Mobile computing unlocks new way of learning
HP grant supports pioneering computer engineering education at UNISINOS

“HP was essential to the achievement of our vision for applying mobile computing to undergraduate education. The use of HP mobile devices stimulates our thinking to explore new ways to apply technology to learning.” — Dr. Jorge Luis Victoria Barbosa, head of the Mobile Computing Laboratory (MobiLab) at UNISINOS

Objective:
Support experimental learning in a new educational model using mobile computing devices.

Approach:
An HP Technology for Teaching Grant provided UNISINOS with a variety of mobile computing products allowing students to pursue individual projects both in and outside the classroom.

Educational benefits:
• Mobile computing allows students to design and carry out a variety of individual Learning Projects.
• Hands-on experience applying technology to problems in computer engineering, physics, linguistics and other fields.
• Mobile computing products effectively extend the classroom.

Since 2003, Universidade do Vale do Rio dos Sinos (UNISINOS) in Sao Leopoldo, Brazil, has pursued an innovative, experiential and project-based model for undergraduate education. And in the computer science area, HP has played an important role in transforming that model from theory to reality.

“HP was essential to the achievement of our vision for applying mobile computing to undergraduate education,” says Dr. Jorge Luis Victoria Barbosa, a researcher and lecturer at UNISINOS, and head of its Mobile Computing Laboratory (MobiLab). “The use of HP mobile devices motivates both professors and students in a significant way. They stimulate our thinking to explore new ways to apply technology to learning.”
HP educational support
HP believes that technology, when used effectively in teaching, can have a positive and transforming impact on student learning. The HP Technology for Teaching Grant Initiative, through which UNISINOS students and professors received state-of-the-art HP mobile computing products in 2005, is designed to support the innovative use of mobile technology in education.

UNISINOS and HP have been working in partnership since late 2003 on research topics related to mobile and ubiquitous computing. HP support has been a key enabler for UNISINOS’ MobiLab, which studies the use of mobile devices to improve learning and teaching processes. One of MobiLab’s major projects is “CoolUnisinos — Mobile Computing in Unisinos,” which has been enabled directly through the HP grant.

New approach to undergraduate education
UNISINOS structures undergraduate education based on a new and unique academic approach, called the Undergraduate Course of Reference, or GRefe. A professor leading the course mixes thematic workshops, lectures and experiments.

Students use those activities as a springboard to launch individual Learning Projects, which integrate lessons into a practical, experimental framework. Learning Projects are the primary pedagogical instrument of the GRefe.

One particular GRefe, called ComGRefe, is dedicated to Computer Engineering. Since 2005, the majority of Learning Projects in ComGRefe have been based on HP mobile computing products received by UNISINOS through the HP Technology for Teaching Grant.

Mobile computing facilitates ComGRefe
“The HP hardware we received through the grant is a major stimulus to the development of more complex Learning Projects,” Barbosa says. “All of the major projects in ComGRefe are currently based on mobile computing products. Students have been using HP iPAQs and Tablet PCs in many of their daily activities, and in their individual explorations.” Some 80 students and 24 professors have access to the HP products for use in ComGRefe Learning Projects and other activities.

The key to success in UNISINOS’ new undergraduate GRefes is the ability of students to apply lessons learned in the classroom through their own exploration and experimentation. That may be where mobile computing technology plays the biggest role.

For example, ComGRefe currently has two Learning Projects specifically designed around the use of HP mobile computing technology: (1) the creation of mobile robots, and (2) the use of mobile computing to automate residences and industries.

Both projects are using HP Tablet PCs and wireless technology to control robots, doors, video cameras and energy consumption. Students meet individually with their professor/tutor each week to discuss their progress and how the project might evolve in the future.

Enriching education in all subjects
Barbosa says the educators involved in ComGRefe have two major educational objectives. “First, we are interested in using wireless and mobile technology to improve each of the Learning Projects,” he explains. “Learning Projects are the main pedagogical activities because they integrate everything a student has learned into a practical framework, where students and professors can participate side-by-side.”
Second, he notes, the technology is used to support the specific activities of each area of knowledge. Mobile computing is being used in multiple academic areas, ranging from computer science and physics to linguistics and philosophy:

- In computer science, the students are using mobile computing to test programs they develop using Java and C++, to create distributed applications that are connected using WiFi and Bluetooth; and to experiment with network programming concepts, like sockets and client/server models.
- In electronics, mobile computing products are being used to facilitate laboratory activities (implementation schemes and use of photos/films of prototypes in development); and to support real-time projection and discussion of alternative solutions.
- In physics, mobile computing devices (an HP Tablet PC, a sensor and an interface with analog/digital converter) are being used for remote data collection, both in and outside the classroom.
- In mathematics, HP products enable students to access mathematic software via the Web, and to introduce computational vision to robots through use of wireless digital cameras.
- In linguistics, Tablet PCs are being used to assemble language glossaries, to record oral practice of dialogues and speeches, for e-mail in various languages, to translate students’ home pages into other languages for worldwide viewing, and to chat with “chatbots” to support English education.

- In philosophy, HP products are being used to access digital libraries (books, texts and videos) and facilitate use of a philosophy site created by the course.

<table>
<thead>
<tr>
<th>Customer solution at a glance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary applications</strong></td>
</tr>
<tr>
<td>Integrated ERP solution</td>
</tr>
<tr>
<td><strong>Primary hardware</strong></td>
</tr>
<tr>
<td>- 45 iPAQ hx4700 Pocket PCs</td>
</tr>
<tr>
<td>- 45 256 MB SD Memory Cards</td>
</tr>
<tr>
<td>- 20 Compaq tc1100 Tablet PCs</td>
</tr>
<tr>
<td>- 14 Tablet PC Docking Stations</td>
</tr>
<tr>
<td>- 2 HP Officejet 6710s</td>
</tr>
<tr>
<td>- 2 HP Photosmart 935 Digital Cameras</td>
</tr>
<tr>
<td>- 2 HP Digital Projectors sb21</td>
</tr>
<tr>
<td>- 4 Cisco Aironet 1000 access-points</td>
</tr>
</tbody>
</table>
The impact of mobile computing

After a year of using HP mobile computing products to support ComGRefe, Barbosa says it’s clear that technology can transform the educational experience — when it gets into the hands of students.

“Based on the meetings conducted with professors related to this project, I would say the impact of using mobile computing products in Learning Projects was clear and positive. In that sense, HP was essential to realizing what we set out to do with creation of Undergraduate Courses of Reference.”

He says the next steps will involve creation of an environment to support ubiquitous learning in the Computer Engineering context. Mobile computing tools will be used to enable student learning anytime, anywhere.

“We’re just beginning to explore how mobile computing will impact undergraduate learning at UNISINOS,” Barbosa says. “HP continues to be a valuable partner in helping education here succeed in new ways.”