Capacity Building in a Changing ICT Environment

2017

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Acknowledgements

Foreword

I am pleased to present to you the first issue of a new ITU publication **"Capacity Building in a Changing ICT Environment"**.

The purpose of this publication is to examine the current and future ICT environment and identify the resulting implications for human and institutional capacity building. Success in the work of the ITU Telecommunication Development Sector depends largely on the reservoir of knowledge and skills that lies within its membership, hence the need to pursue capacity building interventions that are current and dynamic.

Capacity building is a cross-cutting issue, and it is critical for the achievement of all Sustainable Development Goals (SDGs). For this reason, capacity building is mainstreamed into the implementation of development programmes related to the SDGs across all sectors. The rapid pace of technological changes in the ICT sector demands a matching pace in the development of the skills and competencies required to fully leverage the benefits of these new technologies.

This first issue throws a spotlight on the role that mobile technology and mobile devices play in skills development and lifelong learning. Mobile technologies are now almost ubiquitous, and as the range of services and applications that can be accessed through mobile technology is also increasing, mobile devices are playing a critical role in the digital inclusion agenda. Among other learning purposes, mobile technologies have been used in digital literacy and numeracy programmes, enabling people to read and write without having to set foot in a classroom.

Cognisant of this growing role of mobile technology, I launched in 2012 the "m-Powering Development" initiative which, among other things, addresses the role of mobile technology in extending the benefits of ICTs to all layers of society.

This publication is the work of an international team of experts, making contributions on topics related to mobile technologies and learning, according to their area of expertise. The articles will hopefully contribute to the ongoing global discussions on how we can bring technology closer to the service of the people and, ultimately, result in the improvement of their lives.

I trust that the ideas and recommendations presented in this publication will support present and future discussions and developments in this area.

Brahima Sanou
Director, Telecommunication Development Bureau
(BDT)
International Telecommunication Union

About this Publication

"Capacity Building in a Changing ICT Environment" is an online publication which puts together scholarly articles with a focus on the human and institutional aspects of capacity building in the telecommunications/ICT sector. It covers a wide range of topics that may affect people and their skills development, such as the Internet of Things (IOT), big data, telecommunication regulatory issues, smart cities/societies, digital competencies, open source learning and intellectual property rights, etc.

The publication seeks to provide a body of knowledge that will facilitate academic research and innovation exploring the linkages between emerging ICT issues and human and institutional capacity building. It features current and new thinking that will contribute to informed policy debates and decisions among policymakers and regulators, as well as help the private sector to anticipate and plan for human capital requirements and skills development in order to remain competitive in a rapidly changing ICT environment.

The publication, which is released annually, is based on voluntary contributions from academic scholars and other researchers from all over the world. The purpose of the articles is to share views and scholarly opinions that will stimulate debate among its readers. Articles published are subjected to a quality assurance process by well acclaimed experts through a peer review exercise.

The published articles will also be subject to discussion at forums organized from time to time for Academia members of ITU.

Those interested in submitting an article for consideration in future editions of "Capacity Building in a Changing ICT Environment" should contact the Human Capacity Building Division at hcbmail@itu.int.

First Issue

The first issue of "Capacity Building in a Changing ICT Environment" focuses on mobile technologies for skills development and lifelong learning. It features the work of an international team of experts, tackling the issues in an analytical, critical and conceptual fashion.

Recent developments demonstrate an increasing power of mobile devices in bringing the benefits of ICTs to more people worldwide: the number of mobile subscriptions has grown exponentially over the years, from 738 million in 2000, to over 7 billion in 2015, with most of this growth taking place in the developing world; further, mobile broadband has become the most dynamic market segment, and its coverage is rapidly extending to rural areas; and finally, mobile broadband is now affordable in 111 countries, with mobile – broadband becoming less expensive than fixed broadband plans.

The articles in this issue are a contribution to the current discussions on the educational applications of mobile technology. They pay attention to the topics of lifelong learning and skills development, which have not yet been adequately explored.

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Introduction

By John Traxler

The first issue of this publication advocates and explores the increased use of mobile technologies to deliver, enhance and support informal learning and skills development with, for and amongst disenfranchised and disadvantaged people in the developing world. In a rapidly emerging and rapidly changing field, the focus on skills development and lifelong learning is however sometimes only implicit amongst the flurry of other mobile learning activities. The articles of this publication document different aspects of this work and make recommendations. This introduction looks at the bigger picture, the historical and conceptual frameworks.

The development of policy on mobiles and learning

To get a better sense of the context for the current publication and its recommendations, the policy documents and recommendations that have come from kindred organisations and agencies need to be considered.

In the last four or perhaps five years, many agencies, foundations, donors and ministries have noticed the potential of mobile technologies to deliver educational and humanitarian missions to those people, communities and regions who are distant, disenfranchised and disadvantaged. There has been increasing recognition of the potential for learning and training with mobiles, and sometimes including informal learning and workforce development, and understandably these organisations have looked at the literature and asked about the implications for scale and sustainability. They have looked at fixed-term small-scale subsidised pilots run by enthusiasts and visionaries seeking the basis for large-scale programmes to be run at a regional or national level. Now is the time to take stock of this process. This publication is in some senses a milestone, allowing us to critically review the conceptions, the expectations and the progress in this process.

Back in October 2010, the UNESCO Chair in e-learning in Barcelona held an international seminar that focused on mobiles, learning and development whilst about the same time, the GSMA, the trade association for the MNOs (mobile network operators), published *mLearning: A Platform for Educational Opportunities at the Base of the Pyramid*[1]. This gave MNOs an initial sense of the business opportunity represented by mobile learning, followed in February 2011 when the GSMA *World Mobile Congress* in Barcelona sponsored the first of its annual awards for learning. In August 2011, USAID convened the *m4Ed4Dev Symposium* in Washington DC and then launched the *mEducation Alliance*[2] in early 2012. Meanwhile in the course of 2012, the International Training Centre of the International Labour Organisation in Turin produced a mobile learning toolkit[3] for its staff in the field globally and both the Commonwealth of Learning and the World Bank, specifically *Info*Dev, became increasingly active. Earlier, in November 2011, the WISE Foundation debate in Qatar[4] focused on *mobiles, education and the hard-to-reach.* Some of these developments are documented in later articles – here our objective is merely to highlight the gathering agency momentum. The roots of mobile learning do in fact go back further – the first mLearn conference took place in Birmingham, in the United Kingdom, in 2002 and featured contributions from two large-scale EU projects, *MOBIlearn* and *m-learning*, that were already well underway. In the current context, *m-learning* is significant in seeing mobile technologies as a way of delivering and supporting literacy, numeracy and basic education for disengaged young people, some of whom were homeless and some of whom were North African immigrants landing in Italy.

In December 2011, UNESCO convened its *First Mobile Learning Week* in Paris[5]. The sessions focused, regionally and globally, on policy issues and teacher development, the latter seen as the optimal place to break into the educational cycle and thus to promote *education-for-all (EFA)*. In March of 2012, a further *International Symposium*

in Washington organised for UNESCO by the Consortium for School Networks, drew together emerging US practitioners, agencies, funders and stakeholders. The *mEducation Alliance Symposium*, in September 2012, entitled *Partnering For Scale And Impact*, illustrated the growing emphasis and direction of corporate and agency priorities. UNESCO was meanwhile releasing its *Working Paper Series on Mobile Learning*[6]*,* divided into two broad subsets: six papers examining mobile learning initiatives and their policy implications, and six papers examining how mobile technologies could support teachers and improve their practice. Within both subsets, there were five geographical divisions: Africa and the Middle East, Asia, Europe, Latin America, and North America. Each subset also contained a *Global Themes* paper synthesizing central findings from the five regional papers. Two additional *Issues* papers rounded out the Series. One highlighted those characteristics shared by successful mobile learning initiatives and identified supportive policies and another discussed how mobile technologies were likely to impact education in the future. The report, *Turning On Mobile Learning: Global Themes,* made the following mixture of observations and recommendations:

- mobile learning carries a stigma that can and should be overcome;

- existing education policies have yet to embrace the potential of mobile learning;

- mobile learning can help reach marginalized populations and improve education systems;

- questions of access and equity loom large;

- diverse partnerships are required to sustain and expand mobile learning initiatives.

Meanwhile, the *Policy Guidelines for Mobile Learning*, having argued the unique benefits of mobile learning, also made recommendations:

- create or update policies related to mobile learning;

- train teachers to advance learning through mobile technologies;

- provide support and training to teachers through mobile technologies;

- create and optimize educational content for use on mobile devices;

- ensure gender equality for mobile students;

- expand and improve connectivity options while ensuring equity;

- develop strategies to provide equal access for all;

- promote the safe, responsible and healthy use of mobile technologies;

- use mobile technology to improve communication and education management;

- raise awareness of mobile learning through advocacy, leadership and dialogue.

These were probably the first comprehensive sets of policy recommendations, covering the breadth of mobile learning activity, in the context however of the UNESCO mandate to work with member state education ministries.

The second UNESCO Symposium, included in its *Mobile Learning Week*, in Paris in February 2013, continued to align with wider objectives within the development community, specifically Millennium Development Goals, and with UNESCO priorities, namely, Africa, gender equality and teacher development.

At the same time, USAID through the mEducation Alliance published its major *Landscape Review: Mobiles for Youth Workforce Development*, making the following observations, advocating:

- Understanding how youth access information across different devices and designing content that can be accessed from different devices.

- Information on cost and levels of access need to be considered, especially for more marginalized populations, such as rural youth and young women.

- Educational media for instruction should be selected based on the ability to deliver a desired educational technique to the intended location at the most appropriate moment.

- Self-directed learning was shown to be effective with advanced students and learners but is not suitable for weaker students.

- Practitioners recommended designing for the lowest common denominator mobile technology in order to reach the greatest number of users. SMS, however, is not conducive to more complex hard and soft skills.

- Use of mobile devices during program implementation to collect information on user behaviours and skills acquisition can help program managers

The third UNESCO *Mobile Learning Week* took place in Paris in February 2014. It included a symposium devoted to exploring the relationships between policy makers, programme managers, officials and researchers in the mobile learning space. The resulting publication drew attention to some complex and unresolved issues, notably, working with marginal and indigenous peoples and the ethics of intervention; working with for-profit corporates and dealing with bias and pressure; the impact agenda, communication and dissemination; researchers, their careers, building capacity and funding; and working within existing levels of evidence, rigour and documentation.

The mEducation Alliance, supported by USAID, continues to make substantial contributions. *Mobile for Reading: A Landscape Research Review* published in June 2014 recognises the importance of the m4r, mobiles-for-reading, movement but also recognises the complex nature of literacy, as intrusive mobile technologies impact on the nature and balance of literacy and languages, especially within marginal and indigenous communities, at the same time as enhancing the acquisition of literacy. The Review recognises literacy as the foundation of both skills development and lifelong learning. The UNESCO *Reading without Books: 15 Projects that Leverage Mobile Technology for Literacy in Developing Countries* covers similar ground and features projects that address adult readers as well as those for children and young people.

These examples and remarks give a sense of the evolution of mobile learning in development contexts and obliquely of its significance for skills development and informal learning. For whatever reasons, the agency and policy focus has, however, often been formal primary schooling within national education systems, delivering literacy and supported by teacher development. The current publication draws attention to other equally valuable parts of the educational ecosystem, reminding us that children and their teachers interact with elders, families, communities, businesses and civil society, each supporting the other.

The publications mentioned contained numerous examples and case studies, and numerous references and resources. The needs and expectations of the audiences for which the agencies involved publish should be noted, GSMA for MNOs, UNESCO for Member State governments, and it should be recognised that the process of compiling and collating these has not usually been scientific, objective, comprehensive or prolonged.

There were also significant reports to the World Bank, the *eTransform Africa Final Report*, and to the World Economic Forum, *Accelerating the Adoption of mLearning: A Call for Collective and Collaborative Action*, another one from GSMA, their *Transforming learning through mEducation* produced by McKinsey & Company in Mumbai plus more detailed studies in specific countries.

During this period, Western Europe saw the development of the notion of *digital literacy*, those skills, competences and attitudes needed to comprehend, communicate, create and critique in a digital world. The debates about the exact nature of digital literacy have been largely confined to the university sectors (though some aspects, for example *e-safety*, are manifest in schools and South Africa has been active in this respect). Our points here are that such debates should also be addressing the meaning of digital literacy in the vocational sector, the community learning sector and across society in general, that such debates should be taking place in developing as well as developed counties and communities, and that these debates should explicitly include mobile digital technologies, as the major component of the digital experience of most people, especially those in developing countries and regions. Digital literacy, implicitly or explicitly, is now the foundation of lifelong learning and skills development.

This period also saw the emergence of research communities devoted to ICT for development, ICT4D, and mobiles for development, m4d, documenting and analysing the transformative impact of digital technology on economic and social lives in developing countries. This work is important for establishing the evolving context for skills development and for informal learning. Richard Heeks, in analysing the development of ICT4D[7], much of which is in fact mobile, theorises that ICT4D moves in generations, from the established ICT4D 1.0 characterizing the poor largely as passive consumers or recipients, at 'the bottom of the pyramid' to an emergent ICT4D 2.0 seeing them as active producers and innovators. Within ICT4D 2.0 he sees *pro-poor* innovation occurs outside poor communities, but on their behalf, *para-poor* innovation is done working alongside poor communities and *per-poor* innovation occurs within and by poor communities. Education and training can be seen in a comparable framework, with large-scale teacher-led initial education systems in the first category but skills development and lifelong learning enabled by mobile technology having the potential to populate the other two later categories, to work with and within poor communities.

There were increasing numbers of regional mobile learning trade shows and commercial conferences, in, for example, South America and South Asia, often with development and infrastructure themes. In Africa, *Balancing Act* continued to report on the development of the mobile sector, covering infrastructure, regulation and policy, and the *eLearning Africa 2012 Report* and the subsequent *eLearning Africa Report 2014* drew critical attention to mobile opportunities and to patchy progress. The latter featured an interview with Brahima Sanou, the Director of the Telecommunication Development Bureau of the International Telecommunication Union, in which he said,

> "The telecom sector must approach this from a "shared value" perspective joining the notion of profit and social good, and not strictly from a corporate social responsibility or philanthropic angle which often lies at the periphery of firms. Working in collaboration with the ecosystem in building long-term financially sustainable business models using the companies' core competencies and technologies is the only way e- and mLearning will truly be able to scale and have a transformative impact on education in the developing world.

> Government policy is largely needed and must be strengthened for e- and mLearning. Collaborative work amongst all the players to include governments and industry is necessary to help increase adoption and awareness."

This represented a move away from ideas of cost-effectiveness and return-on-investment as the rationale for mobile learning and argued for different bases for scale and sustainability. There was increasing talk of the *triple bottom line* – financial profit, social good and environmental sustainability. Social enterprises are grass-roots manifestation of this ethos, often exploiting mobile technology and documented in the *m4d* literature. There was also increasing talk, as here, of *shared value*, a concept that focused on the connections between societal and economic progress. It involved reconceiving products and markets, redefining productivity in the value chain and enabling local cluster development, and had advocates in amongst Intel, Walmart, Google, IBM, Unilever, Johnson & Johnson, Alcatel, Nestlé and others. The Harvard Business Review of January 2011 gives an overview and contrasts the concepts of CSV, *creating shared value* with the prior focus of CSR, *corporate social responsibility*, hitherto the main source of corporate support for mobile learning for disadvantaged communities and developing regions, one that proved increasingly vulnerable in a worsening global economic climate.

Notions of development

Underneath many discussions have been assumptions about *development* that are not clearly articulated. This lack of clarity is common. The prevailing definitions and priorities are however moving away from a focussing solely on economic growth and away from solely addressing extreme material deprivation in the global South. These definitions and priorities are however still powerful and often portray development as modernisation, as *catching-up*. In the context of education, there is much talk of mobile technology enabling a process of *leap-frogging*, jumping over computer implementations and going straight to mobile implementations. These notions have consequences for skills development and lifelong learning since they imply specific and immutable

trajectories and objectives independent of local culture and customs, independent of local traditions about learning, knowing and finding out.

An alternative, the Capability Approach of the Nobel Laureate Amartya Sen, has gained considerable visibility,

> "Development can be seen as a process of expanding the real freedoms that people enjoy."[8]

and

> Focusing on the "substantive freedom – of people to lead the lives they have reason to value and to enhance the real choices they have."[9]

In this more holistic view of development, economic growth plays an important, but not exclusive, role. It sounds like a very inclusive definition, one that should include learning, especially informal and lifelong learning alongside training and skills development. There are, however, problems:

> The first is uncontrollability: the structure of the 'development industry' is such that funders tend to be persuaded to commit resources based on the promise of pre-determined impacts, not by a promise that people will be empowered to make much less predictable choices of development outcomes. The second is practical applicability: even if one were to accept expansion of freedom, and thus freedom to choose, as the primary end and principal means of development (Sen 1999:36) then how can the conceptual richness of this approach be translated into an operationalisable modus operandi in development planning, execution and evaluation?[10]

Several things are apparent: the issue of 'practical applicability' is exactly the challenge faced by informal and community learning programmes and by education in general, and secondly the Capability Approach puts training in a more holistic context than merely mechanically servicing the needs of employers and the economy. And then, specifically in relation to digital technology,

> Technologies become sources of unfreedom, for example, when first people who would like to use them in order to better lead the lives they value cannot access them, while others can; and second, when people feel or are forced to use technologies which do not reflect the lives they value. The challenge facing "information and communication technologies for development" (ICT4D) is thus twofold: first, to work toward a situation in which people can have access to information and communication technologies (ICTs) if they so wish and, second, to consider whether and how new technologies relate to the lives that people value, individually and collectively.[11]

This discussion is important when the possible contribution of mobile technologies to lifelong learning and skill development is considered and there is a resonance with the commercial community discussion of *shared value*.

At a less conceptual level, the *Sustainable Livelihoods Framework (SLF)* adopted by the UK DFID amongst others offers a more rounded vision of development compared to earlier, purely materialistic ones and provides an analytical tool to understand systemically the elements influencing the lives of poor people. It addresses the issue of 'practical applicability' that afflicts the Capability Approach. The SLF includes the concept of an individual's *capital portfolio* made up of five *capitals*: human capital, natural capital, financial capital, physical capital and social capital. Human capital is measured by formal education and health indicators. *Social capital* is more problematic but this is exactly where informal and lifelong learning operate, building social cohesion and education empowerment. Furthermore, in the SLF livelihood outcomes are defined *a priori*. In the DFID version, *more income* is listed at the top, even before *increased well-being*. The SLF offers a broad and systemic view of development but its set of capitals is limited and the development goals are predetermined; unlike the Capability Approach, they are not up to the individual to choose.

Mobile learning

Some fundamental tensions in how mobile learning is perceived should also be discussed.

Looking backwards, mobile learning is a continuation of e-learning, of learning with computers, something that took place only in schools, colleges and universities and in corporations, institutions with the expertise and resources necessary for working with scarce, expensive, fragile and difficult devices, to enhance and extend the existing curriculum and to support the existing education systems. Projects were often small-scale, fixed-term, subsidised and run by skilled enthusiasts. The first decade of mobile learning was often characterised by challenges of sustainability, scale and transferability. Seen from this perspective the responsibility for mobile learning rested with the ministries and authorities in formal education and the commercial opportunities rested with those companies with e-learning expertise and legacy.

Looking forwards, ownership and familiarity of mobiles is becoming widespread; mobiles becoming ubiquitous and pervasive, cheap, robust and easy to use, and ordinary people and communities using them to produce, share and discuss ideas, information, images and opinions; in effect taking learning into their own hands not only as learners but as each other's teachers. Seen in these terms, the responsibility for mobile learning should be more systemic and societal, not limited to one department or one ministry, and the commercial opportunities should extend beyond publishers, networks and broadcasters to the communities themselves, their centres and their people, their values and their concerns.

In both cases it should be recognised that for many communities and regions, mobile technology and network connectivity are the portal to online resources and online communities; looking backwards, these might be web sites, OER (open educational resources) repositories[12], institutional MOOCs (massive open online courses), institutional VLEs (virtual learning environments) and formal SIGs (special interest groups); looking forwards, these will be Facebook groups, blog-posts, podcasts, twitter feeds, YouTube videos and user group sites. These examples show just how potent and empowering skills development and lifelong learning can be once accessible through mobile technology. The role of the teacher and trainer becomes that of continually monitoring and selecting resources, communities and experiences that their learners can exploit, and equipping these learners with the critical skills to continue this on their own behalf subsequently.

In both cases, however, the mobile learning advocates and activists must provide the necessary examples and evidence to move these various stakeholders forward, to take mobile learning up their priorities, to allocate resources and to take some measured risks.

In the subsequent articles, our contributors tackle definitions of mobile learning, and indeed various other kinds of learning, from a variety of perspectives, unpacking the implications and illustrating the fluidity of the various concepts.

Endnotes

1   Available at: www.gsmworld.com/documents/mLearning_Report_Final_Dec2010.pdf

2   www.meducationalliance.org

3   www.itcilo.org/en/community/news/mobile-learning/image/image_view_fullscreen

4   www.wise-qatar.org/content/31-mobile-learning-hard-reach

5   www.unesco.org/new/en/unesco/themes/icts/m4ed/

6   All available at: www.unesco.org/new/en/unesco/themes/icts/m4ed/

7   Heeks, R. (2008). ICT4D 2.0: The Next Phase of Applying ICT for International Development. *Computer*, 41(6), pp. 26-33.

8   Sen, A.K. (1999). *Development as Freedom*. Oxford: Oxford University Press, p. 3.

9   Sen, A.K. (1999). *Development as Freedom*. Oxford: Oxford University Press, p. 293.

10   Kleine, D. (2011). The capability approach and the 'medium of choice': steps towards conceptualising information and communication technologies for development. *Ethics and Information Technology,* 13(2), *p.119.*

11   Kleine, D., Light, A. and Montero, M.-J. (2012). Signifiers of the life we value? – considering human development, technologies and Fair Trade from the perspective of the capabilities approach. *Information Technology for Development*, 18(1), p. 43.

12   See https://oerknowledgecloud.org/content/why-open-educational-resources-are-needed-mobile-learning

Lifelong learning

By Alastair Clark

In this article, the importance of lifelong learning will be explored, and in particular, the ways in which hand-held digital communication devices can be used as effective ways for adults to learn. Mobile Learning offers some very significant potential benefits to adult learners. Our challenge is to ensure that, educators, policy makers and learners themselves can all play their parts in ensuring that these new ways of learning really do make a positive difference to people's personal and professional lives.

Learning

Learning taking place at any time in a citizen's life can rightly be described as lifelong learning and the UNESCO Institute for Lifelong Learning indicates that it 'encompasses learning **at all ages** and subsumes formal, non-formal and informal learning.'[1] However, the term is commonly used to focus on the learning that takes place after a period of initial education. Lifelong learning can be pursued for both personal and professional reasons. Indeed some advocates have dismissed the validity of making a clear divide between these two types of learning. They argue that non-vocational learning can often produce learning outcomes which are beneficial in the workplace and conversely vocational training can often satisfy broader individual needs for personal fulfilment.

Learning throughout life will have a range of functions for different people and at different stages at their lives. For instance, lifelong learning provides a vital opportunity for adults to 'catch-up' on elements of their initial education and training that they have missed. It can also prepare adults for a new life stage, for example: new employment, preparation for retirement or accepting new family or civic responsibilities[2]. Lifelong learning can also play an important part in helping adults to define and shape their own identities by exploring their past biographies and framing their aspirations.

UNESCO convenes the Confintea world conferences on adult education every decade. The priorities for action set at Confintea VI in Belem, Brazil in 2009 provide an indication of key global policy trends. These priorities are:

- to push forward the recognition of adult learning and education as an important element of and factor conducive to lifelong learning, of which literacy is the foundation;

- to highlight the crucial role of adult learning and education for the realisation of current international education and development agendas (EFA, MDGs, UNLD, LIFE and DESD)[3]; and

- to renew political momentum and commitment and to develop the tools for implementation in order to move from rhetoric to action.

Learning can include the acquisition of knowledge, skills and values and this is especially true of lifelong learning and can be characterised as, what you know, what you can do and what you believe in. Learning itself can take place in so many different ways and it has become common to recognise a distinction between Formal, Non-Formal and Informal Learning. These distinctions are used widely in policy and there have been some bold attempts to offer formal recognition for the outcomes of informal and non-formal learning. Although there are some variations in the detailed definitions that are used, the following descriptions offer a useful indication of how the terms 'formal', 'non-formal' and 'informal' are commonly applied to education and learning.

Formal education: the hierarchically structured, chronologically graded 'education system', running from primary school through the university and including, in addition to general academic studies, a variety of specialised programmes and institutions for full-time technical and professional training.

Non-formal education: any organised educational activity outside the established formal system – whether operating separately or as an important feature of some broader activity – that is intended to serve identifiable learning clienteles and learning objectives.

Informal education: the truly lifelong process whereby every individual acquires attitudes, values, skills and knowledge from daily experience and the educative influences and resources in his or her environment – from family and neighbours, from work and play, from the market place, the library and the mass media.[4] It is often added that a substantial element of informal education may not even be conscious on the part of the learner or may be understood or implied without being specifically stated (tacit learning). Non-formal learning has many manifestations but examples would include village-based literacy classes for adults and training of coaches in a sports club. The iSpot Nature web site offers an online example of self directed and collaborative learning where users learn to identify and appreciate flora and fauna through sharing information on an online community (Box 1.1).

As seen from the priorities set at Confintea VI, ensuring that citizens have access to learn throughout their lives has become an object of policy and has been associated with efforts to create a more just world. Beyond the formal

Box 1.1: iSpot Nature

The Open University iSpot website works well on mobile devices and provides a platform for anytime, anyplace, informal learning. The collaborative features of the site enables a community of over 33 000 users world-wide to share their knowledge. Nearly a quarter of a million images of flora and fauna have been uploaded to iSpot and the species have then been identified by one or more fellow users. Images have been submitted to iSpot from over 140 countries and can be uploaded directly from a mobile device. The community of users includes students and enthusiastic amateurs as well as teachers and academics.
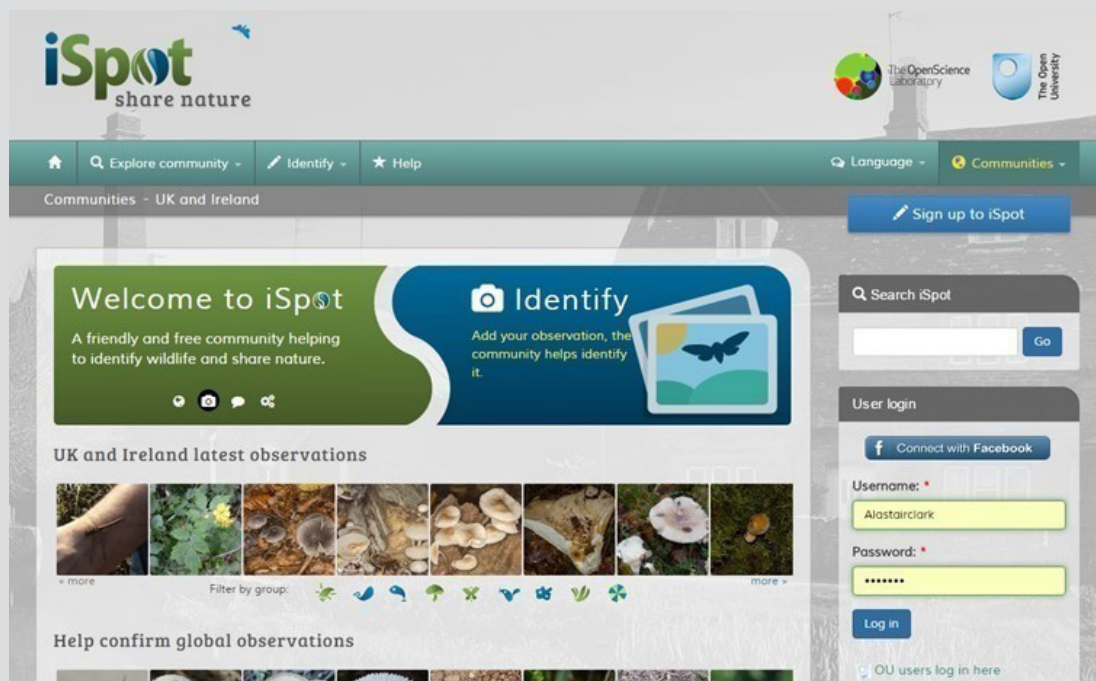
iSpot is a Citizen Science project run by The Open University in the UK but used worldwide. It was originally developed as part of the Open Air Laboratories (OPAL) project 2008-12.

Photo credit: iSpot. www.ispotnature.org/

structures of UNESCO and national governments, the Non-Governmental Organisations have raised their voices in support of lifelong learning in the name of social justice. The International Council for the Education of Adults identifies this key role of adult learning in promoting positive changes. The Council has as its mission:

> to promote learning and education for adults and young people in pursuit of social justice within the framework of human right in all its dimensions, to secure the healthy, sustainable and democratic development of individuals, communities and societies.[5]

This role for lifelong learning resonates with the approach to critical pedagogy championed by the influential Brazilian educator, Paolo Freire who challenged the notion that learners were like empty bank accounts waiting for deposits from the teacher but instead advocated the co-creation of learning. This notion of co-creation was central to the foundation of the Workers Educational Association in the UK that set out in 1904 to ensure that 'teachers would be learners and the learners would be teachers.' The *Folkbildning* movement of the Nordic countries has had a world-wide influence on approaches to lifelong learning with its strong on the value of self organised Study Circles and the principles have also been applied to online learning circles too.

