Handheld Devices

Towards a More Mobile Campus

Personal computing is on the move—if slowly—from the desktop to a more mobile environment. Handheld devices, connected wirelessly to the campus network, will certainly change the way we work and communicate. But how soon, and when? Here, Mary Fallon offers an overview of the acceptance and use of handheld devices on campus.

By Mary A. C. Fallon

Most of the nation's 3,913 accredited colleges and universities haven't launched initiatives that recommend or require students to use handheld computers. Yet hundreds, like USD, are experimenting with how to enhance learning with the mobile devices—hoping to leverage the coming convergence of wireless networks, Web services, and enterprise applications. Some pilot projects, like those at Western Carolina University in North Carolina and Loyola College in Maryland, are sputtering for lack of funds, or because they aren't central to the college's technology strategy yet.

Small Devices, Growing Status

"Handhelds haven't hit mainstream yet," says Mike Lorion, vice president of education for Palm Inc. "They are still building momentum. Mainstream is a couple of years away." Palm, which has garnered the lion's share of handheld sales to college students, faculty, and institutions, estimates sales to higher education climbed 10 to 15 percent over last year despite a slow economy. Lorion and a host of educators say that Palm's persistent financial difficulties don't seem to be having a negative effect on college sales.

While handheld initiatives on college campuses percolate, educators and IT experts debate whether handhelds will supplement or supplant laptop computers. Meanwhile, looming on the horizon are new types of portable computers based on Microsoft's Tablet PC software that could shove laptops and handhelds aside, or at least give schools more choices. The first tablets, which can be written on like paper, are being introduced this month by Hewlett-Packard Company, followed by Acer, NEC, Legend, and Toshiba. As an alternative, AlphaSmart Inc. licensed the Palm operating system and in June introduced a mobile computer called Dana, that has a screen 3.5 times larger than a handheld screen and a full-size keyboard. The Dana costs about two-thirds less than a typical laptop.

Access is the Issue

IT experts anticipate the array of computing form factors won't be the driving issue; instead the focus will be on how the range of computing and telephony devices can share and distribute content and services anytime, anywhere.

"All the stakeholders have to acknowledge that everyone wants access to resources in new ways," says Gil Gonzales, chief information officer for California State University at Monterey, which has a campuswide wireless network. "Universities need to repackage their content and services for a growing number of end-node devices—personal digital assistants (PDAs), tablets, and embedded devices designed for single tasks."

Kendall Whitehouse, director of Advanced Technology Development for The Wharton School of the University of Pennsylvania—where Palm handhelds are as commonplace as telephones—is convinced that the most effective strategy is to create a single universe of information that can viewed from different size windows, depending on which type of computer is accessing it.

For many universities, re-creating all of the institution's information so as to be viewable via a Web browser that can be used by any type of computing device could prove to be an expensive and daunting assignment. Equally as challenging as that great leap forward in information access, is translating anytime, anywhere access into exemplary pedagogy.

CSU Monterey has teamed up with Western Michigan University and received two grants to develop a business plan for a wireless institute to study how technologies are used, and to do applied research on how wireless access changes learning and teaching. They expect new faculty projects launched this fall will yield some answers by June.

Applications—Present and Future

College educators can expect to be challenged by the paucity of academic software applications and e-textbooks for handhelds, the lack of professional development training on integrating handheld computers and wireless access into instruction, and the snail pace of providers of course management software to enable handheld computer access to their products' learning tools.

"There has not been enough software written for academic purposes, and you can't rely on faculty to create robust, enterprise -wide applications for handhelds," says Ray Dannenhoffer, assistant dean for support services and director of medical computing at the University of Buffalo's School of Medicine.

For the most part, colleges with handheld initiatives rely on basic productivity software such as word processors, spreadsheets, and calculators, and the ability of handhelds to view specially-formatted Adode Acrobat Reader PDF files and a smattering of

e-Books.

But there are some faculty who are exploiting the key attributes of handhelds to engage students in new ways and to assess their students' understanding of subjects.

