Mobile Technology

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Pocket School: Exploring Mobile Technology as a Sustainable Literacy Education Option for Underserved Indigenous Children in Latin America

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Abstract

Literacy is a human right unequally distributed among the world's population. Despite global efforts to fight illiteracy, high illiteracy rates continue to jeopardize access for many to basic schooling, life-long learning, health, and environment safety. Illiteracy also hinders the economic prosperity of the poorest societies in this digital age. Among the underserved population in Latin America, many of the indigenous children are the poorest of the poor who hardly have access to formal and stable schooling. This paper reviews the literature addressing education inequality issues in Latina America, opportunities with mobile learning technology, and various language education projects involving mobile devices. This paper also suggests technology design considerations to meet the learning needs of the extremely underserved indigenous children in Latin America.

Pocket School: Exploring Mobile Technology as a Sustainable Literacy Education Option for Underserved Indigenous Children in Latin America

Despite global attention and efforts to eradicate illiteracy, deep inequalities persist. In the highly unequal societies of Latin America, children of different social backgrounds do not have equal opportunities to learn and reap its benefits (Reimers, 2000). Many are still denied their right to an education and find themselves unable to break from the cycle of poverty. Inequality is particularly acute for indigenous populations. Wherever they live, many indigenous people are among the poorest of the poor in that country (Psacharopoulos and Patrinos 1994; Tomei 2005; Hall & Patrinos, 2006). In Latin America, there are approximately 50 to 60 million underserved indigenous people residing mostly in Mexico, Peru, Bolivia, Guatemala, and Ecuador (UNDP, 2004).

Significant differences exist in literacy rates and access to formal education for non-indigenous and indigenous populations (UNESCO/OREALC, 2004). For instance, in Ecuador, 18% of the people benefit from a full-time education while the figure for indigenous people is a mere 1% (Gradstein & Schiff, 2006). In Bolivia, indigenous children receive 4 years less schooling than their non-indigenous classmates (Hall &Patrinos, 2005). Schmelkes (2000) recounts the situation of indigenous children in Mexico. She reports that many indigenous children live in communities so small that no school is provided, and another group, consisting of about 400,000 to 700,000 school-age children, travel with their parents every year for the harvest, never staying in one place long enough to be enrolled.

Neither do conditions remarkably improve for indigenous children attending school. “Poor and indigenous children often attend the worst schools, are served by the least educated teachers, have the least amount of didactic resources, and are more likely to arrive to school hungry and ill” (Hall & Patrinos, 2005, p.11-12). Evidence of the poor quality of education is depicted by a study that surveyed indigenous schools in Mexico, Bolivia, Ecuador, Guatemala, and Peru. It found that indigenous schools have the highest drop-out, repetition, and failure rates, and their students scored significantly lower in reading and math

tests (Hall &Patrinos, 2005). Parker et al. (2003) concurs that indigenous children fare worse than their non-indigenous counterparts, adding that it holds true even when relatively homogenous samples of rural, marginalized communities are used. McEwan & Trowbridge (2007) describes the three major reasons for indigenous children's poor performance: parents' lack of schooling experience, fewer and inferior quality instructional materials and infrastructure, and linguistic diversity of the indigenous children. Often times, indigenous children are asked to learn in a language they do not know, which poses a formidable barrier to their advancement. Bilingual schools that use the children's native language for instruction reach only a fraction of the population but still suffer from an inferior and deficient quality.

In this digital age characterized by the rapid development of information and communication technologies, the illiterate are at a greater risk than ever before. Those with the least amount of schooling will find it increasingly more difficult to participate in the evolving knowledge-based societies, deepening the social divide (Reimers, 2000). Without an innovative intervention to counter the effects of globalization and technological advancements the gap will only increase, further excluding the uneducated from society and leaving the extremely poor without the necessary skills to secure their well-being.

The potential of mobile learning technology

Recent innovations in mobile technology offer promising opportunities to combat the deep-seated chasm of inequality entrenched in Latin America. Mobile learning devices now have the potential to achieve a large-scale impact due to their portability, low cost, and versatile features (Roschelle, 2003). A convergence of rapid advancements in information and communication technology (ICT) have made this possible; the increase in processing power, storage memory, and connectivity have resulted in an explosive growth in media richness, ubiquitous access and highly personalized learning solutions (Pea & Maldonado, 2006). Today's conventional mobile device can store and deliver a vast amount of information, including an entire K-12 curriculum, and is capable of reaching even the hardest and most disadvantaged audiences (Attewell, 2004).

