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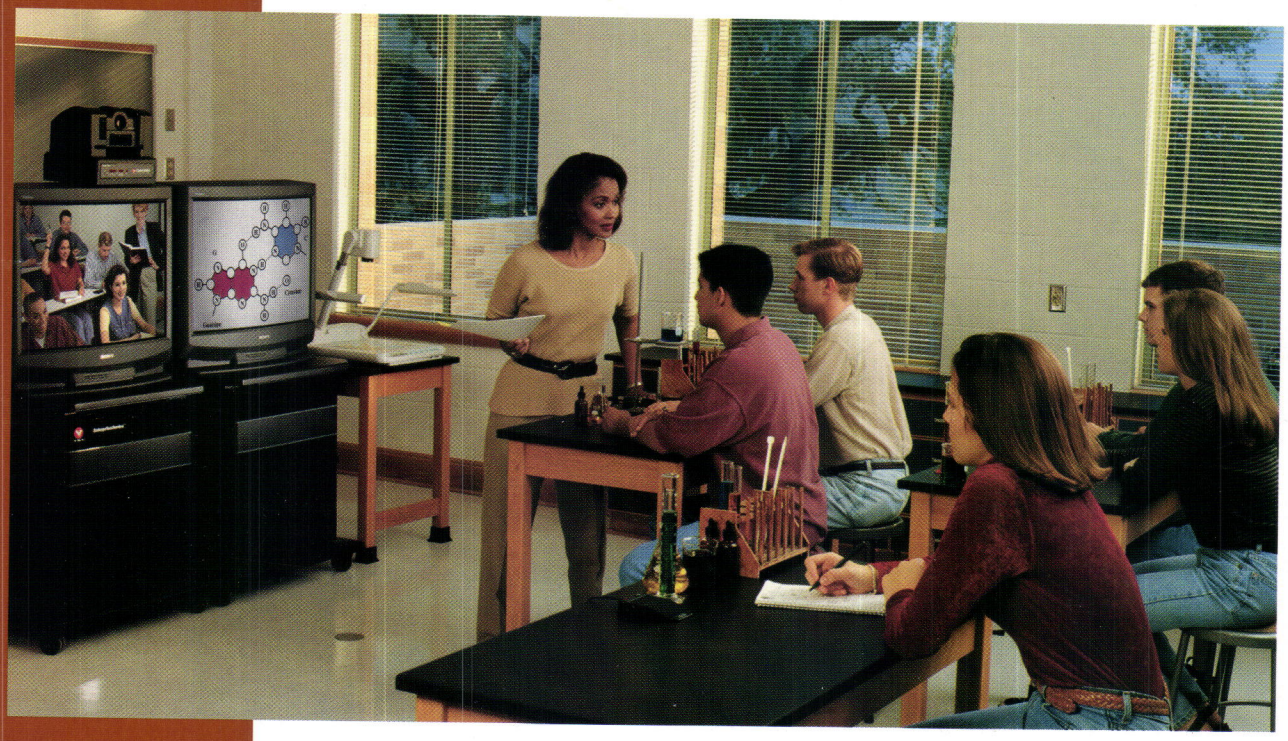

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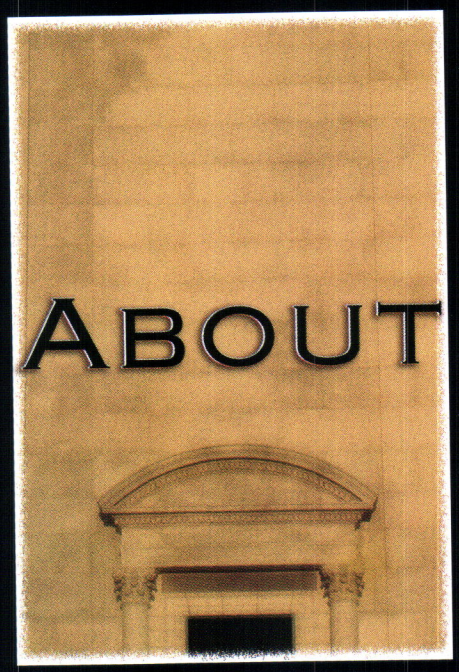

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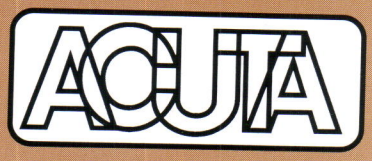

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Dr. Rosemary DuMont
Director of Development for
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Kent State University

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Volume 1, Number 3
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FOCUS

Technology in the Classroom

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President's Message

Margie Milone

Kent State University

ACUTA President, 1997–98

Next summer, as I reflect on my year as ACUTA's President, I expect my memory of how difficult writing my first column for the Journal has been will be dim. In the months to come, I'm sure there will be large issues to consider, important questions to answer, many opportunities to learn and grow from new experiences. But for now, writing words of wisdom to share with other telecommunications professionals for whom I have a great deal of respect is a humbling task.

If I play to my strength, I need to deliver a message that motivates you. Those who know me know that they can always depend on me for enthusiasm and support. I believe we are called to encourage one another always and to live by the Golden Rule. So in this column I'd like to suggest a few ideas that might energize you as we begin a new academic year and a new ACUTA year.

1. "Be all that *you* can be."

The Army definitely has this right. Do you know yourself? Do you accept yourself? It's really unfortunate that we spend so much time and energy trying to be somebody else. Change bad habits, improve your mind and body, help others when possible. But be yourself. How much happier we would all be if we took the time to identify what is actually important to us, faithfully follow truthful standards for everyday living, and then enthusiastically pursue that which will allow us to be the best we can be.

2. Set goals.

We are usually asked by our superiors to set goals for the workplace. By a certain date we expect to have achieved measureable results. Often our career path and salary are determined by how successful we are at achieving those goals. Do you also set personal goals? Does your family have goals? Without goals, we wander through our days maintaining but seldom accomplishing.

3. Read.

If the last book you read was assigned by your freshman English lit teacher, it's time to dust off the bookshelf. Books take us away from ourselves for a few minutes. They put us in someone else's mind, give us a different set of eyes through which to view life. Read the most published book…a biography…a child's poem. Read some good fiction to spark your imagination and replenish your creative spirit. Read the trade press, the newspaper, professional journals, and your e-mail to increase your productivity at work. But read for fun and personal satisfaction as well.

4. Listen.

We live in a hurry-hurry-rush-rush world. When was the last time you spent 15 uninterrupted minutes listening to a child—or to

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someone over 80? Designate one day a week to listen more and speak less: Take time to listen to all the other people in your life. Ask questions, clarify answers, but minimize verbalizing your opinions or advice. Say "What do you think?" more than any other phrase that day. It could be an enlightening experience.

5. Volunteer.

Volunteering is a win/win situation. You give a little, you get a lot. Do your institutional goals include community service? Do your departmental priorities include staff development? Volunteerism provides the means for community outreach while you and your staff members gain experience and exposure. Participating in speaking engagements, fund-raisers, promotional events, committee work, and even behind-the-scenes worker-bee tasks allow us to contribute to our community in meaningful ways while we improve our career skills as well.

Recently, some pretty influential people have spoken out in support of volunteerism. At the nonpartisan President's Summit for America's Future, Chairman Colin Powell, who spent more than twenty years performing "threat assessment" for the US Military, was asked to identify our nation's greatest threat. He stated simply, "The threat is young people who are disengaged from American life, who don't believe in the American dream." Powell, President Clinton, and others have emphasized the absolute necessity of helping our youth, particularly those at risk, by contributing personal time, skills, and resources through public service in our communities today.

Get involved. Look for organizations in your community that need you. Our technical knowledge and skills can be shared, mentored, tutored, and provided in numerous ways. Young people who may someday attend classes at our campus or lead our country could be there because someone cared enough to help those who need it. And remember, too, that ACUTA is a volunteer organization and we need you as well!

This issue of the Journal focuses on technology in the classroom. In the pages that follow, you'll find a wealth of information about learning technologies that promise to dramatically change our campus environments in the years ahead.

I hope the words I've offered and the articles you are about to read will encourage you to realize your full potential, commit to creative goals and objectives on a professional and personal level, and enjoy all the opportunities to grow, learn, and teach as "technocommunication" administrators on your campus.

Margie Milone

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In Support of Distance Learning

by
Gene T. Sherron, D.B.A.

Much is being written today about new and exciting technologies that expand our distance education capabilities. And the excitement certainly seems justified as we reach more people more conveniently and more efficiently. Yet, as a participant in distance learning, I find my biggest frustration and concern not with inadequate technology, but rather with support. Instructors will teach. Students will learn. But, unless both are mightily *supported*, it is a tough and lonely road.

The Need for Lifelong Learning

Lifelong learning has been widely recognized as a characteristic of our culture as we enter the 21st century. Just when you've reached a higher rung in your educational ladder, you realize another one lies ahead. The American Council on Education recently made a similar observation in *Guiding Principles for Distance Learning in a Learning Society:* "We are becoming a society in which continuous learning is central to effective participation as citizens and wage-earners. Telecommunications technologies are not only transforming our needs for education and training, but they are expanding our capacity to respond to these needs. Distance learning, with a long history of serving isolated and remote learners, is now emerging as part of mainstream education and training efforts to provide learning opportunities that are flexibly responsive to learners' needs."

The reality of lifelong learning was further illuminated in *Transforming Higher Education: A Vision for Learning in the 21st century*, with Dolence and Norris's prediction that the necessity of new models of distance learning will expand dramatically in the next century. They estimate that the amount of learning required by every Information-Age worker by the year 2000 will be the equivalent to that currently associated with 30 credit hours of instruction every seven years. That translates to another master's degree every decade!

This level of new learners would put one-seventh of the workforce in "class" each year. Or, it could add 20 to 28 million more full-time-equivalent (FTE) students to our already capacity-strained campuses all across America. An alarming picture.

We could spend another lifetime conducting research about the viability of distance education and comparing the effectiveness of one delivery system or technology over another. The list of such research has probably "tenured" dozens of professors. The conclusions are usually the same: The question to be asked is not *whether* to use the technology, but rather *how best* to use the technology.

Begin with a Definition

It would be an understatement to say that there are as many definitions of distance learning as there are techniques for teaching. Broadly defined, distance education is the transmission of education or instructional programming to geographically dispersed individuals or groups.

Given this generalized definition, distance learning has been in existence since the late 19th century in the form of correspondence courses. However, we should fast-forward a century or so to a definition that acknowledges the role of technology in distance education. For this, consider a definition from Barry Willis as a good reference point: "At its most basic level, distance education

takes place when a teacher and student(s) are separated by physical distance, and technology, that is, voice, video, data, and print, is used to bridge the instructional gap."[1]

Willis points out that even though it is technology that is opening so many new doors in this field, the technology of distance education should remain relatively *transparent*, allowing the instructor and students to concentrate on the process of teaching and learning. Otherwise, we find the tail (technology) is wagging the dog (effective education).

Before your campus can get a distance learning project off the ground, administrators will ask: Is it as good as traditional methods? What are its costs? What kinds of students benefit? Do instructors have to teach differently?

Yet, research has shown that no matter how it is produced, how it is delivered, whether or not it is interactive, low-tech or high-tech, students learn equally well with each technology and learn as well as their on-campus, face-to-face counterparts, even though students would rather be on campus with the instructor, given a choice.

Let's Talk "Support"

Most distance learners require support and guidance to make the most of their learning experience. Three services have been found to contribute to successful distance programs: (1) timely student feedback; (2) on-site support; and (3) access to library materials. And, the key player for the distance learning (DL) program appears to be the on-site facilitator. Library resources are also very important to distance education students, and a majority indicate that success in the course requires access to library materials.

Remote learning resources is a new term that is gaining some acceptance in this field. It has been used to include the traditional distance learning components and systems, such as audio and video, plus the notion of text and file transfer from a remote computer. Over the past decade, important computer networking initiatives and an improvement in the quality of the public telephone system have paved the way for an explosion in databases of information that can be used in the classroom.

As part of the support issue, those who are championing this adventure into distance education will encounter resistance to change. Yet, changes will accelerate, and educators will make some unproductive decisions about technology. Such is to be expected in developing a robust system; if philosophical and technological shifts in education are to survive, the system will have to be tolerant of stumbles. Further, educators cannot wait for developments in technology to stabilize. And, it should be noted, improvements in instructional strategies will probably continue to lag behind technological advancements.

Although it is true that distance education provides many institutional opportunities, its inherent fluidity tends to create numerous challenges in the process. Nowhere are the challenges more pivotal than in the area of the faculty and their *support*. Faculty members and administrators must work together to identify and resolve issues, policies, and biases that inhibit systematic use of distance education in meeting academic goals. Yet there can be no doubt that the ultimate success or failure of the distance education enterprise is inextricably tied to the enthusiasm and continuing support of the faculty. This support must begin with faculty training, as it is critical to the success of any distance education program. In fact, designing, creating, and

implementing effective in-service training of the faculty is regarded by many as the most efficient pathway to the long-term success of distance education.

Regardless of the noble motivation, *change* is something we humans resist. Thus, going into a program of teaching at a distance will evoke reactions from the participants in ways that are hard to rationalize, which is the point—many reactions or responses are *not* rational. But, we should be prepared for them and ready to work through them. Lack of know-how, loss of control, and loss of privacy are grounds for educators' reluctance to embrace distant learning programs.

The challenges faced by the distance education instructor are imposing. Willis offers a few guidelines to help face these "opportunities":

- Look at the course in a new way.
- Shift from the role of content provider to content facilitator.
- Gain comfort and proficiency in using technology as the primary teacher-student link.
- Learn to teach effectively without the visual control provided by direct eye contact.
- Develop an understanding and appreciation for the distant students' lifestyle.

Distance Learning Options

The lists of distance learning methods, technologies, and delivery systems are many—some more comprehensive than others. Using the list below, it will be easy to see how some of the examples that will be discussed fit into the "big picture" of distance learning options. Although it is probably patently obvious, the technology is moving at such a pace as to make it impossible to say that this is anything more than a snapshot of today's options.

- "Remote" the faculty
- Correspondence
- Audio conference
- Electronic white boards
- Computer-networked interaction (Internet linkages, bulletin board systems)
- Video-ased education (videotaped lectures; broadcast video, including local origination channel TV and private university broadcast; one-way video/ two-way audio; and interactive videoconferencing)

Interactive videoconferencing is used here to cover two types of systems: two-way, interactive candid classroom systems and two-way, interactive videoconferencing. In the first instance, the classroom can be in-the-studio quality or an economically adapted classroom for sending and receiving. Videoconferencing has grown in sophistication and application such that some sites are actually used as remote sites to send or receive scheduled instruction.

Video-Based Education

Some states, like Florida, have spent a considerable amount of money building an infrastructure to promote distance education. There are currently over 100 ITFS (instructional television fixed service) channels licensed to educational institutions. A satellite network, called SUNSTAR, has placed steerable C and Ku band satellite-receiving dishes in 35 sites, including one at each of the 28 community college service areas. This network allows the use of interactive videoconferences within 55 miles of every person in the state. As a result of its availability, the community colleges in Florida enroll more than 15,000 students annually in telecourses.

The Instructional Television (ITV) Office in the Florida Department of Education has leased or purchased more than 400 series comprising almost 5,000 programs for use in schools, colleges, and universities.

In 1990, Florida State University's School of Information Studies began delivering its master's degree program to students in western Florida through an ITV site in the FSU Panama City Campus. Purchased in 1988, this Compression Labs, Inc. (CLI) system is connected to the main campus with a T1 commercial circuit shared with a statewide engineering education system (Florida Engineering Education Distance-learning System or FEEDS), which translates to a one-fourth T1 for the signal in one direction. Obviously, this gives some shadowing during rapid movements, but it has proven not to be a distraction to learning. Unfortunately, this CLI system predates the time when the major video manufacturers started to include in their CODEC (COmpression/DECompression) a standard interface algorithm. Today, the major video players offer their proprietary algorithms *and* one that complies with the CCITT H.261 standard.[3] As a consequence, when institutions try to interface today's technology with that of yesteryear, the CODEC interface problem will arise.

By 1996, FSU was ready for prime time. To fulfill the statewide mission in various fields, the President and Provost selected the School of Information Studies' master's degree program as the pilot program to initiate distance learning from one end of the state to the other.

Three of the sites—Orlando, Fort Lauderdale, and Miami—used already-constructed two-way interactive TV studio/classrooms. These were great additions to the infrastructure and worked very well. Without hitting too hard on the obvious, a classroom with several cameras, a good sound system, sound dampening, staff, and high-speed connections to the

switched network can make your life like a "box of chocolates."

To provide videoconferencing throughout the state, the Division of Communications in the Department of Management Services (DMS), acquired PictureTel rollabout systems for most of the major cities. These are self-contained videoconferencing units on a cart: monitor(s), camera, CODEC, and remote-control system. For this system, one-time costs were approximately $122,000, and operational costs for six months were $11,000, making a total project cost of $133,000.

In the past two years, the State of Georgia has used millions of dollars in lottery money to pump technology into education—K through 20. Under a state contract, it purchased hundreds of CLI Radiance "classroom" rollabout systems for about $50,000 each.

