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MOBILE LEARNING FOR TEACHERS
IN ASIA

> Exploring the Potential of Mobile
Technologies to Support Teachers
and Improve Practice

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ABSTRACT

This paper is a descriptive review of recent and ongoing mobile learning initiatives to support teaching and learning in Asia. The review focuses in particular on the use of mobile phones – either alone or in combination with other technologies – to increase access to educational opportunities and resources, provide direct instruction in formal and informal educational settings, enhance teachers' competency and professional development, and enrich educational quality for all students. The paper was originally planned to focus exclusively on teacher support and professional development delivered through mobile learning; however, programmes and relevant literature in this area are extremely limited. Teacher development in the projects identified takes the following forms: the mobile learning package as a teaching tool, teacher training on how to use mobile learning tools, and the use of mobile phones for administrative communication and student support services. Beyond the scope of these activities, there is currently little to no information available on the use of mobile devices for teachers' professional development in Asia.

The mobile learning initiatives included in this review target primary- and secondary-school education, higher education, and informal education aimed at disadvantaged groups. Findings indicate that some educators in Asia now consider mobile learning a viable strategy in achieving the Education for All (EFA) goal of universalizing literacy by 2015. Countries like Bangladesh and Pakistan, which have large populations of illiterate people, are actively employing mobile learning strategies for basic education and literacy development.

Notable success factors for the mobile learning initiatives presented in this review include the affordability and user-friendliness of mobile devices, creative uses of mobile phones for learning, the readiness of the education sector to adopt mobile learning strategies, and advocacy and social mobilization (ASM) schemes that have resulted in community ownership of the projects. Emerging project drivers are enthusiastic individuals and their supporting institutions or non-government organizations (NGOs) who leverage mobile technologies for educational purposes. Both individual and institutional drive and support are needed to make mobile learning projects successful. The challenges involved in implementing mobile learning projects are primarily technical and logistical. Technological issues include weak mobile phone signals and the delimiting nature of mobile communication, particularly Short Message Service (SMS) character limitations. Logistical challenges include overcoming difficulties during the start-up phase, especially in orienting the community on the nature and scope of the project, and ensuring the security of project equipment.

To inform future mobile learning initiatives, this paper identifies the primary strengths of the projects discussed. These include: a project framework that is mindful of the culture, context and condition of the learners; clearly-defined performance indicators; multisector engagement and partnerships; a mobile learning curriculum with an instructional design based on rigorous curriculum mapping; built-in teacher training and educator incentives; appropriate technology architecture that is responsive to the needs of the learners; a robust monitoring and evaluation (M&E) system that provides timely feedback on project progress and impact; and strong community ownership with broad-based private, public and civil society support.

BACKGROUND

The 2000s saw the unprecedented growth of mobile telephony around the world in both developed and developing countries. There are now 5.9 billion mobile phone subscriptions worldwide, which represents a penetration rate of 87%. In the developing world the mobile penetration rate is 79%, nearly as high as the global average (ITU, 2011*b*). Mobile phone ownership is increasing exponentially in developing countries, even among poorer communities, where people often spend a substantial portion of their income on mobile phones and accompanying service charges. In India and Sri-Lanka, for instance, expenditures for mobile subscriptions represent between 4% and 8% of the average monthly income. These statistics show that mobile phones are becoming increasingly accessible to lower-income populations (Rashid and Elder, 2009). This does not necessarily mean that mobile phones are easily affordable for all members of society, but rather that people are increasingly willing to give up other resources to be able to own and use mobile phones. In Asia, the immense popularity of mobile phones, especially among low-income groups, has encouraged proponents of development programmes to explore the potential of mobile learning to deliver key educational services to people outside the reach of traditional school systems.

This paper aims to describe the present state of mobile learning in Asia; to identify the most significant mobile learning initiatives that support teaching and learning; and to discuss the potential role of mobile learning in addressing the educational needs of underserved populations. The projects surveyed in this review all use mobile phones, either alone or in combination with other technologies, to provide or supplement instruction and support teachers and learners in both formal and informal educational settings. The paper also provides a comparative analysis of the identified mobile learning initiatives, with particular attention to their strengths, weaknesses and implications for future projects. To ensure the relevance of the strategies described, only current, ongoing projects or recent projects that ended after 2009 were included in this review.

For the purposes of this paper, mobile learning refers to the use of mobile phones to access learning resources and materials, and to serve as a tool for teaching and teacher development. This definition also includes the use of mobile phones for administrative communication and student support services.

METHODOLOGY

Data for this paper were collected in late 2011 and early 2012. Initial internet-based research was conducted on mobile learning initiatives in Asia as well as other parts of the world in order to gain an understanding of the global 'lay of the land' for this emergent field in education. This research was followed by a more in-depth review of Asian mobile learning initiatives. Information on individual projects was gathered primarily through a review of the projects' literature, both in print and online, as well as the projects' learning materials, including printed, audio and video resources used by teachers and students. Additional data were collected through interviews and focus group discussions (FGDs) with project planners, implementers, beneficiaries, partners and other stakeholders, whenever possible. Only mobile learning initiatives with available project literature written in English were included in this review.

Projects were grouped according to the following categories: primary- and secondary-school programmes, informal education programmes, higher education programmes, programmes for administrative communication and student support services, and professional development programmes for teachers. Particular attention was paid to the following aspects of each project:

- Scope, setting and context, especially the educational needs the project aimed to address

- Target populations

- Organizational structure and implementation strategies

- Content areas and instructional design

- Technology platforms or content delivery strategies

- Advocacy and social mobilization strategies, and incentives for participants and other project stakeholders

- Evidence-based results and impact

After creating an inventory of projects, the mobile learning initiatives were compared and analysed to identify their strengths and weaknesses; key project enablers, drivers, barriers and success factors; and insights and lessons for future projects, with a focus on replicability, sustainability and scalability.

Information was validated whenever possible through a review of available project data. Further data validation was done by cross-checking information on the websites of project partners, such as organizations or institutions responsible for managing or providing funding to the project. In the case of the Text2Teach (T2T) project in the Philippines, researchers were able to conduct site visits, interviews and FGDs with project managers, field implementers and beneficiaries.

MOBILE LEARNING INITIATIVES

BRIEF OVERVIEW OF THE PROJECTS

This review identified the following mobile learning initiatives that support teaching and learning in Asia. A more detailed description of each of these projects can be found in the Appendices.

1. *Text2Teach (Philippines)*
    This project is part of the global mobile learning programme BridgeIT, which was founded in 2003 by Nokia, the International Youth Foundation (IYF), the Pearson Foundation and the United Nations Development Programme (UNDP). T2T makes use of mobile phones in combination with other technologies to bring educational videos and other learning materials to public primary schools in the Philippines (Ayala Foundation, 2011). For more information about this project, see Appendix A.

2. *SMS for Language Learning (Hong Kong)*
    This mobile learning programme is led by the Information Technology Services Centre (ITSC) of the Chinese University of Hong Kong (CUHK). Developed in 2006 and evaluated in 2009, the project makes use of the SMS feature on mobile phones to conduct follow-through activities in a language learning course. Participating teachers send questions about lessons to their students using SMS (Clarke et al., 2008). For more information about this project, see Appendix B.

3. *Literacy Promotion through Mobile Phones (Pakistan)*
    This post-literacy project, piloted in 2009 in Lahore, Pakistan, is an initiative led by UNESCO Islamabad, the Bunyad Foundation and the telecommunications company Mobilink. The project uses the SMS feature on mobile phones to deliver continuing educational content to young-adult learners who have finished face-to-face courses in literacy centres (Miyazawa, 2009). Teachers send messages and tests to students via SMS, and students practice their newly-acquired literacy skills by reading, copying and replying to messages using their mobile phones. For more information about this project, see Appendix C.

4. *Boat School (Bangladesh)*
    This project is led by Shidhulai Swanirvar Sangstha, a national research and development organization in Bangladesh. The project aims to bring educational access to some 87,000 families in marginalized waterside communities affected by seasonal flooding in Northern Bangladesh. The project deploys a fleet of 88 flat-bottomed boats that serve as mobile classrooms and resource centres for the communities. Each Boat School has a classroom for thirty to thirty-five students and contains resources such as an internet-connected computer, mobile phones and other learning materials (Rezwan, 2007). For more information about this project, see Appendix D.

5. ***Incentives to Improve Health Knowledge through Mobile Phones (Bangladesh)***
    This project makes use of mobile phones to deliver information about basic health and sanitation to people living in underserved communities in Bangladesh. The project was developed by the Bangladesh Rural Advancement Committee (BRAC), an international NGO; and Dimagi, a technology company that helps organizations deliver health care to urban and rural communities around the world. Mobile phones are used to deliver SMS and audio courses on health topics (Dimagi, 2012). Although it does not directly involve teachers, this project was included in the review because of its effective and innovative strategy for delivering content via mobile phones. The project's user-friendly technology platform, its use of incentives to encourage learner participation, and its wide reach make it an excellent model for other mobile learning programmes aimed at education and teacher development. For more information about this project, see Appendix E.

6. ***BBC Janala (Bangladesh)***
    Launched in 2009, this project is managed by the British Broadcasting Corporation (BBC) World Service Trust. BBC Janala is a multiplatform project that uses mobile phones, the internet and television (TV) to support English language learning in Bangladesh. It is funded by the United Kingdom's Department for International Development through English in Action, a major educational initiative aimed at improving the language skills of 25 million people in Bangladesh by 2017. The project technology is provided through a partnership between all six of the country's telecommunications operators: Banglalink, Citycell, Grameen, TeleTalk, Robi and Warid (GSMA, 2010). For more information about this project, see Appendix F.

