External Research Digital Inclusion Program

Mobile Language-Learning Tools Help Pave the Way to Literacy

In many developing countries, literacy in a "world language" such as English can make the difference between a life of poverty and socio-economic opportunity. To help nurture these possibilities, researchers at the University of California, Berkeley, are combining the immersive nature of electronic games with the rapid growth of cell phones to create a mobile language-learning environment for children. Their innovative approach is yielding promising results among the rural poor in India.

Throughout the developing world, low levels of literacy are often a barrier to social and economic empowerment. The poorest people tend to be at the greatest disadvantage, especially if the doors to education are effectively closed to them.

In India, for example, where English literacy is considered an effective means of overcoming poverty, parents who can afford the tuition send their children to private English-speaking schools because they consider the country's public education system ineffective. Meanwhile, lower-income families whose only option is public schools worry that their children aren't developing even basic knowledge or skills.

Researchers at the University of California, Berkeley (UC Berkeley), believe that the growing number of cell phones in India—the World Bank predicts 450 million users in the country by 2010—could offer a solution to this challenge. As mobile phones with PC-like capabilities extend into rural areas, even people in many of the poorest villages have access to an inexpensive yet sophisticated wireless computing device.

Under the auspices of a project called Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE), the team of UC Berkeley researchers aims to

Professor John Canny and Matthew Kam, two of the principal researchers on the MILLEE project.

Fast Facts

Project: Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE)

Project Principals:
Professor John Canny, University of California, Berkeley; graduate students Matthew Kam and Divya Ramachandran

Partner:
Suraksha, an India-based nonprofit organization

Web Site:
http://www.cs.berkeley.edu/~mattkam/millee/index.html

Profile:
Researchers at UC Berkeley are pairing e-learning games and "smart" cell phones to create engaging, affordable language-education tools that can help improve literacy among school-age children in developing countries. This mobile learning technology is being applied first in rural India.

Digital Inclusion Program

The Microsoft Research Digital Inclusion Program provided US$1.2 million in research funding in 2006 to empower academic researchers worldwide to tackle technological challenges that could positively affect health, education and socioeconomic conditions. The 17 recipients, selected from among 162 proposals from 34 countries, received technology resources as well as project funding.

The Digital Inclusion Program is administered by the External Research group within Microsoft Research and is part of the group's ongoing commitment to investing deeply in innovative research. The External Research group collaborates with the world's foremost researchers in academia, industry and government to move research in new directions across nearly every field of computer science, engineering and general science.

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capitalize on the country's fast-growing cellular network to deliver English as a Second Language (ESL) instruction to children in out-of-school settings. To make the learning experience engaging, the team is incorporating educational content into computer games that mirror the way humans naturally learn language. The project was one of 17 recipients of grant funding and technology resources from the Microsoft Research Digital Inclusion Program in 2006. It also receives funding from the U.S. National Science Foundation and a BREW Wireless Reach award from Qualcomm Inc.

"A child's first language learning happens outside the classroom," says John Canny, a computer science professor at UC Berkeley and the faculty advisor for the MILLEE project. "It takes place in immersive environments where everyone around you is fluent."

Cell phones offer an ideal platform for this learning model because they are ubiquitous, affordable, compact and wireless.

The e-learning games created by the team concentrate on simple English-language skills such as vocabulary, phonetics, sentence composition and spelling. Canny says cell phones offer an ideal platform for this learning model because they are ubiquitous, affordable, compact and wireless. Plus, their audio/visual technology lets children see the alphabet, hear words spoken in English and test their pronunciation.

The researchers are designing a series of games that constitute a curriculum equivalent to a first-semester ESL course. In collaboration with Dr. Urvashi Sahni, who heads the India-based nonprofit organization Suraksha, the team is deploying and testing the cell phone–based e-learning games in North India. In a four-month study currently under way, 25 rural children participate in gameplay sessions three times a week.

The games in this pilot are informed by six rounds of earlier field studies that took place over six months in North and South India. These exploratory studies were conducted with 120 children in rural government and private schools and in urban slums. Results from the UC Berkeley team's first major quantitative study in the summer of 2007 showed that gameplay can produce significant learning benefits. One group of 47 children who played games designed around simple vocabulary tasks saw their average score increase from 1.97 points out of 5 on the pre-test to 3.85 points out of 5 on the post-test. Another group of 16 children scored an average of 3.50 points out of 8 on the pre-test and 7.06 points out of 8 on the post-test. The MILLEE team plans to assess English learning using more complex learning metrics in the current pilot study.

"We're confident that this type of learning will enhance students' basic skills and vocabulary enough that they will score well on a traditional exam," Canny says. "This longitudinal study will also provide clues to the sustainability and scalability of our approach."

Eventually, the researchers hope to hand off a sustainable version of their immersive language-learning system for wider deployment. Canny believes the ideal host for this cell phone–based content would be some combination of state education departments and telecom carriers.

In the meantime, the MILLEE team is developing other technology elements of its system, including a speech recognition component made possible through the Microsoft grant funding. The team ported a high-performance speech recognizer to the Microsoft® Smartphone platform to support more advanced language uses and further develop the ESL curriculum. New elements include a pronunciation feedback tool, which the team will begin testing soon, and a speech interface to help students build vocabulary through dictionary lookup.

"The Microsoft Research funding has filled in one of the most difficult and crucial parts of the whole language-learning solution," Canny says. "It has also allowed us to contribute to the body of knowledge about interface technology and, more generally, about how people who are illiterate or semi-literate can interact with information technology. We've created an open source tool that many groups can use, and we expect to use it in other projects."

More immediate plans for the MILLEE team call for deploying an English-language teaching tool for migrant farm workers in the United States, likely in the fall of 2008. Canny notes that literacy rates for this population, including children, run as low as 10 percent. Also later in 2008, the team hopes to work with a nonprofit organization to scale up its teaching tool to at least a dozen schools in rural India.

Further down the road, MILLEE researchers expect that the lessons learned in India will be applicable to other world languages, including Mandarin Chinese and Spanish, and will serve as a model for enhancing literacy in other developing countries in Asia, Africa and Latin America.