To date, mobile learning technology has emerged at the forefront of discussions in the context of well-developed support infrastructure and technology enriched learning environments. Its prospective role in reducing global inequalities is less discussed and hardly considered for millions of illiterate children. We argue that mobile learning technology can play a significant role in addressing the learning needs of indigenous children, through either multilingual or monolingual learning methods. We acknowledge the multidimensional complexity surrounding issues of learning and believe that mobile learning technology is uniquely positioned to overcome many of them. In the following sections, emerging opportunities for literacy development with mobile technology are explored. Then, a series of considerations addressing issues including culture, learning theories, usability, and sustainability to meet the learning needs of this marginalized indigenous population is discussed.

Opportunities with mobile learning

Learning is hardly a discrete episode; rather it is an experience interwoven in our daily lives made up of the numerous tasks and stimulants we encounter. When we are faced with problems in various contexts, we often try to understand and respond with the cognitive and physical resources available within and around ourselves. Mobile learning provides the learner with frequent engagement opportunities in a non time-intensive way, increasing the learning chances by allowing the learner to chip away at a large task once motivated (Beaudin et al. 2006) or work on incidental tasks requiring the right mood and occasion in everyday life. At a rapid speed, the practice of mobile learning is expected to increase among learners of all ages, irrespective of ethnic group, class, or gender (Oloruntoba, 2006).

As it stands, mobile learning technology makes sense for children living in rural areas or places that lack various resources including electricity. A mobile learning device that can be mass-produced at an affordable price, along with a solar cell charger, can be of great use even without current ability to connect to the internet. However, given that many developing countries are bypassing landlines to directly install cell phone networks in rural areas, in the future we can

expect that more and more underserved people, in both rural and urban areas, will gain this advantage of mobile network services and information superhighway (Sharples et al. 2005) and benefit increasingly from mobile learning technology.

Insert Figure 1 here

As shown in Figure 1, a mobile device with 2 giga bytes of memory fully equipped with radio, movie player, sound recorder, a 1.5 inch color screen, is sold for $38 dollars in South Korea. By the time this paper is published, the storage size may have notably increased and features such as electronic dictionary, digital camera, and satellite television (Satellite-based Digital Multimedia Broadcasting - DMB) may have been added for the same price. Considering the the manufacturing cost which is around $16, the consumer price may become even lower. A two giga bytes of storage allows for over 600 1000-page textbooks or 300 textbooks with 200 5-minute educational videos in the mobile video format. For rural localities whose inhabitants often lack reading materials altogether, the significance of the content these devices can deliver is vast. To charge the mobile device, a solar power charger with a USB (Universal Serial Bus) plug can be used. It currently sells for around $15 in the U.S. and can be shared within a group. A mobile device similar to the one shown in Figure 1 can run for a continuous 12 to 15 hours, meaning it can last for several days if used a few hours at a time.

Mobile learning in language education

The development of mobile and wireless technologies has opened up a huge array of possibilities for the domain of language learning (Joseph & Uther, 2006). In recent years, there have been numerous studies and projects using the relevant mobile technologies for both formal and informal language learning (see Brown, 2001; Cabrere, 2002; Chinnery, 2006; Kadyte, 2003; Kiernan & Aizawa, 2004; Levy and Kennedy, 2005; Norbrook and Scott, 2003; Paredes et al., 2005; Thornton and House, 2005; Ogata & Yano, 2004; Joseph, Brinsted, &

Uther, 2005). Current use of mobile devices in language learning ranges from vocabulary or grammar learning to story reading and pronunciation practices. Nonetheless, there is no formal theory of mobile language learning developed to date (Joseph & Uther, 2006), but still emerging mobile technologies increasingly suggest potential language learning solutions and environments that will be highly interactive, ubiquitous, and convenient.