It should be mentioned that the more standard approach for ongoing distance education programs is to establish candid classroom operations. In the FSU example, we converted a 30-student classroom into one end of a two-way interactive video for $265,000. We are pricing out the establishment of another such studio/facility, and the numbers are not coming down much. Yet, like PCs, the technology is more powerful and versatile.

Lessons Learned

What worked and what did not work in a year of teaching using compressed video? The following lessons learned are grouped for ease of reference, not in order of importance.

From the Student Perspective

• Who wins?

In many two-way interactive TV situations, there is a residential classroom made up of the local students and a set of one or more DL sites. So, if you ask if this type of instruction is better for the local student or the DL student, the distant student is definitely the winner. The local student or one in the "candid" classroom feels shortchanged. DL programs are large. Thus, instead of the normal thirty students in a graduate level class, the DL classes often exceed 100. This means that the faculty and other resources are pulled in more directions. Residential students will quickly point out that they made the sacrifices—including, but not limited to, costs—associated with moving to campus, yet now the DL students get the "same" education without leaving home or quitting their job.

• Wasting Precious Minutes

Remote sites typically use a voice-activated microphone (mike) system and even whispering to a fellow student could cause an activation of the mikes at a site. So, the remotes are told to keep their systems muted. There is a tendency for the instructor to periodically ask each remote site if they have questions. Residential students regard this as a total waste of their time. They reason that if students have questions, they will ask them. Personally, I rather agree with that approach. One way I get around this is to designate one site each week the "hot site." The mike stays on there and we interact, just as if they were *the* classroom. This avoids the "does anyone have a question?" but it also gives each class a certain amount of special recognition.

• Can't Hear Ya!

There is an old saying in the TV industry that the viewer will forgive a poor picture, but if the sound goes on the fritz, there's no forgiveness. There have been times when the circuits were not working for unknown reasons. Knowing this ahead of time allowed us to substitute a speaker phone at the

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remote site and limp along. But, if we were actually operating when the sound went out on the compressed video, we could not restore the sound fast enough for those students. So, remember to fine-tune the system, especially the audio side, and have a backup system, even if it is POTS (Plain Old Telephone Service).

To reach the five sites, a bridge was leased from the local exchange carrier (telco). And, as you might expect with something that is new and not used every day, it suffered failures. Every week the technicians would spend the hour before class cranking up the system and sorting out the video and audio signals. More than half the time, problems were experienced. But in only one of fifteen nights was one site unconnectable. No one wants to pay hundreds of dollars for a course, drive to the site in rush-hour traffic, and find the site a blank screen.

• "Show Me the Money!"

Does it cost more to provide a course at a distant location? Yes! The question is, who pays? Again, this varies from state to state. Many states cover the communications and infrastructure costs of distance learning (DL) as part of their investment in the future. Stated another way, the legislators have decided it is important enough to their citizens to give all students the same access to higher education. Others make the student pay for the added cost to provide off-campus education. Like it or not, it is currently running about $200 per course in our program.

From the Faculty Perspective

• It's a Lot of Work!

What worked in a classroom with 30 students won't do for a DL situation. A total redesign is needed to adapt instruction for this new mode. Many faculty members will resist this, regarding it as just a lot of work for little return. Through our Instructional System program of the FSU College of Education, the administration paid for the use of doctoral students in instructional design to assist the faculty in this redesign effort. Experience has shown that the first-time presentation of a DL course is seldom what you want. It takes a second or third time before a faculty member becomes comfortable with the format and new design, as adjustments are made along the way.

This added workload, even with added resources, is probably the toughest issue in DL, because the load ultimately must be borne by the person on the firing line, the faculty member. Usually, there is no recognition for the extra effort needed to teach in this format, meaning it doesn't contribute to promotion and tenure decisions. Further, spending time in developing DL courses could even be so demanding on junior faculty members as to compromise their ability to be effective.

If the faculty are to embrace distance education, the administration must consistently address traditional faculty issues with fresh ideas and innovative approaches. For a balanced review of these issues, Willis identified a number of critical faculty development issues in his 1993 book.

• Pressing the Flesh

Some administrators view the Web as the answer to DL programs: It's cheap, worldwide, and scaleable. But, isn't it really just the 21st Century version of a correspondence course? In my view, the more personal contact, the better the learning. Since faculty cannot be omnipresent, we should at least make the effort to visit the remote sites as often as possible. Making one visit a semester seemed to be the most appreciated item found on the student's critique sheet.

From the Support Perspective

• Live or Die by the Web Site

To be competitive in today's educational marketplace, the Web site is as critical as a firm handshake, smiling face, and friendly greeting. At FSU, we spent the equivalent of three FTE staff on the first Web site and doubled that effort for the second semester.

The students don't measure your site by bells and whistles, but by its organization. As a visual example, check out http://www.fsu.edu/~lis.

Here are a few items that our DL students like about our site. In the "syllabus," students want the weekly assignments all described, clearly in one place. They like the hot button links to everything. All readings and assignments that are not on the site are linked to the appropriate commercial site. Using links for cases, quizzes, and exams meant that all they had to do to turn in their homework was to hit that button and it went automatically to the course "bucket." To avoid those "Did you get my assignment?" questions, we built in an automatic reply to the student that messaged them with an acknowledgment. No paper moved between the sites and the main campus.

• "One If by Land"

Some states, like South Carolina, have a transponder dedicated to public education. Going satellite, without the need to recover the cost of communication from each course and its students, makes a great deal of sense. That's what I call infrastructure.

In our case, the best we could do is arrange to "buy" Switched 56 service through our State Division of Communications' network, called Suncom. This was the most cost-effective approach but still expensive with the cost of the local loops coming without the benefit of

competitive bids. Perhaps the Telecommunications Act of 1996 will fix that, but when? Driving compressed video through the public switched network is still an unnatural act. Different brands of equipment, a mix of carriers (both IXCs and LECs), and a cast of in-addition-to-your-other-duties players patching this mosaic together every Monday night should have told us we were an accident just waiting to happen.

• Mix and Match

When it comes to baking cookies, mixing different things together produces a tasty morsel. Try it in distance education and you lose! We ran across example after example, from hardware to software to people where different was not better. One example was the Web browser. We settled on Netscape but did not insist on the latest version. We ended up sending copies to the students to clear up the problems "diversity" was causing us.

• If One is Good, Two Must Be Better

Build a lot of redundancy into your systems. As mentioned above, have a communications backup. The same is true of software that runs your system. Further, students should send homework assignments to one address where they can be graded and another place on the site, just for backup purposes. It doesn't happen often, but having a backup is much more professional than asking a student to resubmit.

• Madam Librarian

It is usually accepted that the cornerstone of higher education is the library. This puts the distant learner at a distinct disadvantage. As James Hall indicates, "The availability of adequate resources, beyond the required texts, for extended student exploration and research is a key problem. In a resource-rich nation, students do have the option of using the local library. But even where libraries are relatively accessible, shortages of book copies, of available staff, and limited hours of operation convenient to distance students pose serious handicaps. The lack of adequate resources in distance education is an unresolved problem."[4]

To get around this problem, our program has been fairly successful in identifying all referenced materials on the Web site and making links wherever possible. In the case of important chapters or articles, permission has been granted to put them on the Web site or make them part of a course packet available in each remote area.

Closing Thoughts

When I think of our experiences in distance education, I am reminded of the "build it and they will come" movie. Such is the case with distance learning: If we build the infrastructure, everything else will follow. By the same token, if we do not make that investment, the entire program will not survive.

The California State University System Commission concluded that three concerns will dominate virtually all discussions of higher education in this decade: student access, academic quality, and fiscal efficiency. Some other observations seem noteworthy as well:

❖ Teaching and learning in the Information Age will be less print-oriented and classroom-bound than ever before.

❖ It will need to be less labor-intensive and more portable and modular in formats and delivery.

❖ The home and the workplace may become the classrooms of tomorrow.

❖ Instructional and support services will be based on the convenience of the consumers rather than that of campus constituencies.

❖ Education that is truly learner-centered should be delivered directly to the individual at a time and in a place determined by the learner.

❖ The recent "marriage" of computing and various forms of telecommunications can be expected to increase the scope and pace of technological innovation almost beyond imagination.

❖ Most estimates suggest that the technical means for integrating the two dimensions of nontraditional instruction—delivery and format—are only a few years away.[5]

Bob Heterick, President of Educom, reminds us of the challenges confronting higher education —the need for quality, cost, access, and productivity. Reaching out to learners rather than bringing them to campus is certain to be one of the strategies to increase productivity.[6]

A leading proponent of distance learning, Gene Sherron, Professor of Florida State University's School of Information Studies, began teaching via interactive TV in the late 1970s at the College Park campus of the University of Maryland. Sherron earned his DBA and MBA at George Washington University. He is presently serving on ACUTA's Editorial Review Board and previously served on the CAUSE Board of Directors.

[1] Barry Willis, *Distance Education: A Practical Guide*, Englewood Cliffs, NJ: Educational Technology Publications, 1993, p. 4.

[2] T. Russell, "Television's Indelible Impact on Distance Education: What we should have learned from comparative research," *Research in Distance Education*, 1992, vol. 3(4), pp. 2-4.

[3] Announced in 1990, the International Telecommunications Union-Telecommunications (ITU-T)'s H.261 is the watershed in videoconferencing which specifies the video coding algorithms, picture format, and error correcting techniques and makes it possible for video codecs from different manufacturers to successfully communicate.

[4] James W. Hall, "The Convergence of Means: The Revolution in Electronic Technology and the Modern University," *Educom Review*, July/August 1995, p. 44.

[5] Stephen L. Daigle & Patricia M. Cuocco, "Alternative Educational Delivery," CAUSE Exchange Library, CNC9238, Dec.1992, p. 1.

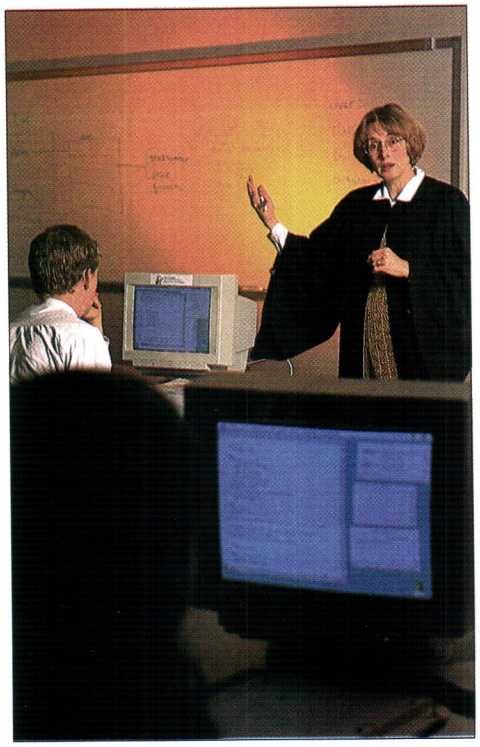
[6] Robert C. Heterick, Jr., "The Four Horsemen," *Educom Review*, July/August 1995, p. 60.

The Paperless Classroom at the University of the South

by Bill Robinson

Students enrolled in one of Professor Gerald Smith's "paperless" classes will not find a course syllabus at the campus bookstore or even in the professor's office. Smith does not hand out assignment sheets or test questions for these classes, and his students do not commit reports or exams to paper.

If you think that Smith must teach an ill-defined course at a university floating in the clouds, you're wrong. He has taught for 28 years at the University of the South in Sewanee, Tennessee, an Episcopal institution founded by the Old South and steeped in tradition. Professors in Sewanee's sandstone, collegiate-gothic buildings can be seen lecturing in academic gowns. A monument to Confederate General Edmund Kirby Smith is a prominent feature of the campus center. And religion, the subject of Professor Smith's courses, is a discipline often perceived as resistant to change.



Tradition shares a classroom with tomorrow as professors retain their scholarly robes while they use the latest technology at the University of the South. ©1996 Billy Howard

Despite external factors that might make a religion course at Sewanee seem an unlikely venue for innovation, Smith has been teaching "paperless classes" at the University of the South since 1994.

His students obtain a course syllabus by accessing a computer file on a campus network server, and he asks that they not print any hard copy. They receive assignments by e-mail which they use to submit compositions (you can't call them papers) and take exams. While the class does meet for discussions, students may also comment and ask questions by e-mail. Each discussion topic has its own computer file, which can be revisited any time.

The environmental cost of using paper initially prompted Smith, whose first paperless class was a course in Religion and Ecology, to explore the possibility of teaching without paper or as little paper as possible.

"I was using case after case of paper each semester to make copies of course syllabuses and reading materials, which is waste on several levels," Smith says. "It wastes trees, landfill space, money, time, and access to unlimited electronic information." Even recycled paper has environmental costs, he is quick to add.

The monetary cost of paper is another issue that may help push academia to go as paperless as possible. Since 1994, the cost of copy paper has risen 52 percent.

With the success of his Religion and Ecology class, Smith vowed to make any new class he introduces paper-free. For the 1997 fall semester Smith plans to continue his computer-intensive Introduction to Religion class, which is restricted to incoming freshman students. He will also teach an Internet-based Introduction to Comparative Religion which he jointly developed with international student Rayid Ghani of Pakistan. Smith's *Religion and Popular Culture* will involve students in intensive use of Internet resources

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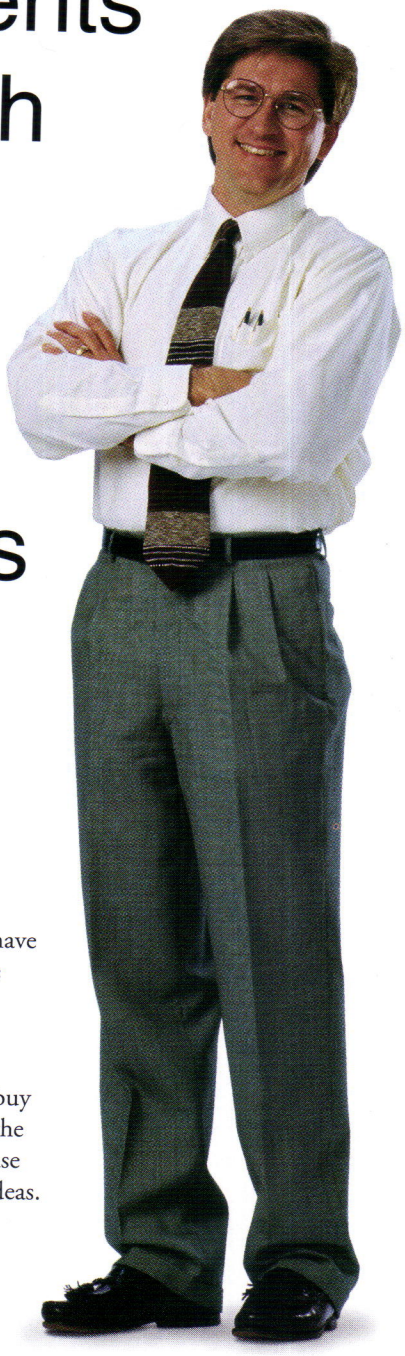
"Now our students can research a term paper while sitting in section G, row 10 at Saturday's ballgame."



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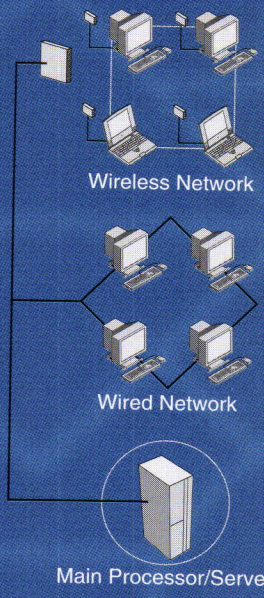

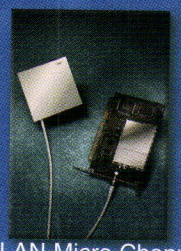

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to explore topics such as UFO cults, religious militias, and resurgent goddess religions.

Smith is also using a team of students to develop a World Wide Web project called the Rural Life Project. This Web site is devoted to documenting the passing forms of rural life such as church buildings, country stores, and log barns. The site will contain photographic and architectural documentation of important structures as well as historical documents and data relating to rural life. "The Rural Life Project," Smith says, "allows students to combine field work and computer graphics with traditional historical research. It's an exciting opportunity for a kind of academic work that doesn't often occur in the area of the humanities."

At least one other professor at Sewanee (the name of the town is often used to denote the school) has followed Gerald Smith's lead and also teaches a paperless class. Dr. Jonathon Grieser, also of the Religion Department, has students in his Images of Jesus class use the campus network to view paintings and drawings and to submit reports. Assignments and lecture notes are also posted on the network.

Posting lecture notes and assignments electronically frees up class time and conserves personal energy, allowing a professor "to teach more in the Socratic style, asking questions and stimulating students to think," says Dennis Prater, a Sewanee religion major who graduated in May 1997.

"Sewanee has many professors with innovative and creative ideas about using technology to enhance teaching. The new Center for Teaching will serve as a clearinghouse for ideas and as a resource center for those not on the crest of the technological wave to develop new techniques, as well," remarks Dr. Frederick Croom, Provost.

