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Universities of the future will be defined by their electronic networks of access instead of by their campus boundaries. New technologies will provide broader access and a wider range of academic experiences. This article describes two projects of Annenberg/Corporation for Public Broadcasting's "New Pathways to a Degree" Program as examples of ways in which metropolitan institutions can make effective use of the new capabilities.

Using Technology to Open the College

The "New Pathways" Program

Cities are places where people live close together. Access shouldn't be a problem. Yet most metropolitan universities face substantial barriers that divide them from their potential students: barriers of mismatched schedules, barriers of traffic, barriers of culture and expectations. To overcome these barriers, higher education must be freed from the constraints of the campus-bound model of instruction and find ways to adapt educational strategies to the needs and experiences of different populations, rather than to expect them to adapt to the institution and its styles of learning. Both changes are needed, without compromising quality or expectations, to realize a vast untapped resource of human potential still unable to gain access to colleges and universities.

In the last few years, a growing number of institutions have begun to use a widening range of new and affordable technologies—such as video, computing, and conferencing systems—to open their programs to new students. The best of these degree programs have also used these same technologies to enrich the quality of the academic experience.

One leader in this movement is the Annenberg/Corporation for Public Broadcasting (CPB) Project. Its initiative, "New Pathways to a Degree: Using Technologies to Open the College," has funded seven model academic programs that are demonstrating how colleges can use technologies to offer richer and more accessible degree programs. Two of the seven

New Pathways projects face special challenges and opportunities presented by their metropolitan environments. Northern Virginia Community College, struggling with the problems of gridlock around Washington, D.C., starts from the framework of a distance learning program. In contrast, Indiana University-Purdue University at Indianapolis (IUPUI) is striving to include disadvantaged students who live literally next door.

Northern Virginia Community College

The New Pathways degree program at Northern Virginia Community College (NVCC) is an outgrowth of the college's distance learning program provided through its Extended Learning Institute (ELI). Students enrolling in distance education at NVCC are both male and female, both part time and full time, married and single, minority and majority. A typical student might be a thirty-year-old woman who comes home from work, takes care of her family responsibilities, and then finally has time for her college education. She cannot ordinarily attend classes or study until after 9 P.M. on weekdays and on scattered segments of her weekend. Most people imagine that the "distance" in "distance education" is measured in miles, but in an urban/suburban environment, the unit of measure is time. NVCC students have only limited time, and when they are available for study, the college must be available to teach and support them. The more the college can eliminate wasted time in this process—time spent commuting through gridlocked streets, for example, or waiting in lines for student services—the more likely the student is to enroll and to persist. Community colleges have always prided themselves on providing convenient access to higher education, and NVCC has furnished easy entry to higher education through its five campuses located within five to ten miles of most northern Virginians. In the fall of 1990, enrollment at NVCC totaled 35,800 students and, even though most students lived close to a campus, ELI enrolled twenty-five hundred distance education students. But ELI only offered a scattering of courses, not access to a degree.

Beating the Challenge of Gridlock

In the next three years, ELI will add course offerings and student services so that, if they wish, students can complete a general studies or business administration associate's degree program through distance education. However, the New Pathways project will not stop with a mere increase in the number of courses. It will attempt to provide the crucial integration of knowledge with courses and disciplines for a degree, and also to eliminate the distinction between distance education and classroom instruction. These goals will be sought by means of the increasing communication and interaction among all constituencies made possible by new technologies. Students, faculty, administrators, counselors, and academic advisors will use technology to keep in closer touch. Computer, video, print, and audio technologies have revolutionized modern communication, and these new information technologies provide faculty, students, and staff access to each other in ways that were not possible just

five years ago. Computer bulletin boards, audio conferences, FAX, voice mail message and information systems, and call-in cable TV for homework tutoring are some strategies ELI will employ to provide all parties more convenient and efficient communication. To help staff exploit the possibilities of the technologies, ELI will conduct distance education seminars and policy development workshops for NVCC faculty and administrators. These seminars and workshops will help staff coordinate and integrate academic and student services.