Design considerations

A mobile learning model that is appropriate for indigenous children in Latin America will require a deep understanding of this diverse population of learners, their learning conditions and needs, and must factor relevant environmental, cultural, and political dimensions. Perhaps addressing and overcoming all the challenges in the design is a naive thought, seeing that experts have yet to disentangle the circumstances leading to such poor learning outcomes in this group. Nonetheless, a few realistic considerations must be taken into account if the learning design framework is going to be useful. Innovative technologies need to be fully interpreted and applied according to the environment in which they will operate, being well aware of its limitations and challenges, bearing in mind their potential impact on transforming current cultures and practices (Cobcroft et al. 2006) in both intended or inadvertent directions. In this section, we expound upon these concerns.

Situation specificity and cultural sensitivity

Mobile learning solutions cannot be formulated according to pre-existing disciplinary matrices and learning design principles, but must be done in relation to the practical problems specific to the location and situation of the learner (Nyrid, 2002). Considering the learning environment available to indigenous children, even the latest mobile learning principles validated through empirical studies in the developed countries may be inapplicable for this population. Indigenous children living in remote areas may only have access to a very poor school facility with little or no electricity, and an insufficient number of untrained teachers to guide them in their learning. Where there are no teachers for the yoing children, adopting learning activities, even if they are educationaly sound,

may be very difficult. For other children moving about seasonally with parents or working in the farm, a sleeping ground, farm, or playing field may have to substitute for classroom space. Therefore, a mobile learning device which can be carried in a pocket (e.g., therefore it is “Pocket School”) may make a tremendous sense for places where there is no substitute for a formal school.

Furthermore, it is common to find large families living together in a crowded or temporary housing facility, occupying an area no bigger than 500 square feet for 8 or more people, where conventional appliances are non-existant and no single book is found. In such situations, educational programs using flash card words like microwave and compact disc may be completely out of context. Murphy (2006) also emphasizes the need to consider cultural and societal factors when designing mobile learning scenarios. Concepts of marriage, family, work, life, and identity are just a few in a long list to be seriously considered when devising appropriate learning content.

Overall, one thing is universal and quite clear. Learning should be fun, satisfying, and rewarding. Playfulness is a key feature that needs to be incorportated, in the right balance, into these applications for young children (Papanikolaou & Mavromoustakos, 2006). A “Pcoket School” protype as shown in Figure 2 can be a fun and joyful schooling experience for the indigenous children who may otherwise play with metal scrapes or trash shown in the background.

Insert Figure 2 here

Practical usability

Careful considerations must be taken into account in designing a mobile learning device that can have a long life in remote area. Given that there will be nobody to service the device should it become inoperable; the device must be highly shock, water, dust, and scratch resistant. For example, a design using fewer buttons sealed with rubber casing materials would be ideal, unlike a touch screen button that would be easily dirtied and scratched. The device must also

render itself accessible to children by having easy to comprehend features and uncomplicated functioning (Papanikolaou & Mavromoustakos, 2006). The user-interface and buttons must provide the learning content as quickly and with as few operations as possible (Low & O'Connell, 2006) without unnecessary complexity (Parsons & Ryu, 2006) [1]. For this regard, a keyboard like input device may not be appropriate because it would limit the usability of the device to older children with basic literacy skills or at least 3rd or higher grade education experience (See Bartholome, 1996; Fleming, 2002).

In sum, a simple device would ensure young children, at critical ages for literacy education, unfamiliar with technology can maneuver it. Increasing the moving parts of a device can be a detriment since it reduced its operation life.

Insert Figure 3 here

The content design for mobile learning device screens requires repetitive testing to see what scheme would maximize readability while maintaining appealing aesthetics of the content. Pocket School devices loaded with literacy program such as the one shown in Figure 3 will require a large memory space to maximize the content it can hold, since updating content may occur infrequently, and would include material for various levels. At the same time, content must be easily retrievable with a few key operations and delivered in granular fashion to avoid overwhelming the user. Instead of using directories and subdirectories that may be complicated for children, the use of colored or icon-based categories to navigate through the lessons can be often preferred. As choices are made and buttons are pressed, voice guidance could further assist users.

In sum, the learning experience must remain fun and accessible for the children; technology should not obtrude upon it (Sharples, Corlett, & Westmancott, 2002; Parsons & Ryu, 2006)[2]

Theoretical applicability

No matter how sophisticated and appealing a mobile learning device or its content may be, the learner will embrace mobile learning only if it meets his/her

individual learning needs (Parsons & Ryu, 2006) and stimulates his/her particular intellectual curiosities.