7. ***University of the Philippines Open University (Philippines)***
    The University of the Philippines Open University (UPOU) uses mobile phones for instructional and administrative purposes. Its technology partner is a telecommunications company that provides the SMS platform and marketing support. UPOU's role is to develop the programme materials for SMS delivery. The UPOU mobile learning programme has SMS modules which form part of a multimedia self-directed learning package that includes printed materials as well as digital resources (Librero et al., 2007). For more information about this project, see Appendix G.

The following sections offer a comparative description of these seven initiatives in terms of the educational needs or problems the projects aim to address; the projects' target populations; educational content and instructional design; the technology platforms employed and the ways in which mobile phones are used; opportunities for teacher development; partnerships and ASM efforts; project results and impact; and the challenges and difficulties encountered by the project implementers or participants.

EDUCATIONAL NEEDS ADDRESSED

Each of the mobile learning initiatives identified by the study addresses a significant educational need or social problem. These include: the low quality of English, science and math education and high dropout rates in Philippine public schools; the need to learn social English in Hong Kong; high illiteracy rates in Pakistan and Bangladesh; limited access to education in underserved and marginalized waterside communities in Northern Bangladesh; major health issues in Bangladesh; and the need to develop more effective tools for university students engaged in distance learning in the Philippines.

TARGET POPULATIONS

The identified mobile learning initiatives target a wide range of learners, from young students to adult learners to teachers. T2T, SMS for Language Learning, and the UPOU project all target students and teachers in the formal school system: public-school students and their teachers in Grades 5 and 6 for T2T, university students at the CUHK in Hong Kong for SMS for Language Learning, and university students and teachers at UPOU in the Philippines. The mobile phone-enabled literacy programme in Pakistan is focused on adolescents, particularly girls, who have just completed formal classes in literacy centres, while the Boat School caters to both children and adult learners in marginalized areas of Northern Bangladesh. The mobile health education programme and BBC Janala both serve adult learners in Bangladesh. Most of the targeted learners belong to underprivileged and marginalized groups, with the exception of the university students at CUHK and UPOU.

While several of these mobile learning programmes have a built-in component for teacher development, this review did not find any projects targeted at teachers directly, with the exception of one experimental programme in Bangladesh supported by the Asian Development Bank. This experimental project was not included in this paper because it ended before 2009.

EDUCATIONAL CONTENT AND INSTRUCTIONAL DESIGN

The educational content and instructional design of the different mobile learning initiatives are based on the needs of the target learners. T2T's learning package consists of more than 400 short videos and teachers' guides in English, math and science, which are core subjects in Philippine schools and content areas where many students experience learning challenges. The majority of Philippine public schools have resource shortages, poor educational quality and high dropout rates. T2T aims to make these core subjects more interesting and meaningful to students, in order to improve student performance and reduce absenteeism and dropout rates. Because T2T is designed for classroom-based learning, the educational content is a key part of the curriculum, not just an enhancement or supplementary component.

The projects in Hong Kong and Pakistan, as well as BBC Janala in Bangladesh, aim to enhance literacy and language learning. The Hong Kong and Pakistani projects both follow up face-to-face instruction with SMS-based educational content designed to strengthen and sustain learning in social English and Urdu literacy, respectively.

In the Hong Kong project, students do not reply to SMS messages because they are not willing to shoulder the cost, so communication is one-way. In the Pakistani project, the learners are required to read and reply to the post-literacy materials sent via SMS. The BBC Janala project delivers actual courses in English language through mobile phones, the internet and television. The health education project in Bangladesh delivers health-related content through interactive audio courses accessed via mobile phones. Learners call a number to listen to the course modules and press numbers on their phone's keypad to answer questions. Each course conveys a few key points, such as the importance of clinician-assisted birth, proper hand-washing techniques, or information about HIV-prevention. Each lesson builds on prior lessons, with recurring characters and a developing storyline, and the project offers users incentives to continue the courses. Because the Boat School project caters to entire communities, the educational content varies: children are taught literacy skills and provided with basic education, while adults are offered advice related to agriculture and health. Since UPOU is trying to encourage students to engage in mobile learning, educational content is currently determined by popular interest value. Topics include English idioms and spelling, healthy lifestyle and nutrition, physical exercise, smoking cessation, and stress management. Content is delivered through both SMS and printed materials.

TECHNOLOGY PLATFORM AND USE OF MOBILE PHONES

In all of the identified mobile learning projects, the mobile phone is the preferred device for one or more of the following reasons: most teachers and learners already own mobile phones; mobile content ensures a wider reach compared to billboards and printed materials; content is easier to update compared to printed materials; most people already know how to use mobile phones, so very little training is needed; the mobile technology infrastructure in Asia is robust and can usually be accessed even in remote areas; and in addition to content delivery, mobile phones can also be used to support teacher-learner and learner-learner communication and collaboration.

The main feature of the T2T technology platform is the Nokia Education Delivery (NED) software loaded onto a high-end multimedia phone, usually a Nokia N95 or N86 smartphone, which use a Globe Telecom SIM card. The NED software enables the mobile phone to download, store and play five-minute videos designed for the project. The mobile phone is attached to a widescreen TV set for classroom viewing. NED is capable of organizing the videos into catalogues and includes search features, which make it easy and convenient for the teacher to navigate the video library. The software also keeps usage records of the videos for tracking and monitoring purposes (Ayala Foundation, 2011).

The SMS for Language Learning project in Hong Kong uses a web-based SMS gateway service that enables teachers to send SMS messages to single students or groups of students. The literacy project in Pakistan also makes use of a similar web-based system to send post-literacy

materials in the form of SMS messages to the participating learners. In the Boat School project, the mobile phone is a component of a whole classroom and resource centre inside the boat, including an internet-connected computer, compact discs (CDs) and other digital materials. Families living near the waterways use the mobile phones on the Boat Schools to make personal calls, send SMS messages, or seek advice from agriculture and health experts. The BRAC/Dimagi health knowledge project, BBC Janala and UPOU all depend on the mobile phones already owned by learners. Mobile phones are used by BRAC/Dimagi to store and access audio courses on health, by BBC Janala to deliver English lessons by voice and SMS, and by UPOU to send SMS messages to students of the Open University.

As demonstrated by the different projects' technology platforms, mobile phones can be used alone or in conjunction with other technologies. In some projects, such as T2T, the Pakistani literacy project, BBC Janala, UPOU, and the BRAC/Dimagi health education project, mobile phones are used to deliver educational content. In the other projects, mobile phones are not used for content delivery but rather as tools to facilitate communication and the exchange of information between teachers and learners.

In the case of UPOU, mobile phones are used for administrative communication and student support purposes. UPOU utilizes mobile phones to provide technical assistance to students enrolled in its college and graduate programmes, such as disseminating information about changes to class schedules, submission deadlines and test results. Teachers also use the mobile system to provide students with feedback about their academic progress. SMS messages are useful for conveying information on short notice, especially advice and suggestions. Most of the time, students in distance learning programmes are physically separated from their professors and teachers. SMS messages can allow students to receive immediate feedback from their teachers even when they do not have access to regular face-to-face instruction. The mobile phone may also help reduce dropout rates and absenteeism, as teachers can send private messages to students about absences without the risk of publicly embarrassing them. At-risk students can be provided with regular academic advice, and both high- and low-performing students can be sent quick notes praising and encouraging their performance, which may help build student motivation and engagement. The immediacy of these types of messages, delivered via SMS rather than email or paper letters, has been found to help encourage students to work harder (Librero et al., 2007).

All of the mobile learning projects identified make use of the SMS feature of mobile phones, while most use the voice feature as well. BRAC/Dimagi's health education project and BBC Janala both rely on the mobile phone's audio feature, which allows learners to access audio materials on various topics through their mobile phones. Only the T2T project takes advantage of the multimedia and audio-visual features of smartphones, probably because these types of phones are significantly more expensive than standard mobile phones that only offer SMS and voice calls. T2T uses the mobile phone's downloading and storage features, so the phone needs to be a high-end smartphone with a large memory capacity. Teachers also use the mobile phones' SMS feature, but only for accessing the Helpdesk and communicating with other teachers. The other projects mostly use the SMS, voice and audio features, so the handsets do not have to be high-end.

In all of the projects, with the exception of T2T, mobile phones are used by both teachers and learners. In the case of T2T, the mobile phone is used only by teachers. Because of this, the project is able to supply a mobile phone to each participating school. This strategy is more

realistic and cost-effective than projects that require each student to have a mobile device, as primary-school students in the Philippines do not usually have mobile phones, and the expense of supplying the devices would be prohibitive. University-based projects tend to rely on the mobile phones that students and teachers already own, rather than providing the devices. Other projects that target adult learners either use the mobile phones learners already own or provide the devices, depending on the learners' needs.

In terms of future plans, because T2T uses a high-end phone with multimedia capabilities, the T2T alliance is thinking of expanding the projects' mobile learning strategies to take advantage of the smartphones' additional features. One possibility is to utilize the mobile phone's camera and recording features to develop user-generated videos specific to the local community. The other possibility is to use the mobile phones to deliver learning materials designed for teachers' professional development.

TEACHER DEVELOPMENT

There are several teacher development programmes in Asia and the rest of the world that make use of information and communications technology (ICT). Notable examples include Intel Teach and Microsoft Partners in Learning, which mainly use computers and various software for professional development. However, this review was not able to identify any stand-alone teacher development programmes in Asia that use mobile technologies or mobile phones specifically. Several of the projects reviewed include a component of teacher training or development, but it is not the main focus of the project.

