Lab Notes

Smart Classrooms at the University of Colorado, Boulder

by Daniel Niemeyer, Barbara Black, and Shaun Dalrymple
University of Colorado, Boulder

Computer Technology Classrooms

A new generation of high technology classrooms is becoming a necessity on college campuses, classrooms where it is easy for faculty to show computer output to a room full of students. More and more faculty are using desktop presentation packages to create text, charts and graphics on their own personal computers and want to bring this material into the classroom. Additionally, faculty want to show information or research data from office computers or from data bases worldwide. They want to access data from the computing center, current stock market quotations from Dow Jones, a NASA photograph from the Internet, a blueprint from the planning office, a rare manuscript from the library or a Van Gogh from the campus slide collection and display it all on a large screen for student viewing. In reality, they want to "take their office to the classroom."

Consultation with faculty interested in using computers for group instruction, visits to other universities, a survey of the literature and conversations with colleagues across the

nation helped Academic Media Services at the University of Colorado at Boulder frame a unique, flexible approach to meeting the changing needs in the teaching environment. The objective is to make computer use in the classroom as simple, friendly and non-intimidating as possible. Installations must serve the faculty well, yet remain affordable. Massive teaching bunkers full of intimidating computer hardware, invariably requiring the assistance of a technician, where faculty are expected to load necessary software and data files in the few precious minutes between classes, does not seem to be the most desirable model.

What is called for is a system that enables faculty, outside of class, to prepare text, charts, graphs, even complete desktop presentations and to practice the presentation as often as necessary. Users need to be confident that everything will work in the classroom without assistance and that, once in the classroom, setup time will take no more than a couple of minutes.

Considerations

Begin designing technology classrooms with what is known. There seldom is adequate time to set up and wire together a display system between class periods, therefore the display system must be built in. Most faculty will find it desirable to face students when using a computer in the classroom. A small computer screen is necessary so the presenter does not need to keep looking over his/her shoulder at the large screen. Faculty don't and shouldn't tolerate a massive desk/console barrier between them and their students. Faculty don't want to push a lot of buttons to make things work.

Since classrooms/lecture halls will continue to be used for traditional instruction, the front center of the room needs to accommodate chalkboards, overhead projectors, screens, as well as walking space for pacing professors, and open space for displays and experiments. Therefore any "podium" for the computer needs to be small and placed at the right or left front of the room. This arrangement is similar to slide presentations, where the speaker is at a podium on one side of the room and faces the audience while the visuals are shown on a screen in the center of the room.

Lighting control is critical. Adequate light is needed for student note taking. Sufficient light is needed at the computer "podium" and on the chalkboard. All must be located and controlled to minimize washing out the image on the screen.

In technology classrooms, there is a need for connectivity to outside teaching resources. Telephone lines, Ethernet connections or ISDN installations make it possible to interact in

real time with distant computers and workstations, databases, or banks of stored text and images.

The Smart College Classroom Approach

The University of Colorado at Boulder offers a reliable and unique approach to the design of technology classrooms. Install video/data projectors in selected classrooms and provide a user access panel requiring little more than hooking one cable from the computer to the panel. A simple, user-friendly interface makes it possible to show campus cable TV, VHS videotapes, as well as computer displays from IBM and Mac machines, plus workstations. Creative, sophisticated engineering makes this possible. The key to success is careful selection of projector, user interface and VCR.

Operation of most video/data projectors on the market today is complicated, requiring multiple input switching or performing a complex set of menu driven commands for showing computer data, playing videotapes, or watching a television program. We looked for a video projector that could "automatically" determine which computer is connected to it, or if videotape or TV display is desired.

Our research indicated that a Canadian company, Electrohome, made projectors that did this and had "automatic" convergence ability as well. The projector's built-in software makes it possible for our technicians to preprogram the different frequencies of computers and to set convergence for each type of video display. Once set, they are stored into non-volatile memory, ready for users. If for some reason an unprogrammed frequency is required, the projector will interpolate between the nearest frequencies, and will set the proper convergence accordingly. Our projectors are programmed for most DOS-based machines, all Apple MAC computers, and for Sun and Silicon Graphics workstations.