What Will the Distance Courses Look Like?

Teaching at a distance has changed dramatically with the use of new technologies. A look at the teaching of French illustrates how distance courses are evolving at NVCC. French is currently being taught at ELI and will undergo several changes in the next three years. The instruction will be based on four elements:

At the core are, of course, appropriate *instructional and primary source materials*. For example, the Annenberg/CPB Project's "French In Action" telecourse will be shown over local cable TV channels. "French in Action" has pioneered a new approach to teaching French, even for campus-bound students. It uses video to involve students vicariously in an unfolding story filmed in France. The video and audio materials, all in French, help students learn to hear, understand, and speak French in its own terms. For example, the instructor of a campus-bound class might speak French like an American, know little of the country, and be unable to "pause and rewind" for a student without difficulty. By contrast, with "French in Action" the student is continually confronted by the language in its cultural setting, and can study both carefully and repeatedly. To adapt Annenberg/CPB materials to local needs, ELI is producing its own video course guides. Students will either view the lessons when broadcast or at a later time if they have recorded them on their home VCRs. The use of a telecourse liberates students who can choose their own times, paces, and places of study.

Second, a *voice mail system* will be used by students to practice their French as well as for general messages. Students will telephone the voice mail system, leave their assigned oral recitations, and complete their language skills tests. The faculty member will receive these messages by dialing a voice mailbox number and will provide feedback to students by placing it in their individual mailboxes. The voice mail system will be in operation twenty-four hours a day, seven days a week so that students and the faculty member can interact with each other on a time-delayed basis. Currently in use at ELI, this system is run by a personal computer equipped with an off-the-shelf voice mail board.

Third, audio and videoconferences will offer *real-time interaction* for students and faculty in the course. Audio conferences will be set up on a regular schedule, and it will not be difficult to schedule additional group conversations on request. Similarly, one-way cablecasts of live television and simultaneous two-way audio communication allow faculty to conduct call-in shows for help on homework, as well as weekly review and oral practice sessions. Students can also host call-in shows.

Such real-time interaction provides pacing for the semester by requiring that all class members tune into a scheduled conference. It also allows students to participate without wasting their precious educational time in repeated commutes to campus.

Fourth, and most important, *the faculty member* sets the standards for achievement in the course, provides coaching and critique, promotes communication among students, and helps inspire students to learn.

Outcomes and Implications for NVCC

NVCC expects this ELI program to become a model for all NVCC campuses as they strive to serve the evolving student population of northern Virginia. The use of telecourses should remove many of the remaining obstacles to enrollment. Probably only a relatively small portion of NVCC students will take all of their required courses for a degree via distance education. Many more will add distance courses to on-campus courses. These courses may well provide more successful academic experiences for students than traditional on-campus instruction by providing many convenient ways to communicate frequently with the faculty, other students, support services, and the rest of the academic community, and by enhancing feedback and support.

Indiana University-Purdue University at Indianapolis

The Community Learning Network (CLN) of Indiana University-Purdue University at Indianapolis (IUPUI) uses technology to extend regular university courses and student services into an urban community. Its objective is to attract historically underrepresented groups into IUPUI's baccalaureate programs. Nestled in the very center of a city of 1.5 million, IUPUI enrolls 27,500 students in about 170 degree programs offered through courses on and off campus. The average age of the undergraduate student population is 26; 60 percent enroll part time. Minority representation is below 10 percent even though minorities account for more than 20 percent of the city's population.

The Community Learning Network is distinctive in the way it approaches the crucial problems of:

- reaching students who have eluded conventional recruitment efforts;
- making the technical and organizational adjustments that are necessary to accommodate unconventional learners and styles of learning;
- adapting courses to use technology and to generate excitement about learning among students; and
- serving as a catalyst or model for institutional change as universities prepare themselves for the new order of the twenty-first century.

