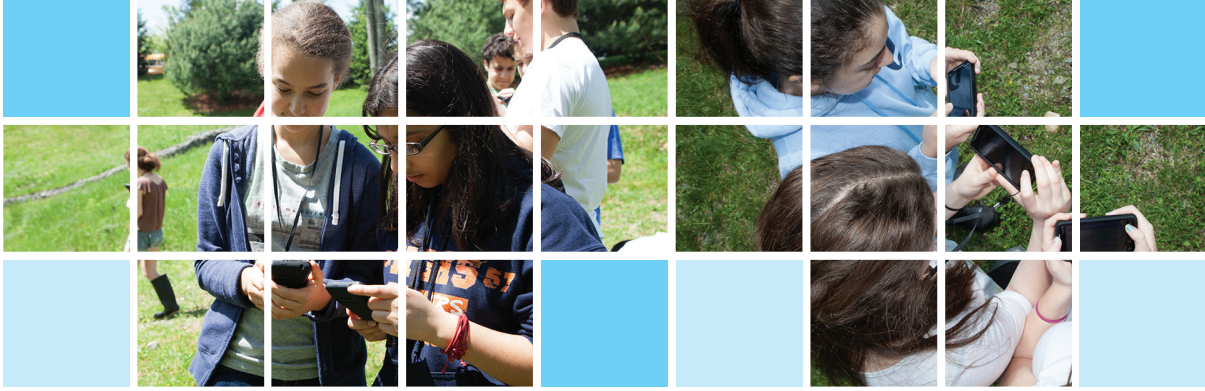
Wireless Reach™
from Qualcomm



Health Care | Education | Entrepreneurship | Public Safety | Environment

Partners

- Harvard University
- MoGo Mobile Inc.

2011 Statistics

- Life expectancy: 78.5
- Population: 313.8 million
- GDP per capita: US$48,100 (est.)
- Internet penetration: 78.2%
- Mobile penetration: 100.9% (est.)

Sources: CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook); Mobile penetration data provided by Informa UK Limited and based on market intelligence. Internet penetration data provided by www.internetworldstats.com and based on data published by Nielsen Online, the International Telecommunication Union, GfK, and local regulators.

"They (6th grade students) are getting to see parts of the world that they don't see…things that they didn't know existed."

- Science Teacher from Cambridge using EcoMOBILE

Case Study

EcoMOBILE Enables Students to Explore New Worlds

Qualcomm's Wireless Reach initiative has teamed up with MoGo Mobile Inc. (MoGo) and Harvard University Graduate School of Education to develop unique educational Augmented Reality Experiences (AREs) using 3G-connected mobile devices and MoGo's FreshAiR™ development platform. AREs overlay digital educational material onto physical environments and can be accessed anywhere from a mobile device with wireless connectivity, camera, and GPS capabilities. Harvard University Graduate School of Education designed custom AREs using Vuforia™, Qualcomm's augmented reality (AR) platform, providing students with interactive media including text, images, audio, video, 3D models, and multiple-choice or open-ended questions during a science fieldtrip to an outdoor environment enabling true mobile learning experiences.

Challenge

- Teachers are looking for creative new ways to increase student engagement and learning that align with state education standards.
- Teachers are concerned about student engagement and participation. Lack of student interaction in the classroom is problematic to learning, and teachers are looking for new and creative ways to involve students in the curriculum
- Many students and teachers do not have resources to apply classroom lessons to real-world experiences.
- Teachers are interested in teaching real-world issues, such as global environmental problems, that help students learn how to analyze complex systems and to work collaboratively to solve difficult problems.
- According to data collected from focus groups facilitated by Project Tomorrow, a national education nonprofit organization, students are requesting learning experiences that have immediate relevance to their lives and future careers. For example, they prefer science activities that are connected to a larger and meaningful context and in an environment that resembles scientific practice.
- There is room for improvement in the teaching of Science, Technology, Engineering, and Math (STEM) subjects. STEM education is important to our nation's economic prosperity in the global economy. Strong STEM skills are a central element of a well-rounded education.

Solution

- Harvard University Graduate School of Education created three middle school AREs aligned with science education standards for students in multiple school districts in the Northeastern United States.
- The project, called EcoMOBILE, teaches students about ecosystems by adding visual overlays, supplemental information and just-in-time feedback to a field trip experience where students work individually or in teams.
- For example, one EcoMOBILE ARE allows students to follow a virtual carbon atom around an ecosystem.
- They work individually to track an atom and in the process they learn about ecological transformations like photosynthesis and respiration. Using 3G wireless mobile devices students can "observe" ecological processes as they occur at the molecular level. Students track different atoms and come together at the end to learn from each other about the path that another atom has followed.

HARVARD
GRADUATE SCHOOL OF EDUCATION

A science student using EcoMOBILE augmented reality applications to learn about the ecosystem during a fieldtrip to a local pond.

- Students learn about the approaches and techniques used by scientists to collect and analyze data in outdoor settings and collaborate with each other to solve problems.
- Lesson plans for teachers and assessment material were also developed to gather information on student engagement and gains in content knowledge after participating in the AREs.

Results

- Teachers reported that the activities were more student-driven and less teacher-directed, providing the students with a different sense of ownership over the experience.
- Teachers noticed that AREs helped students to better understand complex ecosystems. One student said, "It helped me learn what pH, turbidity, and dissolved oxygen were, and if it was good or bad for the environment."
- Afterwards, teachers discussed how the technology facilitated interactions among students and with the pond environment that resemble scientific practice. They also spoke about the benefits of managing a productive fieldtrip. "It felt like 90% of the time they were at the pond environment, they were working on interacting with the pond and their partner, whereas previous times it felt like it was maybe 60 or 50% of their time they were independently interacting," said a science teacher using EcoMOBILE.
- Teachers commented that the smartphones helped to structure students' movement through space and guided their interaction with the pond and with classmates. The students were able to work independently, at their own pace, with the teacher acting as a facilitator.
- Overall, student survey responses showed a positive shift in their attitudes about their ability to understand focal topics, gain science related skills, and draw connections between what they are learning in class and in the real world.
- Significant learning gains were witnessed on the content survey results with students' scores increasing by an average of 19% from the pre to post survey.
- Technology-rich activities tended to receive the highest student ratings in comparison to less technology focused activities.
- The results of the student opinion and content surveys support the idea that the smartphones sustained high levels of student engagement. The student learning gains were most apparent on items related to the combination of AR and probeware, which allowed students to measure environmental variables in real time during the field trip activities. The AREs and probeware were complementary in supporting student development of skills and knowledge related to the methods and procedures of scientific practice.

Project Partners

- **Harvard University Graduate School of Education** develops AREs that are aligned with school curriculum and provides onsite implementation support for the EcoMOBILE project.
- **MoGo Mobile Inc.** developed the AR solution for education using their FreshAiR platform (http://playfreshair.com) and Qualcomm's visual recognition platform. The FreshAiR development platform enables anyone to create a custom ARE without any coding required.
- **Wireless Reach initiative** is the co-funder for Harvard University's EcoMOBILE AREs program with the National Science Foundation. Wireless Reach also provides project management support.

Qualcomm's Wireless Reach™ Initiative
Qualcomm believes access to 3G and next-generation mobile technologies can improve people's lives. Qualcomm's Wireless Reach initiative is a strategic program that brings wireless technology to underserved communities globally. By working with partners, Wireless Reach invests in projects that foster entrepreneurship, aid in public safety, enhance the delivery of health care, enrich teaching and learning and improve environmental sustainability. For more information, please visit www.qualcomm.com/wirelessreach.