Teacher development in the identified mobile learning initiatives takes three forms. First, some projects have a built-in teacher training component 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. Second, many projects use mobile phones as a teaching tool, which can supplement or take the place of traditional instruction. Third, some projects use mobile phones to facilitate communication between teachers and students for administrative purposes or to provide additional student support outside of class.

Some of the projects provide teachers with training and resources to support instruction and facilitate lesson planning. Both T2T and the literacy project in Pakistan have formal teacher training programmes and teachers' guides. In these projects, the mobile phone, either as a stand-alone device or in combination with other technologies, serves as a tool for the teachers both for instruction and other related work, such as communicating with students and accessing technical support. In T2T, teachers use mobile phones in their classrooms to deliver regular lessons more easily and effectively. Because each video is already accompanied by a corresponding lesson plan, the teacher saves time in preparation. While preparing for T2T classes requires the teacher to view the video and read the lesson plan several times, the amount of time dedicated to planning is still smaller than the preparation time required for non-T2T classes. This gives teachers more time for other things like professional development and personal time with his or her family. In contrast, the SMS for Language Learning project in Hong Kong asks teachers to use a mobile phone outside of regular class hours to send follow-

up materials to students. The mobile phone is not used to support classroom teaching but rather to enhance students' learning during non-class times. While this arrangement helps support student learning, it also requires the teacher to commit additional time on top of that which is already dedicated to classroom teaching, lesson preparation and grading.

PARTNERSHIPS

All of the projects identified in this review are run by partnerships between multiple agencies and organizations. In each project the partners play different roles: educational institutions or pedagogical experts are responsible for developing the courses and materials, as well as training teachers; technology and telecommunications companies are responsible for designing and maintaining the projects' technology platforms; and project managers are responsible for implementing the projects, conducting M&E and engaging the local communities.

RESULTS AND IMPACT

Almost all of the projects have a built-in monitoring system that enables the project managers to track progress, obtain anecdotal indicators of success, and identify problems and difficulties. Most of the projects have also conducted evaluation studies, sometimes by third parties. Since the start of T2T's implementation in 2004, two independent summative evaluation studies have been conducted. Both studies pointed to an increase in learning gains of the students both in urban centres and in resource-poor areas, as well as a decrease in absenteeism and dropout rates, and enhanced teacher confidence and competence. The evaluation studies reported that T2T has made learning and teaching more engaging and has enhanced teacher-student and student-student interaction.

The Hong Kong SMS project has been evaluated as well, and the results were similar to those of T2T. The learners enjoyed using mobile phones for learning, and the evaluation found that the programme improved students' knowledge and command of the English language. In addition, the students at CUHK who participated in the project noted the convenience of using mobile phones for learning. Students appreciated the fact that the programme was free, as it did not cost them anything to receive SMS messages. The literacy programme in Pakistan also included a built-in evaluation system and regular tests that measure the learners' progress. The evaluation showed considerable learning gains for the 250 girls who participated in the pilot programme. During monitoring visits, evaluators noted that learners showed enthusiasm for the programme and strong confidence in their literacy skills. It was observed that this confidence was created through becoming literate as well as being connected to other learners and information sources.

The BRAC/Dimagi health education project uses a very interesting mechanism to determine project effectiveness. As an incentive to take the courses there is a short quiz at the end of each call; if the callers pass the quiz, they will get free airtime delivered to their phones which they can use to make personal calls. The project can use the results data for the quizzes to

measure the courses' effectiveness. For its part, the BBC Janala project boasts an extremely large number of callers who participate in the project. According to project documentation, in just 9 months, BBC Janala has attracted over 3 million calls with a high rate of repeat users. The success of the project has given rise to other similar projects in Bangladesh, and the development community is eyeing the project with great interest.

The continuing M&E of UPOU on the delivery of lessons using SMS has generated a number of insights. According to researchers:

> In general, individuals use the cell phone for purposes other than education, and the discovery of educational applications for the cell phone seems to have been unplanned and unanticipated. Getting users interested in educational cell phone content depends on the creativity of the instructional designers. A user must not sense an attempt to 'lecture,' but should find the content engaging in its own right. This must be achieved by employing treatment and instructional design techniques that are intrinsically appealing. The interactive feedback aspect of SMS must be carefully used for this purpose. Appropriate feedback methods have the potential to generate interest in educational topics, and to increase the likelihood that users will seek information voluntarily. Broadcast SMS messages are also effective in educational contexts just as in public information campaigns, even when the initial messages are received passively rather than sought actively. The recipients' subsequent communications are dictated by the impact of the initial information. The user who receives appropriate initial information is more likely to seek more of the same. (Librero et al., 2007)

It is worth noting that with the exception of T2T, the monitoring and evaluation studies are focused mainly on the learners, and almost nothing is said about the impact of the projects on teachers.

CHALLENGES

One of the challenges projects have encountered is the limitation in the volume of content that can be sent via SMS. This is applicable to the CUHK project, the Pakistani literacy project, BBC Janala and UPOU. However, this limitation may also have positive effects. The character limitations of SMS messages may force the teacher or learner to prioritize the information that will be included in the messages, which may promote higher-level thinking (Librero et al., 2007).

Another challenge is the reluctance of learners to shoulder costs related to mobile learning. In the CUHK project, the SMS communication is one-way because the learners are not willing to pay for sending replies. The students view mobile phones as a means of communicating with friends, accessing social networking sites and downloading entertainment materials such as music and videos, and they are willing to pay for these things. They have, however, manifested unwillingness to pay for the cost of mobile learning, probably because they do not associate mobile phones with education.

Cost is also a concern for projects that have to purchase mobile phones and accompanying data plans for students or teachers. In the case of T2T, a number of school districts have refused to accept the project because they are afraid to take on the operating expenses after the one-year subsidy from the T2T alliance ends. Because the use of mobile phones in

education is less expensive compared to the use of computers and other technologies that are widely used in education, the best way to address this reluctance is to demonstrate the usefulness and effectiveness of the project.

The Pakistani literacy project met with some resistance from participants' parents and other members of the community. At first, they did not believe that adolescents should have mobile phones. They did not believe, either, that the mobile learning project would work. This challenge, however, was only temporary, thanks to the credibility of the Bunyad Foundation and the successful results the project has demonstrated in a brief period of time.

Among the identified projects, only T2T listed security or safety of the equipment – namely, mobile-phone theft – as a challenge. The T2T alliance addressed this problem by getting community leaders involved.

COMPARATIVE ANALYSIS OF MOBILE LEARNING INITIATIVES

The various mobile learning initiatives reviewed in this paper can be classified into five broad categories: primary- and secondary-school programmes; informal education programmes; higher education programmes; programmes for administrative communication and student support services; and professional development programmes for teachers.

The majority of mobile learning projects in Asia are implemented in schools, usually at the primary and secondary levels. Many of these projects aim to reach disadvantaged groups, such as children living in impoverished rural or urban areas with little access to educational resources, teachers or high-quality education in general. These populations are also targeted by mobile learning initiatives focused on informal or non-traditional education. For instance, in countries like Pakistan and Bangladesh, which have large populations of illiterate people, mobile learning is being used to provide basic education and literacy skills to marginalized and underserved groups. Some educators in Asia now consider mobile learning a viable strategy for achieving the EFA goal of universalizing literacy by 2015.

In higher education, mobile learning strategies are undertaken by universities offering distance education programmes in order to reach students who are away from school campuses most of the time and complete their course work with the use of self-directed learning modules. These initiatives vary in terms of development – some have already started using mobile phones for instructional purposes, while others are still in the initial stages of exploring the potential of mobile phones to deliver content, facilitate administrative communication, and provide user-friendly learner support services.

Mobile learning programmes for teacher training generally form part of the corollary activities of mobile learning projects both in and outside of schools. Teachers are trained in both content knowledge, technology, and pedagogical strategies for incorporating mobile phones into their instruction.

The following sections compare and analyse the identified mobile learning initiatives in terms of their strengths and innovative features; the factors that contribute to their success; the projects' primary drivers and enablers; and the critical barriers and challenges they have encountered. Distinctions will be made between school-based projects, which refer to mobile learning projects conducted in primary schools, secondary schools and higher education institutions, and informal education projects, which refer to mobile learning projects in which learning takes place outside of traditional school and classroom settings. The goal of this analysis is to provide insights and information that can be used by educators and policy-makers in designing future mobile learning initiatives in Asia.

STRENGTHS AND INNOVATIVE FEATURES

The mobile learning projects reviewed in this paper share a number of strengths and innovative features that may be replicable in other countries or settings. These include:

1. *A well-planned project framework*
   The presence of a project framework is a common strength of all the mobile learning initiatives inventoried for this paper. The framework serves as a blueprint for action, articulating the project's mission and goals, specific objectives, and operational strategies.

2. *Multisector partnerships*
   All of the projects are the result of multisector partnerships and alliances, usually composed of local or national government bodies, respected institutions, technology companies, and local project management teams. The T2T project, for example, has brought together partners with a blend of technical and geographical expertise to create a team with a stronger capacity than any of the organizations on their own. The project alliance combines the distinctive competencies and institutional strengths of each partner into a comprehensive service delivery package not offered individually by any of the partners. The project management team is composed of institutions with strong track records for running effective projects in the local context. The management team also includes a representative of the projects' beneficiaries. This is usually a teacher who functions as a 'voice from the field', providing feedback and suggestions to enrich project services and facilitating communication between the management team and schools. The literacy project in Pakistan also has field-based leadership, with local teachers helping to manage the project at the community level. At the higher levels, the project is managed by UNESCO in partnership with Bunyad, a reputable local NGO with a long history of running effective projects that benefit communities in Lahore. Bunyad's involvement has been instrumental in earning community buy-in for the project.