Participation rates in formal and non-formal adult learning vary greatly. Even in the countries of the Organisation for Economic Cooperation and Development (OECD) the range is from 60 per cent of adults in Sweden and New Zealand to just 15 per cent of the adult populations in Greece or Hungary[6]. Informal learning is far harder to measure but the World Wide Web is being used extensively to seek instant answers to 'just in time' questions through search engines and topic based user-forums.

Global learning challenges

The ability to create and to read communication using the written word remains vitally important skills. Without literacy skill, doors are closed to further learning and to full participation in civil society. It is therefore of real concern that UNESCO has identified that 774 million adults across the world cannot read or write and that two out of

three of these people are women. Even more challenging is the fact that this figure only dropped by 1 per cent between 2000 and 2011, and UNESCO predict that, at present rates, it may not be until 2072 that 'the poorest young women in developing countries achieve universal literacy!

Seeking to address the need for reading materials in local languages, the World Reader WRM app is available in 53 countries and gives access to reading material in 43 languages (Box 1.3).

The problem may not even be solved through the current initial education system as UNESCO has also identified that around 250 million children are 'not learning the basic skills, even though half of them have spent at least four years at school'. It follows that there is huge need to raise the skills and effectiveness of the current teaching work force.[7]

Whilst work on literacy in some countries may be focussed on the widely used colonial languages, there are also shrill calls for new technologies to play their part in strengthening and celebrating the position of traditional and indigenous languages.

South African teachers have shown the effectiveness of using local languages to make audio recordings on mobile phones of key learning points from science lessons (Box 1.4).

The 2013 *UNESCO Education for All Monitoring Report* sets improvements in quality of teaching as one of its six goals. Indeed the reports suggest that 'in a third of countries the challenge of training existing teachers is worse than that of recruiting and training new teachers'. Examples of good practice exist of use of mobiles for in-service training for teachers and school leaders.

In addition to the need to improve literacy levels and to address the closely-related issue of in-service teacher training, there are further global issues that should call upon mobile learning to meet the challenges. The English in Action project in Bangladesh addressed the need for teacher training by deploying small memory cards containing training materials which could be accessed through mobile phones equipped with speakers (Box 1.2).

There remain gender disparities in accessing the benefits of education, with only 38 per cent of

Box 1.2: In-service training for effective language teaching in Bangladesh

The English in Action seeks to raise the English language attainment levels in Bangladesh schools through in service training for teachers. The primary method is to distribute videos of actual Bangladeshi teachers, employing active 'communicative' techniques in their own classrooms.

The training materials, developed by the OU and local partners in Bangladesh, are stored on tiny SD (secure digital) memory cards, supplied to the teachers pre-loaded on mobile phones with external speakers.

The project wanted to use widespread available technology to get high-quality audio and video learning materials to teachers, even in remote rural areas, but without depending on costly, unreliable mobile internet access or intermittent electricity supplies.

English in Action was developed at the request of the Bangladeshi Government, and funded by the UK Government Department for International Development's UK Aid programme. It is delivered in partnership with development consultants BMB Mott McDonald.

Box 1.3: World Reader

The World Reader WRM app is available in 53 countries and gives access to reading material in 43 languages including Hindi, Yoruba, Kiswahili and Twi. The World Reader organisation provides over 6 000 digitised books including newly published African authors and existing material donated by top trade and textbook publishers.

Support is offered locally to promote reading on mobile devices and World Reader also offers training for local project managers and teachers as well as e-reader repair training for local businesses.

Source: West, M. (2014). *Reading in the mobile era: A study of mobile reading in developing countries.* Paris, UNESCO. Available at: http://unesdoc.unesco.org/images/0022/002274/227436E.pdf Accessed 20 Nov. 2016.

countries in the world having achieved gender parity of access to secondary education.[8] Whilst there may also be some parallel gender disparity in access to mobile technologies, there has been some very encouraging work in use of mobile phones to extend literacy material to women.

Changes in global climate are increasing the need to learn how this is happening and what can be done as a result. Whilst UNESCO declared the *Decade of Education for Sustainable Development* from 2004 - 2014 there remains an ongoing and increasingly vital task of raising the understanding of the science along with the social and economic consequences of changes in climate and other environmental changes. These in turn are fuelling a growing demand for new skills and new technologies to support 'green industries'.

Another challenge is presented by the very technology of mobile, learning itself. As the world becomes increasingly connected, there is a need to understand the social and political implications of these connections. Many countries across the globe are recognising the need to develop strategies and learning programmes (often informal and non-formal) to minimise the disparities between those who have and those who do not have access to information and opportunities to exercise freedom of expression. It is right and fitting that mobile learning will play its part in delivering learning in Media and Information Literacy.[9]

When it comes to skills related to specific jobs, the World Bank has identified that:

Box 1.4: Mobile learning through indigenous languages in South Africa

South African secondary school physical science learners used mobile phones to create audio notes of their learning. The notes were in a mixture of English and indigenous languages and were uploaded onto a mobile learning system where they could be retrieved later for revision purposes (Figure 1.1).

The content of these notes was composed from their own individual knowledge gathered from their daily physical science lessons and other sources of electronic and non-electronic learning resources including their text-books.

Figure 1.1: Languages used by learners to create clips (in addition to English)
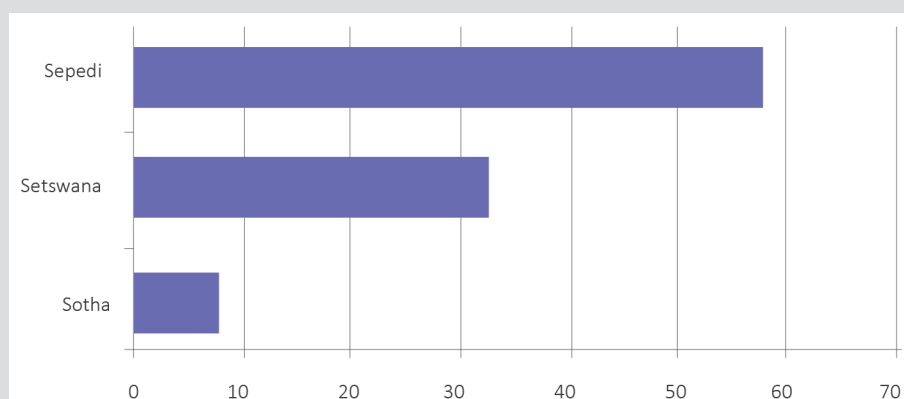
Source: Jantjies, M. and Joy, M. (2013). *Mobile learning through indigenous languages: learning through a constructivist approach*. In: 12th World Conference on Mobile and Contextual Learning (mLearn 2013), Doha, Qatar, 22-24 Oct 2013. Published in: 12th World Conference on Mobile and Contextual Learning (mLearn 2013), Volume 2013 (Article number 14). Available at: http://www.qscience.com/doi/abs/10.5339/qproc.2013.mlearn.14 Accessed 19 Nov. 2016.

"… the share of firms worried about inadequate worker education and skills averages about 25% in the Organization for Economic Cooperation and Development and in Europe and Central Asia, 40% in Sub-Saharan Africa, and 50% in East Asia and the Pacific."[10]

Mobile learning has a distinct and powerful role to play in initial vocational training, but also in supporting the mix of learning methods and styles that help to keep a workforce flexible and innovative.

Charles Jennings[11] has famously proposed the 70:20:10 ratio suggesting that for most jobs, 70 per cent of the skills, knowledge required are learned on the job, 20 per cent from other people and 10 per cent from formal training. Whilst the exact figures will vary, this does remind educators that formal training must be of good quality and relevant and that communication methods are available for people in employment to seek advice from co-workers including those who are not co-located.

Lifelong learning as mobile learning

When facing these global educational challenges, the rapid increase in access to mobile technologies cannot be ignored. To illustrate this recent growth in access to mobile devices Figure 1.2 shows how mobile phone penetration has changed since 2005 and how this has been most marked in developing countries where there has been more than a four-fold increase from 2005 to 2013.

Of course, some users have multiple accounts so these figures cannot be taken to equate directly to the proportion of a population that has phone access. However, this rapid rise appears set to continue and does indicate a vast increase in the number of mobile devices in circulation.

Figure 1.2: Mobile-cellular subscriptions per 100 inhabitants, 2005-2016
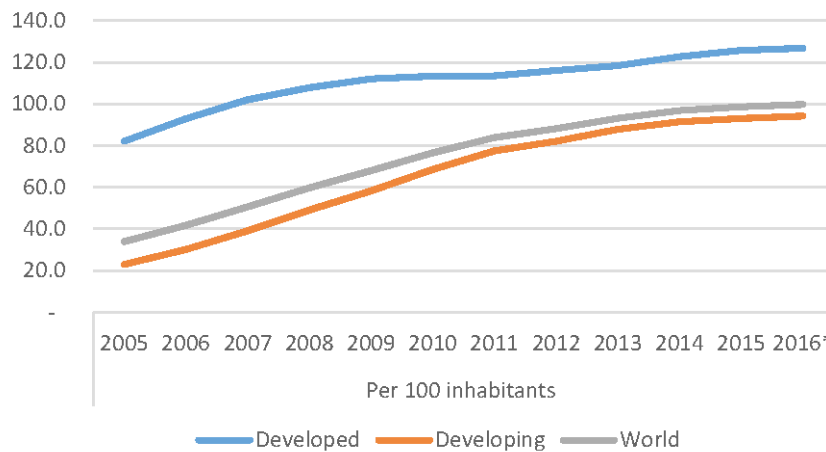
These devices will have a variety of levels of functionality and connectivity, and we illustrate in Table 1 examples of the range of functions which can support learning. In addition to simple mobile phones, 'Feature Phones' have more functionality, but smartphones with a computer style operating system are becoming more widely used as their price reduces. Beyond mobile phones, other handheld mobile electronic devices are also deployed for learning. These currently include tablets, video and audio recorders, games machines, GPS units and industry specific devices, but the market is dynamic and innovative. New devices with new combinations of functions are being introduced regularly.

Following the 2012 Paris declaration on Open Education[12], there is a renewed commitment from publicly funded content providers to ensure that the materials they create are licensed as Open Educational Resources (OERs) and thus freely available for others to use, adapt and share.

Our citizens deserve the best from mobile learning

Throughout the world, access to good quality and relevant education is recognised as playing a key part in supporting economic and human development. The work of UNESCO and others have shown how much still needs to be done to ensure that all citizens have a basic education

on which they can build the skill, knowledge and attitudes for successful economic and civic participation. The opportunities to enhance learning presented by the rapid growth in access to hand-held communication should be seized.

In order to gain the maximum benefit, it is recommended that:

- strategies for improving literacy should include use of appropriate mobile technologies to provide high quality learning experiences;

- policies should be developed for use of mobile technology to develop and celebrate the use of indigenous languages;

- mobile learning should be employed as one method in the initial training of teachers and Continuous Professional Development so that all educators can experience the benefits and develop the necessary technical and pedagogical skills to make best use;

- voluntary civil society organisations should be given technical and pedagogical support to deploy appropriate mobile learning techniques in their delivery of non-formal learning;

- communication providers should promote their networks as gateways to new knowledge and to seek both to stimulate and to satisfy the curiosity that motivates informal learning;

- mobile technology should be presented in policy statements as a tool for all, offering a window on a wider world of knowledge to women and men, all ages, all abilities and to rich and poor alike. Ambitious but achievable goals should be set for widening access to learning for all through technology.

Table 1.1: Examples of range of learning-related functions that can be used on mobile devices

Information delivery	Information provided by phone call
	Information provided by SMS text
	Text made available to read on the device
	Instructional video provided through the device
	Instructional audio provided through the device
	Location-specific content delivery through QR codes and Augmented Reality
Collaboration	Use of SMS message boards
	Web based collaborative tools
	Voice connection to individuals or conference calls
Assessment	Assessment test / quiz activity undertaken on the device
	Feedback to learners via voice or SMS Recording of skill performance by video or audio Collecting evidence of a finished product of learning (eg photo, video, audio)
User-generated content	Video
	Audio
	Text
	Geo-specific information collection

This is non exhaustive, as one of the significant features of this area of technology is rapid change and innovation.

Endnotes

1   UNESCO Institute for Lifelong Learning. (2010). *Lifelong Learning*. Available at: http://www.uil.unesco.org/lifelong-learning-0 Accessed 16 Nov. 2016.

2   Schuller, T. and Watson, D. (2009). *Learning for Life - Inquiry into the Future of Lifelong Learning*. Leicester: NIACE.

3   EFA: Education for All, MDG: Millennium Development Goals, UNLD: UN Literacy Decade, LIFE: Literacy Initiative for Empowerment, DESD: Decade for Education for Sustainable Development.

4   Combs, P.H., Prosser, R.C. and Ahmed, M. (1973). *New path to learning for rural children and youth*. New York: International Council for Educational Development.

5   International Council for Adult Education. (2013). *About Us*. Available at: www.icae2.org/index.php/en/about-us/mission Accessed 16 Nov. 2016.

6   OECD. (2013). *Education at a Glance 2013: OECD Indicators*. OECD Publishing. Available at: http://www.oecd-ilibrary.org/education/education-at-a-glance-2013_eag-2013-en Accessed 16 Nov. 2016.

7   UNESCO. (2014). *Education for All Global Monitoring Report 2013/4*. Paris: UNESCO. Available at: http://en.unesco.org/gem-report/allreports Accessed 16 Nov. 2016.

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10 World Bank. (2010). *Stepping up skills for more jobs and higher productivity*. Washington, D.C.: International Bank for Reconstruction and Development/The World Bank. Available at: http://documents.worldbank.org/curated/en/2010/06/12515032/stepping-up-skills-more-jobs-higher-productivity Accessed 20 Nov. 2016.

11 See Charles Jennings' Blog: http://tinyurl.com/pm4sq9x

12 Available at: http://tinyurl.com/kzfmtqg

Community and informal learning, and skills development

By Agnieszka Palalas

The mobile learning community has the potential and responsibility to bring informal and community-based learning to the hard-to-reach and those experiencing socio-economic, cultural, and ecological uncertainty. The capabilities of mobile technologies, on their own or blended with other local and sustainable technologies, have opened up avenues for transformational change founded on personal, vocational, cultural, economic, social, and civic improvement of individuals and groups. The exponential growth in mobile penetration[11] and handset ownership across the globe coupled with expanding mobile network coverage, offered by competitive mobile network operators, creates an environment in which the immense potential of mobile learning in overcoming the global learning challenges can be realized.

Informal learning via mobile technologies creates a vehicle by which individuals and groups affected by natural disasters, warfare and conflict, economic shocks, ill health, discrimination, and violence can access information, ideas, opinions and knowledge. Mobile devices can thus open doors to equity and welfare by connecting people to aid, resources, advice, supports, and by giving them a voice. Moreover, handheld devices can become an engine of growth by facilitating equitable access to quality education for children, youth, and adults[2], and consequently empowering them with literacy, numeracy, essential life and lifelong learning skills. The use of mobile technologies can now embrace members of marginalized groups and those who have suffered rejection and exclusion from education. Informal learning via mobiles can permeate across many physically or culturally impenetrable barriers to liberate, empower, provide, and help people reach their potential.

Nevertheless, the magnitude of the challenge of taking mobile learning to those in need cannot be underestimated, especially when targeting those hard-to-reach. The various aspects of accessibility have to be considered, including the potential users' digital literacy deficiencies and their preparedness to utilize mobile resources. It is equally imperative to ensure that, while "persuading and presenting" the benefits of mobile learning interventions to individuals or communities, a partnership is established respecting their specific interests, as well as cultural and socio-economic contexts. Successful educational interventions targeting individual and community learning necessitate attention to the particular problems that they are addressing as well as their settings. More listening than telling is essential to achieve outcomes that benefit the learners.

The next section of this article provides a definition of informal learning before moving to a discussion of community learning and the pivotal role of dialogue in the development and provision of education for the community. Subsequently, examples of hard-to-reach communities and mobile learning interventions suitable for these groups are presented and then illustrated with selected case studies. The latter sections focus on the key benefits, barriers, and recommendations with regard to the usage of mobile devices for informal and community learning as well as skill development.

Informal learning and mobiles

Informal learning occurs throughout life, and daily interactions with other people, including individual and community activities, such as learning cultural norms, language, or even how to prepare a healthy meal. Informal learning is an integral part of life and has also been identified as a vital social phenomenon[3]. This article adopts Livingston's[4] definition of informal learning as all "forms of intentional or tacit learning in which we engage either individually or collectively without direct reliance on a teacher or externally

organized curriculum". Livingston refers to both self-directed and collective informal learning, as well as intentional and unintentional informal learning. Tacit learning is so integrated in other activities that it is impossible to distinguish it as an act of acquiring new understanding, knowledge, or skill, for instance when communicating via mobile in a rescue operation. This discussion of the role of mobile technologies in informal learning also includes incidental learning, which occurs unintentionally; however, eventually the learner becomes aware that learning has taken place. Livingston explains that much of the informal learning occurs at irregular times and spaces, and at moments of transitions as well as at other major influential events in life. While people commonly undertake informal learning to gain desired knowledge and skill, they also might engage in learning ad hoc in response to a crisis or in search for solutions to urgent issues or situational needs. All in all, learning "at any time and in any place, in everyday life"[5] might arise from individual and collective goals, either explicit educational objectives or plain survival goals brought about by a random situation, when the aims and processes of learning might be not explicit. Unintentional mobile learning, from unanticipated learning opportunities or unforeseen events, can result in learning that is situated, contextual, and social.

Community learning and mobiles

The community learning process, with or without assistance of technology, is principally about people helping other people and connecting with them. Mobile devices provide an on-demand link to others within and outside our own communities. They enable exchange of information and conversation, which can mediate learning and skill acquisition effecting personal growth and social transformation. Freire[6] posited that the powerless could accomplish freedom and change as a result of critical reflection and informed action. He postulated that by collaborating and sharing knowledge with the least powerful in society, they become more autonomous and empowered. From Freire's perspective, change toward greater equality and social justice presupposes community-based learning based on listening to the community and open dialogue. Community-based informal learning may enable people to transform

themselves by increasing the capacity of individuals and groups of all ages to improve their quality of life. The key to successful individual or community informal mobile learning is the ability to reach all community members and ensure their participation in the democratic processes of mobile content creation, selection, and delivery. Moreover, such educational interventions need to be developed through consultation with communities and other stakeholders as well as with respect to the communal coherence and local networks. Consequently, mobile devices should serve not only as a platform for delivery of educational interventions but also as a network for communication and feedback exchange within the community and with the outside participants. Effective community-based learning necessitates collective action requiring extensive personal contact, regular interaction, and trust enabling mutual aid.

Community learning, although often associated merely with socio-economically disadvantaged individuals and poorer areas, has been adopted widely reaching members of regional and global communities, especially those outside the formal education grid. Mobile devices add another dimension to such informal learning, namely the possibility of linking dispersed communities, connecting them from virtually anywhere, and networking them on-demand in the time when information or support is critical to their survival. Thus, networks among those with similar problems or interests can be built, and new ad-hoc communities created. The use of mobile devices enables individuals and groups who, due to cultural, physical, socio-economic or health barriers, are prevented from participating in learning activities and discussions in person, to voice their needs, and contribute their perspectives. This may include women with limited rights, young sex workers, and those with physical or mental disabilities. Mobiles also become indispensable in more urgent circumstances, such as ecological disasters or military conflicts, when people join their forces to save lives and sustain their safety. Mobile technologies often serve as the sole lifeline and source of lifeblood information for the people united in their struggles. As these people connect, cooperate, and support each other, they co-create new knowledge and help each other acquire new skills, in the course of a rather informal and unintentional learning process.

Many of these communities have limited resources such as money and expertise, technical savvy, expensive hardware, and reliable infrastructure, including Internet access or even electricity. However, they may have access to mobile phones through which they can form and enter their virtual community – their mobile community of practice that in turn becomes their informal community of learners, who share needs, goals and beliefs, and who actively engage in learning from one another. Members of these communities are interdependent in that they have a joint purpose and responsibility for learning while sustaining a mutually respectful and cohesive environment. Mobile devices can serve as the platform for their discourse and for sharing resources. An essential component for successful learning of such groups and individuals is a two-way communication and flow of information - the ability to reach them through their mobiles.

Hard-to-reach

The target population depicted in this article can be characterized as hard-to-reach, for diverse reasons and to a varied degree. For example, the hard-to-reach could include illiterate adults in a remote village in Africa or Asia, victims of the earthquake in Haiti, and women trafficked and exploited in Canada; all who may be hard to reach using traditional and conventional methods. The various causes for this inaccessibility can be grouped into five categories (Table 2.1):

1. demographics (e.g., dispersed farmers, the elderly, living in remote areas, nomadic, poor);

2. socio-cultural (e.g., minority ethnic groups, illiterate, sex workers, homeless, immigrants, drug users);

3. behavioural and attitudinal (e.g., illegal workers, homeless, the disengaged);

4. health-related (e.g., the disabled, visually impaired, autistic), and the less permanent category;

5. situational (e.g., earthquake victims, displaced, dispossessed).

Hard-to-reach audiences might be uninformed or information poor. They are liable to be distrustful and uncooperative owing to their previous experiences. Being disadvantaged in one way or another, the hard-to-reach often prove challenging and expensive to connect with. They are likely to be underserved due to a lack of services available to them or their difficulty in accessing the existing supports. Therefore, it is imperative to invest creativity and out-of-the-box thinking in the development of strategies to reach and include these people. They need support to raise their awareness of the existing interventions and ensure their preparedness to utilize the mobile learning resources available to them or created specifically for them.

Exchanging aid messages after the earthquake in Haiti

Photo credit: DFID- UK Department for International Development. Licenced under http://creativecommons.org/licenses/by-sa/2.0, via Wikimedia Commons

Using mobile networks to promote consciousness and knowledge facilitates personal and collective development, thus bridging socio-economic and cultural differences. Once potential learners are willing and ready to join the virtual human network, mobiles can be used as mediators of the learning process as well as pointers to relevant resources and supports. Engagement in an effective learning experience fosters acquisition of lifelong learning skills and, in turn, sustainable personal or communal transformation.

Table 2.1 provides an overview of the hard-to-reach communities alongside examples of subgroups and case studies demonstrating the positive impact of using mobile devices for informal/community learning and skill acquisition. Selected case studies, representing a cross-section of hard-to-reach communities, are discussed below.

Table 2.1: Hard-to-reach communities

Category	Characteristics	Examples (subgroups)	Case studies/Mobile tools and services[a]
Demographics The quantity and characteristics of an individual/group	Gender, age, ethnicity, nationality, knowledge of languages, mobility, assets, employment status, location, income level, way of living, educational level, faith/religion	Widely dispersed farmers, the elderly, living in remote areas, the rural, unemployed, women, nomadic, poor, indigenous, faith based communities	Common sense net 2.0: http://wiki.epfl.ch/csn2/description Yoza Cellphone Stories: www.praekeltfoundation.org/yoza.html Lifelong Learning for Farmers (L3F)- COL: http://bit.ly/1fYC1d9, http://bit.ly/1do8vg2 Dr Math on MXit: http://bit.ly/PVE4p6 Magpi: www.datadyne.org/magpi-mobile/ The Mobile Alliance for Maternal Action (MAMA): www.askmama.co.za/
Socio-cultural The way of life of an individual/group	Cultural background, social/cultural status, social visibility/ invisibility, language spoken, social respect/acceptance or prejudice, religious bias/intolerance, gender stereotyping	Minority ethnic groups, illiterate, sex workers, homeless, immigrants, indigenous, drug users, the disempowered young, political refugees, victims of violence, LGBT	BBC Janala: www.bbcjanala.com/ PAJE-Nièta: Youth Entrepreneurs Project: http://blog.usaid.gov/2013/08/preparing-youth-for-employment/ MASELTOV: www.maseltov.eu/ FrontlineSMS: www.frontlinesms.com/ Pesinet: www.pesinet.org/wp/ Sexual Exploitation Outreach with Text Messaging: http://bit.ly/1lxfeJ6 Tell-it-True:http://bit.ly/1jPHfbY
Behavioural and attitudinal The manner they function or operate, their beliefs, and attitudes	Distrust toward others, governments, organizations, (un)willingness, (un)awareness, (ir)responsible, (il)legal, (un)stable, (un)cooperative, dis(engaged), (dis)organized, (un)motivated, distressed, (non)aggressive, addicted	Illegal workers, sex workers, homeless, the disengaged, marginal	Project Masiluleke: www.praekeltfoundation.org/projectm.html MiFinder: www.mifinderapp.com/ Sexual Exploitation Outreach with Text Messaging: http://bit.ly/1lxfeJ6
Health-related Experiencing limitations due to health issues	Physically disabled, mentally disabled, chronically ill, special needs, victims of epidemics	Ill, mentally disables, autistic, visually/hearing impaired Impairments due to genetics, diseases, and/or accidents	TxtAlert: http://www.praekeltfoundation.org/txtalert.html MTN Kick Out Malaria: http://bit.ly/1hYxwjv Camp Discovery app: http://bit.ly/O74dzW ChatSalud: http://bit.ly/1gPxHuL CycleTel™: http://www.cycletel.org/; http://bit.ly/MLH4SK Health and disability apps: http://www.disabled-world.com/assistivedevices/apps/
Situational Temporarily constrained by ecological, socio-economic, political disaster/unrest	Victims and workers in places of natural disasters, warfare, political conflicts, socio-economic outbreaks, economic and ecological uncertainty and stress	Earthquake victims, displaced, dispossessed, disrupted, displaced	FrontlineSMS to improve service delivery after floods in Pakistan: http://bit.ly/NS1GcV FrontlineSMS to improve food aid delivery to refugees: http://bit.ly/1f45bTE Refugees United: http://bit.ly/MLPARz Global MedAid (GMA): www.globalmedaid.com/about-us-2/

Note: [a] Not exclusive to the categories in which they are mentioned, many of these tools and services have multiple uses. Also, examples (subgroups) are not mutually exclusive to each category.

Case studies: Harnessing the power of mobile devices

Mobile devices enable learning and skill acquisition by connecting people to others and to information. Similarly, numerous Mobiles for Development (M4D) initiatives have joined communities across regional and global networks to support underserved people in emerging markets in their pursuit of socio-economic growth, for instance mHealth, mAgri, mWomen or mobiles for banking and for employment[7] (discussed in more detail in Article 6). Some specific examples include the Magpi[8] mobile data collection system, used in more than 170 countries; it provides low-cost access to real-life data for commerce, agriculture, conservation

and education. It has been used to gather public health information for monitoring and assessment as well as to prepare communities for disease threats and prevent widespread epidemics. In the same vein, FrontlineSMS[9] software, which collects and distributes information via text messages, has been used for monitoring national elections in Nigeria amongst other countries, to report emergency information in the 2010 Haitian earthquake, and for communication between beneficiaries and aid providers to deliver food to refugees in the Western Sahara, amongst plentiful other uses. Many mobile interventions address the needs of farmers to cooperatively enhance the information flow and knowledge management within their local and global community. One of such projects is the Common sense net 2.0[10] aiming to improve the livelihood of marginal farmers in India through a mobile application designed for both illiterate and literate farmers to share ideas and vital information about agriculture. Although not designed with explicit educational goals in mind, such M4D and rescue programs certainly contribute to knowledge and skill building. By interacting with content and people in a variety of life situations relevant to their survival and self-improvement, mobile users benefit from an unintentional informal learning process bringing about new knowledge and skills.

At the same time, numerous mobile interventions are aimed specifically at supporting informal and community learning as well as skill development. A handful of these solutions are presented below with additional ones in Table 2.1. In terms of demographically hard-to-reach groups, projects like BBC Janala[11], serving over 26 million Bangladeshi, provide English language lessons through mobile phones and a combination of other media to increase learners' chances of a better future. Sesame Workshop Initiatives India Pvt. Ltd.[12] has reached 1.9 million marginalized children in India through community radio and telephone-based systems to deliver literacy, numeracy and healthy habits content and prepare them for school and life. The PAJE-Nièta: Youth Entrepreneurs Project[13] in Mali targets unemployed out-of-school youth to become more educated, economically productive, and civically engaged in their communities. It serves over 12 000 rural out-of-school Malians age 14–25 by offering multimedia applications pre-loaded on their mobile phones. These and similar mobile learning initiatives open opportunities to illiterate and out-of-school adults, youth, and working children who are often wage earners contributing a substantial portion to the family's income. They cannot afford time or extra costs associated with formal education; even if they could, for the most part there are no schools to attend in the slums and villages they inhabit. The following case study (Box 2.1), the MASELTOV project[14], further illustrates the barriers to learning and inclusion amongst those hard to reach for socio-cultural reasons.

Box 2.1: The MASELTOV project

The MASELTOV project, funded through a EU research grant to The Open University, aimed to foster local community building and integration of immigrant populations into the host country by improving the skills and local knowledge of immigrants living in European cities. The project targeted migrant populations with low literacy and at risk of remaining on the margins of society - excluded from full participation in their new country. The target group have access to mobile phones, but represent varied digital literacy levels. The project edto develop integrated mobile navigation, information, learning, gaming and social network services on smartphones providing assistance on essential topics such as the healthcare system or transport services. The final outcome of the project, namely the MASELTOV app offers an ecological suite of ten most relevant services, including, (1) forum, (2) help radar, (3) information service, (4) pedestrian navigation, (5) transportation navigation, (6) places of interest, (7) translation tool, (8) language learning, (9) serious game, and (10) recommendation service. It also provides help in moving around an unfamiliar city, making contact with people and learning about the local culture. *"Through technology-mediated persuasion and social networking, we will offer support and help change attitudes and behaviours of migrant people living in Europe,"* concluded Professor Agnes Kukulska-Hulme, who led The Open University's contribution.