Physics professor William F. Junkin, of Erskine College in South Carolina modified an application called Beyond Question for Palm handhelds. The student-response software works in combination with WebTarget Access Point, a new wireless technology from TriBeam Technologies that extends the communication range of the Palm handheld's infrared ports to 50 feet. The Beyond Question modification allows Junkin to electronically poll a classroom of students using Palm handhelds and see their responses displayed on his desktop computer in the classroom.

"Because I receive immediate feedback, I can determine my students' level of understanding at any point in time," Junkin said. "This free flow of communication keeps students involved, thinking analytically about the material, and more inclined to discuss their ideas."

Because WebTarget supports multiple users with bi-directional wireless communication, Junkin can gauge how well students understand a lesson by sending a set of multiple-choice questions to their Palm handhelds, receiving their answers within a second or two, and viewing their responses several different ways.

Junkin can view answers as they correspond to a seating chart, as answers from a work group, as an anonymous histogram that shows how many students choose a particular answer, or as a spreadsheet that lets him quickly spot which students are having difficulty and which ones are ahead of their

The First Wave: Mobile Medicine

The first discipline to integrate handheld computers is the field of medicine. Handhelds are as common as stethoscopes at dozens of U.S. medical schools today. Physicians and student doctors alike are quickly embracing this mobile, wireless technology to keep pace with their always-on-the-go work mode and the deluge of new information that daily informs their practice.

Medical schools are leading the way in the deployment of handheld computers and wireless technologies to monitor student performance, enhance student-educator communication, improve course management, and ensure that students have the latest information as they move between classrooms, hospitals, libraries, and clinics throughout their communities.

About one-fifth of the country's 125 medical colleges require their third- and fourth-year medical students to use handheld computers. Even at medical, dental, and nursing colleges that don't require handhelds, large numbers of students own personal digital assistants.

At the University of Buffalo, the largest concentration of handheld devices can be found in the medical school. "Handhelds, with their instant-on ability, are a natural for the medical professions. With them you can provide more-informed patient care right at the patient's bedside," says Ray Dannenhoffer, assistant dean for support services and director of medical computing at the University of Buffalo's

School of Medicine and BioMedical Sciences.

In August, the University of Louisville School of Medicine became the first medical school to provide all of its 594 medical students with the mobile devices (Palm m500s). "We want to ensure that our students graduate with the skills they will need to practice medicine in the 21st century," says Ruth Greenberg, director of health sciences academic programming for the University of Louisville. "We believe that many of those skills require technological familiarity. By the time our students graduate medical school, using a PDA should be second nature to them. For the most part, I don't believe having medical students using PDAs will change how students learn the practice of medicine. At the same time, however, I do believe the PDA is changing, and will continue to change, the way physicians practice medicine."

Today, physicians use handheld computers to write accurate prescriptions, monitor critical information such as vital signs and medication at the point of patient care or from outside the hospital or their offices, track patient care, calculate a variety of health indices, and access reference materials such as pharmacopoeias that explain drug interactions. Some medical textbooks have been converted into e-Books readable by some handheld computers. Many of the medical colleges requiring students to use handheld computers are creating customized applications to track patient care.

classmates.

"I can immediately determine if a single student or the entire class understands the lesson," Junkin says. "When this [anonymous histogram] view is displayed for the class to see, students know if others share their views. Their commitment to an answer increases their desire to participate in the discussion, but no one is embarrassed by the anonymous display of the responses."

In a similar fashion, business professor Don Sower of the University of North Carolina at Greensboro relies on a Palm handheld computer customized with LearnTrac classroom management software from eLearning Dynamics. The wireless application gives him the means to get student feedback during class much like television networks and public opinion experts analyze live audience responses.

Polling with handheld computers "has broadened the discussion participation in my classes," says Sowers. "People have had a chance to see how their ideas are shared by their colleagues, and they gain confidence from that."

"Technology is not going to replace the relationship between student and teacher, it's going to multiply it," says Robert Harris, president of Paradigm Research, which recently produced a white paper on LearnTrac.

Going into the second year of a handheld initiative that requires all first-year undergraduate, law, and medical students to buy Palm handhelds, University of South Dakota CIO Roberta Amber echoes that sentiment. She reports that USD educators have experienced an increase in the interactions between students and faculty, greater student participation in

classroom discussions, and students developing better organizational skills.

