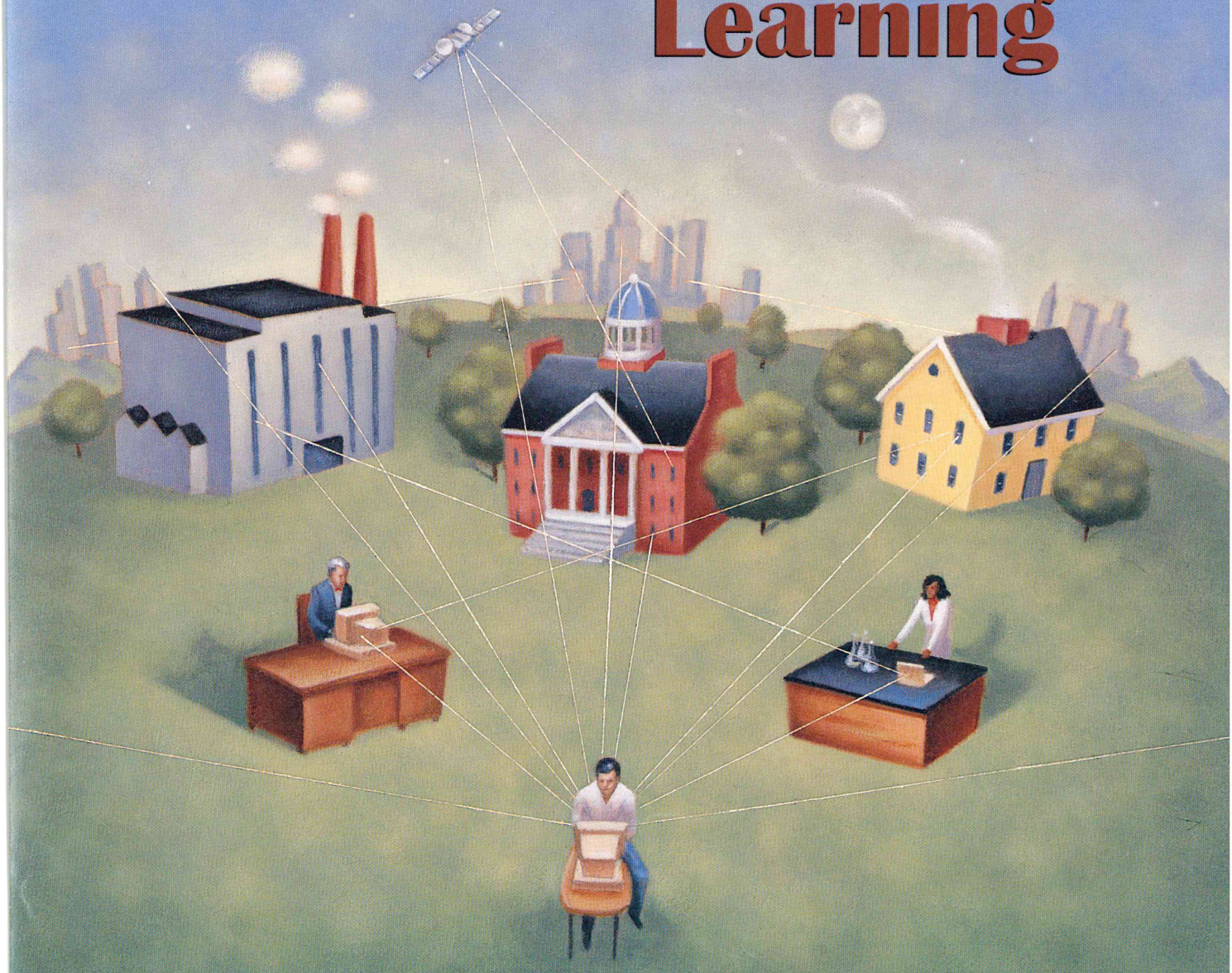
CONNECTION

NEW ENGLAND'S JOURNAL
OF HIGHER EDUCATION AND ECONOMIC DEVELOPMENT
VOLUME XII, NUMBER 2 SUMMER 1997 $2.50

Distributed Learning



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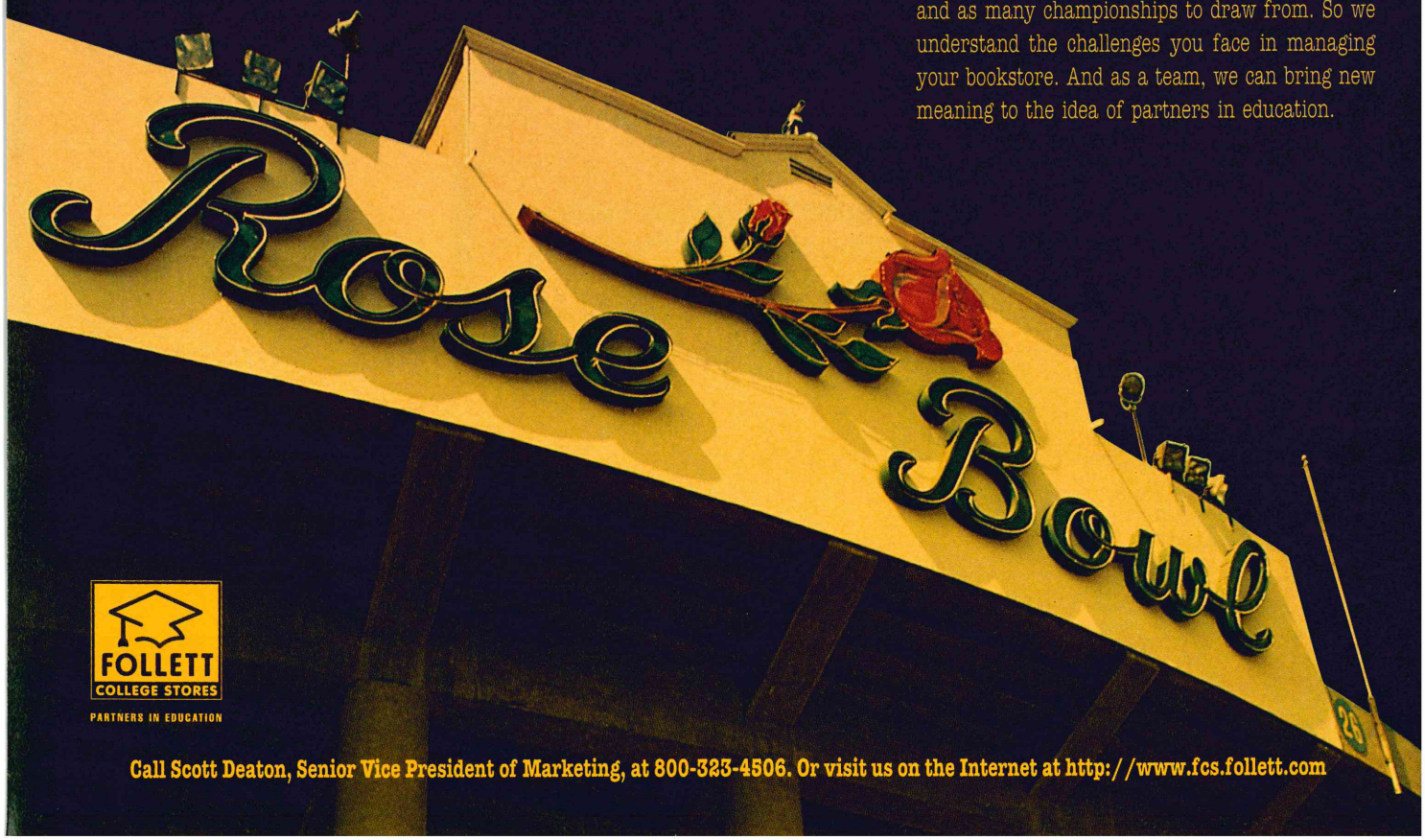

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Volume XII, No. 2
Summer 1997

Cover art by Fred Lynch, who teaches illustration at Montserrat College of Art and the Rhode Island School of Design.

COVER STORIES

COMMENTARY

DEPARTMENTS


"I wanted to help one of my students solve a problem."
Mary Givhan,
Financial aid administrator
Student had problems repaying loan.
Called Sallie Mae.
Student set up new repayment plan.
Student was able to pay on time.
Student was able to pay on time.
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OF HIGHER EDUCATION AND ECONOMIC DEVELOPMENT

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The **New England Board of Higher Education** is a nonprofit, congressionally authorized, interstate agency whose mission is to foster cooperation and the efficient use of resources among New England's approximately 260 colleges and universities. NEBHE was established by the New England Higher Education Compact, a 1955 agreement among the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Chair: Eleanor M. McMahon,
Distinguished Professor, Brown University

President: John C. Hoy

EDITOR'S MEMO

Remember when *competencies* were called *skills?* Or when *enrollment management* was called *admissions?* Now, higher education's lexicon is about to be amended again.

"The term *distance education* will be outmoded 10 years from now," predicts this issue's lead author, educational technology expert Chris Dede. "There won't be any such thing as face-to-face education, either. There's just going to be something called *distributed learning.*"

