access to mobile phones in AME, especially among the region's youth, holds potential for expanding learning opportunities to underserved communities that are at risk of exclusion from affordable, high-quality learning experiences. A related driver is the potential of mobile learning to enable ODL, which is becoming an increasingly popular educational option among the region's young people and adults, especially in rural areas (Mishra, 2011).

Finally, mobile learning is encouraged by the new ways in which youth are using mobile phones to communicate and share knowledge. Recent studies have pointed to a potential groundswell of emergent social and educational uses for mobile phones that could drive further mobile learning developments, particularly as mobile technologies advance over the coming years (Shah and Jansen, 2011; UNICEF, 2011).

BARRIERS

In comparison to the rapid proliferation of mobile phones and the continuing growth of ICT in education programmes in AME, the development of mobile learning initiatives in the region has been relatively weak. One of the inhibiting factors seems to be a lack of awareness among government decision-makers about the potential of mobile phones to support the effective and efficient delivery of quality education. This observation is supported by the fact that the majority of mobile learning initiatives in the region are not government-led. The limited awareness among policy-makers and government officials could be due to lack of human-resource capacity within Ministries of Education, as well as MOEs' preoccupation with rolling out existing e-learning initiatives that do not include mobile phones. Furthermore, the paucity of evidence-based research on the efficacy of mobile learning, mainly due to the limited use of mobile phones in educational settings and the small-scale and experimental nature of most mobile learning initiatives in the region, contributes to a generalized lack of awareness.

The technical limitations of mobile phones, especially in poorer communities, form another barriers to mobile learning in the region. Connectivity is restricted in many areas by the cost of data and the limited availability of high-speed third generation (3G) networks. When learners own or have access to mobile phones, they are often older or lower-end handsets with limited functionalities and small screens. More expensive, higher-end handsets with data capability are only useful in areas where the mobile network can service them, and where the cost of data access is not prohibitive. The absence of industry standards also serves as a further barrier to mobile learning. Issues include a lack of standards for screen size and resolution; inconsistent support for Java, Flash, and various types of audio and video formats; incompatible internet browsers; and a wide array of memory sizes. All of this fragments the mobile platform landscape, rendering the development of mobile learning applications a significant challenge. As a result, there is a dearth of mobile phone-based educational content and applications, which poses a further impediment to mobile learning in the region. This is especially true in poorer communities where people predominantly possess lower-end phones, for which little educationally-rich content and few educational applications have been developed.

Lastly, anti-mobile phone sentiments in communities in AME form a significant barrier to mobile learning in the region. Concerns about the disruptive nature of mobile phones expressed by teachers, administrators and parents have led many institutions to ban the use of mobile phones on school premises altogether. Negative attitudes toward mobile phone use stem mainly from reports of inappropriate or unsafe behaviour facilitated by mobile phones, such as cheating, cyber-bullying and sexual predation in mobile chat platforms, which places young girls in particular at risk. Parents also raise concerns about teenagers using mobile phones to organize parties or access drugs. These sentiments are reinforced by the media, who have at times sensationalized stories related to the abuse of mobile phones and contributed to a growing panic about mobile phones facilitating a decline in moral values. In very few cases has this been counterbalanced by positive stories of the successful educational use of mobile phones or their role in facilitating social and moral support among users. Furthermore, few acceptable use policies been adopted to circumvent the abuse of mobile phones in educational institutions. Some government organizations, such as South Africa's DOE, have established e-Safety Committees to consider ways to raise awareness and promote the safe and responsible use of technologies in schools in particular. In 2010, Tunisia's Ministry of Education launched a campaign to jam students' mobile phone signals during examinations to prevent cheating, demonstrating that it is possible to provide a technological response to the problem of cheating during tests and examinations (Sawahel, 2010). If such measures are considered for policy adoption, a case can be made for locating them within the context of awareness-raising and advocacy on the fair and acceptable use of mobile phones for learning. These considerations should be incorporated into AUPs so that students can be taught the importance of making informed choices about their behaviour online and in mobile environments.

POLICY CONTEXT AND IMPLICATIONS

In 2007, *infoDev*, a global partnership programme within the World Bank, reported that forty-eight out of fifty-three countries in Africa had some form of ICT in education policy in place (Farrell and Isaacs, 2007). By now these countries and others have developed their policies further, and many have also designed policy implementation strategies. For example, in 2009 Rwanda developed an ICT in Education Policy and a draft Implementation Plan (Isaacs, 2011b). South Africa reinforced its White Paper on e-Education, adopted in 2004, with a teacher development strategy in 2005, and in 2009 the government gazetted the distribution of 365,000 laptops to all teachers in the public school system (DOE, 2009). Global policy guidelines have also been developed to support national policy development. For example, UNESCO has published an ICT Competency Framework for Teachers (ICT-CFT) as well as Guidelines for Open Educational Resources (OER) in Higher Education, which were developed in collaboration with the Commonwealth of Learning. Similarly, the COL recently adopted a Commonwealth Certificate on Teacher ICT Integration (CCTI).