A learning solution necessitates in-depth learner assessment to develop appropriate content material and should be guided by relevant theories pertaining to the learners' needs. Children's prior knowledge and literacy skills need to be studied in order to develop effective reading content that can provide them with a meaningful and successful reading experience. Positive reading experiences lie at the foundations of instilling a love of reading in a child. In following, relevant studies addressing learning theories applicable to Pocket School concept will be reviewed in depth.

Researchers in the field of reading development have unveiled some of the mysteries of how a child learns to read and offer practicioners significant guidance for successful reading programs. It is this knowledge that we turn to in order to create reading content that is pedagogically effective and culturally appropriate for indigenous children. The goal of reading goes well beyond decoding and recognizing words. Reading is about constructing meaning from a text (Pressley, 2002). Also, reading is purposeful only when a child can build meaning from a text and connect it to his or her everyday life. A lack of comprehension leads to negative attitudes and a loss of motivation; therefore avoid engaging in futher reading opportunities (Graves et al., 2003).

A child must attain several insights before s/he can make sense out of print, which can be promoted through the use of a mobile learning device. One of the most important and most basic understandings is that a printed word carries meaning. Children acquire this knowledge through frequent exposure to print. Many indigenous children, however, live with illiterate parents and do not have access to reading material in their homes. The rural environments in which they live in are also devoid of printed letters. A mobile learning device that displays and reads words out loud would provide children ample opportunities reach this understanding.

Phoenomic awareness. Other vital insights for learning to read are phonemic awareness and the alphabetic principle (Snow et al., 1998, Juel, 1988,

1991, Adams 1990, Stanovich, 1986). Phonemic awareness is the understanding that spoken words are made up of a sequence of somewhat separable sounds. It is purely an auditory ability but fundamental to mapping speech to print. Examples of phonemic awareness include the ability to blend a series of sounds (“mmm” “aaa” “mmm” "aaa" makes the word “mama”), to identify the first sound in a spoken word (“Gato” begins with /g/), and to recognize words that rhyme (“gato” and “pato”). There are many degrees of phonemic awareness; the most advanced forms being the best predictor of reading achievement (Juel, 1988). To foster it, rhymes and texts with alliteration can be used, which draw attention to the sound of words and their similar parts. Due to their large capacity to store content, Pocket School devices such as the one shown in Figure 4 can house hundreds of multimedia-basd words, songs, poems, and nursery rhymes, which could be replayed again and again, exposing the child to the kind of language s/he needs to hear to develop phonemic awareness.

Insert Figure 4 here

Alphabetic principle. The alphabetic principle refers to the correspondence between sounds (phonemes) and letters. This knowledge is a prerequisite for the identification of words as we read (Juel, 1991) and can be taught through a mobile device. It requires that a child first have knowledge of the alphabet and the individual letters. Content to learn the alphabet can be easily programmed into a device, preparing a child to receive phonics instruction. Simple multimedia scenarios that feature the letter-sound association of only a few letters can also be developed. For example, it is possible to write a multiple-page coherent book, one phrase per page, using only the letter “m” and the five vowels. For example, the phrase “mi mamá me ama” (my mother loves me) is commonly encountered in instructional materials in Latin America. Repeated readings of simple stories that use only a few letters will allow children to discover these letter-sound relationships and give them practice blending two sounds together to form a word.

In Latin America, the sequence for teaching letter-sound correspondences varies (Ferreiro, 1998). A typical program first covers the five vowels, followed by the easier consonants that appear most frequently in the Spanish language. The content of any of these phonics books can be placed inside a mobile learning device, where a child could further benefit from the audio that would accompany the text. Children need considerable practice to master the skill of decoding and know which letters correspond to which sounds. They can only practice if material is easily available for them. Mobile learning devices have the potential to make this happen.