By the same token, informal and community learning via mobiles can reach people living on the street, the elderly, refugees, physically or mentally impaired (using assistive technologies), or women in more restrictive cultures, who often do not even own phones and have to rely on others and their community for access to mobile technologies. In fact, according to Groupe Speciale Mobile Association (GSMA) there is a "mobile gender gap" in low- and middle-income countries with 21 per cent less women than men owning a mobile phone (37 per cent in Asia)[15]. Many mobile interventions have been launched globally with the aim of liberating and educating women; for instance, CycleTel™[16] in India: an SMS-based family planning method available to women via their mobile phones, Pesinet[17]: a women-run mobile service that brings healthcare to infants in Mali, and Praekelt Foundation projects[18] in South Africa delivering vital health information to new and expectant mothers through mobile phones. Another Praekelt Foundation mobile learning tool, which presents an unprecedented opportunity to increase access to healthcare information and save lives, is described below (Box 2.2).

Mobile technologies have also proven advantageous in extending learning to those who have been underserved due to health reasons. Selected mobile apps for autistic children can serve as an encouraging illustration of how mobile learning engages people with disabilities by enhancing their motivation and self-esteem – a catalyzer for improving their learning and performance. The Camp Discovery app[19] offers fun learning for children with Autism Spectrum Disorders (ASD) who learn by matching, sorting, and completing receptive tasks. Likewise, the

following two examples can be gateways to effective informal learning: apps for visually impaired using text-to-speech technologies, and MiFinder[20] designed for diverse communities, including the disabled, to find each other, make friends, and gain social support in real time. Many other benefits of informal and community mobile learning are listed in Box 2.3.

Depending on the tools in their pockets, there are ready-available solutions as well as potentially available resources to support and overcome barriers, to take learning to communities where it has never been before, to cross the boundaries of contexts and attitudes, to connect across personal, socio-economic, health-related, and cultural barriers.

Barriers and issues

As mobiles continue to be more accessible and reliable, sustainable models for extending and supporting mobile learning should become increasingly feasible. However, there are several limitations to the ubiquitous nature of mobile learning. Apart from multiple issues related to developing human capacity (shortage of tutors, experts, teachers) and educational content, the key challenges would still include the issues of affordability and accessibility of devices and services, connectivity and electricity (sometimes solved by communities through home-grown solutions), and the limited usability of some of the cheaper devices. Many potential learners cannot access mobile resources as a result of their inadequate literacies or phone access restrictions for reasons beyond their control, such as children

Box 2.2: Young Africa Live (YAL)

The mobile portal was developed by Praekelt Foundation, supported and hosted by Vodafone Live, and it was launched on Dec 1, 2009 - World AIDS Day. Its aim is to provide a space where young South Africans can talk about issues relevant to their daily lives: love, sex, relationships, gender and cultural issues, as well as HIV/AIDS. The three key objectives of the mobile platform are to share information and educate, generate discussion, and promote HIV testing. YAL offers a combination of regularly updated dynamic stories and live chats/blogs, as well as a series of permanent content pieces providing the essential facts around HIV and AIDS. It also includes helpline numbers and contact information for referral organizations who can support YAL-users in times of need.

"A tribe is a group of people connected to one another, connected to an idea." Seth Godin

Box 2.3: The key benefits of informal and community mobile learning

- Facilitates learning across demographic, socio-economic, behavioural/attitudinal, health, and cultural barriers.

- Promotes connection, exchange of information and knowledge, dialogue over virtual networks.

- Combines horizontal transfer of knowledge with vertical integration.

- Reduces informational asymmetries and the educational gap.

- Provides lifelong learning skills and self-directed learning competences.

- Fosters digital inclusion leading to socio-economic inclusion and transformation.

- Strengthens regional and global communities, their knowledge, and social capital.

- Provides tools critical to transformative change and development.

- Empowers underprivileged groups and improves their livelihoods.

- Builds new networks and virtual communities, locally and globally.

- Facilitates disaster response and rescue operations.

- Eases disaster, socio-economic, cultural crisis impact.

- Fosters participatory learning benefiting from diverse talents, resources, and perspectives.

- Creates long-term networks of relationships.

- Promotes trust, reciprocity, and cooperation of participants and stakeholders.

- Aggregates actual and potential resources into knowledge repositories, self-help groups, advisory bodies, and community-based rescue/aid initiatives.

- Complements the existing learning systems by delivering on-demand relevant and timely content and discussion.

of poor families who, being at the bottom of the "chain of command", are prevented from using mobiles even if these are provided by a mobile learning project. Related to the issue of access is the need for tutors to introduce supports available via mobiles to special needs groups, for instance the disabled or illiterate, so that they can start on their path to informal learning. It has always been an instructional challenge to provide learning supports and scaffolds to distance and dispersed learners, especially those with special needs. Some hard-to-reach groups are, in fact, hidden away

from the community and isolated (e.g., mentally disabled in some cultures), therefore inaccessible. Other barriers that limit or prevent connecting to mobile learning resources could include lack of mobility, security, confidence, awareness, or privacy (e.g., women in patriarchal cultures).

In addition, addressing the needs of unfamiliar and dispersed populations situated in unfamiliar cultural and logistical contexts without their input is likely to generate unsatisfactory results. Balancing out the right blend of regional

knowledge and global knowledge to provide learning that is relevant in the local environment is another important consideration and solution strategy. Disparities also exist in mobile technology infrastructure and the handsets at the users' disposal. What can be done to ensure that the divide is not deepened between the haves and have-nots? Finally, the same mobile tools that can be effective in liberating and embracing people can become weapons of discrimination and oppression. They can be used by the marginalized for dishonest or even criminal activities; hence, some of the possible destructive by-products of people connecting over their mobiles must be considered. The next section offers some recommendations on how to utilize mobiles to solve rather than intensify regional and global problems.

Conclusions and recommendations

It does take a village to raise a child and it takes a nation to sustain that village. In turn, it takes the global community to *mobilize* knowledge, innovation, and people power to effect inclusive education and social change. Mobile technology is a real game-changer in terms of reaching the hard-to-reach and connecting them across the local and global communities. It has the potential to broaden access to information, knowledge, people, services, and assistance by affording new channels for communication and innovative forms of learning. It offers fast, safe, and economical routes to deliver food, medicine, and disaster relief in times of economic and ecological crisis or uncertainty. Mobiles enable inclusive education, skill acquisition, entrepreneurial opportunities, and, in turn, personal, community, and global development. Through more transparent communication and information exchange with governments and community-based organizations, mobile networks empower individuals and groups. In addition, they encourage participation and a sense of security by providing unique digital identities and membership in virtual communities of practice. Harnessing mobile technologies to provide cost-effective non-invasive informal learning to marginalized individuals and communities has proven feasible through numerous collaborative projects

involving Mobile Network Operators (MNOs), handset manufacturers, NGOs, educational and government institutions, as well as local people. Several of them have been grassroots initiatives, benefiting from an invaluable insight into the local context and resources, however, often lacking the long-term capacity needed to sustain the intervention. In terms of sustainability, it takes innovative business models incorporating the expertise and resources of all partners along with their commitment to long-term goals. Such interdisciplinary initiatives should be aimed to construct, through in-situ testing and evaluation, a sound replicable framework for provision of community and informal learning and also training. Locally-applicable frameworks should be then collectively tested for broader impact by a consortium of projects. Proven models and frameworks should be shared and openly discussed by alliances of mobile learning practitioners, MNOs, corporates, agencies and organizations, such as mEducation Alliance, UNESCO, and the WISE platform, who should take the ownership of the success of these mobile learning frameworks and include them as their strategic goals.

On a related note, new funding avenues should be explored to involve more community-based organizations, angel investors, associations, charities, entrepreneurs, and businesses. In some cases, local learners could contribute the resources generated through the mobile initiatives enabled by these partnerships. It is imperative to engage local communities and learners also in other aspects of the projects to ensure that the mobile interventions are relevant, practical, and sustainable in their context. Insiders can often point to the best solutions and help advocate mobile learning opportunities to the community members. Working closely with potential learners also promotes their motivation and learner agency. While consultation with the people is vital, the commitment of local governments and organizations is also needed to succeed. States and regulators are accountable for their citizens' welfare. Therefore, it is advisable to partner, collaborate, and problem solve with local governments to provide mobile learning opportunities as a coordinated effort.

Reports of mobile learning initiatives demonstrate that people, even those living in extreme destitution, are willing to spend money on their mobile devices[21]. Users do not consider mobile phones a luxury but rather a necessity. The social and technological capacity should be leveraged to provide community and informal learning to those who might otherwise remain at the margins of education.

Box 2.4: More didactic recommendations

- Focus on the needs of poor and marginalized communities, including people with disabilities as they have the most to gain from mobile learning.

- Maximize the impact of mobile learning interventions - customize and ground them in the needs and cultures of specific targeted groups rather than applying blanket solutions.

- Invest in sustainable educational goals rather than short-lived trendy approaches.

- Avoid the perpetual pilot syndrome by building solid long-term partnerships.

- Minimize the cost of interventions by utilizing the existing local expertise and human networks.

- Communicate and collaborate with potential learners; include them in design and development decisions to create meaningful solutions reflecting their current realities, long-term and immediate needs.

Endnotes

1   Mobile-cellular subscriptions penetration rates stand at 97% globally. The total number of mobile <u>broadband</u> subscriptions is expected to reach 3.6 billion by the end of 2016 (with the global penetration rate reaching 49.4%, a value that has increased 12 times since 2007. Mobile broadband subscriptions penetration rates: in developed countries – 90.3% and in developing countries- 40.9%. – ITU (2016). *The world in 2016: ITC facts and figures*.

2   As per the goals of Education for All Global Monitoring Report (UNESCO, 2010).

3   Tough A. (1979). *The Adult's Learning Projects*. Ontario: Ontario Institute for Studies in Education.

4   Livingstone, D. (2006). Informal learning. In: Z. Bekerman, N.C. Burbules, and D. Silberman-Keller, eds., *Learning in places: The informal education reader*, 1st ed. Peter Lang., pp. 203-227.

5   UNESCO. (2005). *NFE-MIS Handbook. Developing a Sub-National Non-Formal Education Management Information System*. Module 1. Paris: UNESCO, Division of Basic Education, p. 4.

6   Freire, P. (1972). *Pedagogy of the Oppressed*. Harmondsworth: Penguin.

7   Specific examples available at www.gsma.com/mobilefordevelopment/

8   www.datadyne.org/magpi-mobile/

9   www.frontlinesms.com/

10 http://wiki.epfl.ch/csn2/description

11 www.bbcjanala.com/

12 www.sesameworkshopindia.org

13 http://blog.usaid.gov/2013/08/preparing-youth-for-employment/

14 www.maseltov.eu/

15 www.scientificamerican.com/article/mobile-phones-for-women/

16 www.cycletel.org/

17 www.pesinet.org/wp/

18 www.praekeltfoundation.org/projects.html

19 www.centerforautism.com/resources.aspx#tab5

20 www.mifinderapp.com/

21 For instance, in Tanzania, one of the poorest countries in the world, the mobile penetration in 2013 reached close to 60 % (TCRA, 2013); low-income earners often spend more than 30% of their monthly formal income on mobile phone use; they would forgo other important things to ensure access to mobile communications (Mpogole et al, 2008). Mpogole, H., Usanga, H., and Tedre, M. (2008). Mobile phones and poverty alleviation: A survey study in rural Tanzania. In *Proceedings of 1st International Conference on M4D Mobile Communication Technology for Development*. (62-72). Available at: www.diva-portal.org/smash/get/diva2:133042/FULLTEXT01.pdf#page=69. TCRA (2013). Quarterly Telecom Statistics: Quarter 1 (September 2013) Report. Available at: www.tcra.go.tz/images/documents/telecommunication/telecomStatsSept13.pdf.

The global mobile learning story so far

By Helen Crompton

Mobile learning can now be used to take learning to individuals and communities, who for reasons of geography, finance, culture, disability, or infrastructure, were previously unable to access conventional educational opportunities. From its conception, mobile learning has changed the learning landscape over a relatively short period of time. To gain an understanding of those changes, this article provides impressions of mobile learning across the globe since about 2002. This review of recent history presents examples of the achievements and the challenges during those years. It also includes the work of global agencies, such as UNESCO, USAID, and the World Bank and their role in articulating, reviewing, and promoting mobile learning. With stories of success, there are also often many challenges and hurdles to overcome which is illustrated through examples. The article concludes with recommendations.

Mobile learning initiatives - 2002-2006

In 2002, a number of mobile learning initiatives were appearing in countries across the world. These initiatives typically used basic mobile phones as the device of choice, accessible to many at that time. In 2003, a *Text2Teaching*[1] program started in the Philippines. Supported by Nokia, basic mobile phones were used by teachers to access mathematics, science, and English videos. These were then played to the whole class on television sets or portable projectors. This initiative, MoMaths, has since expanded to Nigeria, Colombia, India, Chile, and Nigeria, as a way of providing education to poor families living in rural areas with a low population density. In early 2002-2003, SURF, a Netherlands based foundation, funded different types of projects that integrated practical field-work through mobile activities blended with classroom activities, for example the Manolo and Gypsy projects[2].

In 2000 the Dakar summit set the target of providing primary schooling (UPE, Universal Primary Education) for all children by 2015. This was a difficult target for people living in countries of the world that have little to no access to education, such as the countries of Sub-Saharan Africa. UNESCO reported that in 2001, four out of every ten primary-aged children in Sub-Sahara Africa did not attend school. Despite advocacy efforts from Department for International Development (DFID) UK, UNESCO and the World Bank to use ICT for teacher training, resources were not always available to support training and encourage schooling. A study, aptly titled *Deep Impact: An investigation of the use of information and communication technologies* (Box 3.1)[3] for teacher education, was implemented.

In Bangladesh, a study on the use of basic phones also focused on teacher professional development. The phones were used for weekly conference calls with a tutor to share photos and short videos of teaching practice, and communications with the tutor and other learners. The use of mobile phones in this study provided benefit to the teachers through the facilitation of contextualized, constructive, situated, and collaborative learning enabled by the use of the mobile devices.

Higher education students were the target in the Philippines for the *Viability of Mobile SMS Technologies for Non-Formal Distance Learning in Asia* initiative[4]. To support distance learning students and informal learning, the research team developed SMS learning packs made up of booklets, cassettes, and CD ROMS for various subjects to support students.

Mobile learning initiatives - 2007-2010

In developed countries, activists and researchers were interested in the potential for mobile learning to extend existing teaching practices. *Learning2Go* began in the United Kingdom (UK) in 2003. This project placed hundreds of Windows Mobile handheld devices into the hands of students in Wolverhampton until 2007 and claimed to be the largest collaborative mobile learning

Box 3.1: The Digital Education Enhancement Project (DEEP)

The *Digital Education Enhancement Project (DEEP)* was a research project to investigate ways ICT could be used to improve access and quality of teacher education in the global south. This study included 12 schools in South Africa and 12 schools in Egypt.

As part of the project, each school was provided with a laptop computer and the project teachers were given a powerful – at the time - pocket PC (206 MHz processor) and digital camera. DEEP professional development activities were loaded onto the pocket PC for the teacher to access. These resources included illustrated e-books, case studies and exemplar lessons.

Using handheld computers

Photo credits: Carmen Strigel

Using a handheld computer was a new experience for all the teachers and the respondents to a questionnaire reported that they used the device on a regular basis for use in the classroom and at home. This was confirmed by observations, as the teachers typically used the devices for

a)   lesson preparation including photographs to show the students,
b)   writing and recording appointments;
c)   note taking during lessons;
d)   making calculations;
e)   recording events to use during lessons;
f)   recording and photographing students' work; and
g)   recording student presentations and music for parents.

The findings of the study report that these activities supported teacher professional development and the development of basic computer skills was unproblematic. In Kenya at about the same time, DFID funded an initiative, the SEMA project, to provide in-service teacher training to 400 000 primary teachers nationally to meet the challenge of UPE, using messaging to support and coordinate their distance learning (and incidentally to gather and process school enrolment data nationally). This project exploited teachers' own mobile phones and, in terms of sustainability, contrasted with the DEEP project.

Source: Traxler, J. and Leach, J. (2006). Innovative and Sustainable Mobile Learning. In *Africa Proceedings of WMUTE (IEEE)*, Athens, Greece, November 2006.

project for students in the UK. The *Learning2Go*[5] implementation that began in 2003 moved to the use of mobile Internet enabled smartphones in the Mobile Learning Network (MoLeNET) initiative of 2007. MoLeNET[6], working in the UK TVET sector, is the largest mobile learning initiative to date. MoLeNET was a three-year project from 2007-2010. Approximately 10 000 learners were involved in the project in 2007-2008 and this number rose to 20 000 in 2008-2009. The findings of this implementation show that using mobile phones for learning facilitated students' retention and lower drop-out rates.

The English as a Second Language (ESL) project[7] in 2010 was implemented at George Brown College Canada. Students practiced language skills outside the classroom walls using mobile devices. Web-based mobile tasks, accessible through student-owned mobiles, were developed. Students used their mobile devices to mediate their communication and access supports for the mobile-assisted language learning activities. The cross-platform mobile learning solution proved to be effective in supporting the development of ESL skills amongst immigrant and foreign students.

Around this same time, two universities in Moscow provided mobile devices to the university students. They gave students Android tablets as they enrolled at the university. These tablets were used to provide access to training materials, tests, and for connecting with peers and staff. This mobile learning initiative has been viewed as a step towards open education in Russia, offering learning opportunities that are flexible to the needs of the learner.

Following the positive results of the earlier *DEEP* project, other mobile learning initiatives have

been implemented in South Africa during 2007-2010. Two large projects include the Dr. Math and Nokia MoMaths[8]. Dr. Math is an online math tutoring service. Free live math tutors are available to students via feature phones with GPRS connectivity. The low connectivity costs are attractive to users and this service has been used by 32 000 middle and secondary school students. The Nokia MoMaths group used a proprietary mobile instant messaging service (MxIT) on feature phones to provide access to over 10 000 math exercises. This project began in 2008 with the focus on mathematics students in grade 10. This program was of voluntary use and 3 958 students visited the service with 2 136 active users. The findings show that from the grade 9 baseline, students who regularly used the service scored 7 per cent better on average than peers who did not use the service regularly. The Nokia MoMaths program grew to include in 2011 students in Finland.

A research team in the Ukraine began an initiative in late 2009 to educate students about modern means of communication. A mobile operator worked in collaboration with the Ministries of Education, Finance, and Youth and Sports for this initiative and the lessons have reached over 4 000 students. North America also recognized the need to focus on the effective use of technology. The International Society for Technology in Education (ISTE) developed a set of teacher technology standards (ISTE Standards; formally known as the NETS) to provide a set of standards of good practice[9]. North America has also extended the use of mobile devices in learning with external funding of the Federal Communications Commission *Learning On-the-go*[10] programme in 2010. This initiative aims primarily to increase student access to educational content and to

Use of mobile devices in learning: Child's play

enable communications of teachers and students through the use of online tools for educational access 24 hours a day, seven days a week.

Mobile learning initiatives - 2011-2015

Since 2011 there has been a rise in mobile learning initiatives initiated by the primary stakeholders such as district leaders and educators. There has been a shift from mobile devices being banned in schools to the same devices being encouraged by many educational leaders. For example, the district leaders at Williamson School district in Tennessee saw the potential for mobile devices in the teaching and learning of their students and started a Bring Your Own Device (BYOD) initiative in 2011. This initiative was district wide by 2012 in grades 3-12 (8–18 years old) involving approximately 27 000 students. The district leaders report that 15 000 personal mobile devices connect to the guest network each day.

The mobile learning work of global agencies has increased greatly since 2011 and those efforts include:

a. drawing together mobile learning researchers and scholars to better understand what is known about mobile learning and how it can be used to extend and enhance learning and providing opportunities to access appropriate learning around the globe; and

b. produce publications to share what is known about mobile learning with policy makers, educational leaders, and other stakeholders.

These goals provided a focus for future mobile learning initiatives. As information was shared about mobile learning implementations, it became evident that a one-size-fits-all methodology was not effective. To be successful, the design of the initiative needs to connect with the culture, language, and needs of that society. Two examples of projects that were designed to better meet the needs of specific societies, and also align to EFA 1, were Project *Urban Planet Mobile*[11] and Project *Alphabetisation de Base par Cellulaire*[12]. Urban Planet Mobile designed a mobile literacy program for Ugandan parents and children in their native language Rutooro. Funded by USAID, World Vision, and AusAID, the program uses affordable, accessible mobile phones and SMS with audio to deliver daily literacy activities and related parenting education to rural parents and their young children. The messages are in text and audio so the parent(s) can access the messages in Rutooto regardless of their literacy level.

Project Alphabetisation provided literacy and numeracy lessons over a two-year period to 6 700 adults in 134 villages in Niger. This initiative used the official and local languages of English, French, Hausa, Zarma, and Kanuri. Following the norms of the Ministry of Non-Formal Education, the literacy classes were split into separate classes for men and women. Preliminary results revealed positive outcomes with average math scores higher in villages that were involved in this initiative than in villages not involved. Another underserved population were served in Afghanistan, as women were targeted in a literacy initiative (Box 3.2).

Figure 3.1: Education for all (EFA) goals

- Improving levels of adult and youth literacy: how mobile technologies can support literacy development and increase reading opportunities

- Improving the quality of education: how mobile technologies can support teachers and their professional development

- Achieving gender parity and equality in education: how mobile technologies can support equal access to and achievement in basic education of good quality for all, in particular for women and girls.

Source: UNESCO. (2000). *The Dakar Framework for Action. Education for All: Meeting our Collective Committments*. [pdf] Paris: UNESCO. Available at: http://unesdoc.unesco.org/images/0012/001211/121147e.pdf Accessed 7 Nov. 2016.

Box 3.2: Improving women's literacy in rural Afghanistan

The *Mobile Literacy Program* was a one-year program specifically targeted at improving the literacy skills of women living in villages in rural Afghanistan. Afghanistan has the lowest literacy rates in the world with an estimated 43.1 per cent of men and just 12.6 per cent of women. After mobile phone use rose from 1 per cent to over 18 million active mobile phone users in 2012, this telecommunication infrastructure was used to provide access to the under-served population in Afghanistan.

This initiative used a combination of classes and literacy tasks using mobile phones. The students received written assignments and additional work texted to their phones and involved topics that were relevant to the daily lives of the women in the group. This helped the learners understand why literacy was a practical skill for everyday life.

Mobile literacy programme

Photo credits: UNESCO. Available at: http://www.unesco.org/uil/litbase/?menu=14&programme=146

Students sent an average of 1 750 messages using the mobile phones. The mobile devices were used for the assigned tasks and were also used for communication with classmates. The mobile phones provided a method of communication for women who were typically confined to their homes. Four months into the program, 83 per cent of the students were able to meet the literacy level three test determined by the Afghan government curriculum, as they were able to use correct sentence structure and vocabulary.

Source: UNESCO (2013). *Mobile literacy programme in Afghanistan.* [online] Available at: http://www.unesco.org/uil/litbase/?menu=4&programme=146 Accessed 7 Nov. 2016.

Global agencies are also looking at ways to use mobile learning to support women and girls who are marginalized in segments of today's society. Aligned to EFA 3, UNESCO started a project to answer questions on how mobile learning can be used to appropriately and effectively support women and girls. This project aims to answer three driving questions:

1. How should effective mobile learning initiatives for women and girls be designed?

2. How can they be created in gender-sensitive and sustainable ways?

3. What barriers need to be addressed and what pre-conditions need to be in place for successful implementation?

One study that will provide a step towards answering these questions is the *Mobile Literacy Program in Afghanistan* (Box 3.2).

Since 2003, there has been a rise in the number of mobile learning initiatives taking place around the world. In the later years, these projects became more focused and more culturally appropriate than their predecessors, with attention to language and social norms of those communities and societies. As mobile opportunities become more attractive, the collective knowledge and experiences can be used to offer communities and cultures richer learning opportunities, and the challenges and hurdles faced in these implementations should also be considered as they provide a depth to our understanding toward the design of future successful mobile learning initiatives.

Challenges

The challenges and hurdles reported during mobile learning projects are arguably as important as the documentation of the achievements. Challenges are often location specific and culture specific, but as these reported challenges are aggregated, common trends appear. This list provides examples of the challenges reported from mobile learning implementations since 2003. In reviewing the hurdles to a successful implementation, trends can be found among developing countries and similarly across developed countries, though contexts rather than countries might be a more accurate characterisation. Common issues faced by both groups can be found in Figure 3.2.

For the developing countries, or contexts, the issues are often a lack of resources. As many developing countries have more access to the hardware, software, and personnel resources needed for a successful mobile learning implementation, the challenges change to concern about the use of mobile devices for educational purposes. These concerns are due to insufficient information among government leaders, policy leaders, practitioners, and parents regarding the power and potential of mobile learning. This leads to a cyclical issue (Figure 3.3).

This is a very simplified view of the problems faced by those initiating mobile learning, taken from a highly complex network of issues defined by the identity, language, and practices of a culture.

This article provides an overview of some of the initiatives since 2003. Over that short period of time it is evident that knowledge and

Figure 3.2: Challenges for mobile learning projects

Developing Countries

- A lack of governmental policies for the development of mobile learning
- A lack of modern mobile phones
- A lack of understanding of the potential of mobile devices for educational purposes
- A lack of network coverage
- A lack of appropriate educational resources that match a particular regional language
- A lack of local trainers familiar with technology to sustain technical needs
- Limited battery life and a lack of access to a constant source of power

Developed Countries

- Student exposure to innappropriate content
- Student exposure to innappropriate behaviors e.g. cyberbullying, gaming addiction
- A lack of understanding of the potential of mobile devices for educational purposes
- Perceived as a learning distraction by parents and those in education, or a method for student to cheat
- A lack of teacher training on how to use mobile devices for learning purposes
- A lack of bandwidth in schools
- High cost of mobile learning initiatives

Figure 3.3: Problems faced by those initiating mobile learning
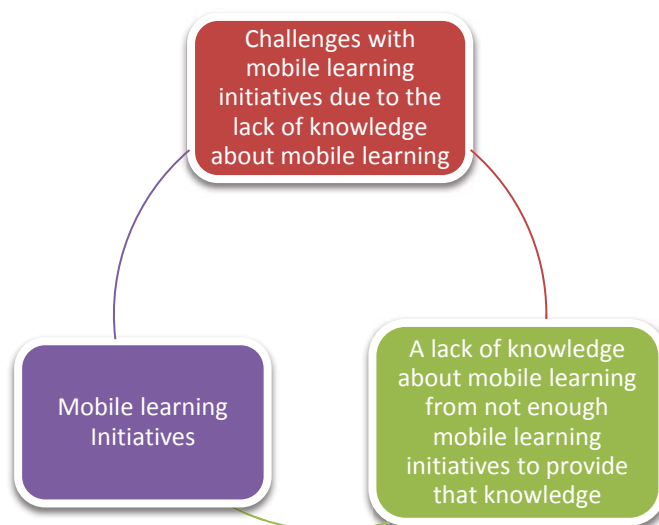
understanding are being built of how best to support a variety of learners with the use of mobile devices in both formal and informal environments.

Recommendations

These are a few recommendations for future mobile learning initiatives:

- Learn from failure as well as success: Gather all the available information to provide robust conclusions.

- Context matters: Local factors such as location and language, culture and individuals will have an impact on outcomes.

- Scale matters: Approaches that work in a small-scale implementation may not work in a large-scale implementation.

- Return on investment matters: Funders need to see that initiatives have far reaching benefits.

- Sustainability matters: Can the current and future infrastructure and wealth of a community sustain a project in the long term?

These recommendations are just a few lessons from studying past implementations. The successes and failures and the challenges of each implementation will provide further information on how mobile learning can be used to meet the needs of learners around the world.

Endnotes

1   Text2teach: www.text2teach.org.ph/?page_id=2

2   www.wageningenur.nl/en/Publication-details.htm?publicationId=publication-way-333339313833

3   Leach, J., Ahmed, A., Makalima, S., and Power, T. (2006). *DEEP IMPACT: An investigation of the use of information and communication technologies for teacher education in the global south: Researching the issues*. Department for International Development. London, UK. Available at: http://oro.open.ac.uk/17802/ Accessed 20 Nov. 2016.

4   Baggaley, J. (2006). *Information and communication technology for social development*. [online ebook] Jakart: ASEAN Foundation. Available at: www.aseanfoundation.org/documents/ICT4D_book_v2.pdf Accessed 4 Nov. 2016.

5   Learning2Go: https://www.wolverhampton-engage.net/sites/anonymous/Learning2GoOld/default.aspx

6   MoLeNet: www.molenet.org.uk/

7   Palalas, A. (2012). *Design guidelines for a Mobile-Enabled Language Learning system supporting the development of ESP listening skills*. Available at: www.academia.edu/2032959/Palalas_A._2012_._Design_guidelines_for_a_Mobile-Enabled_Language_Learning_system_supporting_the_development_of_ESP_listening_skills_Doctoral_dissertation_Athabasca_University Accessed 7 Nov. 2016.