The purpose of national ICT in education policies is to align education with the economic and social visions that governments and states have developed. These policies also serve to enable the integration of ICT in the education system and its institutions, and to coordinate the participation of various stakeholders, such as donor agencies, NGOs and the private sector (Isaacs, 2011a). Notably, many of these policies were written during the 'pre-mobile' phase of technology development. Near-universal access to mobile phones emerged only recently in AME, and the first experiments using mobile phones in education began around 2006. At the national-government level, ICT in education policies sometimes address the use of mobile technologies in a broad sense. For example, Rwanda's ICT in Education policy refers specifically to the OLPC initiative, setting the goal of distributing XO laptops to an estimated 1.3 million primary-school students by 2012 (Isaacs, 2011b). However, these policies do not consider the inclusion of mobile phones and their potential to expand access to learning opportunities, improve the quality of education and promote equity in education.

This evidence suggests a policy vacuum in relation to mobile learning in AME. Comments made by policy-makers and education practitioners in the region indicate an unmet demand for clear guidelines and policies on mobile learning. For example, in 2006 the Minister of Education for the Western Cape Province of South Africa, made the following statement in relation to mobile learning:

More research is needed on this phenomenon. There is no national or provincial policy – normally, individual schools would determine their own codes of conduct. But the time has come for us to now give very clear direction on this. (Keating and Williams, 2006)

Similarly, blogger notes on a mobile learning summit held in Zambia in 2009 revealed that:

By the end of the sessions, the participants had compiled a list of what they wanted. The list included 'educational policy to be changed to support m-learning in the classroom', a Zambian syllabus with aligned content on the web, discussions dealing with cellphone misuse and risks

around m-learning, and 'lower prices for cellphone handsets and tariffs [so that] more learners can use them in the schools'. (Jaschke, 2009)

The mobile learning policy vacuum is exacerbated by the limited involvement of governments in the region. In the absence of national policies, some institutions and projects, such as Dr Math in South Africa, have developed acceptable use policies to steer the use of mobile phones in education, and networks of teachers and teacher-development institutions are also considering adopting AUPs. National policy-makers would be wise to draw on these local policies, particularly to gain an understanding of the perspectives and needs of the end-users.

POLICY RECOMMENDATIONS

This review of current and recent mobile learning initiatives in the AME region highlights some recommendations for developing national policies that can help mainstream mobile learning as a formal educational practice. These include building a value proposition for mobile learning, encouraging supportive policies in other government sectors, anticipating the effects of rapid advances in technology, and including a variety of stakeholders in policy development.

BUILD A VALUE PROPOSITION FOR MOBILE LEARNING

Due to the emergent nature of mobile learning and the fact that evidence on the educational value of mobile phones is sparse, a collective understanding of what constitutes successful mobile learning is still being defined. This uncertainty challenges the development of a defensible value proposition on mobile learning that would encourage government attention and investment. It is therefore important, as attempts are made to design policy guidelines on mobile learning, to also build an evolving value proposition and a defensible case for government investment as accumulating evidence for successful mobile learning emerges.

Such a value proposition should focus on: (1) how mobile phones have supported and expanded access to education for children, youth and adults who have previously been excluded from educational opportunities; (2) how the use of mobile phones can improve the quality of learning and educational experiences; (3) how mobile phones enable improved participatory decision-making and communication for marginalized groups; and (4) how mobile phones can improve the administration, management and governance of local, national and regional education systems. This value proposition will need to guide policy-makers and educators on how best to manage the potentially dramatic changes to traditional modes of formal educational delivery that mobile learning entails, and to address ways of engaging in the new forms of informal education that have accompanied mobile learning. Furthermore, the value proposition should also include clear responses to moral panic and sensationalized claims about the negative effects of mobile phones on young people.

This proposed value proposition will need to be coupled with advocacy and awareness-raising efforts targeted at decision-makers in governments and educational institutions at all levels. Conversations around mobile learning needs to include key stakeholders that are influential in the lives of learners, such as parents, teachers, community organizations, mobile

network operators, content providers and the learners themselves. Over the past few years, a number of research projects focused on building the case for mobile learning have been launched around the world, including in AME. It is essential that these projects engage in the monitoring and evaluation of mobile learning initiatives, in order to develop a body of evidence in support of the widespread adoption of mobile learning. Linked to this is the need to develop appropriate mobile learning evaluation methodologies that consider the new learning terrain that mobile phones are opening up (Traxler, 2009).