Reading fluency. Fluency is another important component children need to become successful readers. It is the ability to read through a text quickly and efficiently without conscious effort, freeing up their mental capacities to attend to the meaning of the text (Graves et al, 2003). Fluency requires the automatic recognition of words, a feat that can be achieved only by repeated readings and recurrent practices. Predictable texts and repeated readings of a book previously memorized also foster fluency (Kuhn & Stahl, 2000). Vocabulary is another indispensable competency linked to comprehension (Anderson R.C. & Freebody, 1981, cited in Pressley, 2002). For a child to understand what s/he reads, he must be able to match the sound to a concept already established in children's mental schema. Research has documented that children living in impoverished environments have smaller vocabularies, which puts them at risk for reading difficulties (Graves et al., 2003, Hart & Risley, 1995). Indigenous children, especially those whose mother tongue is not Spanish, will need considerable exposure to new words. Multimedia dictionaries and stories tailored to build vocabularies would be a significant asset for these children, who may have no other chance to encounter such words in the environment they live. Literacy development progams and many other educational tools and contents can be developed to specifically fit the medium of a mobile learning device.

Economic scalability

Beside various benefits discussed by many researchers, mobile learning technology may make sense to the indigenous children because: advanced

mobile learning technology can integrate and present educationaly sound contents; there is rarely or no formal learning facility or support in many of the places the children are found; there is more chance of getting a future wireless communication signal than wired network in the region the children are located; and also there is possibly an economy of scale that can be realized from mass production of mobile devices. As discussed earlier, with mass production, the price of a mobile device with a large storage can be dramatically lowered. Many underserved families located in poor regions of development countries live on less than $2 a day (UNICEF, 2003). If establishing a well resourced school facility with a well trained teacher would cost $X, providing a Pocket School with sound educational programs would cost much less than $X. Thus, what is $38 today may one day become less than $10 if there was to be a production effort with an economy of scale in mind. Obviously, governmental or international programs could be integrated to partially, if not entirely subsidize, the cost of mobile learning programs.

Viable sustainability

Developing an effective mobile learning solution for illiterate indigenous children is in itself a challenge. Implementing and sustaining such a solution at a substantial scale would be quite another. Technology innovations in education can become futile and obsolete very quickly if there is no committed plan for adequate support and maintenance. Obviously, deploying a mobile learning technology involves various costs in the repetitive cycles of assessment, design, production, distribution, observation, and enhancement. Therefore, seeking and devising plans to sustain a project of a mass scale such as Pocket School discussed here requires strategic alliances with relevant technology industry leaders and socially responsible entrepreneurs.

Although academic research on social entrepreneurship is still in its infancy (Dorado, 2006), increasingly more entrepreneurs and ventures are bridging profit and service goals in new and creative ways (Eakin, 2003). A variety of social innovation and entrepreneurship studies have emerged rapidly through business school programs such as the Research Initiative on Social

Entrepreneurship at Columbia, the Social Enterprise Initiative at Harvard, the Center for Social Innovation at Stanford, the Center for the Advancement of Social Entrepreneurship at Duke, the Berkley Center for Entrepreneurial Studies at NYU or the Skoll Center for Social Entrepreneurship at Oxford University. If any of these centers can combine their force with education experts and allies in the industry sector, Pcket School may become more than just a concept on paper. It will be important to examine, plan, develop, implement, and re-examine such an educational model with experts in various domains to ensure its success and effectiveness.

Conclusion

A significant number of indigenous children in Latin America are denied their right to an education. A well-planned and supported innovative intervention is needed to intervene on their behalf. Without access to a quality education, many children will remain functionally illiterate and will find themselves incapabable of participating in the information-based socities in which they live. They will be unable to away from the cycle of poverty and the inequality that exists today will only worsen.

Mobile learning technology, thanks to its portability, low production cost, versatile features, and significant memory space, has the potential to provide indigenous children with learning material that could possibly teach them to read. As discussed, many considerations, such as situation specificity, cultural sensitivity, practical usability, theoretical applicability, economical scalability, and viable sustainability along with various learning needs of the children must be taken into account to develop a useable and effective personal learning space such as Pocket School. This paper merely scratched the surface. We hope it generates constructive discussion on the topic and challenges educators to think of innovative ways to use advanced technologies to serve those who need its help the most.

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Figure Caption

Figure 1. $38 multimedia player sold in Korea

Figure 2. Indigenous children enjoying a mobile learning deivice prototype

Figure 3. Mobile language learning device prototype with Spanish content.

Figure 4. Multimedia dictionary prototype.


Pero no había nada en el agua. No había perro ni carne.
Speaker
CAMERA
BACK
S/N 23510365
Microphone
Queso
FRONT


Gato
G
M
MIC
M
MIC