The environment, academic as well as technological, that enables professors at Sewanee to utilize electronic media so thoroughly began to take shape in 1986, according to Laurence Alvarez, the university's Associate Provost. That was the year Sewanee became the first institution in the south to make the Apple Macintosh its desktop computer platform.[1] The Mac was chosen for its ease of use, an important consideration for a community with more than a few members who took a dim view of technology. At that time, one faculty member even required student papers to be handwritten so that no error could be called typographical!

The following year Apple introduced its AppleShare file server, an inexpensive and easy-to-install, however limited, LAN. With AppleShare networks in place, Sewanee adopted Eudora, an e-mail program for the Macintosh that, like the computer, was very user-friendly.

"From this experience [the Macintosh, AppleShare, and Eudora], we picked up right away that

[desktop computer networks] could be a good way to communicate classroom materials back and forth," says Alvarez. "From there, it was not a big step for faculty and administrators to say 'we need a way to communicate across campus,'" he recalls.

A committee appointed in 1989 to study the possibility of a campus network recommended that "anyone should be able to access all the electronic resources they need wherever they are on campus, including classrooms, offices, and dormitories," according to Alvarez.

By 1990, Sewanee was ready to implement a strategic decision to install a new telecommunications switch and campus network. Nearly 3,000 miles of 24-gauge copper pair was put in place along with 160 miles of fiber optic cable, most of it underground. Ancillary wiring included 6,600 copper pairs in 39 buildings and 33 twelve-pair fiber pairs. On August 4, 1990, a Northern Telecom Meridian 1, Option 71 switch was cut over.[2] When the academic term began that September "we had live fiber to all campus buildings except the dormitories, which got fiber the following year," recounts Alvarez.

The University of the South sits atop the Cumberland Plateau, and more than 15,000 cubic feet of its famous sandstone had to be removed in order to lay the new campus network. Still, the task was probably less daunting for Sewanee than for a larger, urban institution with many commuting students, Alvarez points out. The University of the South is a relatively small residential campus with 1,280 students.

The university's decision to invest in fiber was based in large part on its earlier success with Macintosh computers, AppleShare networks, and Eudora e-mail. "We were not absolutely certain just how we would use all the capability of fiber," Alvarez admits, "but our previous success with simple LANs encouraged us to be ready to use new applications as they were developed. In any case, we never doubted the justification for fiber to carry data."

Fiber would provide the university with ample bandwidth for more sophisticated applications in the future, Alvarez notes. In addition, fiber is fast and does not require line drivers to push data along. Some of the runs at Sewanee cover a half mile. "With fiber in place, you don't worry much about speed."

Another consideration pushed Sewanee toward installation of underground fiber cable. The Cumberland Plateau is often battered by electrical storms that sweep across the mid-South. Lightning does not strike fiber cables buried in the ground. In addition, gusting winds and falling trees do not rip buried cables from poles and buildings.

Sewanee's library catalog was computerized the year that the new network was installed, and fiber between buildings meant that scarce library space did not have to be given up to house the catalog server (an HP 3000/937) in the library building.

"Do we need 100 Mbps Ethernet—which Sewanee's fiber is capable of carrying—on campus today?" asks Alvarez. "The answer is no. When we do need 100 Mbps Ethernet with 10 Mbps to the desktop someday down the road, will it be difficult or unduly expensive to install? Because we have fiber already in place, the answer again will be no. We'll just replace the Ethernet hubs we have in place today with Ethernet switches. That will cost some money," he concedes, "but the fiber we invested in years earlier should not have to be replaced. With the fiber cables already installed, we'll just put different boxes at the ends."

At present, Sewanee uses 3 Com hubs and Farallon Fast Paths in buildings to connect Ethernet segments and LocalTalk segments to the larger network. Most remote buildings are connected via fiber to 3 Com Ethernet switches in the main equipment room of the university's CompTel Center. For security, switches are configured so that residence hall traffic and Internet traffic are not routed to the segment where adminstrative machines reside, explains Sewanee Telecommunications Director Jeanne Jansenius.

Within the next two years the University plans to convert all network connections to Ethernet to better accommodate user needs. Uniform connections will also streamline maintenance, Jansenius adds. Category 3 wiring was installed during the 1990 project, but new installations are being done with Category 5.

By the time Sewanee's campus e-mail server went on-line in 1993,[3] all faculty had Macintoshes on their desks. Eudora, the e-mail access program, caught on so that in 1994 the faculty senate voted, without verbal dissent, to make e-mail the official mode of communication between administration and faculty.[4] What made this action remarkable, notes Alvarez, is that it was proposed by one of Sewanee's senior-most faculty members, and his motion was seconded by the professor who had once required that student papers submitted to him be handwritten.

Many other members of the Sewanee faculty, while not as thoroughgoing as Professors Smith and Grieser, take advantage of the electronic communication made possible by the University network to enhance their teaching, facilitate student research, and generally enrich learning.

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Dr. John Willis, who teaches American history and specializes in southern history, makes use of live Internet, facilitated by the University's T1 Internet connection, to access archives and display rare photographs, maps, and other illustrations in his classes. Archival services are making more and more of their primary sources available for viewing via the Internet, he points out. During the 1997 spring semester, Smith used a networked computer and projector to display the papers of a Civil War surgeon.

"I wanted to demonstrate to students how they could use a search engine on the World Wide Web to access the letters, reports, and other papers of Civil War surgeons," Smith explains. "The result was several very good research papers that used the Web along with other resources to impressive effect."

In addition to accessing the Internet, Willis uses the campus network, a computerized classroom, and CD-ROMs running on servers in the academic computing center to bring primary historical materials to his students. "The introduction of pictures, tables, and graphs expands students' comprehension beyond words, making their minds work in different ways," he explains.

In another class this spring, Willis projected a 15-minute motion picture—now on CD-ROM—that was taken from a camera mounted on the front of a Boston street car in 1906.

Willis showed this video several times. The first time, students viewed it with a narration prepared by the publisher. The next time, the professor would turn the narration off and then stop the motion at various points to ask the students to think about the architecture, the pedestrians on the sidewalks, the types of stores and offices. "The goal is to get students to ask more questions on their own and to think more about history after they leave the classroom," explains Willis.

"We're finally getting out of the Stone Age," remarks the history professor. "Not long ago we were writing on boards with chalk, scratching one stone with another. Now we are pulling images off of the Internet from around the world as well as from CD-ROMs."

A Sewanee art professor, Pradip Malde, will be teaching a course in the fall of 1997 designed to teach students how to produce material for the Internet as well as to take advantage of its resources.

"I am fascinated by the possibilities," says Malde, "and those possibilities include those offered by Sewanee's campus network as well as the Internet. We are going to learn how to input files by using a scanner, how to draw on a computer tablet, how to create Web pages. I want my students to discover what designs and typefaces work best on a Web page as opposed to a paper page," Malde continues, his eyes dancing with excitement.

He also wants his students to see new possibilities. "How does creating on the computer differ from more conventional methods? How do artworks created with different tools differ? What is the effect for the creator as well as the viewer?"

Each student in Malde's class will create the contents of a book on the computer, but they will cover and bind it by hand. And each student will create his or her own Web site. "The most important thing will be to use each—the book and the Web site—to its own strength and compare their differences," he adds.

"Here we have a medium (networked computers) that pulls together all the traditional media," Malde points out. To use it, however, "we need computers with great graphic capacity, efficient networks for transmitting images, and massive amounts of storage." Sewanee's network capacity will make this kind of transfer and storage possible.

The University is proud of its innovative faculty who have embraced new technology to the benefit of Sewanee students. The campus also boasts eight fully equipped electronic classrooms, including their latest addition with fifteen PPC 7100/80 computers (with 24MB RAM), a Sharp VCR, Sony Laserdisc player, Elmo Video Presenter, two Proxima Projectors, and an Ethernet network. The University of the South is truly a beautiful campus rich in tradition but commited to providing students the advantage of access to information through new technologies.

Bill Robinson is a freelance writer living in Richmond, Kentucky. He attributes his interest in and knowledge of telecommunications to his tenure as ACUTA Publications Editor from 1990–1993.

[1] The university reevaluates its desktop computer choice each year in light of changing needs and the changing marketplace.

[2] A Meridian 1 voice-mail system with 20 voice ports and 94 hours of storage was also installed. Every private phone on campus, including dormitory room phones, has voice mail.

[3] Originally, the server was a Hewlett-Packard 9000/F30. In 1997, the University upgraded to a dual CPU Hewlett-Packard 9000/D200 using the HPUX operating system.

[4] Approximately 1,500 members of the university community are regular e-mail users. The Sewanee student body totals 1,280.

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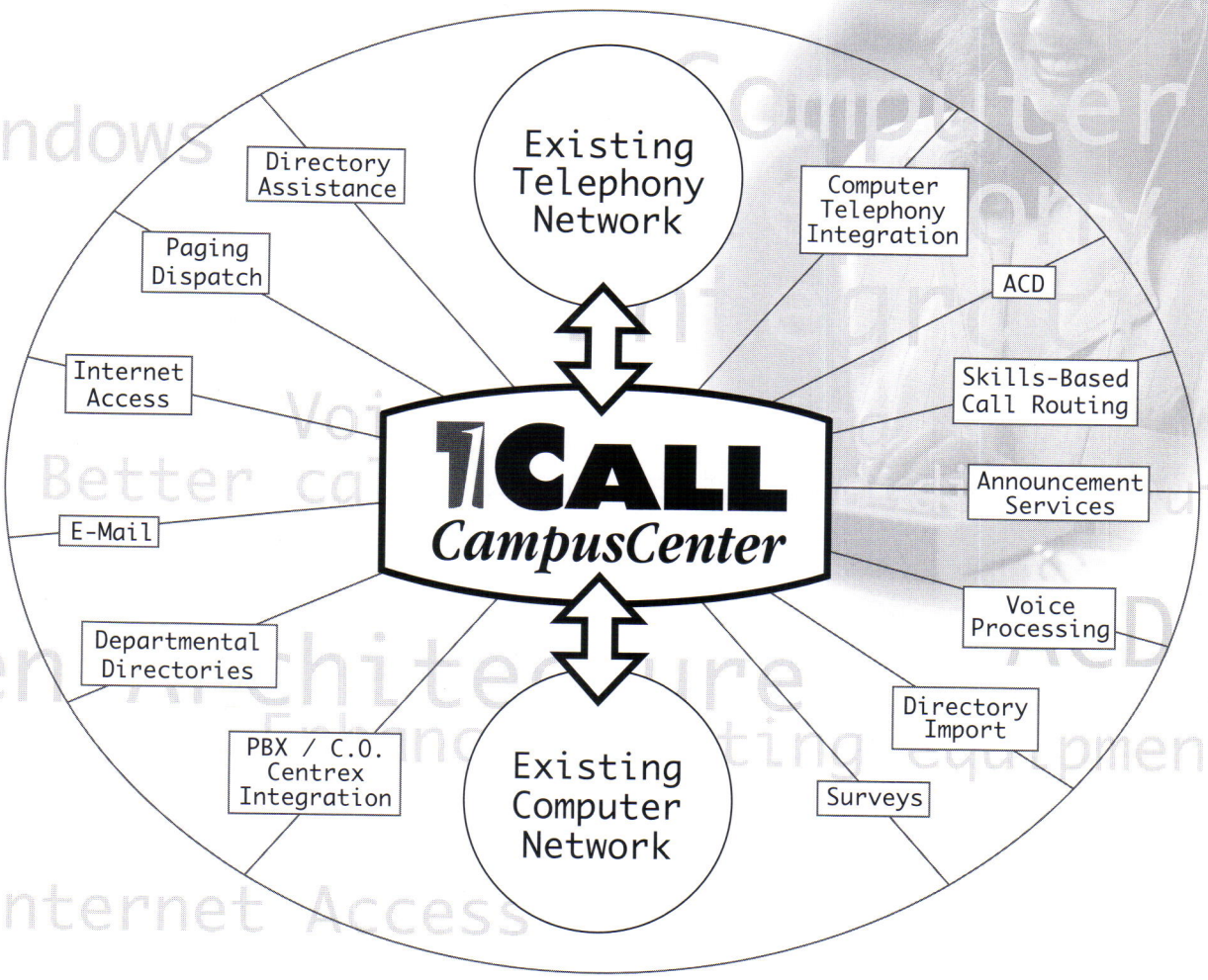

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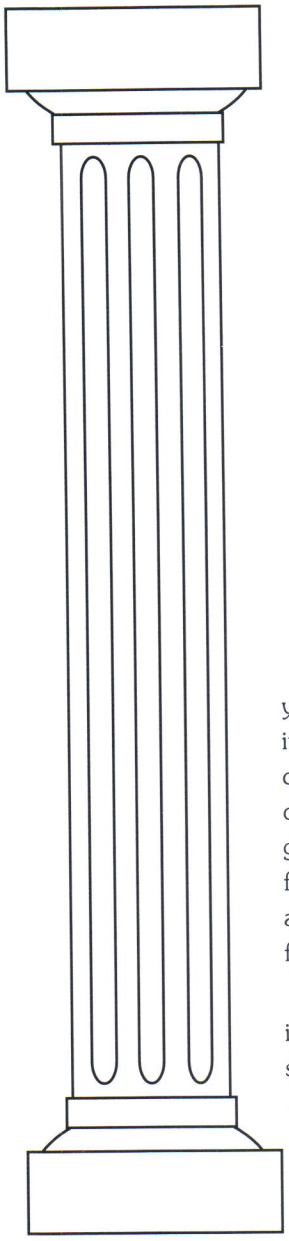

New Jersey's Cybercampus Brings New Structure to Education

By Charles H. Harrison

New Jersey is less than two years away from linking most of its 563 public school districts, 46 colleges and universities, and dozens of public libraries in a giant communications network featuring distance learning, interactive television (ITV), teleconferencing, and the Internet.

That's the prediction of William Reynolds, Director of Instructional, Technical, and Media Services for the Division of Continuing Professional Education at New Jersey Institute of Technology (NJIT) in Newark. His institution plays a major role in the fast-paced drive to create a cybercam-pus for the nation's most densely populated state.

Fueling the effort is a $200-million state appropriation that enables each public and private college and university to fully equip at least one distance-learning classroom. Additional funding is allocated to schools through the Office of Technology in the state Department of Education. To date, the state has awarded Tele-Measurement Inc. of Clifton, New Jersey, contracts to equip distance-learning classrooms in 40 colleges and 22 high schools and technical schools. The company provides cameras, monitors, videotaping and audio equipment, master control panels, table microphones for student tables, and all electronic software, according to Bill Endres, President of Tele-measurement. Tele-Measurement has also installed ITV equipment in an additional 160 schools.

Governor Whitman's 1997-98 budget proposes a $50-million bond issue to promote and finance extensive networking among the state's institutions of higher education. The bond issue will provide matching funds to colleges and universities that provide a long-range technological plan that will "enhance interinstitutional or intrainstitutional connectivity and information technology as it relates to advancing the instructional, research, and service missions of the institution." One likely candidate for bond funds is Rutgers, the state university, which is planning a mega-center in New Brunswick that will connect its distance learning/ITV facilities with up to sixteen remote high school sites.

Another development that may make the statewide cybercampus possible is that, under the recent Telecommunications Act, Bell Atlantic will be able to offer fiber optic connections between local area telephone access (LATA) in north Jersey and LATAs in south Jersey. Until now, federal regulations prevented Bell Atlantic from providing such long-distance service. The new law effectively wipes out LATAs, each one now designated by an area code. Bell Atlantic, for example, can wire colleges and schools in south Jersey so they can receive signals from colleges and schools in north Jersey, and vice versa. The current Bell Atlantic monthly rate for connecting a school via fiber optics is $753.

New Jersey's race toward a cybercampus would seem at first to be at odds with a recent report by the Educational Testing Service (ETS) in Princeton that ranked the state's public school districts below most other states with regard to student-computer ratio and teacher training in computer technology. According to ETS, New Jersey placed 42nd among the states in number of students per multimedia computer (37.5 compared to a national average of 23.7) and ranked 37th in percentage of teachers with at least nine hours of technology training (11 percent compared to a national average of 15 percent).

However, the state's technology establishment advances the following rebuttal:

- ETS student-computer data reflect the 1995-96 school year, when the state was just beginning major strides toward its cybercampus.

- Distance learning and ITV allow large numbers of students to learn at the same time using a very few TV monitors or computer screens. For example, Bergen County College in north Jersey involved 100 middle school students at three locations in a mock constitutional convention. Bell Atlantic linked approximately 300 high school students at eight sites in Bergen County for a special program called "Celebrating the Vision."

- Since 1995, many more schools in New Jersey have been wired for technology, including access to the Internet.

- New Jersey Intercampus Network (NJIN), created to oversee a technology revolution in higher education, adopted a strategic plan that calls for training at least a third of all college faculty, school teachers, and librarians to effectively use new instructional technologies by 2001.

The strategic plan also recommends a "stable funding strategy" to finance "coordinated technology applications for New Jersey's higher education, schools, and library communities." A new education network should be created to provide oversight, planners suggest.