8   Nokia MoMaths: www.meducationalliance.org/content/momaths

9   ISTE Standards: www.iste.org/STANDARDS

10   Learning on the go: www.fcc.gov/document/funding-schools-and-libraries-wireless-internet-projects

11   Urban Planet. MobiLiteracy Uganda: Testing and providing the efficacy of SMS with audio in developing literacy-rich home environments in central Uganda. www.urbanplanetmobile.com/mobiliteracy-uganda

12   Project ABC. (2010). Project ABC: Mobile 4 literacy: http://sites.tufts.edu/projectabc/

The basic platform

By David Hildebrandt

Mobile learning is about people learning while being mobile. People are mobile not the devices they carry[1]. While it is true that the devices are untethered, having no wires connecting them to networks, they still must rely on people to carry them. The technology behind mobile learning allows the learner better access to information, resources, and other people when and where he or she needs or desires it[2][3]. Danaher defined a mobile learning community as "a group of people who are mobile for sustained periods of the year or their lives and who recognize in themselves and others a common experience of mobility and a shared commitment to learning for themselves and other group members"[4]. This definition of a mobile learning community does not mention technology; the focus is on people that are mobile that have an interest in learning. The goal of life-long learning is to provide access to learning resources while being mobile—which can take on many forms.

Mobile learning devices

Today there are numerous devices that can be used for mobile learning. Feature phones, smartphones, and tablets can all be used for mobile learning. The features and functions described in this article are common across smartphones and tablets. A subset of the features and functions is found on feature phones. Google and Windows license their respective operating systems to many hardware manufacturers, as such the functions and features enabled on these devices will vary by manufacturer.

Voice calls

The ability to make, or receive, a phone call regardless of location is what started the cell phone revolution. Making and receiving phone calls may not seem like an educational opportunity. However, being able to call an expert for advice could be a form of coaching. The power of a simple phone call is often overlooked. A phone call can connect the caller with his or her learning community—support can be just a phone call away. The learner can also register for a course by dialling a phone number and verbally agreeing to enrol in the course by responding to voice prompts or by entering acceptance via the numbers on the keypad.

Interactive Voice Response (IVR) systems enable a degree of interactivity by playing a pre-recorded message (prompt) and listening for a response either by voice or depressing keys on the phone keypad. The power of IVR systems can be harnessed to create mobile learning applications when the learner may only have access to a mobile phone and an auditory response, such as when learning to speak a foreign language.

Figure 4.1 shows a simplified view of a learner using a basic cell phone to make a call to an IVR system. An IVR system can be programmed to handle numerous learning objectives. The learner makes a phone call to the IVR system. The IVR server answers the call and plays the initial message to the learner. The IVR could recognize the learner's Caller ID and by accessing the Learning Database determine which initial message to play and what options should be made available. The learner would then respond to the voice prompts either by depressing keys on the keypad or speaking his or her response—depending on the sophistication of the IVR system.

Language learners can call in and listen to a mini-lecture, listen to and practice the word of the day, or take a test to determine if they can pronounce the word correctly or to understand it in a sentence. The menu options to support such a system are shown in Figure 4.2. The limitations of using an IVR system with a phone are limited only by the IVR capabilities and the appropriateness of the subject matter to be learned.

When coupled with an IVR system a basic cell phone can become a learning tool. It is the

Figure 4.1: Learner using cell phone to communicate with IVR server
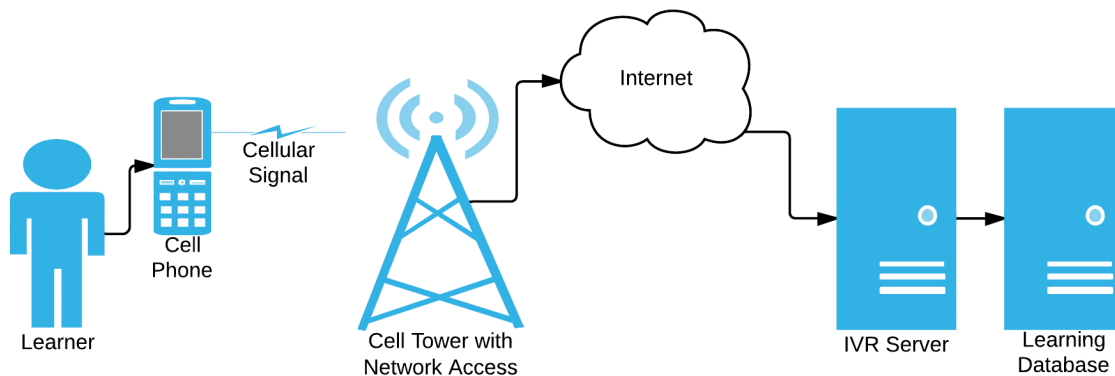
Figure 4.2: Example flow of IVR call for foreign language learning
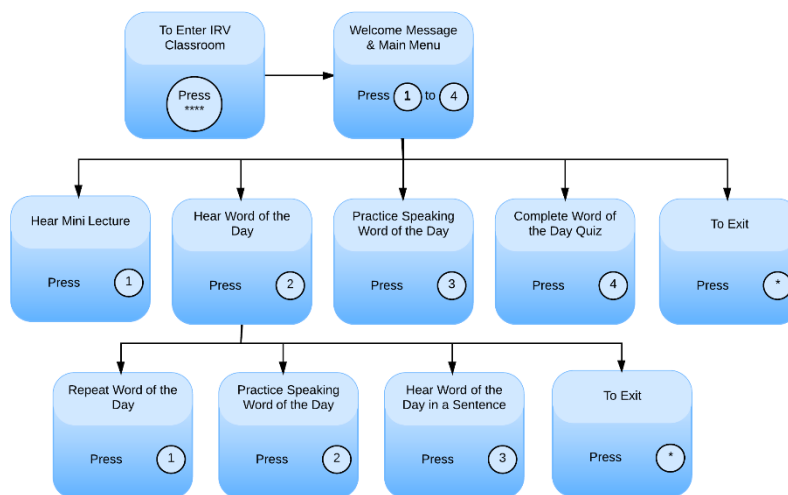
inherent capabilities of the cell phone coupled with other learning technology that creates a powerful learning platform. In addition, the IVR provides visually impaired learners with an opportunity to engage in mobile learning. There is also the ability to use this approach to reach nomadic populations that are illiterate—being able to hear instructions provides a starting point for their learning.

Text messaging

Short Message Service (SMS), often referred to as *text messaging* or just *messaging*, was designed to allow brief messages to be sent over the cellular network using the phone number of the recipient as the destination identifier. SMS is limited to 160[5] characters though some popular services such as

Twitter limit the message length to 140 characters. There is also the Multimedia Messaging Service (MMS) that allows text messages of unlimited length as well as rich media attachments. MMS can be used to share images, video, audio and other multimedia with other cell phone users. Text messaging has become a ubiquitous form of communications found on even the most basic cell phones.

Text messaging can be enabled on a Learning Management System (LMS). The learner, via SMS, can respond to the LMS initiated text message. Returning to the IVR example from the previous section on voice calls, the learner with the help of text messages, could enrol in a class simply by sending a text message. The learner could receive the word of the day along with the definition via text message, and then practice using the word

of the day in a sentence by sending and receiving text messages. Text messages could also be used for learning assessment via true/false, multiple choice, or short answer quizzes. The SEMA project, mentioned elsewhere, used all these formats as well as creating groups for message-based discussion, calendar alerts, administrative reminders and study guide support.

The simplicity of text messaging makes it an attractive option for mobile learning. Text messaging as a learning platform is also simpler and less expensive to implement than an IVR system. The constraint of text messaging is that there are still cellular service providers that charge for each text message. There are also cellular service providers that charge for text messages that exceed a monthly quota. Refer to the discussion in the Tariffs section below for more information on monthly charges. Variable charges based on monthly usage can result in hidden costs for the learner that they may be unable to pay.

Consider the cost of text messaging to learners when looking to implement a text messaging based mobile learning application.

A powerful example of using text messaging is found in Edmonton, Canada's Centre to End All Sexual Exploitation (CEASE) that build a program to use mobile text messaging as an outreach strategy (Box 4.1).

Text-to-speech/speech-to-text

With the introduction of Siri[6] and Google's Speech Recognition for Android devices it is now possible to give voice commands to a smartphone. It may be as simple as the smartphone reminding its owner about a scheduled meeting, setting an appointment for next Tuesday at 2PM, or converting an incoming text message or email to speech and reading it aloud. This ability to convert natural speech into text for a message

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Box 4.1: Reaching the sexually exploited in Edmonton, Canada via text messaging

Recognizing the ability to send a text message that had sufficient information to be actionable by the recipient, Edmonton's Centre to End All Sexual Exploitation (CEASE) decided to send text messages to a mobile phone list culled from an adult advertising site about the services offered by CEASE. The phone numbers were entered into FrontlineSMS, a free SMS management tool, and CEASE crafted the text message. FrontlineSMS sent the text message to the mobile phones informing the recipient that he or she could contact CEASE for counselling, training, income support, victim advocate, and peer coaching. The goal was to augment the work CEASE does in person as many sex workers are no longer working on the streets and a new way to access sex workers was needed.

CEASE found that the work to gather the numbers using automated tools and to import the phone list into FrontlineSMS was about an hour. This gave them the potential to access hundreds of potentially exploited persons with ease. Though this was a pilot program the number of recipients that responded positively was encouraging. They did have a few individuals respond asking to be removed from further notifications. The positive responses either thanked them for the good work, or asked for more information.

FrontlineSMS required a laptop running their software, and a GSM modem plugged into the laptop to send and receive SMS messages. The cost for sending the SMS messages was considered negligible, as it was part of the monthly service plan. FrontlineSMS is free.

This case study shows that text messaging can be used to communicate with a group of at risk men and women that could not be reached easily any other way.

Source: Gow, G., Quinn, K. and Barlott, T. (2014). *Sexual Exploitation Outreach with Text Messaging: Introducing Project Backpage*. Frontline SMS Case Study. Available at: http://static1.squarespace.com/static/56e1a99907eaa0941d037b0a/56e1aa9e06dcb7bbf42a70ce/56e1aaf306dcb7bbf42a7a35/1457629939677/frontlinesms_casestudy_Sexual-Exploitation-Outreach-with-Text-Messaging.pdf?format=original. Accessed 6 Nov. 2016.

or email, or to issue voice commands by speaking to the smartphone are powerful tools when developing training for visually impaired learners. While powerful, the technology is not perfect and users may find it difficult to be understood by the smartphone. This can be mitigated somewhat when the smartphone can be trained to understand the owner. There may also be higher monthly costs due to increased data consumption.

eMail

Many mobile devices provide access to email. While this may not be thought of as a learning solution, sending email messages to an automated system can engage the learner in educational activities. By responding to an email message and performing the task as directed a new email can be sent furthering the exploration of the subject being studied. Email should not be discounted as a learning tool. Email can be used for performance support, sharing or exchanging resources, and keeping in touch with a community of practice. However, email will require the learner to have a data plan on their mobile device so that they can manage the monthly cost. Designing an interactive learning environment without consideration of the potential to increase the monthly cost is disingenuous to the learner.

Internet

Internet over a cellular device provides the learner with access to the vast information on the World Wide Web. This also means that a Universal Resource Locator, or URL, can be used to direct the learner to specific resources. By tagging specific resources with a URL the learning system can send a message to the learner and include the URL to a resource to further the learner's knowledge. URLs are the backbone of the Internet and they are used to link to audio files, video files, documents, graphics, HTML pages, and websites. It is the URLs that provide the connection to the plethora of social media sites and the Internet based tools.

Leveraging the Internet for learning requires a change of focus from content author to content curator. Rather than spending time developing content from scratch for use in courses, the focus becomes that of locating high quality content on the Internet that can be repurposed to further

the learner's knowledge. It is also important to ensure that selected content remains available as websites can disappear without warning or the URL of a selected site changes due to a website redesign.

Apps

Apps allow developers to create applications that run on mobile devices and access the hardware subject to the device manufacturer's security policies (see Hardware section below). In June 2016, Apple had 2 million applications and Google had over 2.2 million applications available for download in their online stores[7]. With this volume of Apps there is a high probability that there is an App for just about anything a mobile device user wishes to do. There are even Apps that extend the functionality found in learning management systems to mobile devices.

With the introduction of HTML5, it is becoming possible to develop applications that are browser based. HTML5 implementation improves video, audio, and offline capabilities for browser based applications. HTML5 is growing in popularity; however, the implementation of HTML5 is still inconsistent and not all mobile devices implement all the HTML5 features. Therefore, cross platform testing is still required for HTML5 based applications. HTML5 should not be confused with the Apps being described here however. Apps in this article refer to software development where the App's source code is compiled to run natively on the targeted smartphone. As the power of mobile devices grow and network speeds improve, this distinction may become irrelevant.

The benefit of Apps is how they enable the extensibility of mobile devices. If a need can be identified an application can be written. The challenge of Apps is that they are device specific. An App that is written for an iPhone will not run on an Android device and Apps written for iPhone or Android will not run on the Microsoft mobile devices. This lack of portability means that Apps need to be developed for each platform that will be supported. There are tools emerging that allow developers to write code that is portable—but device specific refinement is still required. Overtime the portability of Apps will increase, but for now it requires additional effort to support multiple smartphone operating systems.

Hardware

This section will discuss the hardware that is included on mobile devices and use with mobile learning. Not every mobile device will have everything described in this section. It is difficult to talk about hardware and not mention software—as software is what allows the mobile device's hardware to be utilized by applications. For the sake of simplicity, only the hardware is discussed below. The modern mobile device can be thought of as a handheld computer—complete with internal storage for data, programs, temporary storage, and an operating system that controls the basic functions. Of course basic functions of a mobile device are extensive—as they do much more than make and receive phone calls.

Accelerometer

The accelerometer is a sensor that lets the mobile device know up from down. An example of this is when the accelerometer provides the device orientation so that the screen can rotate as the device is rotated. The accelerometer can detect small changes in the orientation of the mobile device—an example is the game Temple Run that allows the player to navigate a maze just by tipping the mobile device side-to-side or up and down. The accelerometer provides data on the learner's movements allowing an application to respond accordingly. Simulations that require hand-eye coordination are more realistic when the accelerometer is used to track learner actions. The accelerometer is shared by other applications as well as the mobile device itself—and critical movements could be lost due to other applications accessing the sensor.

Battery

It is important to remember that a mobile device relies on its battery and can only operate while the battery contains sufficient power. Individuals that do not have direct access to power to recharge their mobile devices must seek alternative ways to recharge their mobile device. With an estimated 1.6 billion people (Box 4.2) that do not have easy access to electrical power, individuals having to travel to recharge their devices should be taken into consideration.

When developing mobile learning strategies, consideration needs to be given to learners that

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Box 4.2: Community power from mobile-charging services

GSMA published a report on the high cost of charging mobile devices in locations that are off the power-grid (off-grid) in July 2011. It estimates that 1.6 billion people do not have access to electricity. Yet the number of individuals who live off-grid and own mobile devices is increasing each year. These individuals need to use alternative ways to charge mobile devices such as solar-chargers, car batteries, hand-crank chargers, or finding a small power generator. However, these all require purchasing additional equipment that may break, become inoperative, or be costly to access. For example, the cost for charging a mobile device in Kenya is around the same price they pay per minute of airtime (USD 0.18 – USD 0.25)[a].

GSMA noted that many of the cellular base stations in these remote areas operate off the power grid. In such locations the cellular providers have developed methods of generating power onsite either from a generator or from renewable "green" sources. Many of the cellular base stations generate more power than they need. This excess power could be made available to the local people. An example of this is Safaricom that had developed a mobile handset charging dock that is affixed near their cellular base station.

Note: [a] GSMA. (n.d.). *Green Power for Mobile: Charging Choices*. [pdf] Available at: http://www.globaltelecomsbusiness.com/pdf/charging_choices.pdf Accessed 6 Nov. 2016.

Source: GSMA. (2011). *Community Power from Mobile-Charging Services*. [pdf] Available at: http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/07/charging_services.pdf Accessed 6 Nov. 2016.

do not have easy access to electrical power. Deploying mobile devices to learners when the learners will not have ready means for charging the devices will lead to a failed program. In rural areas, learners may only access a generator, and network coverage at a weekly market.

Bluetooth

Bluetooth is a low-power personal network that is designed to allow electronic devices to communicate over short distances, normally around 10 meters (30 feet). The most common use of Bluetooth is pairing an earpiece to a person's smartphone so that they can use the smartphone without having to hold the smartphone to their ear. There is no reason why other uses of this capability cannot be developed. The auto industry has been adding Bluetooth capability to automobiles for several years to allow the vehicle owner's smartphone to connect with the automobile. Recently the sports industry has begun to make wearable devices, such as the Nike Fuelband, to monitor heart rate, steps taken, and calories burned and share the data with applications running on a smartphone.

Bluetooth provides a means for classroom equipment to communicate with the learner or the teacher. Bluetooth capability can be built into field equipment allowing learners to connect once they are within range of the equipment and complete pairing (gaining access). Once paired with a Bluetooth equipped piece of equipment the learner would be able to send commands and receive data for later analysis. Bluetooth also allows learners to share data amongst themselves—creating a collaborative micro-network.

Camera and video

Mobile device manufacturers have continued to improve the quality and capabilities of the built-in camera and video recorder. With the built-in flash and improvements to low light conditions, it is possible to take pictures or video without having to worry about the level of ambient light. This has led to a rise in picture and video sharing using Apps/platforms like Instagram[8] (picture) and Snapchat[9] (photo & video).

A mobile device can even geotag the picture or video using the GPS (see below) coordinates. The *geotag* adds metadata to the picture/video that provides timestamp, geographical coordinates of where the camera was when the picture was taken, type of camera, and a plethora of other data relevant to the image. The geotag, in an academic context, provides validation that the learners were where they were supposed to be. On the other hand, if the learner is performing fieldwork, accurate documentation where the pictures were taken is recorded automatically.

Care should be used with geotagging. Pictures or video that are taken at the learner's home that are geotagged and then shared publicly provide the GPS coordinates of where the learner lives. This may not be in the best interest of the learner. It is best to have learners turn off geotagging unless it is needed for a specific assignment and never geotag from their home or any place that they wish to keep private. It should also be mentioned that video, and high definition images, result in large files—and large files being sent over cellular networks may result in higher data usage fees.

QR Codes are an example of leveraging the built in camera with an App that also communicates with the browser on a mobile device. The QR code shown here contains the URL to the ITU Publications page. The ability to scan a QR Code provides a convenient method of providing links to additional learning resources without requiring the typing of long URLs. QR Codes can be affixed to buildings, signs, and printed on paper or clothing. QR Codes can contain far more than a URL. QR Codes can encode about 4200 alphanumeric characters.

Global Positioning System

The use of the Global Positioning System (GPS) has changed forever the way people navigate in countries where roads have been mapped in sufficient detail. The GPS signals can be received by smartphones as long as there are unobstructed views of the sky.

A smartphone can be turned into an orienteering compass by installing one of the many compass

applications. There are also Apps that let you enter the GPS coordinates of a location and then use the built-in GPS on the smartphone to aid the learner in navigating to the target location. By using a GPS recorder a person can engage in geocaching or other forms of exploration of his or her environment and capture the exact location of observations or phenomena.

Microphone

A microphone is required for voice conversations on a cell phone. There is an additional advantage with smartphones—being able to record voice or ambient sounds. The only limit to the recording length is the available memory for storing the recording.

The ability for learners to record themselves, to record others, or to record specific sounds enables the learner to add another dimension to their mobile learning. The ability to create an audio diary, interview a subject matter expert, or record the amazing sounds of the Australian Superb Lyrebird while researching in the field are all powerful ways that the built-in recording feature could be used to extend learning. Incidentally, some apps can exploit the microphone for measuring wind speed.

Near Field Communications

Near Field Communications (NFC) differs from the other forms of communication, as NFC does not rely on active radio transmission as the other communication services (cellular signal, Bluetooth, & Wi-Fi). NFC uses radio-electromagnetic fields to exchange data with a radio-frequency identification device (RFID). NFC devices must be in extremely close proximity—within 20cm (7.86 in) of each other.

NFC technology can be found in credit cards and mass transit payment cards such as Oyster in the UK and CLIPPER in the San Francisco Bay Area. These cards with their embedded RFID tag allow instant payment, or account debit, with just a quick pass over the NFC card reader. NFC devices are not limited to read-only operation; it is possible to update the content of certain NFC devices.

While this may not seem like an innovation for mobile learning, imagine a scavenger hunt where the learner must navigate to the correct location using GPS and then scan the RFID tag that is located there—retrieving the next clue all at the same time. Another use could be for self-guided campus tours or orientation to a school or university. An advantage of RFID tags is that they can be embedded in any material that allow radio waves to penetrate, thus creating semi-permanent and weather-proof installations.

Universal Serial Bus

The Universal Serial Bus (USB) allows peripheral devices to be connected to a smartphone or tablet, which allows device functionality to be extended. External storage devices, LCD projectors, or connecting to a computer are all common uses for the USB port found on many smartphones and tablets. However, the USB port can also connect instrumentation packages such as signal analysers. This extensibility means that environments can be instrumented and the learner simply provides the smartphone to read data from the devices. The use of USB enabled devices is another example of how the smartphone or tablet can be turned into handheld field equipment that is modified to meet the needs of a particular study.

Wi-Fi

The Wi-Fi capability on mobile devices makes it possible to connect to the Internet over local networks providing faster and cheaper access than using the cellular network for Internet access. Wi-Fi only devices are also available; they do not have the capability to access the cellular network monthly cellular contracts are not required. As Wi-Fi hotspots grow the need for cellular access diminishes. Unfortunately, the growth of Wi-Fi hotspots is occurring at a far faster pace in the Northern Hemisphere, which only exacerbates the digital divide with the Southern Hemisphere.

Security

A mobile device that has access to sensitive information creates a security risk when that device is lost or misplaced. Knowing a mobile device that has confidential information is no

longer under the control of a trusted person is cause for concern. While it is possible to have the mobile phone provider turn off the phone's ability to make calls, they cannot easily remove access to Wi-Fi networks or remove files and data that are stored on the mobile device.

Modern mobile devices can access the Internet. Without proper network filters, it is possible for an adolescent to access Internet sites promoting pornography, hate, violence, and many other websites that are inappropriate. Relying on network filtering is insufficient as the filtering only works while the mobile device is connected to the organizations network via Wi-Fi. All that is required to bypass the local network content filters is turning off the Wi-Fi and allowing the smartphone to connect via the cellular network.

While there are some free apps that can be downloaded to mitigate this, they require the phone to be rooted—gaining full control over the device. This is not something that cellular companies want subscribers doing and rooting a device may void the cellular contract. Furthermore, an app that a learner is directed to download and install can just as easily be uninstalled. Thus, security and content control that is in the hands of the learner is only an illusion— as the learner can circumvent the security and content settings easily.

There is also the challenge of knowing that a website can be trusted. Individuals that are unfamiliar with the Internet may mistakenly believe that everything they read on the Internet is true. For individuals that are engaging in informal learning activities, the lack of critical thinking skills could create misconceptions about the topic under study—thus interfering with the knowledge acquisition they are undertaking.

Recognizing the need to provide security and content filtering that is under the control of a trusted administrator has given rise to several companies that are offering solutions while not being overly intrusive. These companies provide either full device control or create a walled off storage space for sensitive data. While this does require the installation of an App, or family of Apps, once installed the Apps are locked and can only be deleted by the trusted administrator.

Tariffs

The data in Table 4.1 shows that the features that are included in a plan vary greatly by country. Many of the countries are offering unlimited plans, yet there are still countries applying the pricing methods from last century when the price per call was based on distance called and the duration of the call. The same archaic pricing model is also found with text message and data plans. As competition increases in these countries it is hoped that unlimited plans will be rolled out. The importance of unlimited plans is that they remove the financial risk from learners as they enrol in a learning program or engage in informal learning activities. While unlimited plans may appear to cost more, they allow the learner to treat the cost of the mobile device as a fixed cost.

Depending on the design of a learning program the learner may need to access voice, text messaging, and data. Data access may be the biggest cost the learner will face on a monthly basis if the learning program uses rich media—be it downloaded or streamed to the mobile device. This variability in the costs borne by the learner needs to be understood and must be included as an indirect cost the learner will face when enrolling in a mobile learning course.

Creating rich video content may seem to be an ideal delivery method. However, it may put the cost of completing a course consumed by the learner on his or her mobile device out of reach financially. If a course is designed knowing the cost that will be incurred by the learner then the course price could be adjusted. Learners in urban areas may have access to Wi-Fi in cafes or business centres.

Conclusion

This article has covered many features and functions of a feature phone, smartphone, and tablet. At this time the only difference between a tablet and smartphone is that a tablet does not have phone capabilities—everything else is possible. There are some tablets that can use Skype for 2-way voice conversations using voice over Internet protocol (VoIP). As competition in the tablet market continues to grow it is only a matter of time before the smartphone and tablet merge into a single powerful device.

Table 4.1: Selected country tariffs for monthly mobile service for 2016

Monthly Cellular Plans						
Country	Monthly Fee (Euros)	Included Voice Minutes	Overage/Minute Voice	Text Messages	Monthly Data	Data Overage Charges
Brazil	€ 28.19	1,000	n/a	unlimited	2GB	unknown
Canada	€ 61.27	unlimited	n/a	unlimited	1GB	€ 3.40/100MB
China	€ 18.62	500	€ 0.03	10,000/Month	1GB	€ 0.04/MB
France	€ 19.99	unlimited	n/a	unlimited	2GB	speed reduction
Germany	€ 34.99	unlimited	n/a	unlimited	2GB	speed reduction
India	€ 16.51	unlimited	n/a	100/day	1GB	unknown
Indonesia	€ 8.71	75	€ 0.10	150	5GB	unknown
Italy	€ 35	1000	n/a	500	2GB	speed reduction
Japan	€ 60.05	unlimited	€ 0.22	unlimited	7GB	speed reduction
Mexico	€ 54.95	unlimited	unlimited	unlimited	unlimited	n/a
Nigeria	€ 5.81	2,560	Monthly fee charged to reset voice usage	unknown	2GB	Monthly fee charged to reset data usage
Russia	€ 38.79	5,000	€ 1.01	5,000	15GB	unknown
South Africa	€ 142.64	unlimited	n/a	unlimited	10GB	€ 0.07/MB
Turkey	€ 13.94	1000	€ 2.84/250 Minutes	1000	2GB	€ 2.84/GB
United Kingdom	€ 39.00	unlimited	n/a	unlimited	12GB	unknown
United States	€ 91.50	unlimited	n/a	unlimited	10GB	Speed reduction

Source: Data from: Liberty Web. [online] Available at: http://pos.tim.com.br/?franquia=2gb&trk_source=tim&trk_medium=button&trk_campaign=pos.2gb&uf=sp; for Brazil. Smartphone Plans. [online]. Available at: http://www.rogers.com/consumer/wireless/smartphone-plans?ipn=1; for Canada. China Mobile. [online]. Available at: http://www.10086.cn/bj/index_100_100.html; for China. Zen Package with unlimited calls and SMS. [online]. Available at: https://boutique.orange.fr/mobile/forfaits-origami-zen; for France. o2 Free. [online]. Available at: https://www.o2online.de/tarife/smartphone-tarife/; for Germany. airtel Infinity. [online]. Available at: http://www.airtel.in/myplan-infinity; for India. Telkomsel Samsung Galaxy Note 7. [online]. Available at http://www.telkomsel.com/galaxynote7; for Indonesia. TIM Special Start. [online]. Available at: https://www.tim.it/offerte/mobile/voce-e-internet/tim-special/tim-special-start; for Indonesia. For Softbank Smartphone. [online]. Available at: http://www.softbank.jp/en/mobile/price_plan/smartphone/; for Japan. Prepaid Talk, Text & Data. [online]. Available at: https://us.telcel.com/secure/ServicePlans; for Mexico. MTN Xtravalue. [online]. Available at: http://www.mtnonline.com/xtravalue; for Nigeria. Ultra. [online]. Available at: http://en.mts.ru/tariffs/ultra/; for Russia. RED VIP Plus. [online]. Available at: http://www.vodacom.co.za/vodacom/shopping/plans/red-vip-plus; for South Africa. Speaking Packages. [online]. Available at: http://www.turkcell.com.tr/paket-ve-tarifeler/tumu/faturali-hat; for Turkey. Mobile Phones. [online]. Available at: http://www.three.co.uk/Store/mobile-phones; for United Kingdom. Family Plans. [online]. Available at: https://www.att.com/shop/wireless/data-plans.html; for United States. All accessed 9 Nov. 2016.

In developing countries it would be beneficial to see partnerships between the MNOs and the national education providers so that citizens could gain access to mobile device at a reduced monthly subscription rate. By providing another means to access learning the citizens can gain valuable knowledge and increased income—raising the quality of life for everyone.

The development of mobile devices is still in its infancy and continuous innovation is expected. While devices are far more powerful today than the devices from three years ago, what they will be like three years from now can only be imagined. With the powerful capabilities and extensibility of mobile devices with Apps, there is a large unchartered territory that is ripe for mobile learning research.

Finally, to revisit recommendations from earlier in the article:

• Tariffs based on number of voice minutes used and the number of text message sent creates a variable component to subscribers' monthly bill. This may create a financial hardship for individuals accessing learning through their mobile device. Cellular providers should consider a flat tariff structure with unlimited text and voice minutes.

• NGOs that deploy learning solutions need to consider the financial burden they are creating for those accessing learning via mobile devices. Designing content to reduce the bandwidth required will save learners considerable money. If images and graphics are being sent to the mobile device, ensure the files are as small as possible to reduce data consumption.

