THE MOBILE WIRELESS CLASSROOM: POCKET PC'S IN HIGHER EDUCATION

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Abstract

Since 2003, EWU has been using the Mobile Wireless Classroom, a pilot project consisting of a self-contained portable set of 30 Pocket PCs for electronic assessments. Pocket PCs were selected as an alternative to laptop computers as they maintain much of the same capability but at a fraction of the cost and are much less invasive in general classroom use. Students ranging from first-quarter freshmen in English Composition to last-quarter seniors in Developmental Psychology use the Pocket PCs to respond to lectures, watch videos of laboratory procedures, and to submit writing samples for peer review. Professors using the mobile assessments can quickly gather feedback from students and pinpoint areas where further review is needed.

An Idea is Born

In February 2003, Ian Siemer (a colleague in my office) and I were thinking of ways to make computers more accessible to students in classrooms here at Eastern Washington University. We wanted an alternative to laptops, not only because of cost, but because laptops often create a barrier between instructor and student and can become a distraction in the classroom. We wanted a system with similar functionality to a laptop-equipped classroom, but with less intrusive technology and at a lower cost.

We then began investigating the possibility of creating a classroom set of Pocket PCs as an alternative to a much more costly set of desktop or laptop computers. At the time, EWU already had several sets of wireless-capable laptops, but they were assigned to a single classroom, generally required installed infrastructure (wireless access points and mounted projector), and were cost-prohibitive for many colleges and departments on campus.

Based on my personal experience using Pocket PCs, and Ian's insistence that students would be excited to use them in class, we posited that a set of Pocket PCs and related accessories designed to travel with them from

building to building and classroom to classroom would not only be an inexpensive alternative to laptops, but would be an attractive option for many departments and instructors on campus. Thus the Mobile Wireless Classroom was born.

Putting Together the Pieces

The Mobile Wireless Classroom (MWC) is a transportable, self-contained classroom set of handheld computers and a centralized server for electronic polling, quizzing, testing, assessment, and streaming audio & video, connected via an ad hoc wireless network. In a nutshell, the MWC is a set of 30 Pocket PCs stored in a custom built cart (complete with charging cradles, laptop server, projector, and wireless access points) that can be moved to any classroom on campus and used by any instructor in any subject.

For hardware, we chose the Dell Axim X5 (running Windows Mobile 2003) for student use and matched that with a Dell Latitude D600 (running Windows Server 2003) acting as both instructor laptop and server. We mounted 30 cradles and 30 spare batteries in a standard (read: ugly) wheeled cart, along with two Apple Airport wireless access points (Snow models, modified with external antennas), a BenQ PB7200 projector, and pre-wired everything to minimize setup time. Instructors have only to move the cart into their classroom, plug in a power cable to the wall, an optional network cable to the campus network, and the MWC is ready to go in about 90 seconds.

The network cable is optional because many applications of the MWC do not require an outside network connection, and simply not connecting to the campus network keeps students on task and away from Hotmail and eBay. Aside from network access, we did not otherwise limit the Pocket PCs because as a pilot project, we did not want to discount any possibility.

For software, we chose ‘QuestionMark Perception 3’ to drive online assessments and tests, and ‘TurningTechnologies TurningPoint vPad 2003’ for interactive lectures and quizzing and polling. We use ‘Sprite Clone’ for maintenance and cloning of the Pocket PCs, saving hours of configuration. Most navigation is done via an internal Web site and Pocket Internet Explorer, so development is all in HTML and can be easily updated.

We initially intended the MWC as a tool for classroom polling and basic quizzing, and even wrote a custom application to do just that, but after discussion with interested instructors realized not only that it had to do more, but that we were just touching the surface of the capabilities of wireless Pocket PCs in a classroom. We've since added on-demand streaming audio and video, more advanced web-based assessments, interactive lecture response, and are investigating in-class instant messaging.

The first public demonstration of the MWC was in May 2003, and we received many inquiries from instructors interested in participating in the pilot. We selected instructors from varying disciplines who expressed a diversity of ideas on how to use the MWC and the Pocket PCs in their classes. During the

summer of 2003, we met several times to discuss implementation, logistics, assessment, and pedagogy, as well as the technology.

