Implementing and Supporting a Wireless Classroom

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ABSTRACT
This paper discusses the challenges in setting up and supporting a seminar style wireless laptop classroom.

Keywords
Wireless, classroom, laptop, iBook, Airport, 802.11b

1. SETUP
The Electronic Seminar Room (ESR) was first proposed in early 1999. The idea was to have a seminar style classroom with computer access. The traditional computer classroom with large computers and monitors, and all students facing the front of the room ("sage on the stage") inhibits classroom discussion. The proposed ESR would utilize less obtrusive laptop computers, and a facing the middle layout ("guide on the side"), allowing for more collaborative learning. Laptops could be closed when not needed to prevent distraction, or easily ignored for classes when they would not be used.

Ideally, the laptops would be connected to the network via wireless technology, for even greater unobtrusiveness and flexibility. But we did not know if that would be feasible for a Fall 1999 implementation, given our lack of experience with the technology.

Designing and implementing the ESR involved the collaboration of staff from several offices on campus: the Center for Information Technology (Oberlin College’s central computing and information technology office), OCTET (Oberlin Center for Technologically Enhanced Teaching, an office designed to help faculty incorporate technology in the classroom), the Cooper International Learning Center (the modern language lab), and the Audio/Visual department.

By early summer, a classroom location had been identified. Plans were made to have wired connections for 20 laptops via a 24-port hub that would be placed in the center of the room. For security, an alcove was turned into a locking closet, a security camera placed in the room, and a lockable laptop charging cart <http://spectrumfurniture.com/products/level_3.cfm?prod_line=1 &cat=6&subcat=19> was ordered. It was still uncertain at that time what kind of laptops we would use, Macintosh or Windows, and if/when wireless would be available.

When Apple announced the iBook and AirPort wireless technology, we knew immediately that was what we wanted to use in the ESR. We had already been experimenting with the 802.11b standard and Lucent’s WaveLan products (now called Orinoco <http://www.wavelan.com/>), and AirPort was based on the same technology. We also had a great deal of experience with supporting Macintoshes in classroom and lab settings. But we knew we would have to start classes without the computers, as they were not due to ship until fall.

The iBooks arrived in early October. We manually installed standard software packages, including Microsoft Office 98, Cyrusoft’s Mulberry (our site-licensed email client), Apple Network Assistant and several other utilities. Fixed ip addresses were assigned to each iBook. We numbered and labeled the tops to discourage theft and insure easy identification of each unit. Installation sessions consisted of 3 to 6 people working on the machines and collaborating on how to set them. We decided not to use our standard Macintosh lab management software, RevRDist, since it required a more permanent network connection to maintain software setups.

2. IMPLEMENTATION
By the end of the October, the computers were ready for classroom use, albeit with an octopus tangle of wires. The computers were little used the next few weeks; it took too long and was too inconvenient to plug them into the central hub at the beginning of each class, and to unplug and put them away at the end. The wireless cards arrived later in the fall, but we decided to delay installation until the semester was over.
In January 2000 we installed the AirPort cards in the iBooks, and used Apple's Location Manager to set up "wired" and "wireless" configurations. A Lucent WavePoint access station was attached to the side of the charging cart. Originally, we planned to install the access station in the ceiling of the room, but decided to delay that until we had analyzed wireless configurations for the building as a whole. An advantage to the existing setup is that the cart can be easily rolled to any classroom or other campus location with an active network jack, and that location turned into a wireless classroom.

We held training sessions for faculty who were assigned to teach in the room for Spring 2000 semester. Four faculty decided to use the laptops in 7 classes, including courses in Expository Writing, History and Computer Science.

Short instruction guides on how to use the machines (including tips on common problems and how to fix them) and on Apple Network Assistant were laminated and attached to the cart, along with a notepad for faculty for record any problems. Initially, the cart had to be completely removed from the closet so that the access point could be plugged into a network and power outlet, but that proved awkward. A network cable was run into the closet so that the cart only needed to be moved enough to get the laptops in and out. When computers were put away after class time, we encouraged students to put them in sleep mode, shortening the startup time for the next class.