3. *Local support to reinforce learning*
   The T2T project established several local support mechanisms to reinforce learning. In Phases One and Two of the project, groups of teachers using the T2T platform at their schools met once a month to share updates, review activities and plan the next steps for the project. Participating students formed clubs that met weekly for peer tutoring and review. Parent support was also recruited. Parents who were picking up their children or attending Parent-Teacher Association (PTA) meetings were invited to view the T2T platform and learning packages. In the process, they were also given an orientation on the nature and scope of the project. The parents became more interested in the project and helped in the safekeeping and maintenance of project resources. PTAs also contributed to the project through fundraising. These practices continue in Phase Three of the project.

4. *Cultural sensitivity and context considerations*
   It is encouraging to note that all of the projects reviewed for this paper made considerable efforts to first determine the socio-cultural contexts of the project beneficiaries. A full understanding of these situations enabled project managers to develop curricular designs, instructional strategies, and education content that were appropriate for their targeted audience. For example, the materials and content of the Pakistani literacy project were culturally sensitive and appropriate for the disadvantaged female learners of Lahore.

Participants were extremely isolated, living in cramped shelters in remote villages, with very limited interactions with the community outside of their immediate family, and little access to media resources such as newspapers, telephones or television. Taking this situation into consideration, the project's instructional designers explored the delivery of not only post-literacy content but also information about health, the environment, numeracy, microfinance, and national and community issues. Similar efforts were made by other projects. Cultural context was a major consideration in designing Phase Two of the T2T project, specifically the socio-cultural realities of the Muslim learners who constituted the majority of the project beneficiaries.

5. *Rigorous curriculum mapping*
    A major strength of the pedagogical component of the T2T and Pakistani literacy projects is their alignment with national and local curricula. Both projects conducted an in-depth review of the existing curricula of host countries, together with the Ministry of Education's overall ICT strategy, and used the resulting data as the basis for developing mobile learning curricula.

6. *Instructional design specific to mobile technology*
    The instructional designs of the T2T, UPOU and Pakistani literacy projects were aimed at selecting strategies best-suited to mobile technologies. For instance, content delivered via SMS messages needed to be short, concise and engaging. These same criteria were applied to the videos developed for the T2T project, which were meant to motivate and engage students, not replace the teacher. In Pakistan, project leaders also developed literacy modules with short, concise messages, due to both character limitations and the fact that the mobile phones provided to participants had small screens with low resolution, which made it difficult to read long messages. Instructional designers also sought feedback from teachers in developing lessons.

7. *Professional development opportunities*
    Several projects offered teachers and administrators opportunities for professional development. For instance, T2T teachers receive training in both the content area they teach and in how to use the project technology. Teachers noted that T2T has helped improve their competence and confidence in teaching. They also reported that their daily planning time has been reduced because the mobile learning materials have sufficient information and guidance to conduct their classes, thus leaving more time to devote to professional development. Similarly, the teacher-training component of the Pakistan literacy project has demonstrated the potential of mobile learning to raise teachers' motivation and interest in their work. In disadvantaged areas, teachers have few opportunities to participate in in-service training. Hence, these training programmes are considered a major incentive for teachers to participate in the literacy project.

8. *Built-in incentives for teachers*
    The projects reviewed did not offer any extra monetary compensation or honoraria to the project teachers or school administrators. However, the teachers were encouraged to join the initiatives because they saw the value of the interventions in making learning more meaningful to their students. When they noted increased student attention and active engagement in their schoolwork, the teachers themselves became inspired to teach and also to learn along with their students. T2T teachers view the project videos a number of times before screening them for their classes, and in the process they learn more about the

content and gain more exposure to spoken English. Teachers have reported that they feel they have improved their English diction and grammar through watching the videos. Thus, the programme is not just a teaching tool but also an in-service facility to improve the teachers' knowledge and competencies in the subject areas that they teach. These are intrinsic motivators that encourage teachers to participate in mobile learning projects.

9. *Voluntary knowledge-sharing and mentoring by project-trained educators*
   While the two school-based projects reviewed included teacher training or orientation programmes for educators, T2T stands out in that participating teachers voluntarily conduct mentoring sessions with other teachers at their school to share the knowledge and skills they have gained from the T2T teacher-training programmes. This helps ensure project continuity in case the project teachers retire, resign or are transferred to other schools. This knowledge-sharing among teachers contributes to project sustainability and scalability, as teachers and schools can take responsibility for training new participants themselves.

10. *Blended approach to content delivery*
    The projects reviewed for this paper all used a blended approach to learning that integrates a variety of learning resources – books, reference materials, audio-visual aids and other learning materials – in addition to mobile devices. Mobile phones are not the sole means of delivering content but are used in combination with other delivery methods. This integrated use of resources and technology helps contribute to more meaningful learning experiences among project beneficiaries.

11. *Appropriate technology, rather than newest technology*
    Even if the newest technologies were available at the project sites, all of the project management teams were cautious in choosing which mobile technologies to use for the project. They opted to use the devices that were most appropriate to the learning needs of the project beneficiaries and would deliver content in a meaningful and interesting manner. Projects did not use the newest technology just because they could – they chose the most relevant technology tools based on the specific learning context. Project leaders also considered cost-efficiency in order to help ensure project sustainability. Hence, they chose the least expensive options that were capable of effectively meeting participants' needs.

12. *Immediate feedback*
    This strength is exemplified by the Pakistani literacy project, which leveraged the immediacy of mobile phones to allow teachers to respond quickly to students' requests for help, and to send immediate feedback to students about their performance on tests and quizzes, so that learners could monitor their own progress and feel a sense of accomplishment. Likewise, students were able to send regular suggestions to their teachers and promptly respond to teachers' queries or concerns.

13. *Flexibility of downloading-on-demand*
    Because of the ability of mobile phones to store content until it is needed by the learners, both T2T and the Pakistani literacy project were able to deliver content at the convenience of the teachers and learners. Unlike radio or television, which require learners to be in front of their reception sets at specific times, mobile phones allow users to access content

anytime they wish. This download-on-demand feature is very welcome in the field, where teachers and learners appreciate the flexibility that mobile learning affords.

14. Technical support

The T2T project established a Helpdesk feature to respond to teachers' queries about lesson content and technical issues. Teachers send questions to the Helpdesk via SMS and are then referred to the appropriate subject matter specialists at the Department of Education for content questions, and to Nokia for technology-related concerns. The Helpdesk feature has been well-received, and teachers reported that they found the Helpdesk especially useful in the beginning of the programme, when they were still trying to gain confidence in using mobile learning strategies. Teachers said that they felt reassured they could get immediate assistance with just a short text message to the Helpdesk.

15. Built-in monitoring and evaluation

The projects reviewed for this paper all have strong M&E components, and evaluations were conducted at various stages of implementation. Regular monitoring was done in-house in order to get immediate feedback on the status of the projects. Summative evaluations were often conducted by independent research groups in order to ensure objectivity. This M&E approach provided the projects with timely data and insights that served as a basis for possible revisions to project strategies. M&E results can also be shared with key stakeholders, including policy-makers, education leaders and parents, to gain support for specific programmes and for mobile learning in general. The M&E results of the projects reviewed for this paper all indicated that mobile technologies had a positive effect on student learning. Students showed significant learning gains in subject areas addressed by the projects, and reported that the programmes made learning more interesting and fun. Student participation and confidence increased, and absenteeism was reduced. The T2T and Pakistani literacy projects found that mobile learning helped boost academic performance among students who are considered disadvantaged or marginalized due to ethnic affiliation, gender or socio-economic status. M&E also helps reveal unintended positive results, which were not anticipated by the projects' designers. For instance, several projects reported that peer interaction had helped learners develop the habit of engaging in written communication on a daily basis. One learner in the Pakistani literacy programme said she was sending at least fifty messages to other learners every day. Another unexpected benefit in this project was that learners shared their newly-acquired skills and knowledge with their family members, such as younger siblings and parents. In some cases, participants' mothers even started joining their children at the learning centres.

16. Attention to project costs and sustainability

When the pilot phase of the Pakistani literacy project was completed, the learners expressed an interest to continue with the post-literacy SMS course. Each learner offered to pay approximately US$6, just to be able to continue receiving educational SMS messages. Bunyad, the local NGO, has assumed responsibility for developing and sending SMS messages and receiving feedback from learners. By sharing the costs for the programme, the learners and community members feel a greater sense of ownership over the project, which helps ensure project sustainability (Acker et al., 2010).

17. *Advocacy and social mobilization*

Alliance-building is a strength demonstrated by a number of projects reviewed for this paper. Project partners indicated that prior to convening themselves into project management teams, they reviewed their individual competencies and track records in order to determine what each institution could contribute to the project and to develop frameworks that would address the learning needs of project beneficiaries. T2T is a case in point. ASM for the project is the responsibility of the Ayala Foundation, which has developed strong alliances from the national to the local levels, with a focus on building relationships with community leaders, the local offices of the DepEd, and other community organizations. An innovative strategy employed by the Ayala Foundation is inviting community and local government leaders to contribute matching funds to finance the project. The underlying rationale for this approach is that the community will have an increased sense of ownership if it has made some form of investment in the project. This strategy also contributes to project sustainability and scalability.