- Educational providers should partner with mobile network operators (MNO) when rolling out a mobile learning program. Establishing a partnership between the MNO and the educational provider would allow for a negotiated subscription rate.

- Mobile phones are full of toxic chemicals and contain many small parts. Improper disposal can lead to polluted drinking water and choking hazards to small children and wildlife. To ensure the environment is protected, subscribers should be given incentives to recycle old and broken handsets. This is necessary to keep the devices out of landfills and waterways.

- Mobile Network Operators (MNOs) must protect the youth from content that is inappropriate. Today it is more of a hands-off "not our problem" approach. Yet they do nothing to enable content filtering by 3rd parties. The little content filtering that there is can be easily bypassed. An improvement would be exposing the DNS settings to that they could be set by parents or network administrators to a trusted DNS level content filter such as OpenDNS.

- Understand that devices deployed in areas that are off grid need to be recharged. Bundling devices with heavy duty batteries and self-contained charging devices (solar, hand crank, etc.) could increase safety for women and children that must travel to charging stations in dangerous and hostile regions of the world.

Endnotes

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Mobiles in the workplace

By Dorothy (Willy) Fahlman

The 21st century workplace is changing rapidly. Global competition for advanced knowledge and skills development coupled with societal changes are creating new demands in the workplace. In response, business practices and processes are rapidly evolving leading to changes in the places and times of work, increasing workloads, and greater workforce mobility. Furthermore, mobiles have penetrated the business world opening the door to new approaches for workforce development, across various contexts and career paths. This article examines mobiles for enriching work-based learning practices and supporting performance for those already employed in the business sector. The next section introduces the use of mobiles before progressing to a discussion on informal learning in the workplace. The latter sections focus on work-based mobile learning approaches with selected case studies, affordances and constraints, and recommendations for practice.

Mobile use in the workplace

In the evolving workplace, employees are expected to acquire knowledge and develop skills to perform their jobs well and sustain a competitive advantage. However, budget and time constraints, a mobile labour market, and work-life balance demands are creating challenges for the delivery of traditional work-based education and training. These limitations have given rise to mobiles as the vehicles for workforce development across different locations and times.

Towards Maturity[1] reports the following on mobile use in the workplace from 538 learning and development professionals spanning a range of 28 industries and 44 nations:

- 71% of respondents used mobile devices but this proportion rose to 83% of top learning companies.

- Highest use of mobile devices in the private industry sector included commercial training providers (90%), manufacturing, science, and engineering (79%), professional and technical services (72%), and finance and insurance (69%).

- There is little difference in the uptake of mobile devices for learning amongst those working in not-for-profit (74%), public (73%), and private (69%) sectors. Organizational size had little effect on mobile use.

- More single site organizations (79%) used mobile devices for learning than multinational organizations (72%) or multiple location, single nation organizations (67%).

Mobiles can facilitate seamless learning but also provide decision-support tools for enhancing workplace performance. Like a Swiss army knife, they are very portable and compact providing a readily accessible and adaptable toolkit. This toolkit can also be used offline, when there are connectivity or bandwidth issues, as in remote/rural areas or during airplane travel to access previously downloaded e-books, translators, mobile apps, or other tools. Based on the mobile type, this convenient toolkit can include the tools shown in Figure 5.1.

Communication
Asynchronous and real-time connectivity by phone, texting, emailing, Wi-Fi, or bluetooth for timely communication & access to online resources & cloud

Mobile Apps &/or Games
For supporting work activities & work-based learning

Navigation
GPS & compass

Multimedia
Cameras, video, and sound recorders for documenting work experiences plus accessing, creating & sharing resources

Mobile Toolkit

Administrative
Calendar, notebooks, calculators, contact lists, clocks & reminders

Informal learning in the workplace

The workplace is a rich context for both formal and informal learning. Traditionally, work-based education and training has been delivered in a teacher-controlled face-to-face format including on-the-job training for vocational education and training (VET), continuing competence, and professional development (PD). However, the on-going feasibility of this delivery mode is questionable. Informal learning has emerged as a critical element for advancing today's workforce development.

Informal learning focuses on practical and everyday knowledge gained from experiences with family/friends, leisure, and work, and includes the following types:

1. self-directed learning that is intentional by the learner;

2. incidental learning (unplanned learning that becomes conscious to learner only after the experience);

3. tacit learning (neither intentional nor conscious that corresponds to a sense of

knowing or intuition and is often difficult to articulate by the learner)[2].

In the workplace, most learning is informal in nature and forms a part of everyday work activities. Although the employer may be the impetus for some informal learning, most is self-directed and learner-motivated for knowledge acquisition and skill development. These learning experiences can be enabled and supported by work-based mobile learning.

Work-based mobile learning

The dynamic workplace has created demands for innovative learning practices. In response, work-based mobile learning has emerged as a new and rapidly expanding field of practice combining work-based learning and mobile learning approaches.

Work-based mobile learning is:

"… the processes of coming to know, and of being able to operate successfully in, and across, new and ever changing contexts,

including learning for, at and through work, by means of mobile devices."[3]

As Pimmer and Pachler suggest, this definition ties the affordances of mobiles in *real* workplace situations for mobile learning to the aspects of work-based learning that include:

- *Learning for work* – where learning occurs "off-the-job" and is preparatory or "just-in-case" for future application;

- *Learning at work* – "just-in-time" learning that occurs at the workplace and is immediately relevant;

- *Learning through work* – learning that occurs through work experiences as in social learning that connects learners.

Work-based mobile learning can occur, synchronously or asynchronously, to actively engage employees in the learning process. Mobiles are more widely used for work-based informal learning than formal learning. This is particularly prominent in resource-limited small and medium businesses. Mobiles also provide 'performance support', taking some cognitive load from workers.

Work-based mobile learning approaches

This section provides an overview of work-based mobile learning approaches beginning with the formal delivery method moving to the more widely used informal approaches. Each approach is illustrated with a selected case study.

Formal work-based mobile learning

In formal work-based mobile learning, learners participate using their mobiles in the classroom, or existing eLearning course content is converted to fit handhelds. Either way, the focus is mainly on a teacher-centred instruction for learning to be used at a later time. The delivery is pushed out from the

teacher or the learning management system (LMS) to the learner. It is often used for compliance training and on-going competency requirements, as depicted in Box 5.1.

"Just-in-Time" work-based mobile learning

Moving away from teacher-led approaches, "just-in-time" learning is self-directed at point-of-need as in Box 5.2. For example, healthcare workers can access short medical videos, medical apps, or other mobile resources for constructing spontaneous knowledge, reduce uncertainty, and increase self-confidence when faced with unfamiliar procedures or situations. Likewise, time-starved business executives can pull immediate mobile information whenever and wherever they are situated to engage in informal learning for timely decision-making.

Additionally, mobiles can support individual performance with on-demand access to employer's job aids such as checklists, procedural information, price lists, product specifications, or other documents so that employees can retrieve them anytime or anyplace.

Social learning in work-based mobile learning

Although much of work-based mobile learning occurs individually, it can also connect employees through social interaction, build mutual understanding, and create new contexts for learning in communities of practice. Employees collaboratively learn by sharing practical and professional experiences, problem solving, and providing peer-to-peer feedback that may draw on deep tacit knowledge and leverage employees' knowledge exchanges. They can interact using emails, text, and phone but also use tools such as blogs, wikis, and Twitter, and social networking sites including LinkedIn, Facebook, or MySpace. The case in Box 5.3 illustrates mobile social learning for problem solving and increasing the transparency of employee's competency profiles.

Box 5.1: Conversion of eLearning course: Case from US Department of Defense

The US Department of Defense converted an eLearning course for mobile delivery for active duty military, civilians, and contractors. With the original eLearning course, learners were often challenged to complete the compulsory training requirements while dealing with distractions and attempting to balance mission-critical work responsibilities. The course was reformatted using HTML5 for the users' smartphones and tablets. Flash animations were converted to static images, graphics were refined to reduce bandwidth, and some redundant content was removed to reduce size in the mobile version.

Benefits reported by learners on the mobile version included:

- reduction in time to complete the course from approximately 40-60 minutes in the eLearning course to less than 30 minutes with the mobile version;

- more concise information, convenience, and training with no distractions;

- high level of satisfaction with the mobile version, preferring it to eLearning.
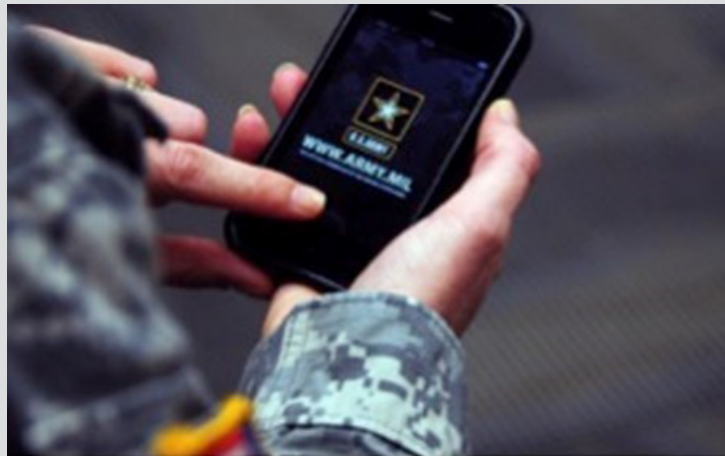
The U.S. Army - Official Army iPhone app

Photo credits: Todd Lopez. Wikimedia Commons / Public Domain.

Source: Haag, J. (2011). *From elearning to mlearning: The effectiveness of mobile course delivery.* 1st ed. [pdf] Alexandria: VA Advanced Distributed Learning Initiative. Available at: https://adlnet.gov/adl-assets/uploads/2015/11/e_to_mLearning_paper.pdf Accessed 20 Nov. 2016.

Box 5.2: "Just-in-Time" learning: Case from Jaguar Land Rover

Jaguar Land Rover exports vehicles to franchises in 169 countries. Based on this global distribution, it was determined that mobile learning was needed to deliver training and resources to nearly 60 000 employees' personal devices in multiple languages. Mobile Application Management (MAM) was used to deliver content in all languages, with the ability to remotely lock or wipe all corporate data off any device at any time from any location.

Employees accessed mobile videos, product data sheets, and product specific apps at point-of-need for decision-support and/or seamless learning in their jobs. For example, mechanics could pull just-in-time resources when doing repairs. LMS integration tracked content interaction and objectives, and any updated content could be pushed out to the learners providing them with a personalized library.

Employees using mobile resources while doing repairs

Photo credits: The Repair Association: https://repair.org/

Source: Wigley, A. (2013). Considering Mobile Learning? A Case Study from Jaguar Land Rover. *Development and Learning in Organizations*, 27 (4), pp.12–14.

Box 5.3: Social learning in work-based mobile learning: Case from a British career advising business

A British career company implemented semantic people tagging with 60 geographically distributed employees. Due to the wide distribution, there was a knowledge gap about overall employees' expertise, skills, and competencies but also emerging career topics for advising clients.

A mobile app was developed for a shared directory and vocabulary with a real-time editor to tag or bookmark colleagues. Employees tagged each other without restrictions and the taggers remained anonymous; no external organizational colleagues were tagged. Assigned tags were immediately visible by all employees. Socio-cultural organizational aspects were taken into account due to the sensitivity of people tagging. The tagging system was well received, achieving the following outcomes:

- increased learners' control and empowered them to contribute to a shared knowledge base;

- simplicity and ease-of-use provided access and networking to more expertise and information

Hot topic: Texting at work!

Photo credits: Mid-Continent Public Library. Available at: www.mympl.org/blog/hot-topic-texting-work

Source: Braun, S., Kunzmann, C. and Schmidt, A. P. (2012). Semantic People Tagging and Ontology Maturing: An Enterprise Social Media Approach to Competence Management. *International Journal of Knowledge and Learning*, *8*(1), pp. 86-111.

Creating and sharing in work-based mobile learning

When employees create and share work-based mobile learning resources, it promotes peer-to-peer learning, active knowledge construction, and skills and vocational identity development within a learning community. Whether it be creating and sharing a video, audio recording, or other job-related resource, it's a bottom-up and learner-centred approach. As the next case discusses (Box 5.4), creating and sharing work-based mobile learning resources can empower and engage disenfranchised learners but also foster leadership skills for upward mobility.

Box 5.4: Creating and sharing: Case from indigenous Australian park rangers

Situated in Northern Australian, this four-year project focussed on workforce development of indigenous park rangers' knowledge and skills in plant biosecurity management. Formal educational approaches had limited success in meeting their needs. Computers and Internet access was limited in these remote rural communities but the rangers' mobiles were always with them. Therefore, handhelds were used to engage disenfranchised learners in indigenous workplace learning.

Using mobiles, five indigenous rangers co-developed learning resources to document work practices. Multilingual digital stories using visual images of the rangers and their field equipment plus audio-recorded instructions were produced for collegial sharing and reuse when doing specific tasks, inducting new staff, or as refreshers from previous training.

The rangers controlled workplace-learning processes and ensured cultural knowledge was maintained. The digital resources connected the learners in their own contexts and provided evidence of vocational competence, expertise in the field, and demonstrated their value as workers. This learning approach empowered the disenfranchised indigenous rangers as they assumed leadership roles in constructing knowledge, enhancing their vocational identities, and promoted peer-to-peer learning through situated experiences and social interactions.

Aboriginal rangers trying out the new I-Tracker applications

Photo credits: Coastal First Nations. Available at: http://coastalguardianwatchmen.ca/sites/default/files/Australia%20Newsletter.pdf

Source: Wallace, R. (2011). The Affordances of Mobile Learning that can Engage Disenfranchised Learner Identities in Formal Education. In: N. Pachler, C. Pimmer and J. Seipold, eds., *Work-based Mobile Learning: Concepts and Cases,* 1st ed. Oxford: Peter-Lang. pp. 117-144.

Bridging informal and formal work-based mobile learning

Mobiles can bridge the gap between informal learning experiences and work-based mobile learning, formal education and training for a blended approach. This allows for differentiation but also personalization of the employee's learning, either individually or collaboratively.

Individually, an employee may reflect on informal learning experiences in relation to their work-based formal learning, using an e-portfolio, blog, or other mobile modes. Managers can mentor an employee at a distance to provide timely support and feedback on their informal learning experiences for decision-making and PD. Mobile mentoring may also have cost implications related to reducing the need for face-to-face meetings and increasing the number of employees a manager could mentor.

Collaboratively, employees can engage in social learning using their mobiles where they interact and share work experiences building on their previous formal work-based mobile learning. The case from the developing country of Peru illustrates bridging informal and formal work-based mobile learning (Box 5.5).

Work-based mobile learning affordances and constraints

The workplace provides a learning environment with competing affordances and constraints for work-based mobile learning, generated from perceived needs of the business organization and also individual employees. As outlined in Table 5.1, the potential affordances of WBML enable learner participation while the potential constraints impede the effectiveness of work-based mobile learning.

Table 5.1: Learning affordances and constraints

Potential Affordances	Potential Constraints
Learning & skills development in businesses where access to computers may be limited	Workplace cultures that are reluctant to change learning practices & adopt mobiles for workforce development
Flexibility, convenience, & learner control over time for learning whether it be in the office, field, or other locations	Lack of educators & trainers with the knowledge & skills to support & facilitate WBML
Potential to increase multi-generational learner motivation, engagement, & performance from WBML opportunities	Lack of managerial support due to the blurring of mobile device boundaries for personal and work use
Facilitation of employee learning for those who are difficult to access due to the changing nature of work, roles, & decreasing opportunities for face-to-face education & training	Challenges with selection & costs in the provision of employees' mobile devices & content in their work settings
Enhancing personalized & contextualized learning in different locations; reducing limitations for learning & improving performance for lateral or upward mobility	IT & security issues including interoperability with different mobile platforms, limited connectivity & bandwidth in remote/rural areas, & employees bringing their own devices in the workplace (BYOD)
Boosting cost-savings as a result of increased efficiencies & quality of learning processes supported over time & distance	Ethical issues related to confidentiality, privacy, & security of data captured on mobiles

Box 5.5: Bridging informal and formal WBML: Case from Peruvian HIV/AIDS training

Twenty doctors working in clinics with limited access to HIV/AIDS teaching resources participated in WBML. Their previously identified PD challenges included lack of access to training, training not meeting regional needs, limitations in the development of health personnel competencies, and high turnover rates of trained healthcare workers.

A formal HIV/AIDs education program was developed and delivered via supplied smartphones incorporating 3D learning scenarios simulating interactive clinical cases. Portable and inexpensive solar chargers facilitated wireless connection to download materials and Internet access.
A mobile platform supported the learning events, tracked doctor's progress, and provided Facebook access for social learning, peer-to-peer sharing of experiences, and networking with experts. From the module discussions, smartphone accessible learning resources were created.

In this resource-limited setting, the main WBML affordances identified were:

- freedom to plan personalized educational activities;

- quality of information received, applicability of the content to clinical practice, and the appropriate relevance of the learning resources;

- equipment portability and easy access to content at the time/location of choice.

Constraints were costs for the handhelds, service fees, and the need for IT support for troubleshooting, all of which may impact widespread use.

The use of cell phones grew 7 percent in rural areas of the country

Conclusions and recommendations

There is no one-size-fits-all work-based mobile learning approach. As examined in this article, work-based mobile learning provides a multifaceted learning approach for knowledge acquisition, skills development, and performance support for effective and efficient workforce development across different contexts and career trajectories. Therefore, the following recommendations should be considered when implementing work-based mobile learning for enhancing rich learning experiences and promoting best practices:

- Embody visionary leadership with a clear strategy for work-based mobile learning that includes collaborative stakeholder communication at all levels to optimize workforce development.

- Select and/or develop mobile content but also encourage creation, sharing, and collaboration of mobile resources to enhance informal work-based mobile learning and support performance.

- Scrutinize the technological affordances and constraints of work-based mobile learning to determine the best mobile fit for the workplace and employees.

- Incorporate on-going managerial, learning and development, and technical support for work-based mobile learning sustainability.

- Develop work-based policies, protocols, and advice to ensure confidentiality, privacy, and security of data captured on mobiles in the workplace.

Endnotes

1   Towards Maturity. (2014). *Mobile Learning at Work.* [online] 2nd ed. [pdf] Available at: http://towardsmaturity.org/shop/wp-content/uploads/2014/06/In-Focus-2014-Report-Mobile-Learning-in-the-Workplace.pdf   Accessed 20 Nov. 2016.

2   Schugurensky, D. (2000). *The forms of informal learning: Towards a conceptualization of the field.* 1st ed. [pdf] Toronto: ON University of Toronto. Available at: https://tspace.library.utoronto.ca/bitstream/1807/2733/2/19formsofinformal.pdf Accessed 19 Nov. 2016.

3   Pimmer, C. and Pachler, N. (2014). Mobile Learning in the Workplace. Unlocking the Value of Mobile Technology for Work-Based Education. In: M. Ally, and A. Tsinakos. eds. *Increasing Access through Mobile Learning*, 1st ed. [ebook] Vancouver: BC Commonwealth of Learning and Athabasca University. pp. 193-203. Available at: http://hdl.handle.net/11599/558/ Accessed 18 Nov. 2016.

Lifelong mobile learning for skills development in low- and middle-income contexts
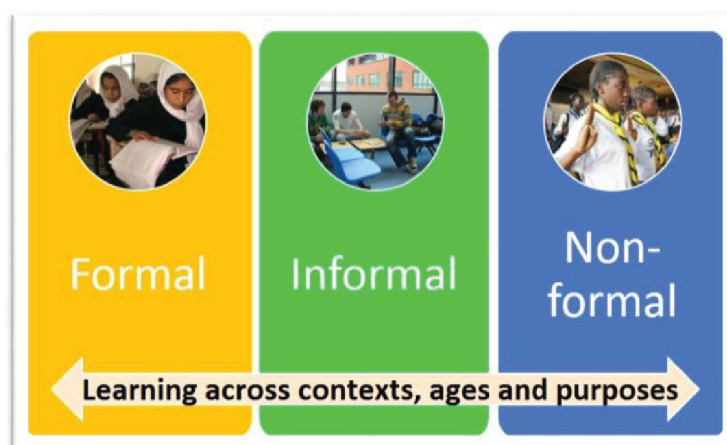
By Ronda Zelezny-Green

When the topic of mobile learning arises, initial connections tend to be made with use of mobile devices to engage in formal learning activities, while a learner of school-age is stationary or on the go, inside the classroom or outside of it. Yet, mobile learning can take place not only across contexts but also across lifespans – at any age – and for broad-ranging purposes (Figure 6.1).

Lifelong mobile learning for skills development (LmL4SD) is one such purpose, and is a small but growing area of interest within the mobile learning community. In low- and middle-income contexts[1] LmL4SD is gaining traction as a mechanism to help people of diverse ages acquire skills that may eventually lead to employment, the creation of new business ventures, and/or improved business practices. Mobile learning is uniquely placed to facilitate skills development opportunities for people in low- and middle-income contexts because this learning process can help facilitate more flexible, cost-effective, and relevant learning and development experiences. (Figure 6.2).

As the percentage of unique mobile subscribers grows[2] and the costs of mobile phone ownership and use declines[3], the number of people who stand to benefit from LmL4SD could be quite high, especially among special populations such as women and girls and out-of-school youth.

This article will begin by briefly revisiting the definition of non-formal learning to explore its links to what will be termed and defined as lifelong mobile learning for skills development in this publication. Then, it will explore reasons why there is an increasing need to explore mobile learning as an emergent lifelong skills development medium in low- and middle-income contexts. Subsequently, brief case studies on LmL4SD will be shared from low- and middle-income contexts in the following countries: the Philippines, Tunisia, as well as an experience from the United States and Canada that has global reach. The article will conclude with recommendations for how local and national governments and civil society organizations can harness the potential of mobile learning for skills

Figure 6.1: Learning across contexts

Figure 6.2: The mobile learning context

Flexibility	•...in where and when the learner undertakes skills development with mobile devices
Affordability	•...since many mobile learning for skills development schemes are offered at a free or reduced cost to the learner
Utility	•...to the learners' lives because the mobile learning experiencs are often localized to help people gain skills in defined areas of work and enterpreneurship that are in demand.

development to help empower people to achieve their learning goals throughout their lifetime.

Lifelong mobile learning for skills development

Earlier, the Organisation for Economic Co-operation and Development (OECD) definition of non-formal learning has been shared. This article will proceed with the following addendum to the OECD definition in order to focus more on the learner and the things they may learn about with mobile devices:

> *Depending on country contexts, it [non-formal learning] may cover educational programmes to impart adult literacy, basic education for out-of-school children, life-skills, work-skills, and general culture. Non-formal education [...] may have differing durations, and may or may not confer certification of the learning achieved.*[4]

This presents the notion that learning for skills development can be conceived as a subset of non-formal learning since a number of skills-based educational programs take place outside of formal

education settings. Non-formal learning and learning for skills development also help learners obtain knowledge that is not typically found in national curricula, which usually focus solely on subject areas such as mathematics, science and the language of instruction (although academic subjects may still be included to facilitate basic education in the non-formal learning sector).

Furthermore, like formal learning, non-formal learning, even for skills development, is led by an organisation concerned with the area of learning to be covered. Some examples of well-known non-formal learning organisations include the Girl Guides/Girl Scouts, Boy Scouts, the YWCA and the YMCA. Yet, unlike formal learning, a rigid instructional structure is not always imposed with non-formal learning or learning for skills development. Moreover, there may be no formal examinations required in order to achieve official recognition for participation or successful completion of a non-formal learning or skills-based course.

With a link between non-formal learning and skills development established, attention will now be turned to elaborating what lifelong mobile learning for skills development is. This will be achieved by

Figure 6.3: LmL4SD

Lifelong + Mobile Learning + Skills Development = LmL4SD
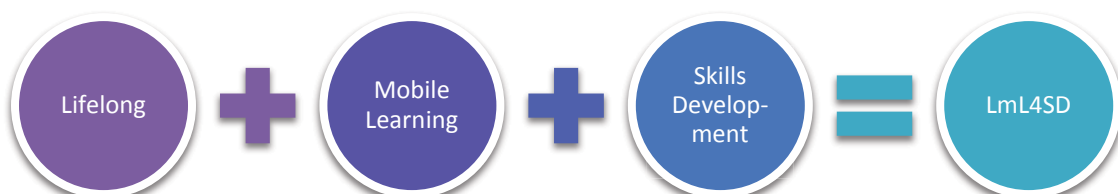
breaking down each component of this phrase as illustrated in Figure 6.3.

Lifelong learning

The Commission of the European Communities (CEC) embraced a definition for lifelong learning that balanced social and economic perspectives on learning. Their definition also traversed the three broad categories of learning in addition to seeking to remove age restrictions. Accordingly, they collaboratively created the following conceptualisation of lifelong learning: "all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective"[5].

In the report to UNESCO of the International Commission on Education for the Twenty-first Century, lifelong learning is framed into four areas (Figure 6.4).

Figure 6.4: Four areas of lifelong learning

Source: International Commission on Education for the Twenty-first Century. (1996). *Learning: The treasure within. Report to 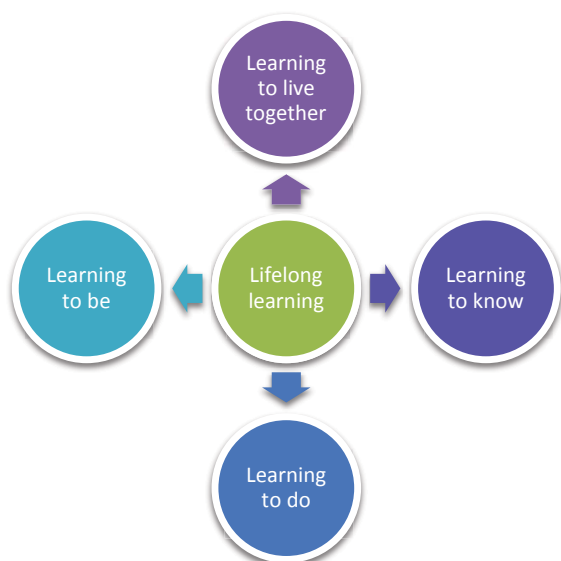UNESCO of the International Commission on Education for the Twenty-first Century.* Paris: UNESCO Publishing. Available at: http://unesdoc.unesco.org/images/0010/001095/109590eo.pdf Accessed 8 Dec. 2016.

By adopting inclusive definitions it becomes clear that because a variety of people participate in lifelong learning, diverse opportunities to know, do, be and live together must be made accessible for all. One way that this is being done is by facilitating instruction through and with mobile devices.

Contextualising mobile learning

In other articles, the question of what mobile learning is has been touched upon. To contextualise mobile learning in this article, the term will be briefly outlined. Mobile learning has undergone numerous definitional transformations that can largely be attributed to how the relationship between people and technology is perceived and articulated (Figure 6.5), as well as the growing sophistication in the technology and the devices with which once can engage in mobile learning.

Figure 6.5: Relationship between people and technology
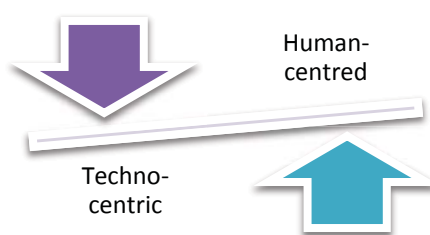
Striking a balance in mobile learning

In acknowledgement of the need to take a balanced yet future-proof approach to the definition of mobile learning, this article borrows from the one formed by Sharples, et al,[6] to position mobile learning (Figure 6.6).

With this conceptualisation in place, it is clear that mobile learning has links not only to lifelong learning but also to non-formal learning and skills development given the flexibility in what is learned where, with who and when.

Skills development

Skills encompass the "know how" for performing activities crucial to a person's ability to earn a livelihood, and can include both so-called soft skills (e.g. professional communication, negotiation, mediation) and hard skills (e.g. foreign or programming language fluency or basic numeracy). The World Bank[7] believes that skills form the foundation of a nation's growth as well

Figure 6.6: A definition of mobile learning
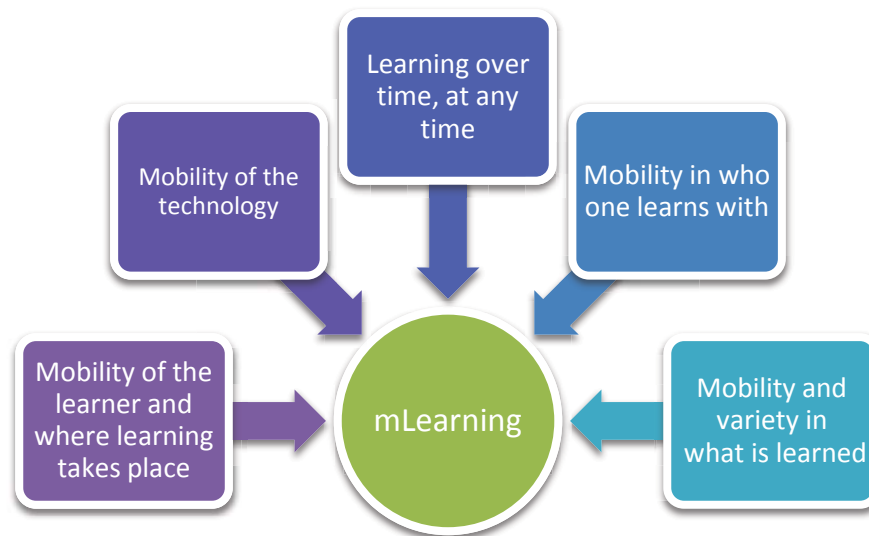
Source: Sharples, et al. (2009). Mobile Learning: Small devices, big issues. In: Balacheff, N., Ludvigsen, S., Jong, T. de and Barnes, S., eds., *Technology Enhanced Learning: Principles and Products.* Heidelberg: Springer, pp. 233–249. Available at: https://www.researchgate.net/publication/44909945_Mobile_Learning_Small_Devices_Big_Issues Accessed 8 Dec. 2016.

as a person's ability to obtain gainful employment during their lifetime. The OECD[8] calls skills "…the global currency of the 21st century". The process of developing skills is one that often does not take a one-size-fits-all approach. Nevertheless, guidance in the form of knowing which skills are in demand for employment and entrepreneurship or which may be helpful for achieving personal fulfilment goals is a pertinent part of the skills development process.