ENCOURAGE SUPPORTIVE POLICIES IN OTHER GOVERNMENT SECTORS

A number of studies have shown how national, regional and global policies on trade, telecommunications and ICT regulation influence growth in mobile subscriptions (Adam et al., 2011). Complex regulatory frameworks, high taxes and the burden of building infrastructure have made mobile phone tariffs prohibitively expensive in some parts of AME, especially in comparison to prices in the developed world (Otto, 2011). According to the GSM Association (GSMA) and A.T. Kearney (2011), the liberalization of the telecommunications industry and the deregulation of mobile telephony have underscored the explosive growth in mobile penetration in the region. Expanding universal service obligations and simplifying regulatory policies can further support the growth in mobile penetration, particularly in poorer and more remote areas. This in turn can extend the reach of mobile learning programmes in AME. Such an effort will require collaboration between Ministries of Education and the government ministries or departments in charge of trade, telecommunications, ICT and finance, among others. Cooperation between education and finance departments is particularly important in the context of establishing tax codes that can support cost-effective mobile phone access.

Policies on internet governance (IG) also influences the educational use of mobile phones, particularly as smartphone access increases and the cost of internet connectivity declines. IG refers to the policies, procedures, rules and regulations that govern the technology architecture of the internet. These include internet infrastructure, Internet Protocols (IPs) and domain names, which are sometimes referred to collectively as Critical Internet Resources (CIRs) (Comninos, 2011). IG includes the way the internet is governed as well as the ways in which stakeholders and institutions are involved in guiding, directing and managing the use of the internet. IG policy is concerned with harnessing the benefits that internet access holds for economic and social development. It tries to reconcile these benefits with protecting the privacy and security of the range of stakeholders involved, in ways that do not violate their fundamental human rights (Wilson, 2005). The 2011 Internet Governance Forum (IGF), a multistakeholder forum focused on IG issues that convened Nairobi, Kenya, acknowledged that as technologies and services such as cloud computing, social media, smartphones and the mobile internet grow, the IG landscape will change in ways that pose challenges for policy development. The IGF discussed the need for ongoing open dialogue between different stakeholders and governments on matters of privacy, security and openness under these evolving conditions. The educational use of the mobile internet will undoubtedly be influenced by these IG policy developments (ICC, 2011).

There has already been significant media coverage of privacy and security infringements in the mobile space, which have caused alarm among some principals, teachers, school-governing bodies and parents. For example, in South Africa in 2010, a 15-year-old girl was

gang-raped by a group of boys who used their mobile phones to video-record the incident and distribute the recording via social media (Mail & Guardian, 2010). Events like these highlight the importance of child safety in the digital age. The development of e-Safety policies focused on protecting children and youth is critical. In 2010 the International Telecommunication Union (ITU) launched the African Children Cyber Safety Initiative (ACCSI) as an extension of its 2008 Child Online Protection (COP) initiative (ITU, 2012). The mandate of ACCSI is to advance the cause of safe internet culture for African children and young people. The initiative includes an internet-awareness campaign targeted at parents, teachers and counsellors. It also appeals to African governments to make information security, including children's online protection, a national priority.

Because of the growth of educational resources that can be accessed online and via mobile phones, appropriate IG related to mobile learning will also need to consider issues of intellectual property rights (IPR). In the AME region, a few initiatives and resources have begun to address IPR in education. These include the UNESCO/COL Guidelines for OER in Higher Education, and OER Africa's Copyright and Licensing Toolkit (OER Africa, 2012).

Policies on mobile learning clearly encompass a complex web of policy environments, regulatory environments and government sectors. This points to the necessity of multistakeholder engagement, including within and between government ministries and departments, as well as between governments and a host of stakeholder groups spanning different sectors such as trade, industry, commerce and education. Policy-makers in AME can build on the experiences of ACCSI, the work already done on IPR in education, and the recommendations of the IGF in Nairobi, as a starting point for the development of future national policy guidelines on mobile learning.

ANTICIPATE THE EFFECTS OF RAPID ADVANCES IN TECHNOLOGY

National policies on ICT in education rarely address how rapid advances in technology can influence and alter the educational landscape. Many ICT in education policies make reference to mobile technologies, but few consider how near-universal access to mobile phones is catalysing a shift toward a mobile society, and how this will influence the delivery of education in the near future. Mobile learning policy development needs to integrate perspectives on future mobile technology trends and predict how these can and will influence possible futures in educational delivery, both consciously and spontaneously, under the conditions of resource constraints and poverty that characterize many communities in the AME region.