NJIN now guides technology application in higher education, and the Office of Technology in the state Department of Education supervises developments among New Jersey schools. Colleges and universities pay annual dues to NJIN ranging from $2,000 to $5,000. The income helps to support NJIN operations based at Rutgers and at Stevens Institute of Technology.

According to NJIN Executive Director George A. Carroll, the organization fosters networking, shares information (including a Distance Learning Clearinghouse), and seeks grants from the state and other governmental and private sources. The state Office of Technology performs similar functions for schools.

The Distance Learning Clearinghouse consists of college faculty members concerned about training faculty to use the technology. "Many faculty members don't understand technology very well," said George McCloud, Clearinghouse Chairperson, "and some of those who are knowledgeable are ambivalent about it." The clearinghouse will develop teaching protocols for distance learning to prevent professors from "reinventing the wheel," he added. Master schedules also can be compiled to control distance-learning "traffic" between colleges and between colleges and schools.

While much of New Jersey's cybercampus still resides on planning boards and in fertile minds, major projects are underway throughout the state. Two years ago, New Jersey Institute of Technology in Newark and Burlington County College (BCC) in south Jersey together created the Technology and Engineering Center in Mt. Laurel, 15 miles east of Philadelphia, Pennsylvania. TEC, as the three-story brick facility is called, is equipped with three distance-learning classrooms. Professors in Newark and Mount Laurel teach classes at both campuses simultaneously. The TEC classrooms can be linked to seven south Jersey high schools.

TEC also offers students these options:

- Videotapes of classroom instruction that students watch at home.

- Three means of electronic conferencing with professors: e-mail, homepage, and via computer directly into the classroom.

Through TEC, students in south Jersey can earn BS degrees from NJIT in computer science, electrical engineering, engineering science, information systems, and engineering technology. TEC also offers a BS degree in science, technology, and society.

In addition to the undergraduate degrees, TEC awards master's degrees in computer science, information systems, and engineering management. Students can earn graduate certificates in managing human resources, programming, telecommunications, and project management. This fall, south Jersey businesspersons may enroll in a 90-hour, non-credit

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program on creating Web pages and managing on-site Internet and intranet.

A promising new venture will soon link TEC with seven other colleges and universities in south Jersey to create a regional economic development hub. "The hub will serve academe," said TEC Dean Phillip A. Laplante, "but primarily it will enable small businesses to have access to the Internet and teleconferencing, and their employees can receive training."

NJIT in Newark is participating this fall in a distance learning project sponsored by the World Bank. A videotape of Dr. Rose Dios teaching her calculus course at NJIT will be sent to universities in six African nations: Ethiopia, Ghana, Kenya, Tanzania, Uganda, and Zimbabwe. Students there will see the videotape and then ask questions of Dr. Dios via telephone-satellite hookup.

Networking that the governor's budget might fund on a grand scale is already happening on a small scale. In addition to the arrangement between NJIT and BCC, Rutgers professors are teaching some classes simultaneously to students on the Newark campus of Rutgers and to students at Sussex County College in the northwest corner of the state. Aviation courses originating at Mercer County Technical School are also taken by students at other sites.

M. Robert Hillenbrand, Coordinator of Instructional Services for Bergen County Technical Schools, is one of the pioneers in distance learning and ITV. Using the satellite on the roof of the building in Hackensack, his school already can, theoretically and technically, link 167 schools and colleges, although he has not yet attempted such a feat.

However, during the school year, Bergen Tech routinely connects students at two, three, or four sites for a teleconference on advanced placement physics, U.S. history, and dozens of other subjects. Or he may arrange for remote ITV training for teachers at schools in another county.

"Distance learning and ITV will never replace the live classroom," predicts Phillip Laplante, Dean of TEC in Mt. Laurel, "but tomorrow's college campuses may be smaller, with fewer classroom buildings and dorms."

The cybercampus is not a replacement for the traditional campus in New Jersey, agreed William Reynolds of NJIT, "but an enrichment of traditional campus learning." For example, he said, three high schools or county colleges might like to offer Japanese language instruction, but individually they can't afford a teacher for the small number of students who might enroll in the course at each campus. With distance learning, they *can* afford one teacher for three or six campuses.

Still mostly in the dream stage is the New Jersey Center for Multimedia Research established at NJIT and Princeton University by the State Commission on Science and Technology. The center envisions laboratory experiments and research being shared on a wide scale among colleges and schools throughout the state via distance learning and ITV.

Charles Harrison is a freelance writer living in Woodstown, New Jersey. He has also written eight books on education in America as well as a number of articles on history and education for a variety of publications, including Better Homes and Gardens.

"Transition Test Partners" Introduces Students to the Real World

by Curt Harler

The universal complaint of students in university programs is the difficulty of getting real-world, hands-on experience. Recently, several schools have begun working with a private company to provide education and experience in testing communications equipment. Not only is this program a practical student educational service of the first degree, but the universities and the corporation also benefit.

St. Cloud State University in St. Cloud, Minnesota, the University of Arizona's College of Engineering and Mines, and the University of Minnesota's School of Engineering/Computer Science have joined with Transition Networks of Minneapolis in a program called Transition Test Partners.

It is the kind of town-and-gown alliance which could be emulated in other locations with similar success.

At St. Cloud State University, Dr. Dennis Guster, professor of computer science and Director of the Computer Network Research Center, has been able to work the testing program into the basic suite of computer programs used at the school. They have been involved in testing a range of products, including the SPS2000, TX hubs, TX/FX media converter, SNMPc, and the Switchmaster. Not only do the faculty and graduate students get the benefit of testing and using the latest in equipment, but the general student body is gaining from the upgraded network at the school.

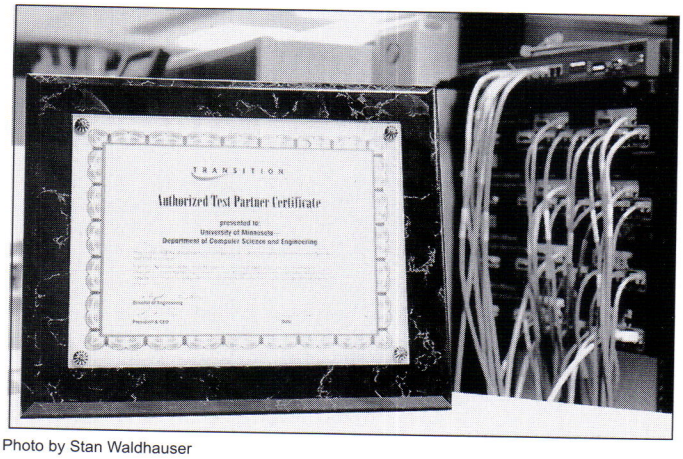

Photo by Stan Waldhauser

"If we took the equipment piecemeal, we knew that nobody would get much out of the research," Guster says. So, Transition agreed to provide a whole suite of products. Guster was working on a project to provide 100 Mbps connectivity throughout the network—a project that the equipment grant made possible.

High-Tech Advantage

At any given time, a dozen or more people are working at the school's Computer Network Research Center, doing research, writing papers. One graduate student, working on a project using a hub with real-time audio, had hit a brick wall until someone suggested using the research components. "He was able to solve his problem in one fell swoop," Guster says. Guster, himself, has been able to do research, recently presented at the Small College Computing Symposium. The program works at big schools, too. "Our dean thinks this is a good learning tool for the students," says Charles M. Glickman, Network Operations Manager at the University of Arizona's College of Engineering and Mines, Tucson. Glickman says the dean appreciates the headstart the program gives students who are able to work with leading-edge equipment and networking. "Once they get into the real world, along with their education, this helps them get pretty good jobs," he says.

Since the school is upgrading Category 3 twisted-pair installed in 1986-87 to 100 Mbps FDDI, the students working in Tucson have the chance to learn a lot about equipment, cable pulling, and high-speed technology.

At the University of Minnesota's School of Engineering/Computer Science in Minneapolis, Irene Jacobson is the Network Administrator on the system staff. While the University of Minnesota is the longest-standing partner in this particular program, it also has experienced a fair amount of turnover. Although put into a new situation because her predecessor left,

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Jacobson still is quite high on the program.

Jacobson says that she does most of the testing work herself, although the graduate students who work in the lab also have access to the switches and other materials being tested.

The Computer Science/Electrical Engineering Building at the University of Minnesota is six stories high. The equipment being evaluated is in that building's research area. There are six IBM RS-6000s and five SGI Challenge-X computers on the switch they currently are testing. In addition, they run a Sun Sparc 1000 and a Sparc 1000E with multiple interfaces. Their NT server is also on the system.

"There are several computers on the subnet," Jacobson says. The computers on the Ethernet network do a great deal of parallel processing, but they do not talk to each other directly. The problem came where the switches reach the Internet.

Since they have ATM (asynchronous transfer mode) and Fibre Channel, Jacobson is in a position to do high-bandwidth testing. Because users on the sixth floor are so far from the link to the Internet, fiber is required. However, she admits, there is not a lot of 10Base-T or 100Base-T used. Most of the network is thinnet.

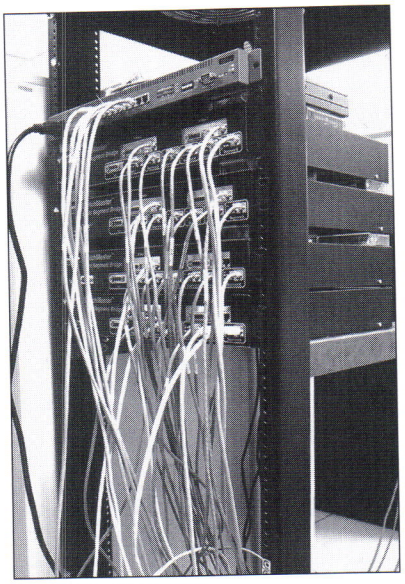

Photo by Stan Waldhauser

Glickman currently has three students — Perry Myers, a senior in engineering physics; Travis Lewis, an electrical and computer engineering student; and Ryan King, a computer engineering student — working for him. At this point, Glickman has the Switchmaster linked to the Stackmaster SPS 2000. From the SPS 2000, the network splits off into four virtual LANs (the unit's capacity is eight). One connection feeds the PC group, a second goes to the Macintosh group. The third handles the two digital UNIX servers which serve the 2,500 student accounts. The fourth runs a half dozen H-P workstations.

"We set it up to see how the traffic flows," says Myers. He is using the SNMPc software to monitor traffic. "It flows pretty flawlessly," he says, sounding a bit disappointed. From an experimenter's point of view, a well-honed network is not too exciting.

The students learn and the manufacturer learns. At the University of Minnesota, for example, one of Jacobson's co-workers found a bug in one of the switches. "No one in the program or at the company had noticed the problem before," she says proudly. Not only was the school able to repay the vendor for the equipment, but they also can take a bow for preventing a potential problem at other user sites.

"We also are testing their SPS 2000," Jacobson says. "We put it into our big server room and connected it to several machines. This unit lets you put up to eight subnets on the device." The University is using it to create virtual networks. Should they need to move a machine to a different network or add a new computer to the network, they can do it by configuring the 2000 and not by pulling new cable to the location.

Jacobson notes that most network administrators go through a typical cycle when purchasing equipment. First, they check out the available products. They then get a demo disk or product, then they make the buy/don't buy decision. "This saves us one full step in that process," she says. By having first shot at the newest technology before it even reaches the demonstration stage, she is able to bypass the early test-drive stage.

Try to Break It

The program is not a beta-test operation. Rather, the manufacturer gives each school selected products and tells the students to go out and, in effect, see if they can break it. The products may be in any stage of development. The undergrads, graduate students, and faculty members are allowed to push the product as far as they like. Some, like Myers at the University of Arizona, take it as a challenge. Whether man or machine wins, however, the student ends up learning.

While there is no worse disparagement than to call a program "ivory tower," the projects being run by the schools unlock the door of any ivory tower and take the students outside. In many cases, the results of their working with and playing with the equipment become a real product which they can encounter in the real world.

"We use test partners to help us deliver and support robust, quality networking products," says Cheri Podzimek, Marketing Director at Transition. "Through Test Partnering, we are able, from time to time, to find and resolve a problem or define and determine the scope of a value-added feature/function opportunity which results in a win-win for us, our distributors/resellers, and our products' end-users," she says.

"It helps the universities leverage their investment in

their graduate students. The students become part of the real world," she adds.

"I'd sure like to work out similar agreements with three or four other vendors," Guster says, noting the value to a smaller operation like St. Cloud State.

Glickman indicates he has more difficulty keeping students (who have the annoying habit of graduating as soon as they collect some expertise in the system) than he does participating with the vendor in the program. Actually, the program is fairly straightforward.

Test Partner Program

The Test Partner Program is managed by Transition's Technical Support Department (TSD). The focus of the program is to get new products and features installed in friendly environments immediately upon engineering release.

TSD qualifies potential test partners initially on the basis of the robustness of their networks, client count, eagerness to participate, and networking expertise of their technical focal point.

"The supreme qualification is that the test partner must possess a partner—not a customer—mentality," says Steve Acord, program facilitator.

The company demands that TSD aggressively participate with engineering to define and insure that product supportability is designed into every product. Also, TSD has an active role in assisting marketing with product launch. "TSD's Test Partner Program is our best tool to enable us to reach and sustain our contribution objectives," Podzimek says.

Test partners do not have to execute a laborious product acceptance test plan. "We recognize that a Test partner's resources are as limited as our own," Acord says. Test partners are allowed to test the product any way they want to.

Jacobson says much of the interaction with the vendor is informal. "A lot of the program depends on how much you want to put into it," she agrees.

There is more than posturing behind the challenge to "break it, if you can." Quite satisfying to the student researcher and the university is the promise that the manufacturer will give priority-one status to all problems reported by any test partner. Guster notes that, in the case of a failure, they simply get another box or a new part to install. More often, they are asked to make firmware upgrades to maintain a leading-edge system.

There are a few other duties. The manufacturer requests that each test partner be willing to do the following:

- Provide a diagram of their network, illustrating backbones, devices, and client count
- Capture a performance baseline before installation so that a comparison can be made
- Give this testing a reasonable amount of priority
- Provide as much detail, as practical, when reporting problems
- Allow the marketing department to interview them so that the prestige of their opinion can be leveraged.

Lastly, it may be necessary, if it is logistically difficult for TSD to do so, for TSD to make a request, not a demand, that a test partner test a pre-release product, a fix, or an upgrade. Requests like that, however, are made only of partners in the program, not of customers or distributors/resellers.

Jacobson says the longest time commitment is when a technician comes in to upgrade the switch or other unit being tested. That can amount to two hours of her time, hardly an unreasonable trade-off.

Guster says paperwork is minimal. "It's my favorite grant program," he says, smiling. "Compared to the federal grants, there is nothing required at all." He says they did sign a letter of agreement to use the equipment and not to sell it. There are stickers on the various components, and he is responsible for tracking serial numbers.

"If they said they had to take all of the equipment out, we would cry," Jacobson agrees. However, that is not about to happen. In fact, the University got to keep one of the switches it had been testing.

"The amount of work we put into the program is minimal," Jacobson says. "I simply put the box on the network and watch what happens."

There is plenty of opportunity for other colleges and vendors to try similar projects. Such alliances can result in big wins for everyone involved, bridging the cost-of-technology gap that puts state-of-the-art out of reach for many campuses.

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Even before the state's master plan, Kent was well into the process of creating classrooms of the future through a strategic plan for electronically linking our eight campuses to the global community. Evidence of the success of this plan literally surrounds us:

- Kent was listed among the nation's top 100 "wired" colleges and universities in the May issue of *Yahoo! Internet Life* magazine.
- A $2 million residence services project will provide 6,600 minimum switched 10 Base-T lines to all residence halls this fall, creating a "port-to-pillow" ratio of 1:1.
- A plan has been developed to upgrade and/or replace faculty computers periodically.
- An ATM backbone is being installed in two phases totaling $2.7 million.
- A $1 million intra-building wiring project for 60 campus buildings will begin in October 1997 and be completed by October 1998.
- The School of Journalism and Mass Communication has developed "The Interactive Reporter," a CD-ROM that gives students computer-simulated scenarios to teach the intricacies of live reporting.
- A new $11 million Northeast Ohio Technology Education Center operating at Kent's Trumbull campus by summer 1999 will serve as the hub of the eight-campus School of Technology.
- Strong corporate partnerships have been established with companies such as IBM Corp., Ameritech, Anixter Inc., Goodyear, SGI, and Thunderstone to share technological expertise. With competing forces vying for shrinking public dollars, state-assisted colleges and universities are increasingly turning to the private sector to find innovative ways to keep up with the explosion in computer-based learning technologies that are leading today's students into the 21st century. Corporate partnerships create a win-win situation for everyone involved.
- Various technological approaches for supporting education will be housed in the Moulton Hall Technologies and Learning Center. The $7.3 million renovation of the historic building built in 1917 will be complete this fall; classrooms should be functional and ready for classes by summer 1998. Moulton Hall, home to the Office of Learning and Technology Services as well as the Office of Media and New Technologies, will be equipped with 350 fully networked computers, 10 classrooms, a software library, media labs and 14 faculty offices.

