



Open Source at Microsoft

Improving the Classroom Experience and Extending Distance Learning

During the online demonstration, a man walks up to a whiteboard and draws an inclined plane – a right triangle whose hypotenuse tilts down to the right. Then he draws a cart on the slope. It's really little more than a rectangle atop some circles. The wheels don't even touch the hill. At the top-left corner of the whiteboard is a little button labeled "Run." The man taps it with his marker, and the cart suddenly rolls down the slope and tumbles out of view. Then you understand that this isn't your run-of-the-mill whiteboard or a regular marker. It's like no physics lesson you've ever seen before.

Called Physics Illustrator, the project is the indirect result of a shared taxicab ride nearly a decade ago.

A collaboration that began in a taxi

In 1998, Microsoft Chairman Bill Gates and Massachusetts Institute of Technology (MIT) President Charles Vest shared a taxi ride after a conference. They started talking about how information technology could improve the classroom educational experience and the ways the two organizations could collaborate to make it happen.

Before long, Gates offered to fund an exploratory project, and Vest to host it. So in 1999, iCampus was born—a 5-year, U.S. \$25-million alliance dedicated to exploring the ways technology could improve education and campus life for university students.

According to Paul Oka, who ran iCampus from 2003 until its culmination in 2006, the alliance's objectives were intentionally left broad.

Projects mainly focused on three goals: making classroom learning more active; providing

educational services online; and fostering student-run research projects.

Oka, the Principal Program Manager in the Microsoft External Programs and Research Group, says, "There was never any intent to make a product or create an information technology." The sole focus of the endeavor was to improve the learning experience of students.

With this open-ended approach, iCampus became a hive of creative work that demonstrated the virtues of giving students a measure of control over their own education and suggested some future directions for education technology.

Open source solutions were vital to the development of iCampus. To facilitate collaboration, "most faculty projects were open source," says Oka, and "student projects had to be available in the public domain." This also helped Microsoft participate and learn more about what makes for successful collaboration with educational institutions.

Bringing the lab to students around the globe

The iCampus administrators, three employees from Microsoft and three from MIT, were patient as the outlines of the project began to crystallize. In fact, the initial costs were lower than expected—so much so that they were able to extend iCampus two years beyond its projected five-year life span.

The open approach worked. iCampus became very active and engendered a diverse group of projects, including:

- iLabs, a distance-learning project that enables students from around the world to conduct experiments over the Internet with laboratory instruments based at MIT.
- Technology-Enhanced Active Learning (TEAL), an approach to teaching undergraduate physics combining a studio format, hands-on lab experiments, visualizations, and small group collaboration.
- iMOAT, a suite of Web services for online writing assessments.

The iCampus projects “transformed how MIT educates students,” Oka says. By his estimation, 30 percent of the MIT community worked on iCampus projects. But the percentage *affected* by the projects was much greater. Consider the question, “How do you teach first-year physics?”

For many MIT professors, the answer is TEAL. Instead of a huge lecture hall, imagine smaller classrooms filled with round tables, each with three teams of three people. The professor lectures or wanders the room commenting on desktop experiments. There are information displays around the room and mechanisms for feedback.

Building on work initiated by the Rochester Institute of Technology, the TEAL project helped design the classroom and create the pedagogy and curriculum. The interactive approach enabled struggling kids to succeed. “Fewer people failed,” Oka says. “Now, all [first-year physics] are taught in this form. And other schools have started to teach physics this way.”

Another example of how iCampus has transformed education is the iLabs project, which lasted the entire seven years of the iCampus alliance. iLabs is about making higher education facilities, expensive labs in particular, available to institutions around the world. It enables students to run real experiments instead of simulations.

What happened with the iLabs project, Oka says, is that “kids took the time to run multiple experiments, multiple times.” The response was so enthusiastic, in fact, that students actually burned out the bearing on lab equipment, something that had never happened before.

Like many of the iCampus projects, iLabs will live on, via a grant from the Mellon Foundation.

An education in product management as well

Work for any organization long enough and you quickly learn that coming up with a great idea is not the hard part. The true challenge is shepherding that idea through the corridors of the organization to bring it to completion. And as remarkable as many of the projects were, the iCampus emphasis on project management was just as important for the participating students.

Students could propose and run their own projects, which was a departure from the norm of having them work on faculty-led projects. “We asked students what they wanted to do and what issues they wanted to address,” Oka says.

iCampus would take on 5–10 student projects a year. Typically, students would start the work in January and have to carry the work through summer and into the fall. Used to doing things over the academic year, they’d have to keep the

project going over the summer. Oka says, “We helped them understand project management, learn how to work across the organization, get stuff to work, [incorporate] real user feedback, and how to address broken things.”

The legacy of an idea

What has iCampus left us with? For one thing, some remarkable technology projects that will carry on independent of the formal iCampus alliance. For another, a generation of students that have benefited from the iCampus alliance—students who are entering the work force knowing how to transform their ideas into successful products and services.

For example, the spirit of iCampus lives on in ConferenceXP, a shared source research platform developed by Microsoft Research that provides simple, flexible, and extensible videoconferencing. ConferenceXP helps researchers and educators develop applications and solutions that feature broadcast-quality audio and video in support of real-time distributed collaboration and distance learning environments.

ConferenceXP embodies perhaps the most important take-away to date from iCampus: the idea that open source technology can improve the classroom experience and extend education to any place with an Internet connection.

In another online demonstration, Professor Bradford DeLong stands in a classroom at the University of California, Berkeley, delivering an economics lecture. With ConferenceXP technology, DeLong can use a “classroom presenter” Tablet PC to write out his lecture notes as he walks through the class. And students can receive those notes on their own

Tablet PCs as he writes. DeLong can also conduct a pop quiz. The students can answer anonymously, allowing DeLong to conduct a real-time assessment of how well the students are learning the material.

With its advanced teleconferencing capabilities, ConferenceXP can also link classrooms in multiple locations. DeLong, in Berkeley, fields a question on the economics of farming. The question is from one of his students—in Seattle.

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