SUCCESS FACTORS

The majority of mobile learning initiatives reviewed in this paper have achieved significant success due to a combination of all or some of the following factors:

1. *High acceptance and growing popularity of mobile technologies*

Mobile devices are the fastest-growing technology for delivering learning resources, because they are accessible, portable and easy to use. SMS, multimedia, voice and audio features allow mobile phones to be used for multiple types of communication. It is also worth noting that even among low-income groups, mobile phones are becoming increasingly popular. Mobile phones are now often more affordable and accessible than other modes of communication, like computers or even fixed telephones.

2. *Openness to mobile learning among educators*

While many educators are still apprehensive about using mobile learning strategies, the educators involved in the projects reviewed for this paper have shown enthusiasm for mobile learning in their programmes. While many of the T2T teachers were initially reluctant to try new technologies in their classrooms, they embraced mobile learning after recognizing its potential to lessen their workload and contribute to more meaningful learning among students. Technical issues are still a challenge for many teachers, especially older teachers who are less familiar with mobile technologies; however, high interest and enthusiasm among younger teacher and students often motivates older educators to adopt mobile learning in spite of initial reservations.

3. *Pedagogical shift in classroom dynamics*

Several of the educational institutions included in this review have recently shifted their instructional focus to new pedagogical strategies that emphasize the learner rather than the teacher. Educational models that highlight student-centred, inquiry-based and collaborative learning are being adopted by many countries and institutions in Asia. Mobile technologies are well-suited to these models, as they provide opportunities for

more personalized and self-directed learning. This shift in pedagogy is an important step in maximizing the potential benefits of mobile learning.

4. *Clearly-defined project performance indicators*
   The school-based mobile learning projects reviewed for this study have clearly-defined sets of performance indicators by which to measure the project's success. These include improvements in student achievement, more active student participation in school activities, improved teacher competence and motivation to utilize the project resources, and community commitment and engagement in the project. Similarly, the mobile learning projects for informal education have pre-determined success indicators such as increased learner participation in education programmes; retention of literacy or numeracy skills; community commitment and engagement in the project; and increased access to educational opportunities for disadvantaged members of society such as indigenous populations, women and low-income groups.

5. *Culture-neutral subject areas*
   The school-based mobile learning projects have chosen science, mathematics and English as the subject areas for curriculum development and the use of mobile technologies. These subject areas are universal and culture-neutral, unlike subjects like social studies and history, for which the content may vary significantly from country to country. This focus on universal content increases a project's relevance and replicability in other countries. For example, the T2T project was used as a benchmark in designing the BridgeIT project in Tanzania.

6. *Responsiveness to feedback*
   Some of the mobile learning initiatives reviewed for this study have developed content to expand subject area coverage in response to feedback from educators in the field, third-party evaluators and the academic community. This indicates that the projects are responsive to feedback, which in turn makes participants more committed to the project, as they see their individual needs and requests being addressed.

7. *Cost-effectiveness*
   Although business models for mobile learning are still taking shape, there are indications that mobile learning has the potential of being highly cost-effective over time. This is evidenced by the cost-benefit analysis conducted by the literacy programme in Pakistan, which demonstrated that learners valued the services provided by the project and were willing to share some of the costs. Mobile technology is also becoming more affordable, with better and more versatile features, which will reduce costs for mobile learning projects in the future. Finally, while initial costs for mobile learning initiatives may be significant, equipment and materials can be re-used throughout the life of the programme. This is also the case for teacher training, as project-trained educators may be able to take responsibility for training new teachers in the future.

8. *Community ownership*
   As discussed earlier, multi-agency and multilevel project alliances that include local partners have contributed to a stronger sense of ownership among the project beneficiaries themselves. In addition, because of these alliances, the projects are more sustainable and have a greater potential for expansion and institutionalization.

DRIVERS

The mobile learning initiatives reviewed in this paper are driven primarily by the following key stakeholders:

1. *Educational institutions and non-government organizations*
   The school-based mobile learning initiatives that have produced the most positive results are those with strong participation and support from the education sector, including primary and secondary schools, institutions of higher learning, and teacher education universities and colleges. For the informal education initiatives, the main drivers are foundations and NGOs with experience in managing mobile learning or other educational ICT programmes.

2. *Technology organizations*
   Leading technology and telecommunications organizations have advanced mobile learning by developing responsive mobile devices, platforms and software that facilitate learning and communication. Notable international organizations such as Nokia and the BBC have made significant investments in mobile learning projects in Asia and around the world, and many projects are supported and partially funded by local telecommunications providers like Mobilink in Pakistan. The participation of these organizations represents an important contribution to the growth of mobile learning.

3. *Local communities*
   Mobile learning projects tend to thrive in communities with a strong sense of local ownership over the project. Community support can come from a variety of sources: local businesses in the private sector, municipal governments in the public sector, or NGOs in the civil society sectors, to name a few. Collectively, communities hosting the identified projects have demonstrated that they posses the capacity to be actively involved in advancing mobile learning both in and outside of schools.

ENABLERS

The following factors enabled the development, sustainability and, in some cases, expansion of the mobile learning initiatives identified in this review:

1. *Project grants*
   Many of the mobile learning projects received grants to enable their development or continuation. Support was provided by a variety of organizations, including Nokia, which offered both technology leadership and funding assistance to T2T; the United States Agency for International Development (USAID) which supplied a grant to the International Youth Foundation to manage Phase Two of T2T; and UNESCO Bangkok, which helped fund the Pakistani literacy project.

2. **Cost-sharing and task-sharing**
    Projects were further supported by matching financial contributions, technical assistance and guidance, resource and personnel contributions, and other counterpart assistance provided by project partners at all levels, from national to local.

3. **Volunteer work and non-monetary assistance**
    Host communities, local government units and project participants themselves enabled the projects' success by contributing time and effort to critical tasks such as securing the schools where project resources were housed, recruiting learners, and orienting community members about the project and encouraging them to get involved.

4. **Monitoring and evaluation**
    The results of internal and third-party evaluations provided vital data and feedback that allowed project managers to improve, maintain and expand the mobile learning initiatives.

BARRIERS

The mobile learning initiatives reviewed for this paper experienced the following challenges and barriers to project implementation, sustainability and scalability:

1. **Limited telecommunications and electrical infrastructure**
    A number of project sites reported intermittent access to mobile phone signals. Some sites and project participants also noted that electrical power was limited in their area due to infrastructure issues or high costs. In some cases, field evaluators found that project participants had to go to neighbouring villages to charge their mobile phones, and project implementers sometimes had to acquire generators to ensure continued access to electricity.

2. **Doubts about mobile phones as an educational tool**
    According to the projects' managers, the introduction of mobile phones did not immediately fit with the conventional educational practices and beliefs of students, teachers, school administrators and communities as a whole. This is probably because people usually associate mobile phones with communication and entertainment, rather than learning. The mobile learning project managers devoted considerable resources to community orientation sessions to overcome doubts and generate interest and participation in the project. In the case of the Pakistani literacy project, UNESCO Islamabad noted that the beneficiaries were initially apprehensive because mobile learning was different from the conventional methods of learning with which they were already familiar. Bunyad, the highly respected local NGO, helped potential participants and community members understand the value of the project. Eventually doubts were allayed as the majority of those involved recognized the effectiveness of mobile learning (Miyazawa, 2009).

3. Socio-cultural concerns and security

Socio-cultural and security challenges were noted at the field level, especially during the early stages of project implementation. The Pakistani literacy project reported that religious and cultural constraints, particularly ideas about educating women, made it difficult to recruit learners at the project's outset. Learners' family members, especially men, were initially hostile toward the project. They strongly disagreed with the idea of giving mobile phones to women and doubted the programme's approach. Fears were also raised about the security situation in Pakistan, as the country's extremist groups tend to be opposed to female education. Bunyad was instrumental in overcoming these barriers and winning the community's trust.

4. SMS limitations

SMS messages can only contain 160 characters per message. In the Pakistani literacy project, long messages had to be separated into two or more SMS messages, which were more expensive to send and interrupted the flow of reading and writing. This project also noted that typing in Urdu with the keypad on mobile phones proved difficult, though not impossible. Learners sometimes used the English alphabet to send messages, though this alphabet was not used in their literacy training programme in order to encourage literacy development in Urdu (Miyazawa, 2009).

5. Alignment of learning materials with local contexts

A number of mobile learning projects faced challenges involving the 'socio-cultural fit' of mobile learning materials with local contexts. Language was a particular issue. For example, several of the T2T teachers reported that the narrators in the videos produced in the US spoke very fast, and that their accent could barely be understood by students. The dissonance between local accents and the narrators' accents also seemed to cause teachers some personal anxiety, as they said it would be embarrassing if they could not speak English 'like native speakers'. Teachers often viewed the videos several times before conducting classes so that they could practice speaking like the videos' narrators. This meant that they spent a considerable amount of time in preparing for their mobile learning classes. These issues detracted from the ultimate value of the learning materials, which might have been more effective if they were developed locally. However, teachers did note that they felt the videos had a positive effect on their English proficiency (Ayala Foundation, 2011).

6. Technical obsolescence

Mobile technology is evolving rapidly, and improvements are being made to mobile devices and software at an unprecedented pace. This issue is a double-edged sword: while technological developments give users access to new features that could potentially enhance mobile learning, they also mean that current devices and platforms will soon be outdated, and equipment will have to be replaced. In the T2T project, for example, the satellite-based technology platform used in Phases One and Two was replaced by the NED system, which Nokia developed midway through the project. While the NED system was a welcome development, as it improved downloading speeds and was less costly in the long-term, the changeover required additional resources to purchase and install new project infrastructure.