INCLUDE A VARIETY OF STAKEHOLDERS IN POLICY DEVELOPMENT

Including groups and communities that have historically been marginalized from decision-making at the policy level will be important when considering the development of mobile learning policies. This inclusion can be accomplished through active engagement with a wide range of stakeholders. While much has been written about the necessity of public-private partnerships, these often exclude important stakeholders such as parents and guardians, the media, and youth. The uprisings in the MENA region during 2011 were fuelled by youth and communities who felt disenfranchised and voiceless. This reflects the necessity of an inclusive

approach to policy development that fosters shared ownership and responsibility. A youth forum at the 2011 eLearning Africa Conference drafted key messages for parents and governments on matters related to their use of technology, signalling the desire of youth to engage with parental and community authority (Kasumuni, 2011). Similarly, when partnering with the private sector, it becomes important to include not only multinational corporations but also local mobile network operators, handset manufacturers and content providers, as well as small and medium-sized community-based enterprises. The diverse partner ecosystem developed by the MoMath project in South Africa is a good model for this type of inclusive approach. Policy guidelines that encourage inclusivity through multistakeholder partnerships will be an important step toward enhancing equity in education.

Finally, gender equality is an important aspect of the EFA equity objectives. Gender equity cannot be achieved simply through increased access to mobile phones or other educational resources among women and girls, but will require transformation in the social, cultural, economic and political practices that militate against women and girls making informed decisions about their lives. Policy guidelines that show how mobile phones can empower women and girls in transformative ways will represent an important contribution toward reaching the EFA goals.

CONCLUSION

The examples included in this review paint a picture of the nascent mobile learning 'movement' in AME, which has not yet been mainstreamed into education systems across the region. Yet mobile phones are already integrated in the daily lives of the vast majority of the region's consumers. The consumer market is likely to develop faster than the education sector, given the rapid proliferation rate of mobile phones that is moving the region toward both universal access and an increase in the penetration of smartphones. Arthur Goldstuck, an analyst on mobile markets in Africa, speculated that within the next five years, the whole of Africa will be a smartphone market, and by 2013 more smartphones will be sold than basic phones in South Africa (Verma, 2011). This points to a strong possibility that learners and teachers, as consumers, will use mobile phones for a variety of purposes which are likely to include education. Mobile phones lend themselves to personalized, informal, self-directed and situated learning, which makes the growth of mobile learning more likely at the individual level than through targeted, project-based interventions. For mobile learning to grow and be institutionalized in formal education systems, governments will need to play a more proactive role in promoting the use of mobile phones for teaching and learning as well as for the administration and management of education systems and institutions.

The purpose of public policy on mobile learning is to provide a scaffold for the variety of mobile learning efforts at various levels in the education system. Policies should create a supportive environment that enables the explosive growth of personalized informal learning and allows the scaling up of project-based interventions. Governments should also take advantage of mobile phones to promote productive public participation in society and governance. The development of appropriate public policies that encourage openness, protect privacy, and support the safe and secure use of mobile phones for learning remains a challenge for policy-makers across the region. In the context of an emerging and rapidly changing mobile learning environment, it is critical to develop policies that define the 'rights and responsibilities of various classes of stakeholders to participate effectively and influence the changing governance system' (Wilson, 2005, p. 35).

In designing mobile learning policies, it is important to consider that the theoretical and conceptual underpinnings of mobile learning remain undefined; the methodologies for knowledge production, research and evaluation are still emergent; and the empirical evidence and practical experience in the region, particularly in relation to reaching EFA goals, is sparse. Furthermore, the dominant preoccupation among policy-makers is with conventional models of e-learning, as many governments in the region have already embarked on large scale e-learning programmes focused on other ICT solutions, such as laptop and PC labs. The information base that informs policy development, decisions and actions related to mobile learning still lacks credibility and trustworthiness and cannot yet be generalizable.

That the EFA goals are not likely to be reached by 2015 in AME points to the enormity of the educational crisis in the region. Even though it is still in its infancy, mobile learning opens up new vistas for pedagogical and institutional change, offering a window of hope for more successful and lasting educational transformations than those attempted by previous ICT in education initiatives in the region.

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Today there are over 5.9 billion mobile phone subscriptions worldwide, and for every one person who accesses the internet from a computer two do so from a mobile device. Given the ubiquity and rapidly expanding functionality of mobile technologies, UNESCO would like to better understand their potential to improve and facilitate learning, particularly in communities where educational opportunities are scarce.

This paper examines illustrative mobile learning initiatives and their implications for policy in Africa and the Middle East. It reveals important lessons for policy-makers and other stakeholders seeking to better leverage mobile devices for education. Four additional papers review mobile learning efforts in other regions of the world: Asia, Europe, Latin America, and North America. A 'Global Themes' paper synthesizes findings running across the five regional papers.

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