The Challenges of Reaching Out into the City

The CLN extends the promise of higher education to three overlapping, historically underrepresented segments of Indianapolis's urban population: African-American, Hispanic, and economically disadvantaged students. In a state where only 15 percent of the adult population holds a college degree of any kind and where there is no community college system, the most difficult barriers to advanced learning can be the invisible walls of mistrust, suspicion, and doubt that come with seeing the university as a remote institution reserved for an elite few.

The psychological and social differences between these first-generation college students and the students who thrive in the university's traditional culture are substantial, even in neighborhoods less than five miles from the campus. Consider just a partial list of these daunting obstacles:

- Confusion about the admission process at the university
- Questions about financial aid and scholarships
- Lack of role models among family and friends
- Limited support (or outright hostility) from family members and peers
- Conflicts among the demands of family, career, and academics
- Lack of self-confidence
- Poor past academic performance
- Changing work schedules
- Insufficient child care
- Difficulties of transportation

Nor does the list stop there. Limited access to technology widens the gap between the potential student and the institution. Many hold the mistaken belief that they cannot enter the university if they do not have a computer. Then there is the campus itself. With its three hundred acres, nearly forty thousand employees and students, and alien buildings, it straddles the streets of their city. For most of these potential students, the values of the university—including those reflected in its physical appearance—are as strange and remote as those of a foreign land. To enter this new land, they have to learn a new academic language (made more mysterious by familiar words with unfamiliar meanings, such as "major"), new customs, and new values (such as distinguishing the difference between plagiarism and learning from someone else).

Many of these obstacles are faced by any first-generation college students, but they are accentuated by economic or ethnic backgrounds that place the individual outside the traditional mainstream. The CLN hopes to lower many of these barriers by linking the university's programs to proven successes in the prospective students' own communities. It will use technology to bring IUPUI's education to the community's centers—centers that already offer educational functions that are appreciated and used by the community. With learning as its focus, the CLN will use the community itself to provide the support mechanisms and physical home from which students can begin on their new pathway to a degree. As T. S. Eliot remarked, home is where one starts, and these students will start their journey toward a college degree from their community "home."

The Neighborhood Centers and their Equipment

Four learning sites are being established in community centers in neighborhoods surrounding the IUPUI campus, less than five miles from campus:

- Christamore House, a community center serving low income African-American and Appalachian white residents, six blocks west of the campus;
- Hispanic Holistic Education Center, a multiservice program that provides a physical center for a dispersed Hispanic population, three miles east of IUPUI;
- Interdenominational Churches for Educational Excellence, a coalition of seven inner-city black churches collectively promoting education at all levels, based at the South Calvary Baptist Church education center three miles south of IUPUI; and
- Indiana Vocational Technical College, a nontransfer, applied education program, three miles north of IUPUI.

Each learning site is equipped with cable television, video playback machines, personal computer workstations connected by modems to the campus mainframe, facsimile machines, printers, telephone voice mail systems, and study rooms where as many as ten to fifteen students can gather at a time, creating opportunities for group learning activities. The centers bridge the gap between university and neighborhood. The high technology rooms are deliberately embedded in the middle of the community centers where they are highly visible and where they will naturally become hubs of activity. Priority will be given to university classes, but personnel are trained to use the machines so they can help with a variety of other neighborhood activities. Recruitment, orientation, and admission services will be conducted on site for prospective students, their families, and their peers. The technological extensions of the university will be used to bring necessary information and services to the community center.

Broadcasting the Message

As explained subsequently, the key to the CLN is student-student interaction, facilitated by peer tutors. This interaction will be based on courses distributed from IUPUI's campus facilities to the community centers by television, augmented with multiple audio and visual materials. By the use of VCRs, the students can study the course materials whenever they want.

The lectures will usually be broadcast from the campus's main electronic classroom, a four hundred-person learning theater with three giant projection screens capable of displaying videotape, videodisc, film, satellite feeds, closed-circuit broadcasts, and computer output from Macintosh, IBM, and NeXT platforms. The facility, now two-years old, has video cameras that can zoom in on whatever details the instructor wants to display to students. The audio system is capable of high fidelity, stereo sound with full telephone connectivity permitting live voice interaction

with external sites. These systems, including lighting, are fully integrated and computer controlled so as to give the faculty member complete flexibility in using the technology. For example, all three computer platforms can be used simultaneously, or computer, video, and film could be used simultaneously. And the single-touch screen controller is so intuitive that faculty usually master it in a few minutes.