CONCLUSIONS AND RECOMMENDATIONS

The comparative analysis of mobile learning initiatives in Asia yielded several insights about effective mobile learning strategies, which should be considered in planning future mobile learning endeavours. First, a well-defined programme framework serves as the blueprint for activities in the planning, start-up, implementation and post-project phases. In addition to detailing the various stages of the project, the framework should speak specifically to the context for learning: the projects' setting and cultural milieu, the proposed learning environments both in and outside of schools, and participants' learning styles and practices, particularly those related to the use of mobile technologies. Project objectives should support national education and ICT goals, and the learning materials and pedagogical strategies should align with national and local curricula and standards. The national Ministries or Departments of Education and local educational bodies in the host countries are critical resources in developing the frameworks for large-scale projects.

As previously discussed, one of the barriers to mobile learning is the burden of convincing stakeholders – notably teachers and community members – of the potential of mobile learning to improve educational quality and access. To address this issue, future large-scale mobile learning projects should attempt to enlist the help of the national government in orienting the public about the benefits of mobile learning and encouraging buy-in from the education sector. In countries where local governments have major roles in financing and managing education projects, it would be advantageous for mobile learning initiatives to engage their participation as well, preferably in the planning stages of the project. Performance indicators need to be identified, disseminated and fully understood by all project implementers and stakeholders, especially at the field level. Project outcomes should be shared widely, and community orientation sessions should be held throughout the life of the project, to provide updates about the projects' results and progress.

Successful projects tend to include strong advocacy and social mobilization components that encourage community ownership and broad-based support. The T2T project in the Philippines, for example, enjoys support from multiple sectors, including private companies, community leaders, local government units and NGOs. Future mobile learning initiatives should consider the following T2T strategies for community engagement: alliance-building at all levels; continuing advocacy work, especially at the field level to reach possible community stakeholders; and agreements with local government units for fund-matching or resource-provision. These strategies help promote the community's engagement and sense of ownership and contribute to the project's sustainability and potential for institutionalization.

In designing learning materials and instructional strategies, project planners should take a number of factors into consideration. First, curricular plans need to clearly articulate the roles and contributions of mobile technologies vis-à-vis teachers and other learning resources. Second, learning materials should be culturally sensitive and address the needs of the specific learners and communities that the project serves. Third, the technology used for the project should be selected based on the needs and learning styles of the project's target population,

rather than by the technology market. Just because the latest technology is available does not mean it is well-suited for the project, and efforts should be made to select technology that is cost-effective and relevant to the project's goals.

Technology is also an important consideration in planning project implementation. Because the use of mobile technologies in education is a relatively new phenomenon, it is best to explore mobile learning strategies using a phased approach. Pilot projects should be implemented to test the robustness of the technology in different environments and contexts, which may vary across a country or region. These projects can then gradually be scaled up using lessons learned from the initial pilot phase. Technical support should be available throughout the life of the project. It would also be helpful to designate school personnel and faculty members as local technology experts who handle the regular technical activities of the project at the school level. These personnel should be included in training programmes along with the teachers who are implementing mobile learning in their classrooms.

Teacher training and professional development should included as key components of future mobile learning initiatives. Teachers, administrators and other educators report appreciating professional development and training opportunities, and project evaluations have shown that training results in improved classroom practices and greater confidence in teaching with mobile technologies. It is also recommended that mid-project retraining and refresher programmes be conducted in order to keep teachers up to date on project developments and new trends in mobile learning, and to give teachers a forum for sharing ideas, success stories, challenges and concerns related to both pedagogy and technology. Projects might solicit experienced teachers to serve as mentors for teachers who are new to the mobile learning programme; this could be done within a single school or across groups of schools in a single area or district. In the T2T project, for example, many of the project-trained teachers willingly share their learning with co-teachers who are not involved with the project. With additional reinforcement through mid-project training, teachers may be able to take on training and mentoring responsibilities themselves, which would allow new teachers to be initiated quickly into the programme if a participating teacher retires, resigns or is transferred to another school.

Lastly, it is suggested that future mobile learning endeavours consider the inclusion of monitoring and evaluation activities as early as the pre-implementation phase, and continue these activities until the project's completion and even beyond. The M&E component needs to have an immediate feedback mechanism to serve as the basis for revision, replication and roll-out. Cost-benefit analyses are also recommended, as they have been found to provide valuable input in formulating the overall project framework. During project implementation, it is helpful to have cost-tracking systems in place, so that project managers can make informed decisions about fund utilization and project resources.

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APPENDIX A: Text2Teach (Philippines)

Text2Teach is a mobile learning project founded by BridgeIT, a global ICT-based programme developed through an alliance between Nokia, the International Youth Foundation, the Pearson Foundation and the United Nations Development Programme. BridgeIT aims to narrow the educational divide between nations by improving the quality of basic education in underserved schools in developing countries. BridgeIT projects enable teachers to utilize digital content to supplement local curricula, with the end goal of equipping students with the knowledge, skills and aptitudes to actively shape their futures (Ayala Foundation, 2011).

In 2003, BridgeIT launched the T2T project in the Philippines. BridgeIT works with local partners to implement its projects; in the Philippines, the T2T partners include: the Ayala Foundation, responsible for leading the project; Nokia, the technology project leader; the mobile infrastructure provider Globe Telecom; the Southeast Asian Ministers of Education Organization for Innovation and Technology (SEAMEO INNOTECH), responsible for curriculum and teacher development; the Department of Education of the Philippines (DepEd); and, until 2007, the satellite provider PMSI and the mobile phone software developer Chikka.

T2T's project mission is to create a sustainable, scalable and replicable platform for delivering digitized education content to in-classroom TV sets through mobile technology, and to empower local teachers with new teaching tools and train them to deliver the content in ways that add substantial value to a child's learning experience. Its intermediate goal is to help improve the quality of teaching in elementary schools through the provision of highly interactive, easy-to-use multimedia packages designed to make learning more exciting and meaningful.

In Phases One and Two of the project, the technology platform was satellite-based. A Nokia-managed server contained more than 400 5-minute educational videos, 100 of which were provided by Pearson and the rest developed by local organizations in the Philippines. Each school was provided with a mobile phone, a TV set, a satellite dish, a storage device called Media Master that also served as the video player, and lesson plans for teachers to accompany each video. The mobile phone was used primarily to order videos by sending an SMS containing the catalogue number of the desired video. The SMS would trigger the server to send the requested video via satellite to the Media Master device, which was attached to the TV set for classroom viewing. The mobile phone was also used to access the T2T Helpdesk and to communicate with other teachers to compare notes and share experiences.

In Phase Three of the project, this satellite-based technology platform was replaced with the Nokia Education Delivery system. The satellite dish, Media Master and low-end mobile phones of Phases One and Two were replaced by a single device – a high-end, high-memory smartphone loaded with NED software. The software enables the teacher to download a five-minute video in fifteen minutes via Globe Telecom's 3G (third generation) infrastructure. The

downloaded videos are stored and catalogued in the mobile phone for future use. The NED software has cataloguing and search features that enable the teacher to easily retrieve the needed videos and to monitor usage. The smartphone can then be connected to the TV or a digital projector to screen the videos in class.

The instructional design of T2T is in keeping with the learner-centred pedagogy called for in the DepEd's basic education curriculum, specifically the science curriculum for Grades 5 and 6. The materials developed for the project align with the DepEd's curriculum and are designed for use in regular classes, not just enrichment or supplementary activities. The overall pedagogical strategy is a blended continuum of interconnected learning strands, which include pre-viewing activities, video viewing, and post-viewing enhancements, with the teacher serving as the unifying thread in the learning process. The T2T technology-based educational strategy involves the teacher, the mobile phone, the video materials and the students – all are considered integral to the learning environment, and each one performs important roles in making learning meaningful to the students.

To date, more than half a million students in 555 schools in 9 provinces of the Philippines have been served by T2T. More than 1,500 teachers have also been trained, not only in math, English and science subjects, but also on how to use the T2T tools for teaching. The schools that participated in Phases One and Two have continued to use the project resources even after Phase Two ended in 2007.

Summative evaluation studies were conducted in both Phases One and Two. All of the evaluations indicated that the project had a considerable impact on education (Ayala Foundation, 2011). Results included:

1. Improved teacher competence when using technology

2. More positive teacher and student attitudes about learning and technology

3. Statistically higher learning gains in English and science for students participating in the programme compared with a control group

4. Learning gains in both well-performing schools as well as challenged schools with weak academic performance and limited learning resources

5. Learning gains for socio-economically disadvantaged students

6. Reduced absenteeism

The M&E team at T2T also gathered from the field the following perceptions of the project: T2T lessens the burden on teachers in preparing lesson plans and instructional materials; T2T makes it easier to teach science, math and English; T2T equips teachers with essential knowledge and skills in science, math and English and teaches them how to impart these understandings to their students; T2T increases students' engagement and attentiveness, as children find the videos interesting to watch; and T2T creates a more challenging learning environment for students.