Connecting the computer to the projector is accomplished through an interface panel of 1/4" thick polycarbonate plastic, better known as Lexan™. It is extremely strong and resists most vandalism. Because it is plastic, it allows our technicians to drill into it and easily conform it to our needs. The supplier of the panel follows a custom template to make cutouts for the VHS tape recorder, five color-coded BNC connectors and the projector remote. We modified the wired remote and color coded some of its buttons. To change input sources, i.e., video or data, the user pushes two buttons, telling the video projector to go to its preprogrammed memory to select the proper frequency. Simple, clear signage completes the panel.

AMS [Academic Media Services] supplies a single, commonly available cable to connect the user-supplied computer to the video projector. A multipin connector on one end attaches to the computer; BNC connectors on the other end are plugged into the panel.

A major consideration is to please multiple users, many of whom do not plan on teaching with computers. We selected a VCR which plays VHS and S-VHS tapes. We use the VCR as a TV receiver, or as a tape player. To show a tape, one need only insert it into the machine, and play begins automatically.

Teaching in *SMART CLASSROOMS* began in 1993 with a pilot project to assess the viability of utilizing notebook computers for data sources. AMS lent Mac Powerbooks 180s and IBM ThinkPads to a select group of faculty representing a wide spectrum of teaching disciplines. Based on feedback received, we suggest that our faculty bring a notebook computer, already loaded with the necessary configurations, applications and files, into the classroom. We recommend that they place their portable computer on the room's small, simple floor lectern at which they may stand or sit. They need to know that Ethernet access requires a special card or adaptor. The chart accompanying this article summarizes what we found makes our *SMART CLASSROOMS* a unique approach to meeting the instructional technology needs of our faculty.

As technological advances occur, *SMART CLASSROOMS* at the University of Colorado will provide instantaneous Ethernet access to a wealth of still and moving images. It will be possible to get slides electronically from the Fine Arts Collection, manuscripts from [CU's] Norlin Library, videos from the media center and historical photographs and films from the Library of Congress. ■

Daniel Niemeyer (niemeyer@spot.colorado.edu) is Director, Academic Media Services, University of Colorado, (303) 492-7345; Barbara Black (blackb@spot.colorado.edu) is Assistant Director for Instructional Support, AMS; and Shaun Dalrymple (dalrympl@spot.colorado.edu) is Assistant Director for Technical Support, AMS.

Unique Features of *Smart Classrooms*

Intelligent Panels & Notebook Computers Instead of Teaching Bunkers & Desktop Computers

Presentations Require Little Set-up in the Classroom.
- Faculty can work with their notebook computer to become familiar with the hardware and software outside of the classroom.
- Faculty are assured that their applications and files will be loaded on the computer in the classroom, since they load it on their notebook computer themselves before class.

Notebook Computers are Simple, User-friendly, Non-intimidating Hardware.
- Faculty have a choice of platform (IBM or Mac).
- The portability of the notebook computer means:
  - Faculty can get the computer set up and ready at their leisure.
  - The presenter has more confidence that everything will be OK.

The Connection to the "Intelligent Panel" is Simple.
- One cable connects the notebook computer to the projector in the classroom.
- Displaying computer output is as easy as playing a videocassette.

The *SMART CLASSROOM* is Self-service. No Technician is Needed.
- Since faculty operate the equipment without a technician, there is less staff cost.

There is no Large Bunker Acting as a Psychology Barrier Between Teacher and Students.
- Panels are less expensive to upgrade in the future than teaching bunkers.

Ethernet Connectivity Provides Access to Information Outside the Classroom.
- Files from an office computer can be loaded onto the notebook computer, or the office computer can be accessed in real time from the classroom using the notebook computer as a terminal.
- Internet text and images can be downloaded in the office and transferred to the notebook computer, or Internet text and images can be accessed in real time in the classroom using the notebook computer as a terminal.