The development of this facility for campus-bound courses triggered a new era of faculty creativity. Teachers from many different departments began to use visual materials and dynamic demonstrations to enrich and extend their teaching. Since the video being displayed to students in the hall could also be transmitted to greater distances, it was, therefore, a natural next step to ask the faculty to think about how they might simultaneously teach off campus. Students out in the neighborhoods could "join" those hundreds in the lecture hall. A seminar room has also been equipped with exactly the same technology to create a course development facility, and to permit faculty to use a small class format while reaching out to community sites.

The CLN uses a community cable television system as the principal delivery mechanism for the courses. A consortium of area schools operates a dedicated channel of the cable system. The channel reaches over half of the homes in the target neighborhoods, thus permitting most of the students to receive the courses in their own homes as well as in the community centers.

Learning through Interaction

The principal innovation and structural change being advanced through the CLN is the adaptation of a model of student interaction developed by Professor Uri Treisman at the University of California at Berkeley. Treisman and colleagues at other universities have demonstrated that learning can be dramatically enhanced when students collaborate and learn from each other, especially when the students' learning is reinforced by others of their community. The Treisman strategy also depends on giving students material that is, if anything, more difficult, open-ended, and interesting than that ordinarily presented in introductory courses. Students tackle such problems in teams, rather than working in isolation.

A new Student Mentor Program based on these concepts is under development to strengthen CLN instruction. The mentors work closely with other students and faculty to help the new students enrolled at the CLN centers to improve their ability to use the tools of learning, their study skills, their oral and written communication skills, and their knowledge of the university culture. Operating from the off-campus community centers, the peer mentors draw on all of the internal university resources ranging from academic counseling to work study opportunities, from the writing center tutoring services to public lectures and student activities. In all of their activities, however, the mentors have been trained to keep the CLN students focused on learning and on the objectives of the courses. The mentors maintain close contact with the faculty, and hence

they can reinforce concepts or material that is difficult or is not being fully understood by a significant number of students. They try to bring students together face to face in the community center's technology room and through electronic connections.

The Courses

Beginning with introductory chemistry, one new course each semester will be offered over the community cable television channel several times each week. The other courses include introductory literature, precalculus mathematics, world history, and a newly designed information research course that combines library skills with using databases and other electronic information sources to prepare research reports (as a complement to the other discipline-based courses). The courses were selected because they are basic building blocks of liberal education. They will permit faculty to illustrate an integrated approach to learning, with methods of inquiry that span different disciplines. Together they should demonstrate that a baccalaureate degree represents much more than a collection of separate courses and an accumulation of credit hours.

All courses will incorporate four forms of interaction with faculty and other students:

1. *Didactic*: televised lectures, recorded lectures available in cassette form on site, supplemental self-paced materials (e.g., the chemistry course will make available a video-based self-contained algebra course for students who find that they need to review their mathematics), a library of print and electronic materials available at each learning center, and occasional lecture/discussions led by the faculty member or peer mentor on site.
2. *Real time*: telephone, interaction among students and with the peer mentor, office hours on campus, faculty visits to each of the learning centers, and collaboration among students in person or through one of the media.
3. *Time-delayed*: electronic mail and computer conferencing, voice mail, FAX mail, bulletin board (the old-fashioned thumb-tack kind), and video playback.
4. *Informal*: through the involvement of community-based individuals, especially community-center personnel, family members, and peer mentors, a variety of informal interactions will be used to increase the sense that learning is a vehicle for personal satisfaction, growth, and empowerment. Guest speakers, field trips, experiments, and special assignments will be used to involve the students in their own learning.