Distributed Learning

Three kinds of instruction will comprise distance/distributed learning at Kent, according to Dr. Lyle E. Barton, Director of the Office of Learning and Technical Services:

- Remote teaching done through videoconferencing.
- Synchronous solutions featuring computers equipped with cameras and audio headsets.

  Classes are taught through a computer-based system with real time video windows, interactive exercises and multimedia content on the students' screens, so even though students are in different places, with learning being *distributed* they can attend classes together.
- Asynchronous solutions, in which all the software and course content resides on a server (which might include video) for maximum access flexibility.

Interaction is supported by threaded discussion groups, electronic mail, CD-ROMs, information posted on the World Wide Web, and so on. Some classes have already been distributed entirely on the Web.

An important factor in the support of new learning technologies at Kent is the ability to reach more students. Students who are unable to travel to the Kent Campus because of work schedules or mobility challenges can receive courses at times and regional locations that are more convenient to them. Distance/distributed learning initiatives allow us to cope with both geography and time challenges, and still be responsive to students' needs.

"Residential campuses are built mainly for 18-year-olds, but higher education is needed by everyone," says Dr. Rosemary DuMont, Director of Development for Media and New Technologies. "For working adults, attending class on campus often doesn't matter. We recognize that the campus only reaches a small group; distributed learning can reach the world."

All colleges and universities have access to technology such as computers, multimedia, and the

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Web, DuMont says, but what makes Kent different is its use of multiple technologies to respond to a variety of needs and learning styles. "We are not married to one particular approach," she says. "This makes us unique."

Recent distributed learning classes at Kent have included Fundamental English Grammar, Nursing as a Profession, Teaching High School Journalism, Contemporary Nursing Issues, Business Writing, Reporting Practices, and Introduction to Microcomputers in Education.

Class Successes

The classes are distributed synchronously to students at multiple locations within Kent's eight-campus system via a unique learning environment that incorporates computer workstations and LearnLinc, an innovative software package developed by ILINC International, headquartered in Troy, New York. Kent is the first university to develop distributed learning courses using LearnLinc.

The success of distance/distributed learning at Kent is already evident, according to teachers of the classes.

John Jewell, an associate professor of English at the Tuscarawas Campus who developed Kent's first distributed learning class, has offered Fundamental English Grammar three times, with class sizes averaging about 30. Jewell says his students have "jumped right in" to the new educational environment.

"Student response has been good," Jewell says. "After the first couple of weeks I don't think the students think about it anymore. They log in, put the headsets on, and go at it.

"I expected more problems than we've seen," he adds. "Students have come to it much more easily than I thought they would. I think it's a better way to teach."

> "Residential campuses are built mainly for 18-year-olds, but higher education is needed by everyone. We recognize that the campus only reaches a small group; distributed learning can reach the world."
>
> *Dr. Rosemary DuMont*

Anne Freitas, assistant professor of nursing at Kent's Ashtabula Campus, is the teacher of the Contemporary Nursing Issues distributed learning class, which was first offered in spring 1997 and will be taught again next spring. The class was taken by 36 students, twelve each on three Kent campuses.

Despite a period of adjustment for both the students and teacher, the pilot class went well, Freitas says. She adds that the distributed learning format lends itself to classes such as Contemporary Nursing Issues because "the discipline changes rapidly, and students need to know what's current about legal and ethical issues in nursing. Possibilities for the class last year are now reality this year."

Freitas says student feedback is an important part of building the distributed learning curriculum. Among the many positive comments from her students were factors such as increased access for students; the high quality graphic presentations; easy access to more information; and the opportunity for students with limited computer expertise to gain experience.

"We're teaching classes at Tuscarawas Campus that we never taught in its 35-year history because there was never a big enough audience," Jewell says. "Now, if we have literally one student at each campus who wants to take a class, we can say 'no problem' and teach it cost-effectively. In terms of access, there is no limit. It's really going to open up things for the regional campuses."

Impact on Telecom Staff

"Providing the technology for the actual delivery of classes is a weighty responsibility, and, for some members of the telecommunications staff, a relatively new role," says Margie Milone, Manager of Telephone Communications at Kent State. "It took decades for people to begin to take phone service for granted, but what began as a luxury is now clearly perceived as a necessity. I don't think it will

take nearly that long for us to grow accustomed to distance learning technology. Our expectation is, already, that it ought to be there when we flip a switch. No service means no class. When you are serving many people at three or four sites, you can't exactly leave a note on the door."

According to Milone, one of the more frustrating aspects of providing service is the reliance on the LEC. "When trouble happens, and of course it will, we would prefer to be able to handle the calls ourselves; but beyond a point, it's out of our hands. We would like to ensure every class, every day, but even with all conceivable safeguards in place, we can't guarantee reliability all the way. But," she adds, "these are very exciting times to be involved in campus telecommunications. We are involved with the educational mission of the institution more directly than ever. "

Milone offers a little advice to others who are implementing distance learning technology:

1. Get circuits up for testing well in advance of delivery.
2. Identify all expectations clearly.
3. Establish communications clearly across all lines: faculty, design team, network manager, equipment provider, and curriculum authors.

Looking Ahead

What does the future hold for Kent State in the area of distance/distributed learning? New classes are in the works for upcoming semesters. This fall, eighteen courses are being offered featuring distributed or distance learning technology.

In the next two years, Kent is looking toward offering entire degree programs such as business, nursing, and technology through distance/distributed learning.

New features being considered for courses include "streaming video," where video is recorded, encoded, placed on servers, and accessed on demand; and asynchronous content is offered on the Web.

"When I recall where we were five years ago and look at our application of new technologies for access and learning today, I can only marvel at our progress and commend those who have led the way," says Kent Provost Myron Henry.

"Our vision is—and always has been—to have our students succeed," says Dr. Carol A. Cartwright, president of Kent State University. "And to succeed in this changing world, Kent has been utilizing the latest computer and communication technologies to provide the very best in education."

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For more information about programs at Kent State:

Kent State University page: http://www.kent.edu

Distributed Learning page: http://www.dl.kent.edu

Learning and Technology Services page: http://henry.contract.kent.edu/LTS

Contract Services page: http://contract.kent.edu

New Media page: http://newmedia.kent.edu

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Technology in Education: Creating a Natural Learning Environment for the 21st Century

by Ray Steele, PhD

One of the few physical environments in our society today that differs little from the way it was in 1856 is education. It is often still a box with uncomfortable seats and a chalkboard, but the lighting has improved. This is the environment in which we are to prepare the next generation of leaders to keep our countries competitive in the Information Age.

Usually in the field of education we are encouraged to speculate and philosophize on that which our preliminary research indicates may work or which might, at some statistically significant point on a chart, be of sufficient interest to pursue for further study. Due to economics and other circumstances beyond our control, we are rarely able to tackle a major environment or problem area with an applications-oriented outcome as our initial goal. I create technologically capable teaching and learning environments and make them operational. I have been very fortunate. For nearly a decade and a half I have been able to use college campuses and K-12 school districts as living laboratories for applying technologies to learning environments.

The following material includes some lessons I have learned about the teaching and learning environment and how I believe it can be impacted both positively and negatively by the application of Information Age technologies.

The Initial Aggravation

In 1982, while teaching in the Executive MBA program at the University of Pittsburgh, I became aggravated by the lack of basic technological support for professionals—teachers—in the education environment. I was one of the early multimedia users in the classroom. In those days, that meant slides, a video tape, and perhaps a video disc or audio conference. My problem was that I could not depend on the loose technologies.

It seemed ironic that one of the most information- and communication-intensive environments, the multi-billion-dollar education industry, was so far behind in providing its professionals with basic information tools. This was not a problem based upon the unwillingness of the staff to be supportive. It was, instead, based upon an approach that simply would not dependably work. It was a poor system, the wrong paradigm. We were delivering lots of loose equipment to the classroom, and it failed regularly.

Thus began the work which led to the first Campus of the Future in the United States in 1983, a project which served all 5,000 people and the 55 buildings of the University of Pittsburgh campus and included voice/data/video-capable, fiber optic infrastructure and satellite. By 1987, we had underway the teaching environment model of the Campus of the Future at Ball State University and the Schools of the 21st Century Project, the first K-12 school district to employ voice, data, video, a fiber optic infrastructure, and satellite to its academic environment. In K-graduate levels, we found that a new system, a paradigm change, was necessary to achieve the results we sought. We learned that we could lessen the aggravation in most cases, and the learning environment changed for the better for teachers and students.

In each of these projects, we selected pedagogical problems as our targets and applied technologies to help faculty and administrators improve their teaching and learning environment and cut back barriers to good teaching, research, and service.

We shifted from an environment dependent upon moving and managing boxes to an environment in

which we move and manage information. This dramatically impacted the number of teachers willing to use the technology.

Technology must be a tool which is a natural extension for the teacher and a readily available and natural part of the classroom and school environment. Students should not give up language, math, science, or history time to take extended classes in technology. Instead, the learning environment should incorporate these "technologies of our time" as tools in the same way that the desk and the pencil sharpener are tools. Students already receive exposure and then training, with lots of hands-on, trial-and-error-based learning, with many tools as they go through school. The computer and many related technologies should be no different. They are not the focus of education, but the means by which education comes alive.

The Transition to an Information-Based Society

Two events in the early 1980s heralded the arrival of the Information Age: the introduction of personal computers to our homes and offices and the divestiture of AT&T. Suddenly change was everywhere: our businesses, banks, even the checkout at the grocery store. Slowest to change were our schools and campuses. As the workplace changed, the institution most responsible for creating a talented workforce did not change. This problem was not a local one; it was national. While a few schools and campuses experimented or modeled change, and there was widespread, usually random purchasing of some computing devices for schools, the results were more often than not rhetoric from school and campus leaders, dust to be found on computers, and clueless graduates with frustrated teachers and communities.

From Islands to Infrastructures and Networks

While electronic infrastructures and networks were not new technologies in the early '90s in the United States, they were not commonly understood, especially in terms of their implications for education. The Internet, the public attention to technology in schools by the Clinton administration, and a few successful K-12 model projects began to help us focus on a truth that large business organizations had learned over a decade ago.

Isolated computers and islands of unconnected and difficult-to-access information are costly and ineffective in other organizations which are information dependent. Why should it be different in education, perhaps the most information-dependent environment of all?

The answer was obvious, and it was more complex than in business or government. Education depended upon good information access for its daily activities, but it did not just need computer-based data. Schools and campuses used video, still images, audio, and varied forms of digital information in the classroom and for their overall operations to a much greater extent than other environments which had been involved with Information Age technologies for much longer.

However, due to old spending habits, the lack of understanding of infrastructure and networks, and little presence within academic leadership circles from those with broader technological knowledge, it was hard to break out of the "buy another computer and it will be OK" mold.

The needs of 21st century schools and campuses must be addressed today through planned projects which first assure that there need be no more information islands. Buildings should be equipped with a wired infrastructure and it should be assumed today that a network which connects students and teachers to the voice, data, and video information resources needed in all classrooms is fundamental to success.

It is also fundamental that those who are entrusted with providing daily leadership in the classroom be well trained in new technologies. Without training, teachers who stand before a class daily will be unable to maximize the use and value of these technologies. They will also be unable to earn and maintain the confidence and credibility of a generation of students to whom technology is not a major mystery.

To be successful in the 21st century and to be able to compete and attract new opportunities, we must have many elements in place. However, nothing is more basic than the perception that a workforce is readily available that is Information-Age-capable. To achieve this, schools and campuses must have a technologically up-to-date teaching and learning environment at every level and a teaching staff trained and confident in the use of this technology as everyday tools for educating future generations. These are the keys to the 21st century.

Most of us accept the discomforting notion that we are in the Information or Technology Age, and we accept the trends suggesting that much of our future success will be based upon competition beyond our borders in an economy with a growing global base.

It is absolutely critical to our future that we also accept the fact that we must make our schools and campuses a place where modern technology is a natural part of the learning environment. The generations we are preparing to work in our behalf in the

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21st century—just three years away—must be comfortable to enter the workforce having mastered the basic tools of technology as one element of their education. That is the future we must face together and it is a powerful argument for projects involving technology.

The Implementation Strategy for a Natural Learning Environment

What should technology look like throughout schools by the beginning of the 21st century? Without a doubt, some of it will look slightly different from our vision in 1997, due to inevitable changes and developments. However, we can make some reasonable determinations and establish standards of judgment which will assure that our choices are at least usable well into the 21st century:

- All infrastructure decisions will be based on (1) maximizing bandwidth potential for an increase in network usage and (2) achieving the most bandwidth within available budget. This strategy reduces the likelihood of rewiring due to short-term planning. All current wiring which meets this standard should be maintained.
- All systems choices will favor open architecture and products which have guaranteed upgradeability or upward expandability to avoid early obsolescence. Whenever possible, off-the-shelf rather than customized applications will be sought. Extra care in selecting vendors with financial staying power in a turbulent market will be the standard. Whenever possible, wide area network (WAN) choices for connecting buildings will be based on school- or campus-controlled and nontariffed network access.
- Phasing in of technology improvements will be done with current leases, agreements, and aging of current technologies in mind to maximize current investment values.
- All phases will be subject to review and revision due to extraordinary opportunities resulting from yet-to-be-completed partnerships, donations, or unexpected changes in relevant technologies.
- Limited special technology experiments within each phase and the results of these experiments may alter technology choices in other phases based upon what we learn. Examples might include trialing DVD technology or the new network computing device or experiments with WAN technologies.
- Every effort will be made to minimize the addition of power demands on classrooms.

Impact on the Typical Classroom

Every classroom should be wired. The minimal infrastructure should include fiber optics and category 5 copper wire.

The classroom will be able to receive, via the appropriate network, phone, Internet, and other data signals as well as analog or digital video signals and to locally control devices such as PCs, laser discs, VCRs, and other sources which reside at a remote location. A monitor of at least 32 inches or a projector for larger spaces should be provided. Where appropriate, a local VCR will also be provided and secured beneath the monitor.

> Isolated computers and islands of unconnected and difficult-to-access information are costly and ineffective in other organizations which are information dependent. Why should it be different in education, perhaps the most information-dependent environment of all?

A hub which can support at least four computers should be installed in the back of the room. Near the teacher station should be:

- A phone with speaker and message waiting light capability
- Appropriate local control inputs for a networked media distribution system with network connections
- Inputs allowing monitor or projector display of local computing signals.

A Pentium-level, multimedia PC should be attached to the hub for direct student research via Internet access, and a scanner keyboard or existing scanner and a printer should be provided.

Every teacher should receive a Pentium-level laptop with the possibility of adding a docking station where needs justify. This laptop will minimally include color display, 16 MB of RAM, and 1GB of hard drive in addition to a 28.8–56 Kbps data/fax modem and a CD-ROM. All machines will have growth capacity to accommodate 32-bit-architecture-based software upgrades for future.

Why laptops for teachers? If we hope to support teachers in a modern, technologically equipped environment and encourage them to fully utilize this

equipment, we must provide mobile tools. Teachers work at home and elsewhere and they need to take ownership in their personal workstation to become self-supporting. Today, a laptop provides capacity similar to a desktop PC. By making it mobile and capable of plug-in display for classroom presentation, the teacher can bring in and easily display last evening's preparation ideas. This will also provide local control for the media-retrieval network in the classroom and access to the administrative data network. In addition, we can minimize the travel time for support staff by having the teacher drop off the laptop when service or support becomes necessary. A loaner system can keep the teacher equipped while support staff spend time managing the repair instead of traveling from room to room in the school.

The Mobile Virtual Lab

While the classroom will have a multimedia access to networked resources for students, and the teacher will have personal network access as well as access to both Mac and PC presentation devices on the network for classroom use, it is important that students receive maximum hands-on experiences. There will still be labs within buildings, but to maximize student experiences, a mobile virtual lab will be provided. This lab will include a cart with enough laptops for the class, equipped with wireless PCMCIA devices.

Very few classes use computers, beyond occasional presentation or reference application, in every class period, and when they do, only a few students are able to be hands-on at the same time. With the mobile virtual lab, the teacher can plan when the class can make best use of hands-on computing experiences and then schedule this time for everyone to have a machine.

Since laptops are battery based, there are few implications for classroom power capacity. In addition, when it is useful for the teacher to download special software applications to his or her laptop to share with students, he or she accesses the wired network going to the server where the software is resident. Then, acting in a client-server relationship, the teacher's laptop becomes the server, and the students wirelessly download the software to their client laptops for local use.

In this process, the students not only gain hands-on experience with the exercise or learning experience provided by the software, but they also participate in learning the functions of downloading software and basic computer operations as a natural part of the class activity.

More importantly for maximizing hands-on access for students and for stretching resources, once this class period ends, the mobile virtual lab can be moved on to another classroom for student use rather than having a room full of computers gathering dust.

The goal of computing devices should be to maximize students' hands-on access and to provide teacher support, class presentation capacity, and research access. The above elements combine to maximize use and access for students while minimizing overall costs to the system.

Once the network is in place and the teachers and the basic classrooms are equipped, the mobile virtual labs can be grown in numbers as demand increases, thereby allowing managed growth relative to budgets.

What Really Makes a Difference?