While T2T has been very successful in terms of community acceptance, teacher empowerment and improvement of student learning, the project also faces several challenges. Feedback from participating teachers and students include many suggestions for improving the programme. First, it has been suggested that the quality of the videos could be improved. Participants complained that videos' narrators speak very fast, and their accent is often difficult for teachers and students to understand. Also, some of the videos lump too many lessons together, and students found a few of the videos unhelpful, particularly some of those produced in the United States. Second, teachers would like to see the programme expanded to include additional grades and subjects, such as social sciences. Finally, equipment shortages caused implementation challenges for many schools. Because it uses a high-end smartphone, the T2T package is expensive compared to the other mobile learning projects included in this review, and schools are only provided with one mobile phone and TV set. Schools typically use a single mobile phone for twelve classes. Some teachers would like to use the videos more often, but because there is only one mobile phone, it must be booked ahead of time and shared between all of the teachers. In some instances, teachers expressed frustration after planning an activity and then discovering that another teacher had planned to use the T2T equipment at the same time. TV availability is also an issue: while some schools have raised funds for their own TVs, many rely on the single TV set provided by the project, and teachers complained that it is time-consuming to shuttle students to and from the classroom that has been converted into the T2T room. Because some classrooms are located in separate buildings, the movement of classes proves doubly difficult during inclement weather. In addition to the improvements needed at the classroom level, the project management team contends with other challenges, including natural disasters like floods that destroy the project equipment and materials; limited mobile phone signals in some project sites; and the safety of project resources, as mobile phones are very easy to steal.

Project sustainability is another issue. ASM and community engagement have been important components of T2T, in keeping with the project leaders' efforts to move the private-public partnership toward local ownership and sustainability. The Ayala Foundation's community engagement approach includes a cost-sharing arrangement among the different stakeholders, where private sector resources are leveraged to encourage fund-matching from the public sector. This has enabled the project to:

> …move on a larger scale, addressing an education need not just for specific areas but for the whole public elementary school system itself, engaging the public sector to put in their share of resources to match the grant provided by Nokia and its partners, thus securing the projects' sustainability because of the stake they have placed in the project. (Ayala Foundation, 2011)

Under the T2T cost-sharing arrangement, local government units and other community stakeholders share in the total project cost of 130,000 Philippine pesos (PHP) (approximately US$3,000) per school. This sum covers pre-operation costs; project management and implementation; one smartphone equipped with 8GB of memory, the NED software and more than 400 audio and video materials pre-loaded onto the phone; a 29-inch colour TV; PHP 150 (US$3.50) per month of free airtime, pre-paid for one year; PHP 1,000 (US$23) of airtime that can be used for downloading new or updated content; teachers' lesson plans; and teacher training.

In planning the project's future, the Ayala Foundation (2011) has developed a sustainability framework with three key components:

1. Encourage community ownership, through the committed participation of community leaders, parents and other stakeholders.

2. Share project results: once the community sees the value of the project in terms of its positive impact on their children, community buy-in will increase, and financial viability could be established through strategic resource mobilization, particularly school-based fundraising activities.

3. Secure DepEd budget allocations and institutional support by integrating the project into the national curricular framework

To establish community ownership, the Ayala Foundation recruits local stakeholders – local governments, DepEd officials, school administrators, parents and other community members – to get involved in the project from the very beginning. Requirements for matching or counterpart financial contributions from local governments and other community organizations are intended to strengthen the community's sense of ownership of the project. The Ayala Foundation also makes sure that the T2T project is useful – that it actually achieves what it promises to accomplish – through conducting regular M&E, collecting anecdotal feedback, and commissioning third-party evaluations. The organization then ensures that the results are widely shared with the community and various stakeholders. Finally, the Ayala Foundation has already initiated some discussions with the DepEd about the possibility of mainstreaming T2T into the regular DepEd framework.

APPENDIX B: SMS for Language Learning (Hong Kong)

Hong Kong is particularly well situated as a testing ground for mobile learning strategies, as it has one of the highest mobile penetration rates in the world, at 195% in 2010 (ITU, 2011*a*). In terms of technological infrastructure, the mobile network in Hong Kong is a robust, reliable and secure system, and users are certain of the availability of the network at most times. While SMS is not a cutting-edge technology, it is simple, easy-to-use, and ranks highly in terms of user convenience. The software and hardware required for SMS are by far more prevalent than other, more advanced mobile platforms. For these reasons, SMS is a logical choice as a delivery method for mobile learning in Hong Kong.

The Information Technology Services Centre at the Chinese University of Hong Kong has developed an online system that enables teachers to send SMS messages to a single student or groups of students through a web-based SMS gateway service, to support face-to-face instruction. In 2006, the university launched the SMS for Language Learning project, in which teachers in the English Language Teaching Unit used the SMS service to supplement classroom-based instruction in a seven-week course on Social English (Clarke et al., 2008). The project leaders chose to focus on English because it is a common second language among students, and the majority of students are not proficient. Teachers used the SMS system to send students follow-up questions to encourage them to review lessons and course

materials regularly. One question was sent per day at the same time each day. The project was implemented in two courses in the 2006–07 and 2007–08 school years.

The project had a built-in M&E component that conducted an evaluation at the end of the project's trial run. Results showed that students appreciated the content of the learning points sent via SMS and felt that they learned from the messages. They commented that after receiving the SMS messages they revisited their notes in order to answer the teacher's questions. Most students found that the one-question-per-day design was appropriate, though many suggested that more questions be sent via SMS because the questions helped direct their attention to important topics. Students also liked the 1.15 p.m. time slot when the messages were sent because they had a chance to discuss the SMS topics while eating lunch with their classmates.

Participants also gave feedback on areas that needed improvement. First, the limitations of the SMS format meant that messages were limited to 160 characters. Second, many students felt that some of the SMS questions were too difficult. Finally, the communication was only one-way, because students were not willing to pay for sending response messages to teachers. The university is considering plans to address this last issue, which include (a) integrating expenses into tuition fees; (b) requesting that the SMS service provider reduce or wave fees as a donation to the university; or (c) finding another organization to provide funding to subsidize the programme costs. The university is also making additional revisions to the SMS programme based on student and teacher feedback (Clarke et al., 2008).

APPENDIX C: Literacy Promotion through Mobile Phones (Pakistan)

Launched in 2009 in Lahore, Pakistan, this project uses mobile phones as a tool for delivering literacy materials to out-of-school youth to increase their retention of literacy skills and sustain their interest in learning. The project was led by UNESCO's Islamabad Office in partnership with the Bunyad Foundation, a highly respected NGO in Pakistan, and the mobile service provider Mobilink. The Bunyad Foundation was responsible for managing the field implementation of the project. The project was piloted with 250 female learners in 3 districts of the Pakistani province of Punjab. After completing a basic literacy course, the participants were provided with mobile phones through which they received SMS messages designed to reinforce their new literacy skills. Participants were asked to read and respond to the messages, copying the messages and replies into their workbooks to practice handwriting. Teachers played an important role in this mobile learning project, both in conducting the initial literacy courses and in sending SMS messages to students during the follow-up course, but there is very limited information in the project literature on how mobile technologies were used for teacher professional development. The participating teachers were trained in literacy instruction and taught how to use mobile phones to send SMS messages in Urdu.

The project was facilitated by a number of factors. First, mobile phones are already popular among youth and young adults in Pakistan for accessing information, learning and communicating with peers. Second, the three project partners noted that a mobile-based post-literacy programme is compatible with existing basic literacy programmes being implemented

in Pakistan. Basic literacy courses normally last about two to three months. In the last month of the basic course, when the learners were already semi-literate, they were provided with mobile phones and instructed how to use them to access their post-literacy course. Third, a simple web-based system made it relatively easy to send messages and monitor the learners' participation and progress. Before this system was established, learners were asked to report to literacy centres for weekly or monthly examinations. Once the online monitoring system was in place, learners could receive tests via SMS and the results could be summarized and recorded automatically. Finally, the mobile phones that were purchased by the project could be used in subsequent literacy courses even after the project was completed. The phones could be passed on to the next group of participants once they finished their basic literacy courses.

An evaluation of the pilot phase showed that participants achieved significant learning gains (Miyazawa, 2009). Monthly examinations over the span of four months demonstrated that the participants' literacy skills improved dramatically. In one particular district, not one student received an 'A' grade (score range between 70 and 100) on the first examination; by the end of the pilot phase 39% of the students received an 'A' grade. In another district, 35% of the students received a 'C' (score range from 0 to 50) at the start of the programme, but only 7% received the same grade by the end of the post-literacy course. The evaluation also noted that that the participants enjoyed learning with mobile phones. Improved life skills, greater enthusiasm for learning in general, and stronger self-confidence were also observed among the participants. Further, the mobile phones helped learners develop the habit of communicating with written media. Learners also shared the knowledge they gained and the skills they developed with family members, such as their younger siblings and parents. Learners, especially girls, felt secure when they had mobile phones with them. Although this was not part of the initial project objectives, it was found that in emergencies the learners could use the mobile phones to communicate with their immediate family members.

One of the challenges noted during the pilot phase was the initial reluctance of the learners and their families to support the project. Many community members were opposed to giving mobile phones to adolescents and doubted the effectiveness of the mobile learning approach. The community's trust in the Bunyad Foundation helped the project overcome this barrier, and eventually learners and their families adopted a more positive attitude toward mobile learning when they saw the impact of the project. The character limitations of SMS messages and the difficulty of typing Urdu also posed challenges.

This project has great potential for sustainability and scalability. After the end of the pilot phase in 2010, the participants agreed to contribute US$6 each to continue the literacy programme. Bunyad assumed responsibility for developing content, sending SMS messages and receiving feedback from learners. UNESCO, the Bunyad Foundation and Mobilink are now expanding project, primarily because of the encouraging results of the pilot phase, particularly the remarkably high learning gains of the participants, especially when compared with the results of conventional literacy programmes.