Summarising LmL4SD

With the individual components of lifelong mobile learning for skills development explained, a working definition of LmL4SD for this article is people using mobile devices, at any age, time or place to develop new or existing skills by working alone, or in a group, on a course or on their own.

With this in mind, the next section of this article will discuss some of the reasons why mobile learning is both a relevant and useful tool in the push to help people in low- and middle-income contexts develop their skillsets.

Why the need for skills development? Why go mobile?

As earlier mentioned, this article will focus on lifelong mobile learning for skills development

to find and obtain employment, create new businesses, and/or improve business practices. While this focus is decidedly economic in nature, these aspects form some of the personal goals and ambitions that people have for their lives. This section will explore why LmL4SD is becoming more common for such purposes.

Sounding the alarm on the need for skills development

For the past two decades, skills development has become an increasingly important area in the learning spectrum. The post-2008 global economic crisis caused not only a significant amount of job loss but also an increase in what the International Labour Organization (ILO)[9] terms 'occupational mismatch', whereby the jobs available to people are too high or too far below their present skillset. The ILO report[10] also stated that in 2012, the total number of people without jobs globally had risen to 197 million people. Some population segments, such as youth and females, were more severely impacted than others.

National governments including India, the United States, and South Africa, as well as regional bodies such as the European Union, have taken critical steps to grow and revitalize the opportunities for their citizens to access learning opportunities that help them improve or build new skills (Figure 6.7).

Figure 6.7: Strategic skills development activities

Strategic Skills Development Activities

South Africa: The push to help citizens develop skills is enshrined in nine national policies, including the National Skills Development Strategy.

European Union: Launched a multi-stakeholder partnership in order to provide ICT skills for citizens in preparation for digital jobs.

United States: Approximately USD170m of the 2015 fiscal budget will be given to help teachers and learners develop skills in STEM subject areas.

India: Created the National Skills Development Agency to coordinate the skills development initiatives of 20 government ministries.

Sources: For South Africa: UNESCO. (2012). *Youth and Skills: Putting Education to Work—EFA Global Monitoring Report 2012*. [online] Available at: http://www.skillsforemployment.org/wcmstest4/groups/skills/documents/skpcontent/mwdf/mdix/~edisp/fm11g_021828.pdf.For European Union: European Commission. (2016). *Digital Skills and Jobs Coalition*. [online] Available at: https://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs-0. For United States: US Department of Education. (2016). *Science, Technology, Engineering and Math: Education for Global Leadership*. [online] Available at: www.ed.gov/stem. For India: Ministry of Skill Development and Entrepreneurship. (2016). *About us*. [online] Available at: http://www.skilldevelopment.gov.in/aboutus.html. All accessed 11 Dec. 2016.

Although these top-down efforts are commendable, more needs to be done at the grassroots level if the most marginalised are to be reached. The OECD[11] asserts that in low-income contexts, youth unemployment is characterised by a prevalence of low quality jobs on the market while in middle-income contexts the issue is a lack of jobs, especially ones that youth qualify for (Figure 6.8). Sustained skills mismatch for youth in low- and middle-income contexts can lead to discouragement that affects employment opportunities and productivity later in life.
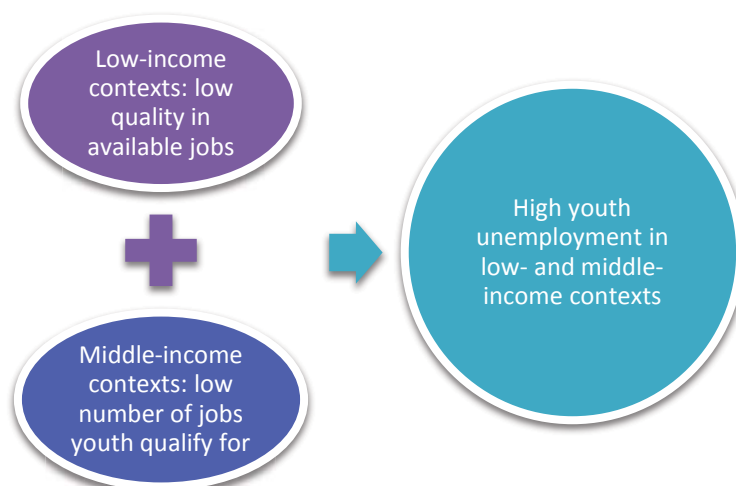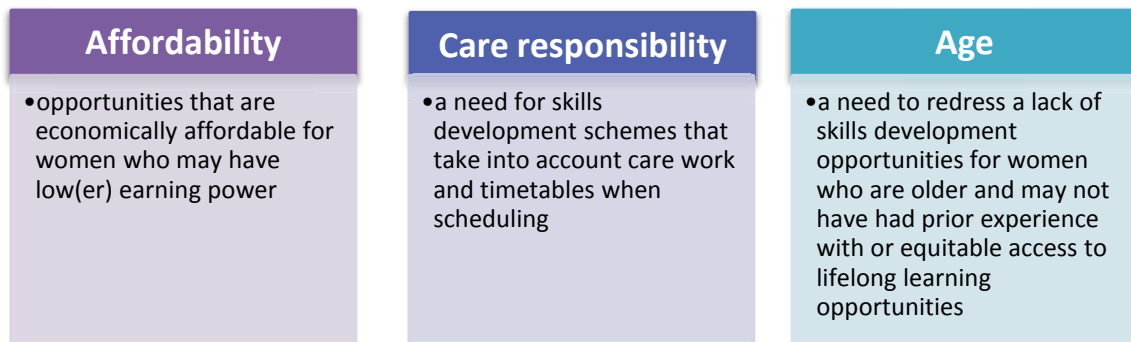
Figure 6.8: Skills mismatch for youth

Low-income contexts: low quality in available jobs

Middle-income contexts: low number of jobs youth qualify for

High youth unemployment in low- and middle-income contexts

Figure 6.9: Gender equality links

Affordability	**Care responsibility**	**Age**
•opportunities that are economically affordable for women who may have low(er) earning power	•a need for skills development schemes that take into account care work and timetables when scheduling	•a need to redress a lack of skills development opportunities for women who are older and may not have had prior experience with or equitable access to lifelong learning opportunities

Source: ILO. (2010). *A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy*. Geneva: International Labour Office. Available at: www.skillsforemployment.org/wcmstest4/groups/skills/documents/skpcontent/mwdf/mdix/~edisp/fm11g_021626.pdf Accessed 8 Dec. 2016.

In order to improve their skillset, youth face barriers such as the cost of transport to and from skills development opportunities, lack of awareness about what skills development opportunities are available to them and how development of these skills can lead to jobs, and even gender discrimination in the skills development opportunities available to them. Research from GSMA Mobile for Employment[12] corroborates these barriers through findings gathered from youth in Bangladesh, Spain, Indonesia, and Ghana.

The ILO[13] points out that gender equality in skills development opportunities is directly linked to challenges shown in Figure 6.9.

Potential female members of the workforce also experience difficulty related to the availability of skills development opportunities that encourage women to enter non-traditional professions.

Mobile as a skills development medium

Given some of the aforementioned barriers to access skills development, lifelong mobile learning for skills development can present people in low- and middle-income contexts with opportunities that other print and electronic media are not as easily able to facilitate.

Undoubtedly mobile devices (their cost, availability, and technological affordances), network reception, and usage costs are issues that still impact the ability of a number of people to benefit from LmL4SD. Nevertheless, in terms of reach (both in the number of people

who can benefit today as well as where these people are located), comparative ease of use, personalisation, speed, and flexibility, mobile devices are poised to help facilitate more benefits for more people in low- and middle-income contexts seeking to develop their skillset than if postal correspondence, radios, television, or telecentres were used on their own. Still, like all other media before it, mobile devices could also serve to amplify inequality among those who are very poor, disabled, have low or no literacy, or face cultural barriers to access and use mobile if care and planning is not undertaken in order to help minimise this undesirable outcome.

In many low- and middle-income contexts, mobile devices have become tools to help achieve individual and collective empowerment by facilitating access to vital services from areas such as government, health, banking and finance, and agriculture. Lifelong mobile learning for skills development is on its way to becoming an integral type of life-changing mobile device use for education and learning, as the case studies in the next section will help illustrate.

LmL4SD case studies from low- and middle-income contexts

The case study from the Philippines (Box 6.1) highlights a lifelong mobile learning for skills development initiative to benefit out-of-school youth with inelastic wallets and a government that is adopting LmL4SD as one of many pathways towards redressing the availability of skills development opportunities despite its own resource limitations.

Box 6.1: Philippines

Facing a constantly expanding "youth bulge", the Philippines has approximately 6.2 million people under the age of 35 who lack employment or are under-employed. With an estimated population of nearly 101 million people in 2015[a] (12th largest country in terms of population in the world), the government's ability to address the youth unemployment challenge through provision of skills development opportunities is daunting given the country must also grapple with yearly, devastating natural disasters which take significant funding from the national budget.

Beginning in April 2013, a coalition of government agencies created and offered support to a national programme known as "Abot Alam," whose goal is to help return or help facilitate first encounters for millions of youth to some form of education or training. With the desire to support the potential reach of this initiative, all three mobile network operators in the country, Digitel Mobile Philippines (Sun Cellular), Globe Telecom, and Smart Communications took the decision to unite to develop innovative LmL4SD products and services to help the government reach its target, competing on the content and quality of their offerings instead of brand recognition or loyalty. This partnership was cemented in September 2013 with a MoU signing[b].

In February 2014, the first skills development services, both based on interactive voice response technology, were debuted at Mobile World Congress[c].

Filipino youth reads training content on mobile phone

Photo credits: Globe Telecom

Rural Filipino community watches an app demonstration on a smartphone

Photo credits: Smart Communications

One service provides basic education in the English language to help people acquire basic English skills, and the other is for people to acquire English for employment within the business process outsourcing industry, an industry that provides a large source of employment in the Philippines. Both services were launched in 2014 with the support from LmL4SD subsidies made by the Department of Education and the Technical Education and Skills Development Agency.

Notes:
[a] Philippine Statistics Authority. (2016). *Highlights of the Philippine Population 2015 Census of Population*. [online] Available at: https://psa.gov.ph/content/highlights-philippine-population-2015-census-population Accessed 11 Dec. 2016.
[b] Luces, K. (2013). Telcos, gov't agencies to collaborate on 'mobile education' for 1 million OSYs. *GMA News*, [online] 25 September. Available at: www.gmanetwork.com/news/story/328130/scitech/technology/telcos-gov-t-agencies-to-collaborate-on-mobile-education-for-1-million-osys Accessed 8 Dec. 2016.
[c] Gallardo, C. (2014). Apps aim to help educate millions of young Filipinos. *SciDev.Net*, [online] 28 February. Available at: www.scidev.net/global/education/news/apps-aim-to-help-educate-millions-of-young-filipinos.html Accessed 8 Dec. 2016.

Figure 6.10: Youth unemployment

Close to 75 million youth worldwide were unemployed in 2012. Middle East and North Africa (MENA) has the highest rate of youth unemployment, with about one youth in four without a job.

North Africa[5]

27.9%

21.4%   17.6%   9.0%

26.5%   13.5%

17.4%

14.3%

11.5%   9.8%

Source: World Economic Forum, (2013). *The Challenge of Youth Unemployment*. [online] Available at: http://www3.weforum.org/tools/gac/youth-unemployment-visualization-2013/ Accessed 11 Dec. 2016.

The next case study (Box 6.2) comes from North Africa, an area of the world that, when coupled with the Middle East, has the highest rate of youth unemployment (Figure 6.10).

Earlier the challenge of encouraging women and girls to pursue skills development opportunities in fields where they are traditionally underrepresented was referenced. The final case study (Box 6.3) comes from the United States and Canada, where this challenge is being approached with backing from major tech companies.

Box 6.2: Tunisia

While some people viewed the so-called Arab Spring as a victorious fight for democracy and a better life, for many youths, that reality has not yet materialised. So is the case of Tunisia, where youth unemployment for people under 30 is a staggering 30%, and countless young women and rural inhabitants in particular have gone many months and even years without a professional placement[a].

In a collaboration between civil society organizations (PRO-INVEST, Edupartage, Silatech) and the private sector (Tunisiana), two services to support Tunisian youth with their skills development needs and job search hopes were launched, Najja7ni m-English and Najja7ni Employment, in 2011 and 2013, respectively.

Najja7ni m-English is promoted as a low-cost way for youth to improve their English language abilities to increase their chances of obtaining a good job, and without the expense associated with hiring a tutor. The service uses USSD technology and users can use short codes to initiate access.

When launched (also using USSD technology), Najja7ni Employment was the first youth skills development service of its kind in North Africa.

Young Tunisian woman tells her friend about the Najja7ni service for the first time

Photo credits: Tunisiana. (2013). *300,000 customers using Najja7ni in one month!* Available at: https://www.youtube.com/watch?v=oDsN27ZKzxg

The service provides access to information on entrepreneurship, available skills development opportunities, and even the possibility for job matching, all on basic handsets and without the need for Internet service.

With carefully planned targeting, outreach and marketing efforts to youth, especially young women (see photo above), and people living in rural areas, as of February 2014 Najja7ni Employment has reached over 1 million Tunisians[b].

Notes: [a] Atkinson, S. (2013). Revolution brings no job hopes for Tunisia's women. *BBC News*, [online] 11 December. Available at: www.bbc.com/news/business-25262847 Accessed 8 Dec. 2016. [b] GSMA. (2014). *Najja7ni: Mobile learning services for improving education, English language skills and employment opportunities in Tunisia*. Available at: www.gsma.com/connectedliving/wp-content/uploads/2014/02/2013-2014-Q4-Tunisiana-Najja7ni-services.pdf Accessed 9 Dec. 2016.

Box 6.3: United States and Canada

The women in global science and technology (wisat) completed a national assessment on science, technology and innovation that found that even in a G8 country such as the United States, women remain underrepresented in STEM fields, and among six countries the US ranks the lowest in enabling policy environments to support women in STEM fields[a]. It is thought that if this situation continues, it will have long-term negative or depressed impact on the employment sector.

Technovation[b] is one organisation working to change this. With backing from Twitter, Google, and DropBox, among others, Technovation gathers girls ages 10-23 from around the globe (primarily from the United States, where the programme originated, and Canada; a total of 1,300+ girls from 38 countries in 2014) to stimulate their confidence and interest in the science, technology, engineering and mathematics subject areas.

A team of girls build their mobile prototype using Android App Inventor

Photo credits: Technovation. (2009). Available at: https://googleblog.blogspot.co.uk/2011/05/future-female-engineers-come-together.html

Adopting curriculum standards developed by the International Society for Technology in Education, girls, working with female mentors who are established in a STEM profession, complete free, intensive 12-week course that focuses on mobile app development to help solve local community issues, including educational challenges, among others. No prior coding experience is required. At the end of the course, teams compete for the best app, with the team with the winning app being awarded a cash prize.

Technovation Challenge finalists selected to pitch in San Francisco, CA in June 2015

Photo credits: Opportunity Desk. (2015). Available at: http://opportunitydesk.org/2015/05/24/technovation-challenge-finalists-selected-to-pitch-in-san-francisco/.

Yet all participants are indeed winners since they gain sought-after skills in a well-paid area, have networking opportunities with some of the top STEM companies in the world, and between 2010-2013, 94% of more than 800 graduates of the programme have expressed an interest in a technology career.

Notes: [a] WISAT and OWSD. *Gender Equality in the Knowledge Society: National Assessments in STI.* [pdf] Available at: http://wisat.org/data/documents/GEKS_KeyFindings_onepage-Feb13.pdf Accessed 9 Dec. 2016.
[b] www.technovationchallenge.org/home/

Conclusion and recommendations

Lifelong mobile learning for skills development is showing potential to complement existing efforts to help people in low- and middle-income contexts gain the skills they need to realise the personal and professional goals they have. As the case studies have shown, there are strong challenges for youth, rural inhabitants, and women and girls who wish to develop skills across a spectrum of areas.

To help people address these challenges, it is recommended that:

1. Governments prioritise experimentation with innovative methods to facilitate skills development opportunities for people in low- and middle-income contexts. Digital literacy skills that can be gained through LmL4SD can serve to supplement the skills learned with mobile devices.

2. Ensure that outreach efforts of government, private sector, and civil society organisations are coherent yet adapted for the people you are trying to reach. Awareness-raising activities are key. The best structured programme will not benefit target groups regardless of their age, location, or language if they do not know they exist or do not think the programme or service is for them.

3. Partnerships for skills development are a must when working in low- and middle-income contexts for lifelong mobile learning for skills development. Governments, the private sector, and civil society organisations all have areas of expertise, strengths, and limited resources that will be amplified by working with partners who share and commit to similar goals. Especially when applying a top-down approach, the work of CSOs becomes crucial in making sure LmL4SD efforts reach the intended recipients.

4. See everyone as a potential beneficiary of lifelong mobile learning for skills development. Learners of every age, gender, location and culture ultimately have the desire for self-improvement. Skills development is one way to do that, and mobile learning is one medium that can help facilitate this development.

Endnotes

1   In this article, low- and middle-income "contexts" is not synonymous with low- and middle-income "countries" in acknowledgement that both developed and developing countries contain areas where low- and middle-income households can be found.

2   GSMA Intelligence. (2014). Available at: https://gsmaintelligence.com/ Accessed 8 Dec. 2016

3   GSMA. (2014). *GSMA and Facebook announce joint initiative to connect the unconnected*, [online] 25 February. Available at: http://www.gsma.com/newsroom/press-release/gsma-and-facebook-announce/ Accessed 8 Dec. 2016.

4   UNESCO. (2016). *ICT Applications for Non-Formal Education*. [online] Available at: http://www.unesco.org/new/en/ unesco/themes/icts/lifelong-learning/non-formal-education/ Accessed 8 Dec. 2016.

5   Commission of the European Communities. (2001). *Communication from the Commission. Making a European Area of Lifelong Learning a Reality*, [pdf] p.9. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2001: 0678:FIN:EN:PDF Accessed 8 Dec. 2016.

6   Sharples, et al. (2009). Mobile Learning: Small devices, big issues. In: Balacheff, N., Ludvigsen, S., Jong, T. de and Barnes, S., eds., *Technology Enhanced Learning: Principles and Products*. Heidelberg: Springer, pp. 233–249. Available at: https:// www.researchgate.net/publication/44909945_Mobile_Learning_Small_Devices_Big_Issues Accessed 8 Dec. 2016.

7   World Bank. (2010). *Stepping up skills for more jobs and higher productivity*. Washington, D.C.: International Bank for Reconstruction and Development/The World Bank. Available at: http://documents.worldbank.org/curated/en/2010/06/ 12515032/stepping-up-skills-more-jobs-higher-productivity Accessed 8 Dec. 2016.

8   OECD. (2012). *Better Skills, Better Jobs, Better Lives: A Strategic Approach to Skills Policies*. OECD Publishing, p.3. Available at: http://dx.doi.org/10.1787/9789264177338-en Accessed 8 Dec. 2016.

9   ILO. (2013). *Global employment trends 2013: Recovering from a second jobs dip*. Geneva: International Labour Office. Available at: www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_202326. pdf Accessed 8 Dec. 2016.

10 Ibid.

11 OECD. (2012). *Better Skills, Better Jobs, Better Lives: A Strategic Approach to Skills Policies*. OECD Publishing, p.3. Available at: http://dx.doi.org/10.1787/9789264177338-en Accessed 8 Dec. 2016.

12 GSMA Mobile for Employment. (2013). *Mobile Services for Youth Employment*. Available at: www.gsma.com/ mobilefordevelopment/wp-content/uploads/2013/07/Mobile-Services-for-Youth-Employment.pdf Accessed 8 Dec. 2016.

13 ILO. (2010). *A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy*. Geneva: International Labour Office. Available at: www.skillsforemployment.org/wcmstest4/groups/skills/documents/skpcontent/ mwdf/mdix/~edisp/fm11g_021626.pdf Accessed 8 Dec. 2016.

Educational aspects of mobile impact, uptake and usage

By Mar Camacho

Societies and individuals around the world increasingly recognize that investment in education is an investment in future growth, particularly in economic, social and personal areas. With the growing availability and related infrastructure of low- cost mobile and wireless technologies, massive opportunities are emerging for learners, teachers and institutions in developing countries. In particular, mobile connectivity can facilitate new ways of teaching and learning that are cost-effective and better personalized to the individual's needs and context. Mobile technologies also offer potentiality for contextual learning, and have unbound learners from classroom walls while also enhancing collaborative processes in informal contexts. These features of mobile learning are particularly relevant to developing country contexts since mobile learning can only take place outside of school as there remains an in-school ban on mobile phone use by learners. Nevertheless, mobile learning still must overcome conceptual, practical, and organizational challenges before people can fully benefit from this learning medium.

This article will begin by exploring three broad areas: (i) mobile learning in the global knowledge economy, with its emerging topics (teaching and learning scenarios, the essential skills for a specific mobile literacy and culture…), (ii) the challenging dimensions of mobile learning in developing countries, and (iii) current uses of mobiles for teaching and learning, including a revision of tools for the construction of learning. The article includes some recommendations based on the need to develop overarching visions for mobile learning that move beyond implementations that cannot be replicated and advocates for the development of a best-practice framework to guide future action and thinking.

Mobile learning in the global knowledge economy: Emerging topics and opportunities

According to the World Bank's report *Information and Communications for Development 2012: Maximizing Mobile*, in developing countries, citizens are gradually using mobile phones to create new livings and improve their lifestyles, while governments are using them to expand service delivery and promote citizen feedback mechanisms.

> *"Mobile communications offer major opportunities to advance human and economic development – from providing basic access to health information to making cash payments, spurring job creation, and stimulating citizen involvement in democratic processes," (…) The challenge now is to enable people, businesses, and governments in developing countries to develop their own locally-relevant mobile applications so they can take full advantage of these opportunities."*
>
> *Mrs. Rachel Kyte*
> *World Bank Vice President for Sustainable Development, 2012*[1]

Mobile phone use in developing countries has exceeded that of developed areas, according to the report. The developing world is using mobile apps to help build, educate, and even entertain.

A recent report by *We Are Social*[2] includes statistics that illustrate 3.79 billion unique mobile users, representing 51% global penetration. While still a long way to go before everyone in developing countries has access to mobile communications, the push to increase access in underserved regions of the world is being made by organizations such as the Alliance for Affordable Internet. Currently, there are as many mobile subscriptions as people in the world, and every

second, 20 new mobile broadband subscriptions are activated. In addition to the rise of subscribers, data consumption also continues to increase[3]. The number of mobile subscriptions is continuously growing across regions. Greater device affordability is encouraging new subscribers in developing regions, whereas an increase in mature markets is due to individuals adding more devices. According to Ericsson, local economic conditions also have a significant impact on the uptake of subscriptions in different regions. The growth is fueled by the strong uptake of mobile broadband subscriptions across most regions. Mobile broadband subscription growth is expected to be particularly strong in the Middle East and Africa due to a young and growing population, rising GDP and smartphone uptake. Several countries in the Asia Pacific region will also experience a strong mobile broadband subscription uptake over the next five years, while more mature regions like North America and Europe will have more moderate growth.

By harnessing the use of mobile devices people are enabled to participate in education, too.

The new teaching and learning scenarios in developing countries

Mobility is understood as a great catalyst of change, and together with digital media, offers learners in developing countries previously inaccessible tools to develop knowledge, skills and social practices. The impact that mobile technologies can have on learners' lives can lead them to situations where educational undertakings are driven by both personal needs. Kukulska-Hulme introduces the concept of "context-aware learning," which alludes to the possibility of enabling learners to use personal and social technologies to draw on aspects of their environment, including people who can join in or help, approaching the environment as a dynamic learning resource[4]. While Kukulska-Hulme primarily works with examples from Global North educational settings, her description of context-aware learning is readily applicable to countries in the Global South as well.

With mobile learning, learners in developing countries can be immersed in their "environment-cum-classroom", and learning can occur at any time and at any place since the means by which

content can be made, received or exchanged is increasingly widespread and sophisticated. Similarly, Fitzgerald[5] states the following: "*If we can embody an effective pedagogy within user-generated content, we can provide learning any time and at any place*".

Any time any place learning

The fluid nature of mobility is a critical element of many mobile learning scenarios and possibilities for people in the Global South. Mobility enables a shift from one-to-one to many-to-many communication, individual to collaborative interaction, and centralized to decentralized systems. All of these shifts can occur when a learner is at home, when they are walking to school or a local market, or even when they are stuck in traffic on a form of public transport. Yet, a key question is how to utilize this fluid nature of mobility to design spaces where learners "on the move" are shifting between various communication and interaction modes in a seamless way that still enables informal learning to take place.

It could be said that there is a shift towards a diverse learning milieu in which learning adapts to each learner instead of each learner adapting to the prevailing learning model where they live – which in many developing countries still

remains a static, uni-directional experience whereby the teacher transmits knowledge to his or her students with no response from students expected. Mobile learning can help transition this learning model type into one where the following traits can be realized:

- The personalization of learning

- Schools will take on new forms

- Learning will no longer be defined by time or place

- A variety of digital network and content resources will help learners to connect and learn

- Geographic and virtual communities will take ownership of learning in new ways

- Social innovation will help address resource constraints and other challenges

## Mobiles for lifelong learning and skill development in developing countries

"We are already at the moment in which the ability to use social media, and particularly social media as amplified through the power of the mobile web, has become a key literacy."[6]

Successful practices, which allow the development of a distinctive mobile literacy, together with the power of mobile learning to blur formal and informal boundaries, could account for new teaching and learning scenarios as well as the reshaping of traditional education patterns in developing countries (Figure 7.1). For a nation to cultivate a skilled workforce, people require skills that prepare them not only to thrive but also to collaborate and innovate in such a way that they can benefit both themselves and potential employers. To be at the vanguard of this new world, educational systems need to enact policies that empower students in developing countries to take advantage of the affordances of technology so that learning can happen across contexts and with diverse subject matter. This, mobile literacy becomes of importance when considering a serious and significative implementation of technology in teaching and learning processes (Figure 7.2).

Given that the first experience that many people in the developing world have with the Internet is via the mobile web, the future that these students will inherit is likely one that will be mediated and stitched together by the mobile web. Learners will need to master effective usage

Figure 7.1: Are we wired for mobile learning?
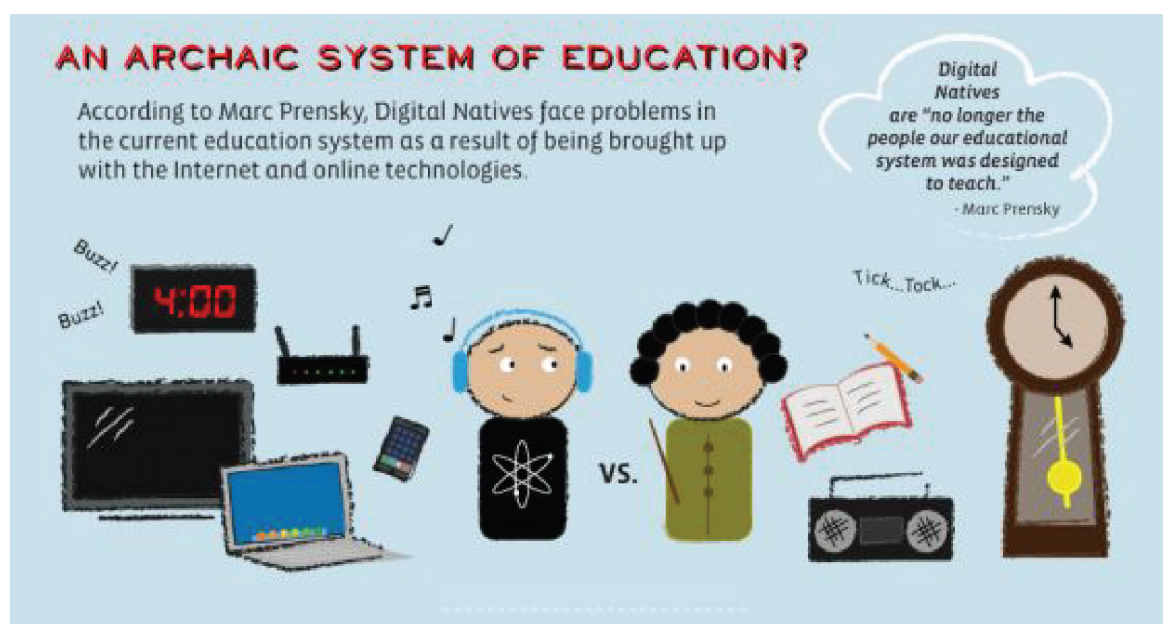
Source: Mobile Learning Infographic. (2013). *How Digital Natives Are A Bit A Head.* [online] http://elearninginfographics.com/mobile-learning-infographic-how-digital-natives-are-a-bit-a-head/ Accessed 12 May 2015.