As always, issues bubble around support and training. Preparing this summer for the second year of its handheld initiative, the University of Minnesota Duluth found it necessary to invest $50,000 to train computer science and engineering faculty on how to better use their HP iPAQ Pocket PCs as teaching tools, and to create software applications fill the void, reports James P. Riehl, dean of the College of Science and Engineering and professor of chemistry at the University of Minnesota Duluth. "You have to invest money in faculty development if you want to incorporate handhelds in a meaningful, pedagogical way," Riehl says.

Some of the software void could be filled by course management providers. They are inching towards making their applications easily readable and accessible by handhelds.

Chris Vento, chief technology officer for WebCT, believes handhelds "…have potential —in the next one to two years you'll see much more traction with handhelds, but it won't be ubiquitous for about five years." With that perspective, Vento isn't rushing WebCT into making its products handheld accessible by tackling the basic functions like calendering and e-mail. Instead, WebCT is trying to determine what applications and level of access will differentiate them from competitors while maintaining a focus on enhancing teaching, learning, and assessment. WebCT expects that its first handheld-specific "learning tools," such as quizzes and polling, will be introduced this summer.

Wireless Technologies and Handheld Devices

The next wave of technological change is building momentum as campuswide wireless networks begin to proliferate. Many colleges are installing wireless access points to provide coverage in libraries or classrooms. About 6.2 percent of all U.S. higher education institutions have made wireless access via 802.11b, commonly known as WiFi, available everywhere on campus, according to The Campus Computing Project's 2001 survey. (note to copy desk – we hope to update the 6.2 percent with the 2002 figure)

"There has been a big leap in wireless between last year and this year," says Kenneth C. Green, director of the Campus Computing Project and visiting scholar at Claremont Graduate University.

"While wireless local area networks (LANs) are in their infancy, and they have associated problems such as lack of ease of installation and configuration, security issues, and scalability issues, one can look ahead and see dramatic changes in bandwidth, price and ease of use over the next few years," according to Charles R. Bartel, director of operations, computing services for Carnegie Mellon University, and John C. Meerts, director of information technology services for Wesleyan University, co-authors of a next generation wireless presentation at the EDUCAUSE 2002 Evolving Technologies committee meeting this past October.

Wireless LANs don't have the capacity to address high-bandwidth demand applications, but they can handle applications such as e-mail, Web browsing, instant messaging, polling, and small file downloads. The ability of wireless networks to handle

those applications is prompting colleges to encourage the use of handheld computers and to lobby manufacturers to produce handheld computers that take better advantage of the wireless network's capabilities. Currently, most handhelds require a special 802.11 sled or card to access the network, or a monthly access service fee much like a mobile phone.

Even if a campus is totally wireless, once faculty, administrators, and students step off campus, access disappears. One solution may be Bluetooth, considered a personal wireless network technology, that colleges such as East Carolina University, Wake Forest University and Carnegie Mellon, are exploring. The latest HP iPAQ Pocket PC has integrated Bluetooth and some Palm OS handhelds provide Bluetooth capabilities through a tiny card placed in the expansion slot.

"Not all learning happens on campus," reminds USD's Roberta Amber. "Bluetooth will let students and faculty go into the field and share documents and information and collaborate easily. Faculty are saying they need this type of mobility."

Handhelds are still a novelty for many of the 14.5 million U.S. college students. But because mobile, wireless technology has the potential to allow people to learn and collaborate anywhere and anytime, it is expected that during the next five years we will see a big change in the way students and educators interact—and how information and instruction are delivered via a myriad of handheld devices.

Mary Fallon is an independent industry analyst, with expertise in handheld computing.