APPENDIX D: Boat School (Bangladesh)

The Boat School project is implemented by Shidhulai Swanirvar Sangstha, a national research and development organization in Bangladesh that aims to provide education and other essential services to marginalized waterside communities in Bangladesh through a fleet of eighty-eight flat-bottomed boats built from locally available materials. During the monsoon season in Bangladesh, many children cannot attend school due to flooding. The boats make their way through the hundreds of rivers and canals of northern Bangladesh to bring a range of educational services and renewable energy supplies to 87,000 families.

On the boats, the project provides daily classes in primary education for children, libraries, training in sustainable agriculture for adults, health advice, mobile phone and internet access, and battery-charging facilities. All boats have solar photovoltaic-powered lights and mobile phone services provided by the Grameen, Robi and Citycell mobile phone networks. The mobile phone connection on the boats allows learners to make personal phone calls. In addition, they can use mobile phones to talk to health experts and get agricultural advice. Each Boat School consists of a classroom for 30 to 35 students, an internet-linked computer, a mobile phone, 500 books, and electronic resources such as locally developed CDs containing literacy and numeracy exercises, animated drawings, and videos. The teachers are usually women selected from local villages, and the students are often working children from poor, landless families. The Boat School provides classes six days a week and gives educational materials to students for free. The ability to access computers and technology, and well as the continuity of the learning experience, gives students hope for higher education and economic improvement.

According to the project's M&E, beneficiaries view the Boat School as a relevant contribution to their education. This is significant in deeply conservative countries such as Bangladesh, where religious and cultural traditions restrict the mobility of women. Because the Boat Schools move from village to village and dock in front of people's homes, they allow women and girls to take advantage of education and internet facilities delivered right to their doorsteps. The proximity of the facilities allays the concerns of the children's parents and guardians. Moreover, the Boat School saves travel time for working children and has motivated parents to help their children continue their education. Shidhulai Swanirvar Sangstha has also adapted courses to meet learners' specific needs; for example, classes are offered both during the day and at night to accommodate the schedules of working children.

APPENDIX E: Incentives to Improve Health Knowledge through Mobile Phones (Bangladesh)

This mobile learning project is implemented by Dimagi and BRAC. Dimagi is a technology company that helps organizations deliver quality health care to urban and rural communities around the world, through a team of physicians and engineers who apply their experience in global health care delivery and technology development to further personal and public health. BRAC is currently the world's largest NGO dedicated to poverty alleviation (Dimagi, 2012).

Dimagi and BRAC developed this project to address major health issues in Bangladesh. The organizations decided to use mobile phones to deliver health-related information because a high percentage of the country's population owns a mobile phone. The cost and effort required to distribute information using paper or billboards pose a substantial obstacle, and updating paper-based materials to reflect new information or respond to feedback is equally difficult. In contrast, deploying and updating content through mobile phones on a massive scale is fast and simple.

With funding from World Bank's Development Market Place, Dimagi and BRAC have developed short, interactive audio courses that can be taken on standard mobile phones. Learners call a number to access the course and press numbers on the keypad to answer questions. Each course conveys a few critical health-related points, such as the importance of clinician-assisted birth, proper hand-washing techniques, and information about preventing HIV-transmission. To increase engagement, the courses build on each other to create an 'audio soap-opera with a consistent story and characters' (Dimagi, 2012). The project also offers participants an incentive for learning. Participants take a short quiz at the end of each call they make to the project; if the callers pass the quiz, they get free airtime delivered to their phones, which they can use to make personal calls. The project is also exploring models in which health topics may be delivered by village phone operators who rent out phones.

APPENDIX F: BBC Janala (Bangladesh)

The BBC World Service Trust manages Janala ('Window' in Bengali), a multiplatform project launched in 2009 that uses mobile phones, the internet and television to provide English language learning in Bangladesh. BBC Janala is funded by the UK Government's Department for International Development through the English in Action programme, a major educational initiative aimed at improving the language skills of 25 million people in Bangladesh by 2017. English was chosen as the subject area based on BBC research findings that 84% of Bangladeshis consider learning English a top priority for their future, and 99% of parents want their children to learn English (GSMA, 2010). The BBC research also found that the population generally aspires to learn English in order to connect with people outside of Bangladesh.

BBC Janala's educational content includes SMS English lessons and about 100,000 audio lessons accessible through mobile devices. The project's mobile technology platform is provided through a joint effort by all six of the country's telecommunications operators: Banglalink, Citycell, Grameen, TeleTalk, Robi and Warid. The platform is very user-friendly – users dial '3000' to access hundreds of three-minute audio lessons, which range from 'Essential English' to 'English for Work'. The platform also includes self-assessment: learners are able to gauge their progress with interactive audio quizzes, or even record their own stories in English. Calls cost 1 Bangladeshi taka (BDT) (around US$0.01) per minute, which is affordable for the majority of the population. In addition, the country's biggest newspaper, *Prothom Alo,* offers print lessons which are aligned with mobile and web content. These print lessons are included in the newspaper three times a week.

The project M&E has noted enthusiasm for the programme among Bangladeshis. In just nine months, BBC Janala has attracted almost three million calls, with some callers requesting that lessons be re-sent to them so they can save them in their mobile phones. The growing interest in the programme is an indication that Bangladeshis find mobile learning a useful and meaningful educational strategy. Additional mobile learning initiatives focused on English as a second language have recently been launched in Bangladesh, most notably Bishaash ('Believe'), the first bilingual drama jointly produced by Bangladesh and the UK, which is accompanied by an English language learning programme called Mojay Mojay Skekha ('Learning is Fun'). The project leaders anticipate that this programme will reach an even larger audience than BBC Janala, giving more people access to English lessons through mobile learning.

APPENDIX G: University of the Philippines Open University (Philippines)

The University of the Philippines Open University (UPOU) uses mobile phones for instructional and administrative purposes. Its technology partner is a telecommunications company that provides the SMS platform and marketing support. UPOU's role is to develop programme materials for SMS delivery. The UPOU mobile learning programme offers SMS modules as part of a multimedia self-directed learning package that also includes pocket-sized booklets. The programme design is based on the following criteria (Librero et al., 2007):

- **Accessibility:** Course materials are designed for use by a diverse audience with no restriction placed on who is allowed to take the courses.

- **Interactivity:** Points of automated interaction between the teacher and student are created for drill and practice, and for personal interaction in feedback and consultation sessions.

- **Usefulness:** The utility of the content is not enough to ensure that the user will seek out the information. Content must also be appealing to be able to attract the learner's attention and interest.

- **Unobtrusiveness:** Teaching and learning episodes are delivered in short modules so that the learner will regard them as part and parcel of normal academic activities.

- **Immediacy:** Instant feedback, whether automated or manual, is encouraged wherever possible.

- **Adaptability:** The learner is allowed to proceed at his or her own pace and can skip or repeat sections of the module depending on specific needs.

- **Ease of use:** Complex menus and commands are avoided.

- **Privacy:** The learner maintains personal privacy, to avoid the embarrassment of poor performance and minimize fears about making mistakes in public.

The UPOU SMS instructional design principles emphasize that authentic communication should be achievable. SMS technology should provide a service with no access barriers, no training necessary, fast response time, and automated responses from teachers if necessary. In addition, learners should find it easier to ask or respond to questions by sending SMS messages. The mobile phone should preferably be personally owned and not shared with others because sharing could slow communication between teachers and learners. Learning can take place outside of school and work hours and during the learners' free time. Other design principles that have worked and should be incorporated into future mobile learning programmes include the following:

• Course topics should have popular interest value, at least until students are accustomed to mobile learning. High-interest topics include English idioms and spelling, healthy lifestyle and nutrition, physical exercise, smoking cessation, and stress management.

• The SMS modules should be designed to include specific learning objectives, units of instruction tailored to these objectives, and assessments measuring achievement in relation to the objectives.

• A simple question-and-answer format should be used to deliver pre-test materials, so that learners and teachers can assess prior knowledge.

• Post-test materials should also be developed and administered using SMS.

Continuing M&E has shown that generating user interest in educational mobile phone content depends on the creativity of the instructional designers. A user should find the content appealing and engaging and must not sense that the SMS attempts to 'lecture'. The 'send-reply' feature of SMS must be carefully used for this purpose. Appropriate feedback methods have the potential to generate interest in educational topics, and to increase the likelihood that users will seek information voluntarily. Technical challenges include the 160-character SMS limit, which affects the types of questions that can be sent to learners, as well as the depth of their replies. In the future, multimedia mobile phone messaging may be able to solve this problem as well as address learners' multiple intelligences, for instance by providing pictorial messages to illustrate mathematical concepts.

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

This paper examines how mobile learning can support teachers and improve their practice in Asia. It reveals important lessons for policy-makers and other stakeholders seeking to better leverage mobile devices to assist the work of educators. Four additional papers review how mobile technologies are being used to help teachers in other regions of the world: Africa and the Middle East, Europe, Latin America, and North America. A 'Global Themes' paper synthesizes findings running across the five regional papers.

Complementing the papers about teacher support is a separate set of six papers which describe illustrative mobile learning initiatives and their implications for policy. These papers are also organized geographically.

Two 'Issues' papers will be added to the Series later in 2012. One will anticipate the future of mobile learning, and another will articulate considerations for creating policy environments in which mobile learning can thrive.

Collectively and individually, the papers in the UNESCO Working Paper Series on Mobile Learning scan the globe to illuminate the ways in which mobile technologies can be used to support Education for All Goals; respond to the challenges of particular educational contexts; supplement and enrich formal schooling; and, in general, make learning more accessible, equitable and flexible for students everywhere.

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