Figure 7.2: Teaching mobile web literacy

Information access	Hyper-connectivity	The new Sense of Space
• The skill of quick information access and credibility detection, will be, according to this author useful throughout their lives	• Encouraging new students to twitter during class can be used as both a collaborative note-taking exercise and an example of how conversation can be extended beyond the classroom boundaries	• Geo-location and the mobile web will change our daily practices. Web services like Gowalla (http://gowalla.com/) and FourSquare (http://foursquare.com/) will substantially alter how we can intermingle with space. Students need to begin to understand how one "can use a mobile device to both create and access spatial information"

Source: Parry, D. (2011). *Mobile Perspectives: On teaching Mobile Literacy*. [online] Available at: www.educause.edu/ero/article/mobile-perspectives-teaching-mobile-literacy Accessed 30 Sep. 2015.

of these technologies so that that the *digital divide* is erased. In places like Kenya, Peru, and the Philippines, teaching mobile web literacy seems to be as crucial as teaching basic literacy. Since the mobile web opens up a host of pedagogical possibilities, David Parry sketches out a few literacies that teachers need to understand and ought to be striving to teach students[7].

Thus, as a distinct mobile learning culture arises, learners can take mobility and context-awareness as a departing point to become more visible and involved as innovators, creators and mediators of learning. Such meaningful and learner-centred participation will help learners develop new skills and literacies, facilitated by mobile technologies, in order to provide additional opportunities to extend their learning beyond the classroom and with formal learning as only one way of knowing (Figure 7.3). Teacher training will need to take place so that educators in developing country contexts can be included in the vision of using new technologies in ways that will enable 21st century competencies and skills such as critical thinking and problem solving, effective oral and written communication, initiative, curiosity and imagination, etc., to be reinforced or to develop in the first instance. Although there is a prevalent opinion that the school as a social institution plays a central role in the life of learners, and that in the future it will remain a key component to a person's educational experience, it will be

necessary for the nature of schooling to adapt and to work towards objectives that contribute to the development of people.

Empowering teachers with mobile devices

The critical importance of teachers in the new teaching and learning scenarios must be underscored. According to UNESCO[8], there are two important areas to consider regarding teachers and mobile learning in developing country contexts: "1) professional development that instructs teachers how to use mobile phones to improve teaching and learning; and 2) professional development that is delivered through mobile phones". Indeed, a major problem with regards to education in developing countries is the lack of qualified teachers. With the introduction of mobile phones in the developing world, areas that were once isolated are now more enabled to communicate both locally and globally. Additionally, mobile phones enhance teachers' professional development by supporting not only mentoring and observation, but content creation and the reshaping of teaching practices. Mobile learning allows teachers in rural areas to connect and collaborate with teachers outside their regions so that they may obtain advice and encouragement from experienced professionals. By involving teachers in such opportunities, it can

Figure 7.3: Skills and attributes of today's learner

serve as an illustration of what is possible to be enacted with their students (Box 7.1).

Compared to print materials, mobile content can provide a wider reach and can even be more affordable; for example, with the Worldreader (2014) mobile phone application, a learner in Kenya can read a book via mobile for about 3 Kenyan shillings, while purchasing a print book can cost at least 100 Kenyan shillings. Use of mobile content therefore can enable access to learning materials that promote new ways of knowing.

Many mobile learning initiatives have a teacher professional development component with built-in teacher training designed to enhance teachers' subject matter knowledge as well as their technological skills and to specifically train teachers in using mobile phones effectively in their instruction. Mobile learning is used for both training teachers in the technological aspects of mobile learning as well as providing teachers knowledge in the subject matter that they teach. Indeed, through mobile learning, teachers in developing countries have the hope of learning

from learning materials that are more up-to-date, which could lead to an increase in the quality of teaching and learning[9].

Current uses of mobiles for teaching and learning: Tools for the construction of learning

Texting, microblogging, video creation or mobile storytelling are instances of new educational possibilities that mobile technologies can offer to learners in developing countries. Successful integration of traditional teaching and learning processes with more learner-centred, experimental processes made possible with mobile technology will be key to realizing the full potential of what mobile learning can facilitate for people in the Global South. As previously stated, successful practices which allow the development of a distinctive mobile literacy, together with the power of mobile learning to blur formal and informal boundaries, account for a new teaching and learning scenarios that can serve to reshape traditional patterns of teaching and learning so

Box 7.1: Empowering teachers with mobile devices: the UNESCO-NOKIA project

Teacher training with mobile devices

Mobile learning offers promising opportunities to combat inequality and to provide teachers with empowering solutions and strategies for their day-to-day classes. In October 2010, UNESCO and Nokia signed a partnership to use mobile technologies to support education which concerned the implementation of four pilot projects to support teacher development through the use of mobile technologies in four different countries: Mexico, Nigeria, Pakistan and Senegal. Each project was designed based on the countries' respective educational needs, telecommunication infrastructure, and existing mobile learning tools. Results showed a significant increase in the teacher's motivation as well as the possibilities for scaling-up the initiative to other contexts.

that the learner has both more ownership and responsibility for their learning (Figure 7.4).

There are examples of best practices with mobile learning which could provide an overview on the potential of mobile technologies and what impact these might have on learning and teaching practices in developing country contexts. Some of these examples include the use of SMS-enabled treasure hunts designed to facilitate peer learning as students need to quickly interpret cues and exchange ideas to reach the prize (Box 7.2).

Other interesting experiences include the exploration of mobile devices to support social work students and mentors when students undertake their placements (REMORA), the use of pocket PCs to support portfolio development by teaching (WoLF), and the use of augmented reality to enhance teaching and learning (SCARLET) simultaneously allow students to experience the magic of original materials, whilst enhancing the learning experience. The FAVOR project Open Resources showcases the work of language teachers in universities, by engaging them in
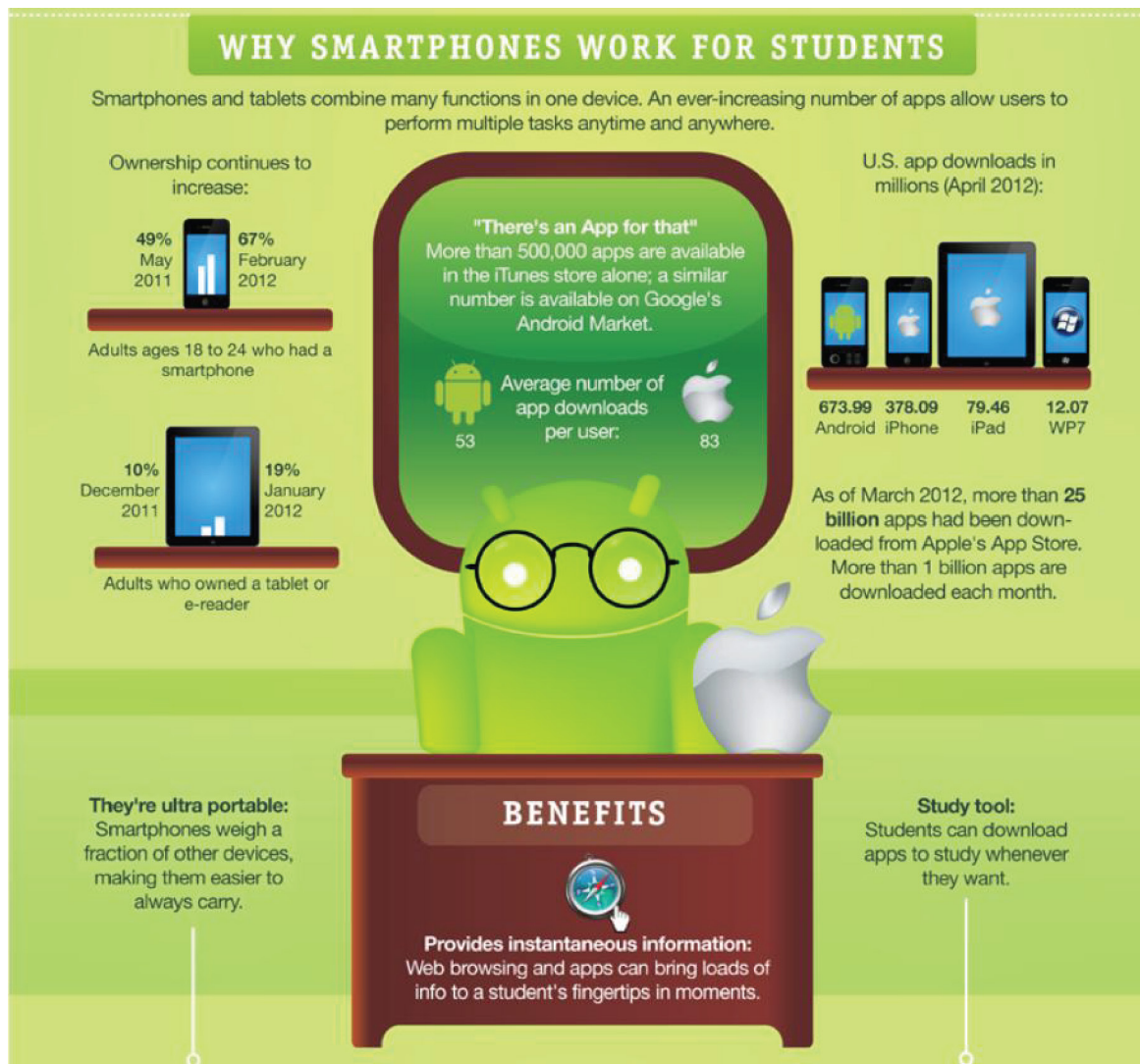
activities that will enhance the student experience and contribute to the academic life of their institutions.

Another example of international and multicultural collaboration, the iCollab project (Box 7.3), constituted by an international community of practice of students and lecturers started in 2011 which aims to explore and evaluate which mobile web tools, pedagogic strategies and learning scenarios can be effective to support international student collaboration, participation in decision-making as part of curriculum development and the development of 21st century skills.

Conclusions and recommendations

Living in a world in which the number of connected mobile devices already exceeds the world's population, the inclusion of mobile technologies in education should be seen as a unique opportunity, rather than a threat, that will lead educational systems to promote change. The advantages of using mobile technologies for educational purposes are manyfold: ubiquity, personalization

Figure 7.4: Why smartphones work for students

WHY SMARTPHONES WORK FOR STUDENTS

Smartphones and tablets combine many functions in one device. An ever-increasing number of apps allow users to perform multiple tasks anytime and anywhere.

Ownership continues to increase:

49% May 2011   67% February 2012

Adults ages 18 to 24 who had a smartphone

10% December 2011   19% January 2012

Adults who owned a tablet or e-reader

"There's an App for that"
More than 500,000 apps are available in the iTunes store alone; a similar number is available on Google's Android Market.

Average number of app downloads per user:
53   83

U.S. app downloads in millions (April 2012):

673.99 Android   378.09 iPhone   79.46 iPad   12.07 WP7

As of March 2012, more than **25 billion** apps had been downloaded from Apple's App Store. More than 1 billion apps are downloaded each month.

They're ultra portable: Smartphones weigh a fraction of other devices, making them easier to always carry.

BENEFITS

Provides instantaneous information: Web browsing and apps can bring loads of info to a student's fingertips in moments.

Study tool: Students can download apps to study whenever they want.

Source: Science's Alphabet Soup. (2013). APPS & B.Y.O.D. in Education. [online] Available at: https://scottbgoldscher.wordpress.com/2012/08/08/apps-b-y-o-d-in-education-infographics/ Accessed 11 May 2015.

of learning, skill development... and they provide new insights with which to face education in the 21st century framework. As mobile technologies continue to grow, their usefulness as powerful educational instruments will continue to expand in the near future. The following considerations intend to summarise key aspects to be considered when facing mobile impact, uptake and usage.

1. A deep understanding of mobile culture and mobile literacy defined in terms of context-awareness, mobility and of learners' specific needs happens to be genuinely important for a successful implementation of mobile technologies and ground-breaking design for learning.

2. New competencies and skills that may develop through the use of mobile technologies demand a very specific mapping between what is expected of learners and how these technologies may be of help to achieve those objectives.

3. Educational institutions and related stakeholders need to take ownership of change and be able to reshape their landscape as it is being challenged by the mobile revolution.

4. Mobile and wireless technologies can provide flexible and timely access to learning resources, instantaneous communication, portability, active learning experiences and the

Box 7.2: SMS to deliver course materials in Nepal

There are more than 6 million GSM mobile phone subscribers in Nepal and about 7 million mobile phone users. This is much higher than the number of households with access to the Internet (about 630 000, 2009 data). Nepal's mobile phone users are not concentrated in any one part of the country. The market has shown growth across the whole country, even in rural areas without proper roads and means of transportation, although compared to urban areas the rate of growth is slower. This presents an opportunity for mobile learning in Nepal. Education institutions[a] – profit seeking or non-profit – can develop course materials and send them via text messaging to subscribers. Incoming messages are provided free of charge.

The messages, which are 160 characters long, may not be suitable for subjects requiring analysis or calculations like economics, pure science or mathematics. Yet for basic courses in English, civics, history, and geography, the characters constraint is not as limiting in terms of what can be taught with a mobile device. With the mobile Internet, institutions can provide an option for students to take online courses, as a supplement to the text messages. Educational messaging can be a useful service, especially to students in rural areas who have little or no access to the Internet or a library. The messages can supplement their classroom instruction. They can also be a way to spread awareness about diseases, social issues and natural disasters in hard to reach areas.

School kids at Ranighat, Nepal

Photo credits: Argenberg, via Wikimedia Commons

[a] Future Challenges. (2011). *Nepal: Opportunities and Challenges For Mobile Education.* [online]. Available at: https://futurechallenges. org/local/nepal-opportunities-and-challenges-facing-mobile-education/ Accessed 23 March 2014.

empowerment and engagement of learners, particularly those in dispersed communities. However, despite the almost ubiquitous ownership of mobile phones, there is a lack of research that informs its real impact upon educational practices in developing country contexts.

5. Due to their portability, low cost and flexible features, mobile technologies have the potential to provide teachers in developing countries with teaching and learning strategies that can empower them to transform educational practices.

Box 7.3: The iCollab project: Building global learning communities via mobile social media

The iCollab project (icollab.wordpress.com) is an international community of practice of students and lecturers started in 2011. The project aims to explore and evaluate which mobile web tools, pedagogic strategies and learning scenarios can be effective to support international student and lecturer collaboration, participation in decision-making as part of curriculum development and the development of 21st century skills. The partner universities in iCollab project are: AUT University (New Zealand), Beuth University (Germany), Salford University (UK), Universitat Rovira i Virgili (Spain), National University of Ireland, Galway (Ireland), Limerick Institute of Technology, Limerick (Ireland), University of Wollongong, Wollongong (Australia). iCollab educational affordances and research interests include:

• Exploring mobile tools for international collaboration of teams of students

• Engaging students in participatory curriculum development by means of social and mobile media

• Exploring the creation of digital identities in social and mobile media

• Using mobile media for situated co-creation of student-generated content

• Use of mobile web 2.0 as catalyst for pedagogical change/innovation

• Collaborative research in mobile social media integration in education

6. Mobile phones are already being used informally in many cases to support learning activities (e.g. communication with friends about homework assignments, recording of lectures, discussion of an education lecture via SMS, etc.). However, to date, these informal learning activities have not been to skills development needs in a manner that will help ensure that people are equipped for entering the workforce prepared to make meaningful contributions.

7. Texting, microblogging, video creation or mobile storytelling are instances of educational possibilities that mobile technologies offer to learners in the Global South. Evidence is growing to support the inclusion of such technologies into the teaching and learning processes.

8. It is important to take into account the increasing impact that informal learning will have upon skills development. Informal learning represents a special aspect of education and training nowadays and greater recognition should be given to it due to the skills with which it provides and the part it plays within the learning process.

9. The quality and diversity of non-formal and informal learning should be acknowledged so as to recognise its social and economic added value. In this sense, new educational approaches that could be attractive for different groups of learners should be further developed.

Endnotes

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Stakeholder, corporate, and policy perspectives

By David Parsons

Those who work to promote the use of mobile tools for teaching and learning do so in a complex environment. There are many different stakeholders who can have a profound influence over the acceptance and support of such innovations. To what extent these stakeholders choose to either promote or constrain mobile learning depends on their own perspectives, driven by financial, political or social considerations. As policy is debated, formulated, applied and interpreted by these stakeholders, their differing perspectives may have positive or negative effects on policy and its progress towards its intended goals.

Taking UNESCO's mobile learning policy guidelines[1] as its starting point, this article identifies the major stakeholders in mobile learning policy. Through a series of case studies taken from the informative New Zealand context, which embodies global themes in challenges facing both developed nations and indigenous peoples, it explores some examples of how these stakeholder roles have engaged with policy. The article identifies a number of important issues and challenges facing policy makers, and concludes with a number of policy recommendations for those involved in mobile learning.

Identifying mobile learning policy stakeholders

UNESCO's mobile learning policy guidelines suggest a number of key stakeholder roles in the development and delivery of mobile learning. These roles include principals, teachers, learners, parents, national and local leaders and community-based organizations. Some stakeholders are engaged in the formulation of top down policy (e.g. national and local politicians, telecommunication regulators and education authorities) while others are engaged in bottom up policy (e.g. schools). Further influences come from industry (e.g. mobile infrastructure providers) and other relevant institutions (e.g. teacher education institutes). These multiple actors have various effects on the way that mobile learning policy is applied and its impact on those at the receiving end; learners, teachers and parents. An additional influence, not referred to directly in the UNESCO guidelines but potentially significant, is the role of philanthropy, both individual and community.

Figure 8.1 summarises the various stakeholders in this overall process. It should be noted that there are many subcategories within these main stakeholder roles. For example, 'Learners' encompasses groups who may need special consideration in terms of mobile learning policy. These include female learners and those who are physically or otherwise challenged, such as deaf, visually impaired or dyslexic learners, or those from marginalized cultures. Schools, too, fall into a number of different categories, since they vary widely in size, socio-economic profile and geographical isolation. These factors can have a major influence on the selection of appropriate mobile learning strategies. The interests of industry stakeholders are equally diverse, spanning concerns about the education of a suitably skilled workforce, acting as suppliers of goods and services to education, and the provision of work-based training within their own organisations. Thus they may be both the suppliers and consumers of mobile learning. Perhaps the most important feature of this role analysis is the wide range of stakeholders that may influence both top down and bottom up policy. These may be quite specialised in their focus, such as international bodies and subject disciplines that are only concerned with specific teaching subjects. Developers of software and content affect the supply side of mobile learning as do, in a very different way, teacher education institutes. Such a disparate range of forces is likely to lead to complex and conflicting demands on policymakers that may lead to inequalities of effect on those ultimately impacted by mobile learning.

Figure 8.1: Stakeholder roles in policy
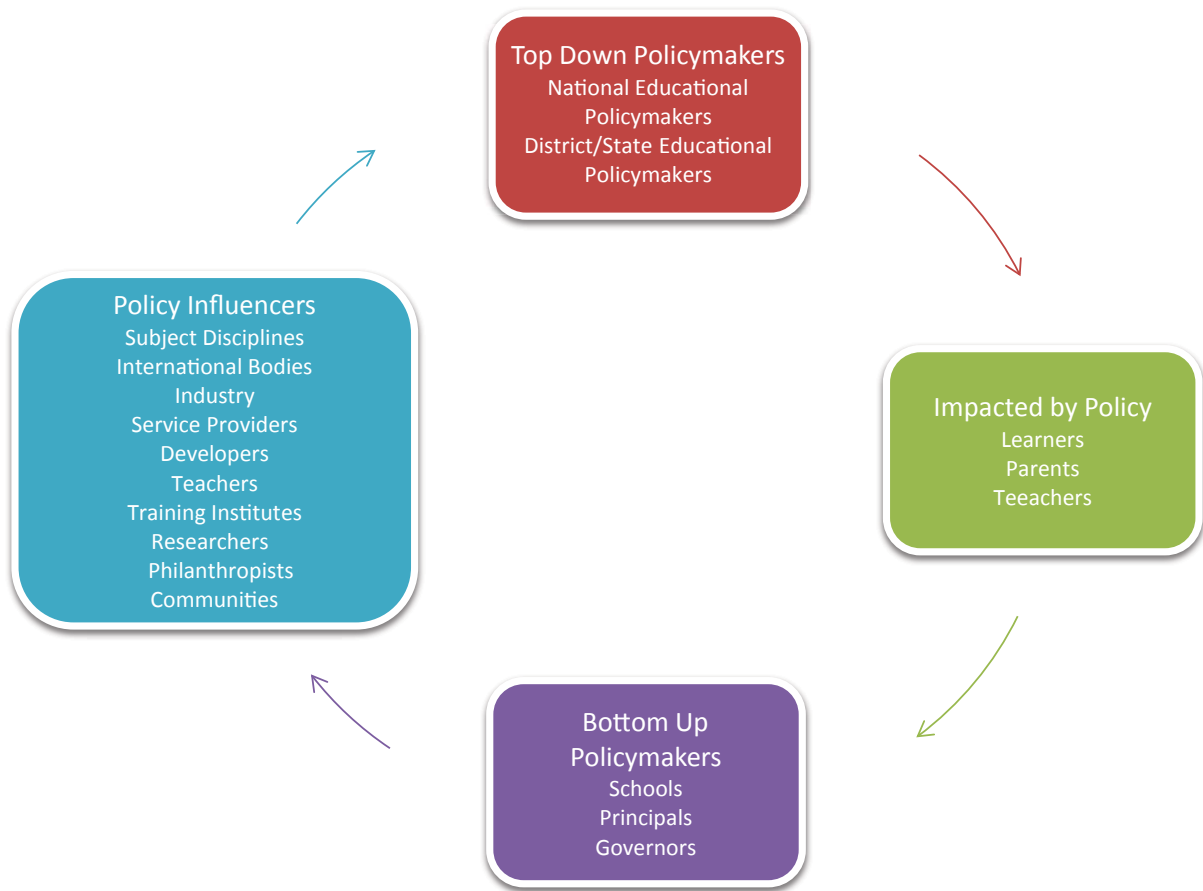
The New Zealand context

This article takes all of its examples and case studies from New Zealand. The main justification for this approach is that New Zealand has been described as the world's laboratory for progressive digital legislation; "if a policy maker, public servant or politician comes to me and asks me who to talk to around digital policy, I increasingly find myself looking at New Zealand as the place that is the most compelling"[2].

The New Zealand economic and social landscape

New Zealand's economy has some unique characteristics but shares others with many developed nations. It has been transformed from an agrarian to a more industrialized, free market economy, but in the process has deepened socio-economic divisions, suffered from mediocre economic performance and is heavily indebted internationally. Although its current population is predominantly of European origin, New Zealand is a bicultural society with a significant indigenous population of Māori, numbering approximately 600 000 (15 per cent of the national population). The bicultural relationship between the Crown and the Māori is embodied in the Treaty of Waitangi. More broadly, New Zealand is a multicultural society. About 7 per cent of the population identify themselves as being of Pacific origin, with the largest group being Samoan (Samoan is the third most commonly spoken language in New Zealand, after English and Māori). New Zealand's largest city, Auckland, is often referred to as the world's largest Polynesian city. Of its 1.3 million inhabitants, 11 per cent are Māori, 13 per cent are of Pacific Island descent, and there is a growing Asian population of around 12 per cent. The Māori and Pacifica communities are disadvantaged from a socio-economic perspective, and their educational achievement, as measured by formal qualifications, is significantly lower than other social groups.

Changing economic patterns and complex socio-economic divisions, compounded by clashes of

indigenous and immigrant cultures, where various social and digital divides impact negatively on learners from disadvantaged communities, are challenges faced by large numbers of countries across the world, and radical changes to education are frequently seen as essential to address these challenges. Recent major policy initiatives in New Zealand in the area of digital teaching and learning, intended to tackle some of these problems, may thus provide us with globally relevant insights into the role of mobile devices in education.

The school decile system

For funding purposes, schools in New Zealand are categorised by the socio-economic status of their catchment areas, using a decile system (from 1 to 10). Two of the case studies in this article are taken from contrasting areas of Auckland. Orewa College is in an affluent area north of the city (categorised as decile 9) whilst the Manaiakalani Trust serves a cluster of twelve schools in East Auckland from the lowest socio-economic category (decile 1A.).

Educational broadband policy implementation

A fundamental enabler for mobile learning is a pervasive and reliable wireless infrastructure, supported by wired broadband networks. Governments across the world are supporting the deployment of such networks, with educational usage a major consideration. The Digital Agenda for Europe, for example, aims to expand broadband access to enhance digital literacy, skills and inclusion. There is general agreement that policy should encourage broadband deployment and reduce digital divides. This means that the vast majority of the policy debate is about how the potential benefits of broadband access can be realised[3]. The New Zealand government is taking major initiatives in providing national broadband for schools and internal school networks (including wireless). The overall investment in ultra-fast broadband (UFB) is approximately USD 1 billion, the government contributing around 90% with private co-investment. Of this sum, USD 20 million is for fibre connections from school boundaries into the schools. As a result of this infrastructure build, 97.7 per cent of schools and 99.9 per cent of students will receive ultra-fast broadband capability, with the remaining 2.3 per cent of

schools in remote areas given wireless or satellite services.

The UFB project brings fast Internet connections into the school grounds, but does not directly address how that connection may be used inside a school. To address the next stage of broadband provision the School Network Upgrade Project (SNUP) has the objective of upgrading internal school networks, and includes a wireless option to support mobile learning. The estimated cost of these network upgrades, which are mostly funded by the government, with some contribution from schools, is estimated at USD 400 per student. New Zealand has around 750 000 school students, so if all schools were upgraded the approximate cost would be around USD 320 million.

A further initiative is the Network for Learning (N4L), a USD 150 million government-owned agency tasked with providing teaching, learning and support services on these new broadband networks. Thus the total technology investment in digital teaching, learning and administration across these three initiatives is somewhere in the region of USD 500 million over a period of 5 years, approximately 0.5 per cent of annual GDP. Whilst mobile learning is only one aspect of these investments, they open the door to a huge expansion of opportunities in mobile learning provision.

Given that the policy landscape around mobile learning is complex, with multiple stakeholders, and the investment required to deliver mobile learning infrastructure and services is substantial and multi-layered, the following section introduces three brief case studies to illuminate some of the main initiatives and challenges that characterise current mobile learning policy in New Zealand.

Case studies

These case studies have been chosen to illustrate various aspects of the stakeholder landscape. Previously in this article, the direct influence of top down policymakers has been outlined. Our case studies therefore focus on policy influencers and bottom up policymakers.
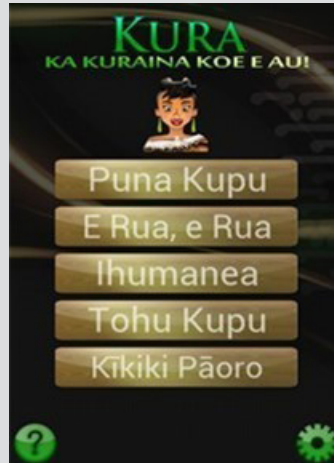
The first case study (Box 8.1) looks at mobile learning apps for the Māori language and culture. It provides an example of policy influencers, more

specifically researchers and software developers,
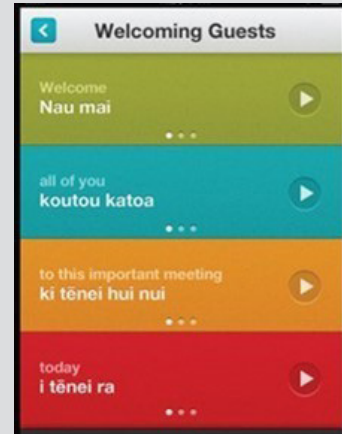working in conjunction with the Māori community.

Box 8.1: Mobile learning apps for the Māori language and culture
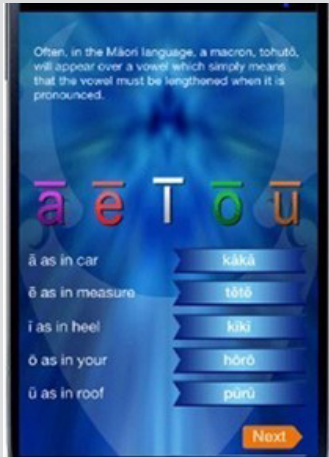
| Te Pūmanawa | Kura | Hika Explorer |

Photo credits: Te Pūmanawa (image courtesy Maori Multimedia Ltd), Kura (image courtesy Te Kura Māori), Hika Explorer (image courtesy Hika Group)

An indigenous language is not just a language but also an important part of an overall culture. As the King of Samoa stated in 2013, if the uniqueness of the Samoan language is lost, "we should be strangers, culturally and spiritually, in our own land. If we lose our language, we lose the meaning of why we are here today."[a] Unlike Samoans, Māori do not have independent nationhood, so perhaps sustaining an independent language is even more essential to cultural identity. The Māori language (Te Reo Māori) is currently spoken (not necessarily fluently) by around 30 000 - 50 000 people, down from 50 000 - 80 000 in 2006. With this rate of decline there is a danger that the Māori language could be extinct in two generations. Sustaining a language requires that language to be embedded in the present, not just the past, and technology can play an important role in this.