The keys to success in the implementation of technology in schools in the 21st century include the issues discussed above, and they are tied to planning and comprehensive versus piecemeal efforts. They also include staffing and organization, training, and the management of current and future technologies in an ongoing and change-based process.

However, the most essential element is providing an environment which is rich in technology access. Hands-on, easy access encourages use. When we are constantly surrounded by these tools, the mystique of technology is diminished and the expectation that we try it is heightened.

Learning does not suddenly improve because of a multimedia PC. However, if I am trying to help you learn the components of human anatomy and I can quickly and easily show you on the screen pictures and relationships and even manipulate those, no matter where they may be resident, then you will find that learning improves. More importantly, having seen my use of the technology, if you begin to use it to answer your own questions as naturally as you now use your reference book, we have made the real difference. You have become not a technologist, but someone who can use technology as a tool to enhance learning. This engagement can lead to more time on task with less drudgery, and that will make the process of education work better for you.

The result is better end products and a community better able to supply a competitive work force for the next millennium.

Ray L. Steele, Ph.D., is the Founding Director, Center for Information and Communication Sciences, at Ball State University, and President, Chairman Emeritus, and International Ambassador of the United States Distance Learning Association.

Targeting Technology Where Students Live

by Leslie S. Wilhelm

Wagner College on Staten Island
Photo courtesy of Wagner College

At a time when two out of three high school graduates continue their education at a postsecondary institution, deciding where to go has become an increasingly complicated process. Not only are students and their parents looking at academics, location, costs, and activities, but increasingly they're asking about access to information technology on campus—local area networks, e-mail, voice mail and Internet connections.

"It has definitely become a more common question, especially among parents," says Peter Cross, Director of Telecommunications at New Hampshire College in Manchester, which offers undergraduate and graduate studies as well as a culinary and hotel/restaurant management school. "Not only do students and their parents want network access in the labs and libraries, but they want it directly from student residence halls. More and more, network access is seen as a necessity, not value-added."

How a school uses and manages technology and infrastructure can dramatically impact its prestige, competitive edge, and level of service to students and staff. Smaller schools and colleges, often operating with small telecommunications staffs and finite resources, are also managing the climb to cutting-edge technology. Bundling access to information technology with the traditional benefits of a small school—small classes and personalized instruction, for example—significantly enhances a school's ability to attract and retain quality students, faculty, and staff.

In the last quarter of 1996, Philadelphia College of Pharmacy and Science, Wagner College, and New Hampshire College all accomplished major upgrades to their telecommunications facilities, including installing new infrastructure and cutting over to new switches. Although each school faced different challenges dictated by existing wiring and technology, they all had similar goals:

- Provide students with voice, data, and cable TV services directly to their residence hall rooms
- Expand or upgrade inside and outside cable plant to state-of-the-art transmission technology
- Unify their systems for reliability and ease of administration

How did these schools make the transition from existing telecommunications facilities—often with limited capabilities—to state-of-the-art systems that targeted technology directly to students' living quarters?

Identifying the Issues

"We were woefully in need of updating," says Patrick Lepore, Director of Telecommunications and Computing at Philadelphia College of Pharmacy and Science (PCPS) located in metropolitan Philadelphia. "We were using old telephone instruments with a Centrex system, with a scattered, haphazard wiring plan. Our system was overloaded serving our 800 residential students and 450 administrative users. What we really needed was a complete overhaul." The school also wanted to offer students access to technology, a service that until now was very limited. "We had a small computing center, and the library had a few stations, but only with library-related information," Lepore continued. In short, the school's thirteen buildings required all new switching equipment, a new cabling infrastructure and new

phones. An upgrade for PCPS would be a dramatic change for students, faculty, and administrators alike.

Wagner College, on Staten Island, was also struggling with a "discordant" system, as Mark Sedutto, Wagner's Director of Campus Technology labels it. The Wagner campus, which sits high atop a hill overlooking New York Harbor, includes seventeen buildings ranging in age from 40 to 70 years old. Wiring for each was done at different times by different companies, with no single company responsible for maintaining the aging cable plant.

"We had installed a PBX system in 1978 for administrative users, and had pulled fiber to about 150 administrative desktops in 1993," says Sedutto, explaining the college's previous experience with upgrading its facilities. "But students were still served by a commercial Centrex system." According to Sedutto, student billing for long distance was an extreme administrative headache because Centrex is primarily used for business applications. "The college would frequently receive an aggregate bill for all long-distance calls," Sedutto explained. "It became very tiresome listening to music on hold trying to affect a correction of this magnitude."

New Hampshire College in Manchester, New Hampshire, was slightly ahead of PCPS and Wagner in that it had cut over from a Centrex system to a PBX in 1987, replacing the entire phone system as well as outside and inside cable plant. "We didn't drastically change our system as other schools have done, but we expanded it," emphasizes Peter Cross. "In 1987, we ran enough cable to the residence halls and had enough switch capacity to support student phones. But we didn't implement student phone service at that time because of cost considerations."

The long-term plan at New Hampshire College, however, was ultimately to provide telecommunications services to student rooms. When the school began to build three new buildings on its Manchester campus, the time seemed right. The three buildings—a residence hall, graduate school, and hotel/restaurant management school—would allow New Hampshire College to consolidate all services on one campus and target technology to students at the same time.

Washington Hall is New Hampshire College's most recently completed residence building. (New Hampshire College Photo © Bob Lundquist)

Deciding to upgrade their telecommunication systems, each of these schools recognized the opportunity and advantages of delivering technology to the residence halls. "It's not a luxury or enhancement anymore," says Sedutto. "It's quickly becoming an inevitable requirement. Network access allows us to be competitive and maintain our edge in the very technically astute New York City area. We decided that the sooner we accomplished this, the more cost-effective it would be."

Searching for Solutions

While making the decision to upgrade was an important first step for each of these schools, accomplishing the transition from old systems to new was a more involved process. Having identified their general needs, each school sought a vendor who could provide technical expertise as well as act as an ongoing resource for network planning, long-distance resale, customer service, and student billing. What each of these schools sought was a holistic solution to upgrading its existing telecommunications facilities and services. As is often the case with small schools, PCPS, Wagner, and New Hampshire College all had relatively small telecommunications departments, with employees already functioning at maximum capacity. Finding a partner to assist in all areas of the process was crucial.

"Undertaking a major change in telecommunications services and facilities can be an overwhelming project, but with the right approach, it can be accomplished in a structured way," notes Joseph Franklin, a marketing manager for CAMPUSLINK, a telecommunications provider that works with colleges and universities to identify needs and implement solutions. New Hampshire College, Wagner, and PCPS, like many other colleges before them, started by evaluating what services and facilities already existed at their locations and sketching out a general plan encompassing their major goals. For many colleges, these initial steps culminate in an RFI (request for information) or an RFP (request for proposal) as the process gets underway.

The RFI is an excellent tool to begin a dialog with vendors, according to Franklin, and one that should be considered very

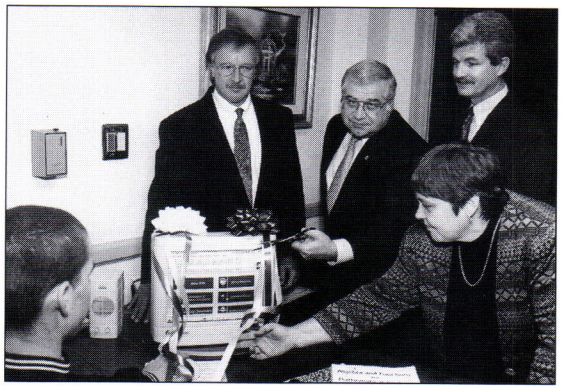
carefully early in the process of upgrading facilities. "Choosing vendors to consider can be accomplished by talking with staff at other schools that have done similar projects or by talking with vendors at conferences and trade shows," suggests Franklin. While every school must consider its needs from its own perspective, other schools can be an excellent resource for examples of RFIs/RFPs. In addition, Franklin adds, vendors themselves may have a template for an RFI/RFP that you can use to develop your own document.

Franklin stresses the importance of creating a useful and meaningful RFI from the outset of your project. "An RFI can help initiate a partnership with your chosen vendor," says Franklin. "The response you get from an RFI will allow you to evaluate the vendor's approach as well as their expertise and experience," he notes. Asking the right kinds of questions will give you a clearer picture of what you might be entering into with a certain vendor." In general, Franklin suggests these basic considerations:

- Be specific about your needs, but more general about suggesting solutions to meet those needs. This will give the vendor room to offer creative solutions that may not have crossed your mind. "Being specific but allowing latitude for presentation of ideas can produce some wonderful solutions," notes Franklin.
- Consider the criteria by which the responses from the RFI will be evaluated and how an eventual contract might ultimately be awarded.
- Be specific about your expectations for responses (format, length, amount of detail) and, with your evaluation criteria in mind, develop a standard form for vendors to use to submit their responses. "The standardized form will help you compare responses from different vendors," says Franklin. Specifying your desired response format will help you evaluate and compare responses easily and thus choose a vendor objectively, he notes.
- Be sure to request names of references. Information from references provides a way to discuss all aspects of a vendor's previous relationships, and will help you get an idea of how a typical installation proceeds. This element was crucial to the project at Wagner. "We looked for a company with a clear comfort level doing large-scale telecommunications installations," Sedutto said, "as well as one that was open to discussing all aspects of the project from the start. We wanted everything spelled out at the beginning."

Evaluating vendors was another crucial milestone for New Hampshire College, PCPS, and Wagner. As Franklin suggests, each college felt it was critically important to choose a vendor with which they could develop a relationship. "We were looking at a long-term contract, so we wanted a company to stick with us for follow-on activities and ongoing technical advice," says Lepore. "We didn't want someone to just install the system and walk away. Another critical consideration was to find a company that had the technical expertise PCPS needed."

Each school also sought companies that could provide the entire range of services they needed, from needs analysis, design, and installation to customer service and student billing. With their limited budgets, financing was another major concern. Like Wagner and PCPS, New Hampshire College wanted someone to manage student services and billing after their systems were installed. Each school had some experience doing this themselves, but with such small departmental staffs, they wanted a third party to coordinate this component of the package.



A ribbon-cutting ceremony marked the official opening of the campus Computer network at PCPS. Pictured here (standing, from left) are Patrick Lepore, director of Telecommunications and computing; PCPS President Philip Gerbino; Mignon Adams, Director of Library Services and Information Technology; and Gary Raisl, Vice President for Finance and Administration. At the computer screen, showing the PCPS homepage, is student Jay Winters. (Photo by Kelly & Massa Photography. Used with permission)

Timing and Targeting Technological Changes

With their RFI/RFP processes completed and a contract signed, each school accomplished its goals during the students' summer recess, undergoing construction, installation, and major cutovers from old systems to new. Because of the schools' academic calendars, installing the schools' systems within the May-September time frame was crucial for each location.

The actual installations were typical of major upgrades and expansions of this caliber. PCPS abandoned all its old wiring and installed new telephone instruments, new data-networking capabilities, and cable TV jacks to all residence hall rooms. "We moved from Centrex to a PBX system, essentially becoming our own telephone company," says Lepore. "This move gave us increased functionality on all three prongs of the equation: voice, data, and video."

The video arm of the cutover at PCPS is particularly significant, because it's a brand new capability for them. "Not only have we taken control of our phones, but we also now act as our own cable TV company, with satellite dishes on top of several buildings," says Lepore. Lepore's department currently collects more than 35 channels for students, including a movie channel, and produces programming for a campus channel. The school also offers service to classrooms for video conferencing and other educational applications.

Wagner College replaced all of its outside and inside cable plant to all buildings, also on a tight time frame. "It's as if the buildings were built yesterday," Sedutto says. Wagner also installed voice and data jacks to every location where students live, creating a plug-and-play environment.

New Hampshire College initially planned to reuse cabling in the *existing* residence halls for phone service and wire the *new* residence hall for phones, network access, and cable TV. "This would have created a discrepancy between the services offered at each location," Cross explains. "We didn't feel comfortable providing students in one building with network access and not others. Because we wanted uniformity, we felt the best thing to do was rewire all buildings with an entirely new cable plant."

The installation at New Hampshire College touched every building on campus in some way, including connecting 100 percent of the administrative users to the data network and an upgraded cable TV system. "In the end we had dial tone and a cable jack installed in the living area of each residence hall room, apartment, or townhouse, plus a data jack for each resident in his or her bedroom," says Cross. All residence hall circuits were hot when the first students appeared on campus in late August.

Working as a Team

Crucial to the installation at all three locations was working as a team with the contractors, and Lepore,

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Cross, and Sedutto were each intimately involved in every detail of their projects. Each cited communication as a key element of successfully completing a large-scale installation. "It is important that the contractor have a close relationship with its subcontractors," says Sedutto. "A good question to ask is whether they have worked together on other jobs. A strong undercurrent of communication should be evident if the contractor is working effectively with its subcontractors."

"Wagner's contractors were very good about identifying potential needs for the future," Sedutto explains. "During our daily meetings, our contractor would recommend where we might need more circuits based on the number of rooms or more fiber based on the number of circuits." It was this foresight that Sedutto believes saved Wagner a tremendous amount of money in the long run. "Our backbone is more robust than it needs to be for our current traffic. When we pursue distance learning or intranet applications, the fiber to support that is in place."

Considering the Budget

Both PCPS and New Hampshire College funded their projects through a small increase in housing fees as well as a technology fee assessed to both residential and commuter students. However, these schools emphasized that the additional cost to students is very small when considering the functionality they receive.

"Our students receive excellent access to technology directly from their rooms for very little additional cost," says Cross. "When they show up on campus, students are asked to bring a phone and their computer. Each unit is preassigned a phone number with unlimited local calling, with long-distance service provided by the same vendor who designed and installed our system. When students check in, they get a PIN and are ready to use long distance immediately. If the student arranged for these services individually, the cost would be considerably higher."

Wagner approached its project's finances from a slightly different angle. "We did not want to increase costs to students," said Sedutto. "Whatever we paid previously to vendors for our old system was consolidated and applied to our new system. We did not seek to add more charges to the students, but we still wanted to increase their access to technology."

Focusing on the Future

For Lepore at PCPS, working within a tight time frame was one critical factor. The ability of a third party to bill the students for long-distance services was another. "We required a turnkey system," Lepore explains. "We wanted a system that worked when it was installed. We had very high expectations for the phone system in particular—we expected it to work and it does. It's as simple as that."

Feedback from students has been favorable on all three campuses. Students who currently own a computer are definitely taking advantage of the network connections, and each school saw an increase in requests for connectivity after the first semester. Although there is room for growth and development at each campus, their systems have been designed to accommodate it.

With their major cutovers behind them, Lepore, Sedutto, and Cross recognize that their new systems have a tremendous impact on students, faculty, and administrators. "We changed the way people are accustomed to communicating in a positive direction," says Sedutto. "We have more lines, better service, and definitely fewer headaches with billing."

"As a system administrator, what I like best is we now have one system," Sedutto continues. "Before, we had three types of systems, which were very difficult to coordinate. Now everything is very manageable."

"Our partnerships address the technology challenges facing higher education," notes Steve Mayo, CAMPUSLINK's chief operating officer, "especially small- to mid-size schools. Systems should be designed and installed to satisfy schools' needs today and position them to expand in the future. Ideally, these schools will be able to adopt new technologies more quickly, align their information technology strategies with their institutional goals, and provide efficient and reliable on- and off-campus communications for students."

Leslie Wilhelm has written about telecommunications products, services, and installations since 1984, when she joined the University of Michigan's Telecommunications Department (UMTel). She presently operates her own business, focusing on corporate communications for high-technology companies.