Rollout

In Fall 2003, the Mobile Wireless Classroom rolled out (literally) to Microbiology classes, and got very positive reactions from the students and the instructor. Students individually reviewed on-demand streaming videos of laboratory procedures from a library of 30 videos. The instructor then followed up with questions about what they just saw, and could give students instant feedback.

Despite initial network problems (streaming 30 different videos to 30 Pocket PCs simultaneously via 802.11b presents many of its own problems), the students used the on-demand videos for several weeks during labs with few issues. During heavy network traffic, many of the Pocket PCs would not reliably stream videos. The videos, encoded at 200kbps, would seemingly choke the access points when more than 15 Pocket PCs were connected. Through trial and error, we found we got the best and most reliable performance using older model Apple AirPorts. We never did identify the exact issue beyond being able to replicate it with almost any brand or model access point, but the problem with the network was something of a blessing in disguise, as having to debug the most technically difficult project first provided us with an incredibly robust network configuration; there have been no problems with it in the 18 months since.

Expanding the Options

During early 2004, we expanded the use of the MWC to include in-class quizzing and polling via QuestionMark Perception, and dealt with issues arising from sharing the MWC between two instructors using it in different buildings on the same day. In Filmic Arts-Directing and Producing, the class viewed student films and then gave anonymous feedback, electronically and instantly. The student filmmakers then responded directly to critiques of their projects and even created questions specific to their own work. The student feedback was more honest than paper-based submissions because of the anonymity afforded by the Pocket PCs. This electronic feedback system replaced a paper-based system where feedback was not reviewed until days after the actual class, thus diminishing its usefulness.

In Electrocardiography Interpretation, students reviewed electrocardiograms in class, interpreted the content, and responded via electronic polls and quizzes. Logistical and scheduling issues aside (and an incident in which the cart was not plugged in over a weekend!), there were few problems.

In Fall 2004, students in English Composition used TurningPoint vPad and the MWC to participate in interactive lectures on grammar and mechanics and to submit their own writing samples for peer review and to discuss them in groups or as a class. While the instructor's original plans included only simple

classroom polling and lecture response via vPad, the addition of essays and open-ended questions, and student-submitted writing samples were very useful and popular with both the instructor and students.

In Spring 2005, students used the MWC, TurningPoint vPad, and QuestionMark Perception in Developmental Psychology to answer questions embedded throughout lecture presentations, and to receive immediate feedback about their responses in order to identify areas in which they need review. This helps instructors manage a dynamic lecture. Students also work in groups to compare individual and group responses. This continued throughout the 2005-2006 academic year.

Pocket PCs are not without their caveats (screen size, resolution, application availability), but in five university classes ranging from first quarter freshmen in English Composition to last quarter seniors in Developmental Psychology, Pocket PCs have proven to be valuable in classroom instruction. Screen size and the stylus input that are the biggest areas of concern to instructors and students, but as long as the classroom activities are designed to accommodate the lower resolution screens and input capabilities of Pocket PCs, these limitations have never caused problems. Students take to stylus input very quickly, and screen size primarily makes web access more cumbersome. Pocket PCs with VGA screens and built-in keyboards would all but eliminate these issues.

A Definite Success, with Promise for the Future

We're now approaching the end of our second year in a pilot program to determine the feasibility of Pocket PCs as a classroom enhancement and as an alternative to a dedicated computer classroom. The results have been very interesting. Our original idea was to see if wireless Pocket PCs could serve as a lower-cost and less invasive alternative to a dedicated computer classroom: in that I feel we've been very successful.

What future do Pocket PCs have in higher education? A very bright one if handled correctly. We found that if instructors treat them as direct laptop replacements, Pocket PCs often fail to impress. But if instructors look at Pocket PCs as a different tool for students to use in-class electronic assessments, audio, video, polling, and quizzing, then Pocket PCs work quite well. Pocket PCs can be an attractive option to many departments, and are very capable for a variety of uses. The MWC prototype system totaled less than $15,000 including development and personnel costs, while a comparable classroom set of laptops costs about $30,000 to $45,000.

We'd like to expand the MWC to include larger classes of 60-100 students, create additional sets for satellite campuses, and take the Pocket PCs off campus for use in the field in courses in the environmental sciences, forensics, marketing, social work, and business. The response from students and instructors thus far has been very positive, and as advances in handheld computing continue, so shall the possibilities for their use in higher education.