There are a number of Māori language apps available on mobile app stores. Perhaps the most significant of these are Te Pūmanawa, Kura, and Hika Explorer. All of these apps have had researcher input to their content. The Te Pūmanawa mobile learning app for the Māori language and culture was the first mobile app to provide a complete mobile learning course in Te Reo Māori. It is certainly more extensive than any previous mobile learning app for the Māori language, with nine interactive modules, voice recognition functionality and more than 100 educational games and quizzes and assessments. It can lead to a certificate approved by the New Zealand Qualifications Authority. The Kura app focuses on game based learning, and supports both single player and multi-player modes. Hika Explorer has been supported by Vodafone, who offered free downloads of the 'Lite' version of the app during Māori Language Week in 2012, and aims to provide a fresh approach to learning by using modern technologies, audio, visual and kinaesthetic functions. Such innovations may help to support the survival and dissemination of the Māori language through informal mobile learning.

Note: [a] Ah Mu, A. (2013). Head of State takes battle for language eastward. *Talamua Media*. Available at: www.talamua.com/11925/ Accessed 23 Nov. 2016.

The second case study (Box 8.2) looks at Orewa College, a school in a relatively affluent socio economic area that was a pioneer of the Bring Your Own Device (BYOD) approach to mobile learning. This example helps to illuminate the nature of policy that is developed in a bottom up manner from school leadership teams.

Box 8.2: Orewa College – school driven policy

Orewa College is a decile 9 school north of Auckland. It was the first state school in New Zealand to launch a Bring Your Own Device (BYOD) teaching and learning strategy based on recommending a specific tablet device (the iPad 2). Previous 1 to 1 device initiatives in New Zealand had involved devices supplied by the school, or BYOD laptop or netbook schemes, mostly (but not exclusively) pioneered in private schools. The choice of the iPad was significant for a number of reasons, but particularly so from a mobile learning perspective. The use of tablet computers rather than laptops or netbooks has enabled learning to become mobile both inside and outside the classroom. As one example, students in PE classes now take their tablets outside and use them to video sports activities for later analysis.

Initially, year 9 students (aged 13-14) were expected to bring their own 1 to 1 digital learning device into the classroom for the 2012 academic year. Following this pilot year, the initiative has now expanded across the school. The school's influence on policy has been significant, as they have disseminated their message and experiences through a series of conferences held at the school for teachers and other stakeholders.

Policy questions raised by the BYOD scheme at Orewa College include the ethical and social impact of mandating that pupils must bring their own 1 to 1 digital device to school for learning. Another potential issue is that other schools may be tempted to follow their lead without going through the long term planning and local negotiation processes that were put in place before the first pilot was launched.

Orewa College students use iPads to record and analyse activities in physical education classes

Photo credits: Image courtesy Orewa College

The third case study (Box 8.3) looks at the Manaiakalani Trust, a community based initiative that has attracted high profile philanthropic support.

One of the policy problems faced by the trust is that its intention to pioneer a community based approach that could be copied and implemented elsewhere has been a victim of its own success. Its high media profile and success in improving outcomes for disadvantaged students has attracted philanthropic support that could not be replicated across other similar initiatives. It also faces issues in that some of its projects are funded as short-term ventures that may be unsustainable if further funding is not forthcoming.

Policy challenges

Mobile learning policy faces many challenges in the context of multiple stakeholder influences and a rapidly changing technological, economic and social global environment. It has to be formulated and enacted in an education system that is constantly changing, with new forms of learning and assessment developing rapidly. Policymakers must address the future needs of economies that are hard to predict so that worthwhile employment opportunities can be offered to future school leavers. This at a time when most developed countries face a shortage of skilled workers in high-technology industries, while often also suffering chronic youth unemployment. Challenges to those who have to create and deliver policy include how to get adequate levels of participation from the wider community, including minority cultures, and tailoring the detail of policy so that it provides concrete tools for action without being too prescriptive or restrictive. Underlying all these concerns is the multi-faceted and long-term nature of attempting to create social equity, particularly in the context of disadvantaged indigenous peoples.

Policy questions

Given the policy challenges outlined in the previous section, a number of important questions need to be asked by policymakers of all types.

Issues of personal choice often come to the fore in policy debates. To what extent should policy drive people towards ICT usage, or give them the option? Currently, the use of mobile learning in schools is supported, rather than mandated, by national policy, but is either mandated or prohibited by local policy. Some schools have moved towards a compulsory mobile learning policy, whether BYOD, by some kind of lease arrangement, or supplied by the school. Other schools have banned any kind of mobile devices from the classroom. In theory, parents and students have a choice about whether they choose to participate in mobile learning, by selecting which school children will attend. In practice, of course, choice of school is strictly limited by physical location and competition for places.

An associated question is to what extent central policy should drive local procurement and practice. Central procurement is often seen as a major benefit of national policy, since this is generally expected to reduce costs (along with streamlining of administration, this is projected to recoup half the cost of bringing fibre to the school gate) but it also reduces choice. An additional risk is that intervention strategies can lead to failure of competition where a single supplier achieves or retains a monopoly.

A particularly difficult challenge is the degree to which policy can embrace both today's questions and tomorrow's. A solution designed to address current problems may lock us into approaches that are inflexible to future needs. However, there is little value in attempting to address the perceived needs of the future while ignoring pressing issues of the present. The question of teaching digital skills relevant to the current ICT employment market is one of these dilemmas, which leads us on to the issue of the creation of ICT artefacts.

From the perspective of industry stakeholders, a critical issue is to what extent people are educated to be able to create ICT artefacts using the same tools that are used by the professional community, to prepare them for the workplace. This addresses a number of aspects of digital teaching and learning. One is the question of how creative modern digital tools actually are, and whether they are really devices for consumption rather than creation. Even where tools are

designed for the creation of software artefacts, those that are increasingly used in schools tend towards the drag and drop approach that often obscures a real understanding of the processes of software development. An example from the mobile learning space is the use of Hopscotch for developing mobile software on iPads. School students can learn to develop mobile software using a mobile platform, but it is unclear to what extent such skills are transferable to other types of IT knowledge. This is particularly important in a context where the routine tasks of software development are often outsourced, and higher-level design, architecture and strategy skills are required by employers. Another issue that arises is whether the software tools that students experience in their formal education prepare them adequately for the software tools used by industry, particularly an issue if students only use mobile devices.

In any innovative approach to digital teaching and learning there is a potential tension between moving ahead with pioneering projects and the maintenance or enhancement of equity. How is it possible to ensure that 'all boats rise on the same tide' while not being held back by the valid needs or attitudes of minorities. There seem to be two aspects to this issue. First, before a new innovation is launched there needs to be extensive dissemination and discussion of information in order to ensure the maximum possible buy-in, while implementation strategies must also ensure that mechanisms are in place to bring all stakeholders along with the main tide. As some of the examples highlighted in this article indicate, this includes supporting minority indigenous cultures as well as providing disadvantaged social groups with the ability to engage in informal learning by building community infrastructure that can support mobile learning.

A question that should be asked when looking to the future is whether concepts such as ICT, mobile devices or 21st century skills are still relevant to debates about future education policy. Our thinking about the future of education is based around some concepts that have common currency, having been well established over the last 20 years or so. The debate about whether the concept of the digital native is real or imaginary has already led to some critical commentary on how today's young people learn. However, there are other commonly used terms that have

so far endured less scrutiny, but may be equally unhelpful. Defining a 21st century skill is largely meaningless, in the same way that defining a 20th century skill would also be meaningless. The concept of ICT is too broad and embedded in the infrastructure of society to mean very much as a distinct entity, and mobile devices are only ephemeral artefacts. Perhaps if there are underlying changes in the needs of education, they are to some extent represented in 21st century views of high level learning objectives where, at the risk of over-simplification, synthesis becomes creation. Although the emphasis on creativity should not make us think that the other types of learning are less important, it is also true that modern digital tools enable them to be more easily delivered direct from source to learner, without necessarily requiring the mediation of a teacher.

Policy recommendations

The policy background and case studies outlined in this article support certain recommendations for mobile learning policymakers, based on a range of evidential sources. The following list provides a brief summary of policy recommendations that are drawn from the literature and case studies reported in this article.

- Policy must take proper account of return on investment. Not just in hard currency terms (profits and savings) but in long-term economic and social benefits that may be hard to predict but are nevertheless demonstrable.

- Policy must be flexible enough to ensure that grassroots approaches are not stifled or derailed by centralised assumptions. Often it is the local community that is the best driver of educational policy.

- Policy must take account of all stakeholders, including employers, though this does not mean taking a short term of view of skill requirements and human potential.

- Policy must be careful to ensure that arguments around personal choice are heard and catered for where possible.

- Policy must be adaptive to concepts of equity; there are many types of digital, social and educational divide. Issues of gender, relative

poverty and minority/indigenous culture all have to be accounted for.

- Policy must balance both short-term and long-term goals.

Conclusion

The main message of this article is that mobile learning policy is dependent on a complex interaction of stakeholders in its formulation and implementation. It requires a major commitment on the part of national government to provide infrastructure and services, but the process cannot only be one of top-down policy. Bottom-up policy

is equally important as it allows communities, cultures and regions to adapt to their specific needs. These may be driven by local industry, socio-economic profile, indigenous language, demographics, or a range of other factors.

The case studies in this article may be drawn from one national context but their lessons can be translated to other countries and regions. They demonstrate the importance of diversity of approach and commitment to develop mobile learning at all levels of society, from national government, to local community, to individual school and individual person, whether millionaire philanthropist, teacher, student or parent.

Endnotes

1   UNESCO. (2013). *Policy guidelines for mobile learning*. Available at: http://unesdoc.unesco.org/images/0021/002196/219641e.pdf Accessed 23 Nov. 2016.

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Challenges and policy options

By John Traxler

The progress and the challenges

It has been noted how lifelong learning plays a powerful role in enabling individuals and nations to reach their full potential. Without widening and deepening access to lifelong learning it will be increasingly hard to meet the challenges of the Education for All goals and adapt our economies and lifestyles to take account of climate change. The article will discuss the recommendations at the end of each of the earlier articles and articulate the reservations and limitations that come along with such recommendations. It is often tempting to make recommendations for *low-hanging-fruit*, for *quick-easy-wins.* This too is understandable since these create early credibility and momentum, and a straightforward account of cause-and-effect, but they should be integrated within a wider, more coherent and consistent framework and direction. This is not straightforward. Our incomplete examples, experiences and evidence will always support a variety of different interpretations and apparently plausible explanations that persuade us to construct the rationale and the narrative and discard the anecdote and the accidental.

A publication in 2005 from the Commonwealth of Learning, *Mobile Learning in Developing Countries*[1], sketched many of the possibilities and challenges, saying

> *"Mobile learning, or m-learning, is a personal, unobtrusive, spontaneous, "anytime, anywhere" way to learn and to access educational tools and material that enlarges access to education for all. It reinforces learners' sense of ownership of the learning experience, offering them flexibility in how, when and where they learn. In developing countries, mobile technologies potentially deliver education without dependence on an extensive traditional communications*
>
> *infrastructure, leap-frogging some of the intervening development phases encountered in developed countries such as installing extensive electricity power grids, and building multiple computer rooms in educational institutions."*

The subsequent decade has not seen the progress that this publication suggested was so obvious and attractive. It has seen a wealth of pilots and projects but these may not have produced the evidence base that would change commercial or ministerial policy. A more recent paper[2] looking at this lack of progress, asked,

- What do examples of small-scale successes tell us about large-scale programmes?

- How relevant, trustworthy and credible are the inferences and outcomes of earlier examples?

- How do earlier subsidised examples with provided devices inform future sustainable programmes with users' devices?

- How does funding and policy skew the choosing, siting, sampling, evaluation and reporting of examples?

- What is the impact of project evidence and outputs from earlier examples on corporate and government policy, priorities and resources?

These questions hint at the problem of realising the potential of mobile learning and help to explain the lack of progress. The earlier policy recommendations and documents now clearly promote and endorse the idea of learning with mobiles; so, what are the remaining barriers? What more is needed? What is the policy recommendation that would unlock all the other recommendations?

Evaluating the evidence

The researchers and the activists might feel that real progress and impact will only happen if the mobile learning community can produce the right kind of evidence and arguments, presented in the right way, to convince corporates to invest in creating viable commercial models and to convince governments to change policy priorities and reallocate public funds. The recommendation would be for better evidence and this better evidence must come from evaluation. Evaluation is however always problematic, in terms of its execution and its relevance. It is tempting to assume that evidence and evaluation from the past and evidence and evaluation from elsewhere will be sufficient to inform the here-and-now and will inform priorities and resource allocations, that small-scale fixed-term subsidised projects run by enthusiasts in one context can inform national programmes in a different context, that delegates and readers take away no more than plenary panels and case studies can actually substantiate. However, there are limitations to our accounts and analyses. These limitations are varied, complex, often obvious and usually over-looked or ignored. Our recommendation is thus not for more evidence and more evaluation but for more scrutiny and more scepticism, perhaps a practical level for improving the communication between practitioners, researchers and policy-makers so that they better understand each other's needs, processes, languages and roles.

One of the obvious limitations of our accounts and analyses is the consequence of the rapidity of demographic and social change as people adopt and adapt each new technical development; whilst technical predictions may be linear and rational, social changes are not. In addition, these changes take place with increasing rapidity and with increasing complexity, synergy and interaction, making the lessons from history, even very recent history, of little value as guides to the future. Were it not both time-consuming and expensive, there would be a strong case for a *systematic review* of the scientific literature of mobile learning, a review that would make explicit what had been searched, using which search terms and for how far back in time. Sadly the field is developing too fast for this process to give a valid snapshot and to get a balanced judgement, so expertise and experience will inform future policy and practice.

There are some reservations about the scientific and academic press in which career academics describe and evaluate their own projects and review those of their peers. Even academic research budgets seldom allow for external evaluation, sophisticated data gathering and analysis, the qualitative methods that would help understand motivation as well as behaviour, and for the novelty of being observed using new technologies to wear off.

Much of this research literature of mobile learning comes from English-speaking communities and comes from a handful of *hot spots* and *patron saints*, often and originally South Africa and UK, broadening out to Western Europe, parts of Asia Pacific and latterly to USA; much can be attributed to dedicated individuals rather than universities or companies. The breadth and diversity of our experience is considerably narrower than we think.

Digesting, comprehending and synthesising complex, incomplete and heterogeneous information and accounts from research journals is not easy. Consequently there is always an audience and an appetite for simpler explanations and more generalised findings. Less demanding resources, such as project reports, vendors' white papers and ministry bulletins, come with different problems, those of partiality and more obvious vested interests. In both cases however, endemic challenges for the reader include understanding the siting and sampling of interventions, trusting the confidence and reliability in reported results and distilling causes from anecdotes.

Furthermore, only recently and still infrequently has failure been seen as the mark of persistence and innovation - the FAILfaires organised by MobileActive have been ground-breaking in challenging the prevailing success-driven mind-set. Generally it has been success that has been noticed and emulated and consequently most accounts of mobile learning discuss its successes not its failures. Our capacity to learn from experience is reduced when half of our experiences are invisible.

Seeing the prestige, publicity, resources and momentum invested in some projects at their launch creates a concern that they are *doomed to succeed*.

The team responsible for this publication is very aware how individual perspectives shape individual contributions. The development of mobile learning has been uneven and opportunistic, and activists have responded to local needs and local conditions rather than manifesting any specific bias. This has resulted in an uneven and haphazard spread of expertise and experience. The issues of transferability and relevance are the critical issues here. Every account will be incomplete and lack the full facts on which to make the judgments necessary to decide about transferring ideas, technologies and techniques from one time, place and culture to another. Simplistic assumptions should be avoided and the net should be cast wide when looking at useful work with disadvantaged people and communities from wherever it happens. The current publication contains case studies and gives space to some projects that have not received their share of exposure. Contributors talk about failure as well as success and focus on critical incidents and counter-intuitive outcomes. The point of this is not to weaken the publication by complicating its message but to draw attention to the on-going need for rich, honest and varied accounts and rigorous analysis of data, methods and findings.

Reading recommendations

Life-long learning is growing in importance and as is the potential for mobile technology support and delivery. Earlier articles have documented different aspects of this work and have made recommendations designed to take this forward. This article attempts to draw these earlier recommendations together into over-arching recommendations that are meaningful, robust and realistic but also sustainable and transferable.

The recommendations in this publication, and others, are phrased in terms of 'should' (for example, 'the government should do something'), but why not ask 'why should?' (for example, 'why should the government do something?'). One response would be 'evidence', the response that the evidence supports these and other recommendations. The evidence, once examined critically, might indeed support such recommendations but there is an alternative, comprehensive and more resilient argument. Using mobile technologies to support skills development

and lifelong learning is a reflection of the changing and more mobile and connected nature of our societies, communities and businesses. The mobile learning space is only a corner of the wider mobile space; mobile activity represents vast amounts of assets, commodities, resources and transactions at a community, informal and personal level, at an organisational, institutional and corporate level, and at a national and supra-national level. Mobile technologies are sweeping away the wristwatch, the analogue camera, the postcard, the diary, the calculator and the CD. Banking, music, journalism and politics are mobile and because of this they reach more people. Other areas of human activity will follow. The Capability Approach and the lives that people could live that would value must now be seen in the context of a mobile and connected world. The argument for using mobile technology to support skills development and lifelong learning is that this is the best, the most appropriate way to enhance their choices in this mobile and connected world. When the 'why should?' question is asked (for example, 'why should the government do something?'), the answer is not that the evidence is compelling but that the morality is, and this publication unpacks the nature of responsibilities and opportunities in a changing world.

It is a mobile, connected and rapidly changing world. Certainly, livelihoods and business are increasingly mobile, connected and rapidly changing, and for communities, cultures and countries to survive and compete then education must be mobile, connected, flexible and responsive, and it must be life-long. In very general terms, it is the responsibility of governments and ministries to reflect and represent their societies, in terms of national expectations about the use of technology and in terms of the mission to build national capacity. This means economic capacity, by attracting inward investment and by nurturing home-grown entrepreneurs and micro-businesses, by increasing and extending connection with the global information superhighway and knowledge economy, and by extending national educational opportunities. It also means the underlying cultural, social and personal resilience, adaptability and capability, especially as the pace of technical change and social adaptation means that governments and societies must be ready for continuing and increasing change in ways that will be difficult to predict or control.

Many of the team's recommendations show a concern for equity and fairness, that voluntary civil society organisations, rural areas, indigenous peoples, poor and marginalized communities, people with disabilities, do not get overlooked, disempowered or ignored by universal mobile technologies, that the skills development and the lifelong learning not only reach them but recognise and involve them. Alongside these recommendations are others that remind us that mobile technologies will not remove digital divides but will in fact complicate and reconfigure them, and other recommendations that recognise that mobile technologies are often ethically problematic. So whilst the team completely endorses the potential of mobile technologies for enhancing, supporting and delivering skills development and lifelong learning, the team also recommends vigilance and caution.

There are also recommendations from the team that encourage educators, managers and officials to recognise that the mobile technologies are changing the world in fundamental ways, ones that require flexibility and imagination, and the courage to work outside the old norms, procedures and practices. Other recommendations ask us to think about the totality of mobile lifelong learning and mobile skills development, to think of tariffs, bandwidth, pollution, electricity supply, participative design and sustainability alongside technology and pedagogy.

Given that resources are always finite, the obvious priorities for national policy makers, institutional programme managers and the donor community should be:

- local language / indigenous culture / nomadic peoples;

- women and girls, especially mothers;

- rural learners / agricultural workers;

- unemployed youth;

- refugees and displaced persons;

- the older or disabled learner;

- the micro business person, the start-up entrepreneur;

- the social enterprise activist.

These are not only groups with most need but also are generally groups with the biggest potential for impact and improvement, both socially and economically.

Perhaps the final recommendation to corporates, agencies, institutions and ministries is that they look out of the window, look into the street and think about their roles and responsibilities in the changing world.

Top priority recommendations

Vision and policy

Policies for adoption of mobile learning should be underpinned by a vision shared between stakeholders (government, employers, learners, communities, network providers, education and training advisors, NGOs) of the ways in which mobile technology can widen access to learning, deepen and enrich learning experiences and place more control in the hands of learners.

Policies for implementation of mobile learning should take account of all key stakeholders, such as community representatives, government, network providers, formal and non-formal education and training providers.

Policies for implementation of mobile learning should identify bold but achievable targets for educational attainment and for inclusion of groups with least access to education and training. Special account should be taken of the power of mobile learning to widen access to learning for women, ethnic minorities, migrants, refugees, rural communities and people with disabilities.

Strategy for implementation and evaluation

A mobile learning policy should be backed up with an implementation strategy that includes measures of return on investment in financial terms but equally recognises social and health benefits.

Strategies for implementation should include robust evaluation processes to inform future plans.

These should enable the reporting of failure as well as success, and the understanding of culture.

Strategies for implementation should take account of resource implications such as connectivity costs, bandwidth limitations, technical support and ensure safe access to electric current in 'off-grid' areas.

Strategies should deploy technical solutions to ensure privacy of personal data and to protect vulnerable learners from inappropriate content and intrusion, but also incorporate online safety into training programmes.

Role of network operators

Network providers (MNOs) should adopt a shared values approach and seek to balance business benefit with their corporate social responsibility and develop pricing policies and network infrastructure that will widen and deepen access to learning.

Role of training and education providers

Training should be provided for educators in the formal and non-formal sectors. This should include selection and creation of content that reflects local contexts, workforce needs and uses local languages where appropriate.

Educators and trainers should consider employing the full range of applications of mobile learning including participative design, learner collaboration and user-generated content.

Environment

As mobile devices contain toxic materials, planning should include collection and safe disposal when devices become redundant.

Endnotes

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About the Contributors

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Educational aspects of mobile impact, uptake and usage

Mar Camacho is a Doctor in Educational Technology, Lecturer and researcher at the Department of Pedagogy of the School of Education at *Universitat Rovira i Virgili* (Catalonia, Spain). Author of several publications about the use of ICT in teaching and learning processes, her latest research streamlines have been the use of Web 2.0 tools and resources and the use and implementation of mobile learning and emerging technologies as tools that help to transform, enrich and extend the learning experience. She is a co-author of the first monograph on mobile learning in Spain, Portugal and Latin America, published in 2011.

During recent years she has been working on research projects concerning educational methodologies and mobile learning and the design and development of teacher capacitation programs for international educational institutions. At the same time, in the last years she has actively participated in international seminars, round tables and conferences such as Online Educa Berlin, EDUTEC, IADIS Mobile Conference, EDEN, ECER, PLE Conference, e-Challenges, Ed-Media and DisCo Conference. From April 2013 to October 2013 she has worked at UNESCO'S Paris headquarters in the Division for Teacher Development & Higher Education (ED/THE) Education Sector, as invited Visiting Scholar, collaborating with the Mobile Learning Team. Her current research topics include mobile learning and teacher capacitation, mobile learning design, methodology and content creation.

Alastair Clark
Lifelong learning

Alastair Clark has a career history in lifelong learning where he has worked in informal, non-formal and formal learning programmes. He held national leadership roles in the UK at Becta (government lead agency for technology in learning) and the National Institute of Adult Continuing Education (NIACE) where he is now a Senior Research Fellow. He is also a trustee of the Association for Learning Technology and director of Stirring Learning Ltd. His post-graduate research explored the learning experiences of adults following vocational courses in UK and France. He has subsequently specialised in the use of technology to enhance learning opportunities for adults. For this work his team was awarded the UNESCO ICT in Education award in 2010. His training programmes include the use of handheld mobile technology for formative assessment and for learners to create their own content. He has delivered keynote speeches in English to conferences in UK, Germany, Russia, Qatar and Korea and in French to conferences in France and Switzerland.

Helen Crompton
The global mobile learning story so far

Helen Crompton (PhD) is an Assistant Professor of Instructional Technology at Old Dominion University, Virginia. She gained her PhD in educational technology and mathematics education from the University of North Carolina at Chapel Hill. Crompton's research focus is on mobile learning and a particular interest is in a sub category of mobile learning called context-aware ubiquitous learning. This research often connects with the teaching and learning of mathematics in the elementary and middle grades. During the time she spent at UNC-Chapel Hill, Crompton was awarded the National McKeachie award for improving university teaching. Helen Crompton draws from 20 years of experience as a classroom teacher, working with students K-10 in England, her home country, and the United States. While working as a full time classroom teacher, she has worked as an Information, Communications, Technology (ICT) Coordinator, and is also a faculty member for the International Society for Technology in Education (ISTE), teaching the ISTE Standards leadership academy, consulting, and recently designing ISTE self–paced Mobile Learning Academy, and the Verizon Mobile Learning Academy. She holds various awards in the United States and

England, for her service to the field of educational technology and the innovative ways she has extended the boundaries of traditional pedagogies with the effective integration of technology. These awards include two awards from the British Educational Communications Agency (BECTA), the NAACE MARK and the National ICT Mark as well as the 2012, 2013, and 2014 Presidents Volunteer Service award for her work in mobile learning.

Dorothy Fahlman
Mobiles in the workplace

Dorothy (Willy) Fahlman (EdD) earned her Doctor of Education in Distance Education from Athabasca University, Canada. Her doctoral research investigated informal learning using mobile devices in the healthcare workplace. Willy is an experienced online practitioner and researcher in the field of distance education, plus a registered nurse. She facilitates distance learning in the Centre for Nursing and Health Studies at Athabasca University, and also blended learning as an eHealth Educator at Alberta Health Services in Alberta, Canada. Willy has published scholarly articles and presented at international conferences pertaining to mobile and informal learning in the workplace, e-learning leadership, and distance learning. Her current research interests include work-based mobile learning, informal learning, mobile learning, nursing, informatics, and e-learning.

David Hildebrandt
The basic platform

David Hildebrandt is an adjunct professor in the School of Education at Northcentral University, Arizona, USA where he teaches classes in adult learning strategies, technology futures, mobile devices for teaching and learning, and global training and development. David has spent over 20-years developing global training programs for Fortune 200 companies. He has implemented online learning programs as well as corporate universities for his employers and clients. After a career in high technology he returned to school to earn his PhD in management from Walden University. David earned his MAED in instructional technology from San Jose State University. His academic research is on the use of mobile devices to increase engagement in adult learners and methods and tools to improve online learners' sense of belonging leading to improved retention of online learners.

Agnieszka Palalas
Community and informal learning, and skills development

Agnieszka Palalas (EdD) is an experienced educator and researcher of technology-assisted learning and teaching with focus on mobile learning. She holds a Doctor of Education degree from Athabasca University. Agnieszka (Aga) has been teaching graduate courses in the area of mobile learning and instructional design at the University of New Mexico and Athabasca University. She has shared her expertise in mobile learning through a variety of teaching, research and consulting activities both locally in Canada and across the globe. Her most recent cross-cultural assignments include a mobile learning collaboration project between Ghana, Canada, and the USA as well as a Mobile Learning MOOC (Mobiles for Development-M4D) offered by the Indian Institute of Technology Kanpur and the Commonwealth of Learning. Agnieszka has also published a number of articles and book articles pertaining to mobile, online, and blended learning. She has been active in international mobile and blended learning associations and is a regular presenter at local and international conferences. Her current research interests include the pedagogy of mobile learning, formal and informal learning, Mobile-Assisted Language Learning, mobile learning design principles, and mobile learning for diverse educational and cultural contexts.

David Parsons
Stakeholder, corporate and policy perspectives

David Parsons is Associate Professor of Information Technology at Massey University, Auckland, New Zealand. He holds a PhD in Information Technology and a Master's degree in Computer Science, and

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John Traxler
Introduction
Challenges and policy options

John Traxler is Professor of Mobile Learning, the world's first and a full UK professor, at the University of Wolverhampton. He is a Founding Director and current Vice-President of the International Association for Mobile Learning and Executive Committee Member of the USAID mEducation Alliance, as well as Associate Editor of the *International Journal of Mobile and Blended Learning* and of *Interactive Learning Environments*. He is on the Editorial Advisory Board of *Progressio, South African Journal for Open and Distance Learning Practice*, of *Research in Learning Technology* and of *IT in International Development*.

John Traxler has co-written a guide to mobile learning in developing countries for the Commonwealth of Learning and is co-editor of the definitive book, *Mobile Learning: A Handbook for Educators and Trainers*, with Professor Agnes Kukulska-Hulme. They are completing a second book, *Mobile Learning: the Next Generation*, due 2015. He is co-authoring books, *Mobilizing Mathematics: Case Studies of Mobile Learning being used in Mathematics Education* and *Mobile Learning* and *STEM: Case Studies in Practice,* with Dr Helen Crompton.

Ronda Zelezny-Green
Lifelong mobile learning for skills development in low- and middle-income contexts

Ronda Zelezny-Green is a mobile technologist, language educator, teacher trainer, consultant, researcher and learner who has lived and taught on four continents and visited more than 40 countries. She is a PhD student in Information and Communication Technology for Development (ICT4D) at Royal Holloway, University of London, and the UNESCO Chair in ICT for Development. She is an expert in gender, learning and mobiles, and advocates participatory and sustainable approaches to the use of mobiles for educational purposes.

Ronda has completed a Master of Science in Practising Sustainable Development with ICT4D specialism, a Master of Arts in Applied Linguistics with a foreign language pedagogy concentration, as well as a graduate certificate in Instructional Design with a focus on mobile learning. During her studies, she has specialized in the use of technology for educational and development purposes.

Ms Zelezny-Green has published and presented on topics related to mobiles for development (M4D), most recently an article in Gender & Development on the links between girls, mobile learning and school attendance in Kenya. Previous M4D reports authored by Ronda have received media recognition from the GSMA, Alcatel-Lucent, Nokia, and infoDev (World Bank). At present she works as the Ecosystems Manager (mLearning) on the Connected Living Programme and as the Strategic Partnerships Manager for the Mobile for Development Economic Inclusion team at the GSMA. Ronda enjoys reading, traveling and volunteering.