3. SOFTWARE MAINTENANCE

Our goal was to find a way to configure as well as administer the classroom in a way that would be transparent to the users (faculty and students) and be relatively trouble free for the people who were supporting it. We chose to use Apple Network Assistant 4.0 (ANA), a component of AppleShare IP, <http://www.apple.com/appleshareip/> to distribute the software that the faculty requested on the machines. In some cases, manually installing this software was easier and faster, however, ANA simplified the installation of smaller applications and minor configuration changes. In addition, ANA has many features that, while created for system administrators, can be used by the faculty for interaction with their students.

For example, ANA allows the administrator to observe the screens of the other machines in the classroom, screens to be shared between machines, and the administrator to control others' screens. Small files can be quickly distributed. It even allows for chat (sound and text) between the administrator and the student machines. Teachers in Oberlin's expository writing classes have used these features and have found them to be successful additions to their classroom pedagogy.

The administrator "side" of ANA can be loaded onto a machine within the classroom, and also onto any other machine on the network. Therefore, if a laptop is on and in use in the classroom, it is possible to make changes, additions, substitutions, deletions, etc., to the set up of that laptop without disturbing the flow of the classroom, and to do this from a remote location outside of the classroom.

This ability of ANA to remotely administer the laptop machines allowed us the possibility of checking up on the machines and doing routine maintenance without having to physically be in the room. If applications, settings or documents were accidentally deleted during classroom use they could be reinstalled over the network using a backup copy of the student set up that was burned onto a CD.

As an added protection, this fall we will be adding FoolProof, from SmartStuff Software <http://www.smartsuff.com/>, to lock down the desktops, prevent deletions, prevent the downloading and opening of extraneous applications, etc. What is wonderful about Foolproof is that at one point it was bundled with ANA and therefore works seamlessly with ANA. Thus, one can lock down the desktops with FoolProof but continue to administer the machines using ANA without having to compromise the security that FoolProof provides.

4. RESULTS

We had remarkably few hardware, software or networking problems throughout the semester. Laptops with hardware problems were taken to the CIT for repair. Software problems were corrected by the CD which contained an image of the standard setup. By mid-semester we were confident enough in the reliability of the wireless technology that we removed the hard wired hub from the room.

As can be expected, the more technologically savvy faculty were most comfortable using the iBooks and ANA software. However, even the less techy faculty were enthusiastic about the possibilities. For example, the Expository Writing faculty have asked for first chance at the room for the Fall 2000 schedule.

A survey showed the students of the more technically savvy faculty also tended to find the use of laptops more valuable, though all students in general gave high marks to the use of laptops. Part of this may be because the technical faculty were able to more smoothly integrate computer use in the curriculum.

There were some problems. While the theoretical speed of the wireless (11Mb/sec) is the same as wired 10BaseT, in practice it is rather slower. We also found in our testing that once you have more than 5 or 6 laptops demanding large bandwidth (for example, copying a large file), significant slowdowns occur. Thus network performance was adequate for most web browsing, copying of small files, and some level of screen sharing. Extensive screen sharing, video and other high bandwidth applications did not work well.

Another problem is that the iBooks do not have video-out ports, which means they cannot be used for projection. While the ability of ANA to do screen sharing eliminated much of the need for
projection, those times when it was needed required faculty to bring in another laptop that did have video-out capabilities.

The most commonly used applications included Power Point (where students followed along with copies of the presentation on their own machine), Excel, web browsing both internal and external sites, and Word (using some of Word’s special annotation features). Students most often each had their own laptop, but sometimes worked in small groups.

5. THE FUTURE
The success of the Electronic Seminar Room has prompted us to expand wireless access around campus. By August 2000, the main library building (which includes the Center for Information Technology), the student union, the two largest classrooms in the main academic building, parts of the Conservatory of Music, and two large outdoor areas will have wireless access. As part of our Back to School resale program, we are encouraging the purchase of laptop computer. All laptops are being sold bundled with wireless cards.

We expect students will begin bringing their own laptops to class, the library, and other areas where they study and do research, as students strive to become even more connected. In a classroom, wireless laptops have shown far greater flexibility for student centered learning and collaboration than the traditional wired desktop configurations.