Also enriching the courses will be dimensions of learning made possible by technology: e.g., showing a video of an experiment too complex or too dangerous to be conducted in a classroom, making available an interview with the author of a novel, introducing a database that permits research on "real" data, illustrating an abstract mathematical concept with computer-generated simulations.

Participating faculty will also be asked to reconsider how they use their time and how they conceive of their essential work. *Are there more effective and efficient ways of teaching students that do not use the conventional lecture/discussion format and that can be designed in formats other than the*

conventional Carnegie course unit? Through an on-going faculty development seminar, this issue will be discussed continuously during the years of the project.

Institutional Impact

Still a community, the new university is now defined by its networks of access instead of by its walls. The network of interaction includes electronic highways reaching out into the surrounding neighborhoods as well as to scholarly resources around the world. NVCC, IUPUI, and many other institutions like them are beginning to take advantage of these possibilities, each in its own way. NVCC is evolving from a base of traditional distance education, while IUPUI's push comes from its electronic lecture hall and the need to serve more minority and disadvantaged students in its degree programs. Both of these institutions are headed in the same direction, however. They are using technology to provide broader access and a wider range of academic experiences.

However, colleges and universities still face formidable challenges as they break out from the customs of the campus-bound institution. For example, traditional budget mechanisms are biased in favor of the campus-bound portion of a college's program; the buildings are "free" for the faculty to use, while the equivalent capital costs of more accessible programs may be charged to that program as operating costs. If institutions are to evolve into forms that allow them to reach out to include new students, they may need to rethink their budgeting and accounting mechanisms. Other changes are needed as well. Many accreditors still attend to how many books a library owns, rather than to the books and information services it can provide on demand. Such practices foster the ownership of resources rather than access to them.

Furthermore, as colleges and universities reach out, there will be more overlap of turf and competition for the same students, as well as both the advantages and the problems related to possible sharing of resources. How are jointly used facilities to be managed and shared? If, for example, the public schools are used as outreach sites, will public and private colleges have equal claim on them? How will the city's libraries evolve in relation to the college's libraries as both serve students? If everyone is doing interlibrary borrowing, who is actually acquiring the resources, and how are they to be purchased? What arrangements are needed when corporate facilities could be used for educational purposes? Could corporate and collegiate laboratories and libraries become part of a single network?

For that matter, with change occurring so spontaneously and rapidly all across the country, how are colleges to avoid reinventing the wheel? Over 10 percent of all colleges in this country were involved in New Pathways proposals and virtually all said that they had little idea of what anyone else was doing in this arena. No professional associations or publications yet serve as common sources of information. In order to deal with this intellectual isolation, the Annenberg/CPB Project staff and New Pathways colleges are developing a variety of resources for colleges

around the country. These resources include a 1991–92 series of regional workshops on program design, a book of tactics and strategies derived from applications to the New Pathways program (Annenberg/CPB Project, 1991), and an on-line newsletter and database. Information on all these can be obtained by writing to the Annenberg/CPB Project, 901 E Street, NW, Washington, DC 20004–2006 or sending electronic mail to EHRMANN@UMUC.UMD.EDU.

The saying goes that when a lawyer moves to a small town that has never had an attorney, starvation looms. But if two or three lawyers come to that same town, they all can make a comfortable living. It takes two lawyers to make a trial. It is the same with innovation in education. If a college succumbs to the lure of establishing an innovation that is truly the only one of its kind (or if it ignores other innovators so as to be more secure in the illusion that it is unique), the innovation thereby becomes isolated and it usually dies of stigma and starvation. But if, instead, colleges help each other turn outward toward New Pathways, sharing ideas and resources (that are becoming steadily easier to share), then tomorrow all students will be able to attend rich, accessible colleges like NVCC and IUPUI.

Suggested Readings

The Annenberg/CPB Project, *Pathways to Success: Ideas for Using Technology to Reach Distant Learners*. Washington, D.C.: 1991. To receive a copy of this book, send a large self-addressed envelope with \$2.36 in postage to The Annenberg/CPB Project, 901 E Street, NW, Washington, DC 20004–2006.

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