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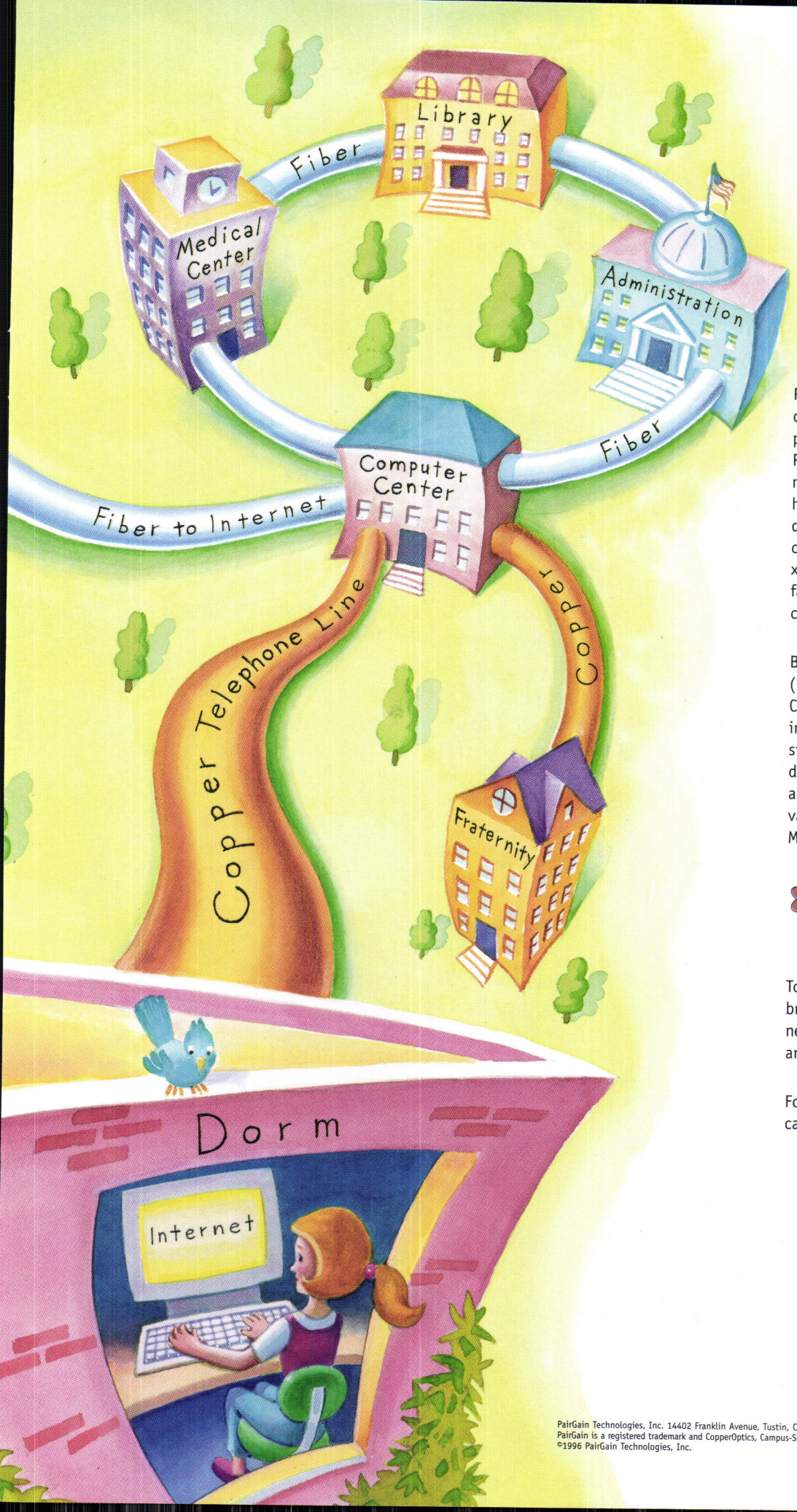

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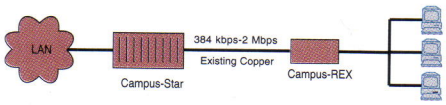

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Interview:

The Virtual University: How Do We Get There from Here?

Leon Zaborowski, Ph.D., Dean of the Center for Extended Learning and Communication Services at Governors State University

Dr. Leon Zaborowski, Dean of the Center for Extended Learning and Communication Services at Governors State University, discussed his view of the future of higher education with ACUTA Publications Committee member Bob Hopper, Purdue University at Calumet. The following is a transcript of that conversation.

Zaborowski: Technology is driving the process of change in higher education.

That's the position I come from in my work, and that's a position a lot of people have begun to take. A major shift is taking place in higher education, from a primarily campus-based, scheduled, teacher-centered context to a position of serving the time/space-independent learner. This is a continuum. Where each institution will settle on this continuum depends on its mission and strategic plan.

Many institutions are undergoing a significant cultural change that will result in substantial revisions in instructional design and courseware. Increasingly, we're going to see multimodal or mixes of technology used to deliver instruction.

It's important to point out that because of the time/space-independent nature of where we're going, phraseology like "distance learning" is out of date. Technology will allow the faculty to interact with the students in so many ways that distance becomes a secondary factor. The instructor may be working with a residential student body, and the student may be working in the lab for part of their coursework, or in the dormitory, or in the library. In many people's minds, that's not distance learning, but that same kind of instructional design can be used to serve the student halfway across the country.

Hopper: What impact do you see the new technology having on the attitude of the traditional institution?

Zaborowski: I think that loops back to the continuum idea. How each institution embraces technology is going to be driven by the vision from the top, the strategic plan, and the type of students. The traditional residential campus will embrace technology in a way that will help to empower the faculty and students within the confines of the campus environment. The institution will use educational resources and knowledge it imports to the campus through various networks. It will not be a closed system.

Hopper: How do you get the faculty and staff to buy into the new technology? They're going to have to participate in the development of content, and there's going to be special training. What's their motivation?

Zaborowski: I think the marketplace is going to be the driving force because of the diffusion of the learning environment. We're moving toward a learn-it-anywhere, access-to-multiple-institutions environment, so that the learner now has a plethora of educational options. The learner is going to be in a more powerful, more decisive position in terms of determining where he or she wants to go. If the academic program doesn't suit his academic and professional needs, he's not going to go to that institution. So it gets down to a bottom-line kind of thing. If the academic program does not provide the right content, does not use the best delivery systems, and

is not responsive to what the marketplace is saying the learner needs, the enrollment is going to go down.

Hopper: We're starting to see an increase in commercial companies that are providing content on the Internet, which could be competition for the university. What does this mean for the institution?

Zaborowski: Looking into the future, if many learners are independent, they can learn at home or at work, as well as on campus. The institution has to be responsive and flexible in serving those people. And I'm thinking of the whole spectrum of learners, from the traditional person right out of high school to the mid-career professional. We must not underestimate the impact of the mid-career learner—that market is large.

Because of this new access to knowledge and information, higher education institutions are going to become more and more credentialing agencies rather than deliverers of knowledge. One thing the institution has that commercial operations don't uniformly have is the ability to authorize or certify the knowledge that the individual has in a way that the general public and accrediting agencies recognize, and for the time being, that is our advantage. We will see more and more commercial vendors being accredited, and in fact, we have some examples of that: University of Phoenix, Jones Education Connection's International University, and others.

If you go back in time, to the 12th century, for instance, the monks had it all in a library and you couldn't even see the books. Now we have just the opposite. Knowledge is everywhere. Educational institutions still have the best set of skills to organize, present, quantify, and certify that knowledge, but that position is shifting.

Hopper: What are the problems associated with out-of-state students and interstate accreditation?

Zaborowski: I think that has to be answered state by state. In many states the higher education governing bodies are willing to create an open market environment because they're trying to encourage the educational institutions to embrace technology. So they're quite willing to let the institutions go beyond their traditional service boundaries, providing encouragement to get the university to use more technology. They are thinking it will create a more productive environment, a networked environment, and that it will benefit the state and the citizens if the universities are doing more with technology. So they're willing to keep the barriers to a minimum.

One of the best examples of that is Western Governors University. That entity is growing by leaps and bounds. They've gone well beyond the original handful of western states and now have close to 20 states and two foreign countries and some corporations involved. So it's a very open concept and a great many governors are saying this is going to be good for our citizens and if we can have a good reciprocal working relationship, that will be the best thing that can happen.

Hopper: Using Western Governors University, for example, where does the student credit come from?

Zaborowski: There are several models out there, but I understand that Western Governors University is going to create unique degrees. In other consortial arrangements, it's an institutional degree, but the learner can pull courseware from a variety of institutions and transfer those into the institution granting the degree.

At Governors State University, we offer the Board of Governors BA degree. This program is learner-centered, not discipline-based, and the students design their focus based on their career needs. We tend to work with mid-career professionals. They have a heightened awareness of what they need in order to succeed in their endeavors and are outspoken about what knowledge and skills they need. So the faculty works with them to help bring together the best mix of courses. Part of that is portfolio credits and life experience, with a reasonable amount of latitude to go to other institutions.

Hopper: What impact does accommodation of multimedia activity and learning processes have on the providers of telecom services on campus? What kind of things do we need to be aware of in order to meet your needs as an academic?

Zaborowski: My perspective is that course work is going to become more of a mixed-media, multimodal type of structure, and it's not going to be templated. The institution is not going to say here's the way our institution's course is going to look, here's the model, and you use it. We're going to see more and more faculty involved in more and more uniquely designed instructional environments. That obviously means we have to be developing systems that are flexible.

Courses are going to become more modular. A three-credit course will probably be made up of dozens of smaller modules that can be modified as

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content changes; so having an infrastructure that can be adaptable will be very important.

Second, we are part of an educational chain. One link is to a higher education backbone infrastructure providing services to the institution. This gives us external access to various networks and bandwidths and so on. The other link is the commercial market through which many of our learners will be buying services—cable systems and telephone systems and others. We are the link in the middle.

Third, as technology administrators, we must be involved in what is being done at the state and regional level to assure that we're part of a larger backbone which is going to provide us the capacity and the access we need to be connected to the global knowledge environment.

Finally, we must empower our faculty and academic administrators to develop educational products to meet consumer needs and deliver these through commercial networks, at the same time that we're serving the campus population.

That means having a campus network that's a strong link in the chain to interact with the regional educational resource networks, and at the same time interface with the commercial networks to deliver the product. This is a daunting task. It boils down to: (1) having the strongest campus technical infrastructure; (2) empowering faculty and other users of the technology on the campus so that they can make the best use of that resource.

Hopper: Can you expand on some of the administrative and financial issues we need to consider as we move toward the concept of the virtual university?

Zaborowski: I think we're going to see a tremendous cultural change, as we've mentioned. The institution has to see itself in a new and different way. Technology must be used in a way that's consistent with the mission of the institution. That's a really important issue.

At the next level there has to be true faculty buy-in and commitment. There needs to be some sort of faculty-led or faculty-facilitated leadership component. Add to that leadership from the upper levels of the institution. Another strand in the mix is the continuing education and outreach unit. These are people who have, over the decades, understood how to be sensitive to faculty and student needs to create constructive learning environments, and they've been the earliest proponents of the use of technology. The combination of faculty, administrative, and outreach leadership will create a faculty- and learner-sensitive infrastructure that will facilitate the alternative delivery of education.

I'm seeing so many examples of continuing education departments no longer functioning as traditional CE units. They're becoming change agents in the provost's office, helping faculty use technology in a variety of ways both on and off campus, involved in things like strategic planning and enrollment management. So the outreach professional is taking on a new role in institutions in the higher education environment.

Finally we need a strong affiliation of these three components—top administration, faculty leadership, and the facilitating faculty/learner infrastructure that continuing education people can bring to the table—to work closely with the administrators of the technology systems on campus. Telecommunications administrators must come to the table as an equal partner with the others to form a team to look at the strategic plan of the institution and move forward. So I see telecommunications administrators moving to a much broader area of responsibility.

For instance, at Governors State my office is in the same building as the person responsible for our information services. We talk every day, we share mutual problems, and we are close colleagues trying to bring together the academic side and the administrative side to address the institution's problems.

Hopper: There needs to be that partnership.

Zaborowski: Yes. Three years ago, my first year at Governors State University, the American Association on Higher Education conducted technology roundtable sessions at their annual meeting in Washington. The group that attended this meeting included the Provost, our administrative information and technology person, the outreach person (myself), someone from the library, and three faculty members. It was a very productive event. That's a statement about the kind of people that have to come together to create the right kind of connections and do some really good things for the institution. I think that many elements of the model that the AAHE activity represents can be very useful to create new cultural elements at institutions to move this kind of agenda.

Hopper: Are you aware of any studies that provide feedback about how faculty and students are responding to the technology associated with the virtual university?

Zaborowski: Most of my experience has been with the mid-career professional learner for whom

convenience has always been at the top of the list. They want it conveniently, they want it in a cost-effective way, and they want it to be good—in that order. If they can conveniently get to a campus and sit in a traditional classroom, people still gravitate to that type of learning environment. But if the technology environment is going to give them a good experience, and it is more convenient, that is acceptable.

Research has shown that well-designed distance learning courses can be just as good as on-campus classes. You can have a quality class through technology or face-to-face; you can have a poor on-campus class or a poor technology class. If you put quality in, you get quality out.

Hopper: Are you finding that designing courses to fit individual needs on demand helps with retention?

Zaborowski: What seems to dominate the retention issue, for adult learners, is personal life situations. If they've got financial problems, personal problems, or an illness in the family, these are the things that come first. Retention is becoming an out-of-date concept in that sense, because adults are continuous learners, and they're not trying to do it in four years anymore. They're trying to do it at a pace that allows them to maintain their personal life and professional life as well as their academic life. Nevertheless, convenience and quality, as mentioned, should enhance retention.

Hopper: What are some of the barriers that you see with virtual universities with regard to cultural and financial needs?

Zaborowski: Of course we've already mentioned the need for cultural change, the need for leadership from the top, and a high level of faculty involvement. Faculty involvement can be far reaching because we have to address not only the faculty's willingness to get into the technology, but also a mechanism for providing new faculty skills. We need to place at their fingertips the tools and the mentoring to get the job done. Finances continue to be a problem, not just because of initial costs, but also because of the rate of change. That can, in some ways, be addressed as it relates to mission. If the institution wants to grow and is interested in serving adult learners, that growth can take place without capital investment in construction. Money that might have been used to put up buildings can now be put into technology to reach greater numbers of learners.

Hopper: Another question that arises with some frequency is who schedules the classes? If bandwidth is limited, who decides what will be offered when? Do we have a director of distance learning? This doesn't seem consistent with the telecom administrator's job description, but to a degree, there must be some understanding and communication.

Zaborowski: I would go back to first principles: Why do we exist as higher education institutions? We exist to serve learners. I think that at a very basic level, those academic programs that can put the technology to use to serve their learner whether on campus or off campus, and programs that have the faculty at the highest level of readiness are going to be the first ones to come to the table. Hopefully it's going to be the schedule of the learner that will drive the schedule of classes. If we are sensitive to the needs of the learner in terms of how they want their education, when they want their education, that's going to tell us how to design our technical systems and when to deliver the education. If we want students in our programs, we'd better think about what they're asking for. Add to that the fact that the adult student market is much larger than the traditional student market—that is the growth edge in higher education. Lifelong learning is a fact of life. Some futurists say that the average adult is going to need two classes per year throughout their working life.

I believe we're going to see a new kind of higher education institution. If you go back three hundred years, the first American education institution was a liberal arts school. Then we created science and engineering institutions, land grant institutions, and community colleges. Now we're fostering a new age for American universities that is going to be technology rich, learner centered, and without campus boundaries. The student will define where the learning takes place. There are some prototypes of that out there already: MEU, University of Phoenix, Western Governors University, and even some preexisting institutions like Governors State University. These new models will join the ranks of traditional colleges. The learner will pick which one suits his or her needs.

Leon Zaborowski, Ph.D., Dean of the Center for Extended Learning and Communication Services at Governors State University, has a distinguished record in the field of continuing education and distance learning. He has worked for twenty years in continuing education in Wisconsin, Minnesota, Massachusetts, Idaho, and Colorado. Zaborowski recently shared an Outstanding Practitioner in Telecommunications Award with University of Northern Colorado colleagues for their book Reaching Learners through Telecommunications.

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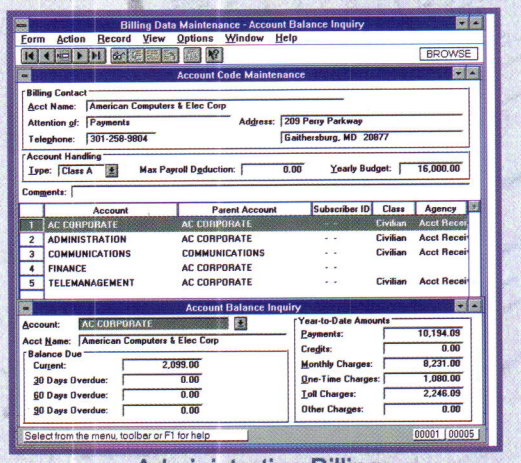
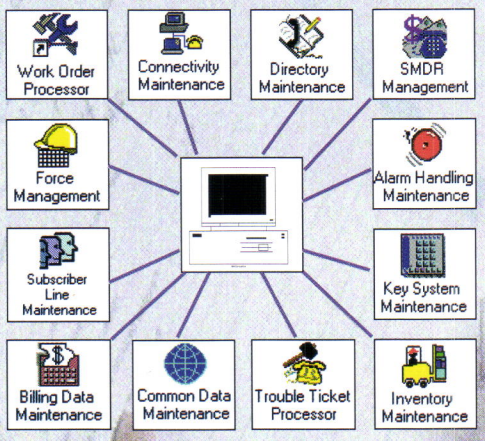
- Inventory Management
- Work Force Management



Administrative Billing

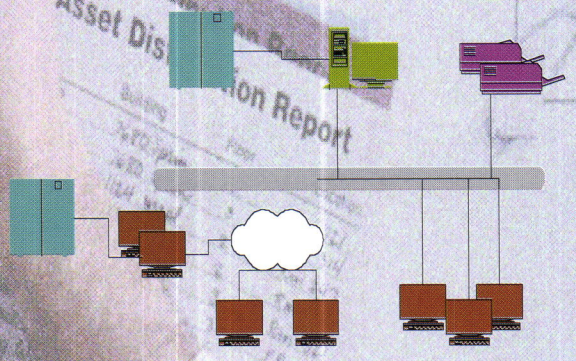


Easy

- Microsoft Windows
- Browser Applications
- On-Line Help
- Report Generators
- Automatic Switch Updates
- Automatic Back-ups

Open

- UNIX or NT Server
- Internet Connectivity
- Open Database
- Enabled Web
- Integrated SNMP



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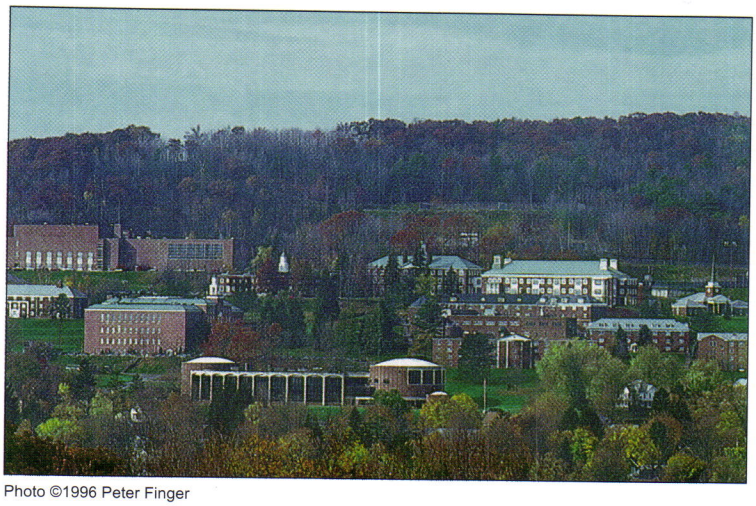
Campus Profile: Hartwick College

Effective, Affordable Networking for the Small College



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by Ellen Falduto

Hartwick College's Network Project Team included Ellen F. Falduto, Chief Information and Planning Officer; Douglas J. Carroll, Director of Telecommunications and Networking; Timothy J. Catella, Director of Facilities Services; and John Willis, Director of Curricular Technology Services.