Headline

Product, Company	Connectivity	Memory	Processor	Weight	Battery	Wireless Capabilities	Other Features	Web site
iPAQ Pocket PC H3970 model, Hewlett-Packard	USB cradle, consumer IR and IrDA (115Kbps) and integrated Bluetooth(tm)	64 MB RAM, 48 MB ROM	400 MHz Intel PXA250 Application Processor	6.5 oz	1400 mAh lithium polymer	integrated Bluetooth, requires an attachment for 802.11b	Transreflective, color liquid crystal display. Record button; 4 hot keys; side up/down buttons; navigation pad; includes software applications. Pen-and-touch interface, handwriting recognition, soft keyboard, character recognition, voice record, inking. Supports computers running Microsoft Windows OS. Not compatible with Macintosh computers. Supports MSN and AOL instant messaging: Email is end-to-end secured using DESX encryption. Audio speaker, Microphone, audio out jack (3.5mm Stereo).	www.hp.com
Palm i750, Palm*	USB cradle, slot for Bluetooth card, infrared beaming	8MB RAM, 4 MB ROM*, Palm OS Version 4.1	Motorola Dragonball VZ 33 Processor	5.9 oz	Rechargeable lithium polymer-one week power normal use	via Palm.Net service, built-in antenna, always-on wireless network support within coverage area; slot for Bluetooth card	Transreflective, monochrome liquid crystal display with backlight; 160 x 160 pixels. Pen-and-touch interface, Graffiti handwriting, soft keyboard, collapsible keyboard. Built-in dual expansion via card slot and universal connector. Supports computers running Microsoft Windows OS and Macintosh computers; customizable soft buttons, vibrating and LED alarms; includes software applications. Supports Microsoft Exchange, POP3, IMAP4 and SMTP and supports AOL Instant Messenger service.	www.palm.com
Treo 90, Handspring	USB cradle, infrared beaming, slot for Bluetooth cards	16MB, Palm OS 4.1	33 MHz	4 oz.	Rechargeable lithium ion, built-in, 10 days life normal use	slot for Bluetooth card	Transflective, color STN liquid crystal display, backlit. Pen-and-touch interface, Graffiti (r)handwriting, soft keyboard, built-in keyboard. Secure Digital/MultiMedia Cards, phone drivers for connecting to compatible GSM phones. Supports computers running Windows 95, 98, Me, 2000, NT, XP and Mac OS 8.5 - 9.x with USB port, Built-in keyboard, removable protective flip lid, key lock. Supports Blazer Web browser, One-Touch Mail (POP3), Palm SMS messaging application.	www.handspring.com
BE-300 Cassiopeia PocketManager, Casio	USB cradle, optional modem kit	16MB (8MB program memory), 16MB RAM	NEC VR4131, 166MHz, 280 MIPS (64 bit CPU)	6 oz.	Rechargeable lithium ion, About 1 week of normal use	slot for Bluetooth and network cards	320x240 pixel, 32,768 color STN. Pen-and-touch interface, soft keyboard. Type II CompactFlash card slot, expansion PC card slot. Based on Windows CE 3.0, No Macintosh support. Supports Microsoft Exchange. Stereo earphone jack.	www.casio.com
Clie PEG-SJ-30, Sony	USB (cable), Infrared, Memory Stick media slot	16MB (15MB available), 4MB ROM, Palm OS 4.1		4.9 oz.	No		High resolution transflective color display, 320 x 320 pixels, displays 65K colors. Pen-and-touch interface, Graffiti handwriting, soft keyboard. Memory Stick expansion slot. Jog Dial navigator, Supports Microsoft Windows 98SE, Millennium, 2000 Professional, XP Home Edition, XP Professional. Supports Microsoft Exchange, POP3, IMAP4 and SMTP.	www.sony.com
Pocket PC E310, Toshiba	USB cradle or cable, slot for Bluetooth SD card	32MB RAM, 32MB CMOS Flash ROM	Intel StrongArm 206MHz	4.9 oz.	Rechargeable Advanced Lithium ion	slot for Bluetooth card	High resolution transflective color display 240-by-320 pixel, portrait resolution with 64K colors, front light fluorescent lamp. Pen-and-touch interface, soft keyboard. Secure Digital card slot. Microsoft Windows Pocket PC 2002 OS, plays MP3 music files and MPEG4 video files, navigation wheel.Supports MSN Messenger, Microsoft Outlook 2002.	www.toshiba.com

*Palm introduced its Tungsten handheld with wireless e-mail access after production deadline.