The typical small- to medium-sized college finds that access to voice, video, the WWW, and the Internet requires a sophisticated and powerful network — at significant cost and installation effort. Installation can take years. But what if the college doesn't want to (or can't) settle for the typical?

Hartwick College didn't settle for typical. In just eight weeks, we designed and installed a sophisticated voice, data, and video network with completely new infrastructure, despite many perceived insurmountable challenges, including budget, service expectations, timeline, and terrain.

This is the story of a college committed to educating people to thrive in and contribute to the world of the future. The project won Hartwick one of ACUTA's Institutional Excellence Awards for 1996-97.

Introduction

More than a decade ago, Hartwick adopted Curriculum XXI, a curriculum for the 21st century. The College knew it could not wait to complete the plan before implementing its most compelling parts — and information technology (IT) was the first and most compelling. We had two guiding principles: first, we needed a method to leverage the human mind—a method to access, process, and communicate information; and second, it had to be implemented pervasively, whenever and wherever a person normally works or thinks.

Earlier Hartwick initiated its "countless computers" program, providing each first-year student a notebook computer, software, and printer. As students and faculty now had the tools to process information, they began to ask for access to information and networks for communication. Hartwick's Student Senate had passed a resolution asking for a campuswide network, including phone, voice mail, data, and video services.

The Vision

Our vision document for our futuristic infrastructure was titled *Information Systems Infrastructure for the Third Millennium*. ISIT has two fundamental components: transport and management. We envision a pervasive implementation enabling people to access information technology tools and resources whenever and wherever they need them for doing class assignments, undertaking research, organizing events, contacting friends in foreign countries, or paying college bills. The transport component of this system would be wired to resources and wireless to people. We wanted incredibly seamless simplicity in management of this system (there would be transparent hardware and software protocol translation and automated database integration).

With *ISIT* in hand, we went shopping (University President Detweiler always sends us shopping without our checkbook or credit cards). We chose to use

➤

a request for information rather than request for proposal. We wanted the best thinking about how to meet our goals. We wanted vendors to obsess about solutions, not pricing. We did not necessarily want the latest technology — we could not take that risk. We wanted proven technology to meet current, desired, future, and unanticipated needs.

At this point we had 25 days. Five of us were available to do the "campus tour with the vendor" routine with 60 vendors. Rather than acquiesce to requests for individual meetings, we held two open information sessions. Respondents received detailed information about the project, got a campus tour, and had a chance to ask the project team questions. We hoped to spur competition and creative thinking. (While it was not intentional, we held the sessions in the worship room of our chapel. Thinking back, the setting couldn't have been more appropriate.)

The Realities

Beyond the conceptual issues of what this network should be, there were limits posed by a long academic calendar, an active summer schedule, a long winter mud season (until June), the campus terrain (Hartwick is built into the side of a hill of shattered shale and bedrock), and an existing Centrex contract.

Parameters called for installation of a totally new wiring infrastructure, inside and outside. New electronic distribution systems for video and data were required everywhere. The Centrex system likely would be converted to a PBX with voice mail (at the time, we had no staff with extensive telecom experience). Network applications software had to be identified and tested. The "countless computers" (more than 700 student-owned PCs and 400 faculty and staff ones) would need to be reconfigured and have network cards installed.

Budgets based on the proposals totaled $4-6 million, reasonable for an undertaking of this size. Enthusiasm was high. Projected total capital-equivalent budget was $4.3 million. This was reasonable, particularly since the entire campus wiring infrastructure required upgrade. This equated to about $1.2 million annually with service fees included, or $852 per student. We then discovered it was unlikely the board would approve more than a $400 annual fee increase per student for the project. That equated to a capital investment of approximately $2 million.

The Real Fun

We went back to the drawing board. The commitment to students, faculty, staff, and board members had been made that we would have a network. We had until August 15 to find a solution, wire the campus, and train people.

The first budget decision we made was to proceed with the wiring plant. The least expensive option was to do it ourselves with assistance from local professionals and contractors already on campus. We designed a dual Petroduct conduit system. Deciding to proceed with underground service links was critical. We needed to begin this if we were to make the completion date. We also needed to leave room for growth, without installing an overkill project.

The project had 10 basic steps:

1. GO! (motivate the troops)
2. Build the budget, project, etc.
3. Find partners willing to take risks and make the vision a reality
4. Go! (don't ponder)
5. Ooops! (correct immediately)
6. Go again (use creative abilities)
7. Design/build with partners and campus staff (keep staff excited along the way)
8. Plan cutover and introduction for the campus community
9. Cutover
10. Do punch list items

Still without a complete network design, the campus infrastructure was underway (we were in GO! mode). The team had only a few weeks to decide what would go in (and over) that infrastructure. Only one vendor met our challenge to deliver a system at budget: Intecom (Dallas, Texas), a network/communications systems provider. They proposed a state-of-the-art voice system, a high-speed data network, and the ability to link voice, data, and video in a product they were about to release.

By mid-July we still did not have a video solution. We had two models for video before us. The first was our local cable company which had some experience wiring other campuses. If we did the wiring, we could get services for less (which is what we were doing). The alternative was to build a dish farm and provide services ourselves. This model involved a big capital outlay and monthly fees based on services chosen.

The cable model allowed us easy access to regional television outlets, not easy to attain in our hilly part of the world, and a variety of programming. However, it failed to meet our need for foreign-language and multicultural programming. We chose to do a combination of both, partnering with the local cable provider and installing a small dish farm of our own.

Cutover Weekend

If we thought we were nuts before cutover weekend, we didn't quite appreciate what was ahead. We literally lived on campus 24 hours for three days. We thought far enough in advance to run training sessions for office staff the week before cutover and two sessions during faculty workshops.

Simultaneously, work began on data and video, where the project would be "made" or "broken." When school opened, every person had a 10 Mb data connection (with design capability of moving to 100 Mb) and every building was connected by a 100 Mb channel (with design capacity in the gigabit range). Every person had a video connection with services ranging from CNN and MTV to live foreign language news broadcasts direct from about 30 countries around the world. Every person had a new phone and voice mail system. This "pretty incredible" system consisted of an entirely new horizontal cable plant in all campus structures, one port per pillow, four-pair cat 3 for voice, four pair cat 5 for data, RG-59 coax for video, and a new fiber optic campus backbone with Petroduct duct system, 18 multimode fiber strands, six single-mode strands in a Star topology.

We have an Intecom digital, non-blocking PBX which is fiber distributed with digital service for staff and analog service in residence halls. We have Incite multimedia networking capabilities; an Octel voice mail system; a FDDI campus data network; 37 FDDI-to-Ethernet bridges; 97 24-port Ethernet hubs with SNMP; HP OpenView network management software; a campus video network; a 32-channel system carrying a mix of programming, including Scola and four language channels; a movie channel; a student-programmed channel; five classroom channels; a steerable dish channel; and a DSS, programming from six three-meter C-band dishes, three satellite digital feeds, C-band, and fiber feeds from Time-Warner; and an AMX system which allows pre-programmed playback over seven channels. All workstations, offices, classrooms, and "pillows" are cable-ready, including a bidirectional video distribution backbone. There are Ethernet cards and adapters for 1,500 machines on campus. We even got one additional staff to help support this, and a UPS and generator system with two-hour battery backup, a 35 kV natural gas generator, and automatic bypass switch. AT&T is our current communications services provider.

We met our budget with some creative thinking about how to acquire hardware and software, and by negotiating new service agreements. Table 1 shows how it ended up.

We had about 10 percent "troubles" following cutover. Not bad, given our timeline and the fact that many were student lines and some students had changed housing assignments since we built the database. We had more trouble reconfiguring faculty, staff, and student PCs and getting people up and running on the new data network. It took nearly a year to do all of the configurations and one-on-one help sessions with faculty and staff. For students, we took our help desk "on the road," working on their network connections, phones, and PC problems by bringing teams to their residence halls in the evenings.

TABLE 1

	Where we were	Where we needed to get to	What we spent
CAPITAL			
Wiring Plant	$1,400,000	$690,000	$687,600
Video System	200,000	85,000	85,200
Data Network	650,000	300,000	34,350
Voice Systems	1,400,000	750,000	1,093,200
Software, etc.	300,000	125,000 in PC program	
Staffing			
Other stuff	350,000	50,000	76,000
Total	$4,300,000	$2,000,000	$1,976,350
ANNUAL EXPENSES			
Wiring Plant	$268,901	$64,000	$71,900
Video System	73,414	70,000	66,500
Data Network	274,847	137,500	78,063
Voice Systems	343,901	100,000	314,773
Software, etc.	57,622	25,000	5,860
Staffing	150,000	70,000	73,000
Other stuff	67,225	15,000	29,300
Less: New revenues			(188,525)
Total	$1,235,911	$481,500	$450,871
Per student*	$852	$332	$311

* net financial aid

The Future

We are now extending these tools: Networked classrooms with one network connect per student so faculty members can make a typical classroom into an instant computer lab with all students now having a notebook PC and network software. Our "Help Desk on the Road" project was such a success that we have been asked to continue the program as a regular function of user support. We upgraded our central systems (both academic and administrative) as demand for services and economics of upgrading quickly led us to realize this was the way to go.

Look at any such project positively: an opportunity to learn new things and a chance to work collaboratively with other departments. It will truly be a "conversion" experience, and we have held a few more meetings in the worship room of the Chapel.

This information was a part of Hartwick College's presentation at ACUTA's Annual Conference detailing their application for the 1996–97 ACUTA Institutional Excellence Award.

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From the Executive Director

Jeri A. Semer, CAE

ACUTA Executive Director

The past year has been another active one for the ACUTA headquarters office in Lexington. I'd like to highlight some of the ongoing efforts, and touch on some new developments that you can expect to see in the coming months.

One major area we have focused on is improving ease of access to information for our members by expanding our online information resources. Since the introduction of ACUTA's homepage in 1995, we have been continuously adding content to our Web site. Since its debut, we have had more than 17,500 separate visits to the site.

This year we have added some major features that we hope will be useful to you. In some cases, we have made a decision to limit access to these services by password to ACUTA members, as they are considered benefits of membership and have been developed using your dues investment.

- ACUTA's Resource Library is now online. Resource documents are stored in our server and can be downloaded at your convenience with no waiting period.
- The ACUTA listserve has nearly 600 subscribers. So that you may review past discussions, we have archived two years' worth of listserve messages on the Web site, which you can search to find the information you need.
- We added online event registrations and purchases, including credit card payment.
- We expanded our legislative/regulatory information, including copies of ACUTA filings and white papers, legal opinions, information on all of the issues that ACUTA is monitoring, and links to the FCC, the U.S. Congress, and other key sites.

At this year's conference, we demonstrated several additions and enhancements:

- An online searchable membership directory, with e-mail links to member schools and companies and hypertext links to their Web sites.
- A Facilities and Services Guide, which allows you to search the Institutional Member database for schools with particular equipment, facilities, and services.
- An online Products and Services Guide. This new database enables you to search for companies offering a product or service that you need.

Don't forget you can also respond to a call for presentations, peruse the exhibitor list for the next ACUTA seminar, or print out a registration form for upcoming events.

Another effort this year has involved the development of alternative forms of educational program delivery to the membership. We introduced our first audio conference, covering Universal Service and Access Charge Reform. More than 140 member sites participated. We plan to expand these audio programs on hot topics during the coming year.

We also offered the first ACUTA Webcast from this year's conference, and we will be seriously looking at the Web as an efficient method of delivering educational content.

Another major focus of the Lexington staff this year has been production of the new *Journal of Telecommunications in Higher Education*, which debuted in the spring. The first two issues have received positive reviews from the membership, and advertising support from the corporate community is excellent.

We've also continued to strengthen our relationships and information exchange with other professional associations in higher education and telecommunications. Through these activities, we have sought to increase ACUTA's visibility and to be identified as a resource for information on technology in higher education.

ACUTA continues to thrive and grow. Our membership base is solid, membership renewals are outpacing recent years, and our finances are strong. Our challenge as a leadership team is to continually assess ACUTA's place in a dynamic higher education and technology environment. We are prepared to change and mold the association's services to meet these changing needs.

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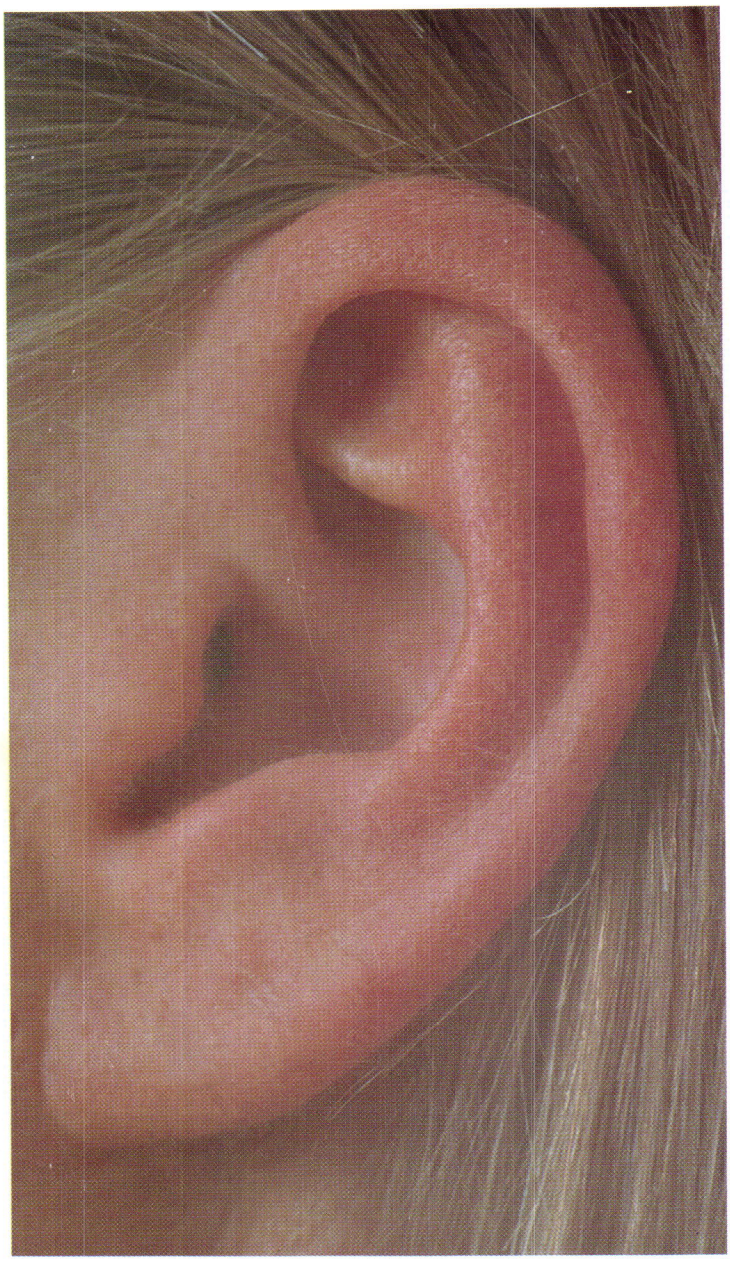

Amazing, isn't it? How so many communications companies try to sell you a package of products and services without taking the time to do the most important thing: Listen.

We've spent years studying and testing a full range of campus technologies. Worked with countless colleges and universities. But all this technical knowledge means nothing if it's not applied properly.

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