Dede, a professor at Virginia's George Mason University who is on leave exploring instructional technologies for the National Science Foundation, made a similar observation at a recent New England Board of Higher Education conference on "Higher Education in the Virtual Era"— a gathering held in Boston at precisely the time when the annual spring swarm of moving vans snarling the city's Fenway area confirmed the enduring power of real brick and ivy campuses to attract living, breathing students.

The distributed learning model is based on the premise that no single style of teaching, no single source of information and no single level of technology promises the best education for every student. "Old-fashioned" face-to-face interaction between teacher and student has a place; so does virtual reality.

Indeed, only now is a sufficient range of technologies becoming available to create a true "network" of learners, linked interactively to seemingly infinite information resources, as well as such critical aids as tele-mentoring and tele-apprenticeships. "Distributed learning is sometimes face-to-face, sometimes across distance and sometimes involves teaching-by-telling," Dede told the group in Boston. "But it often involves other kinds of pedagogy that aren't now part of our repertoire, yet are needed to prepare people for the incredibly chaotic knowledge-based society we seem to be moving into."

If a fellow student or instructor on the network doesn't know the answer to a question about astrophysics, maybe the NASA engineer that pops up in the corner of your computer screen will. Or maybe you'd prefer to don virtual reality equipment and find out for yourself with a walk along the wing of the space shuttle.

The 200 or so New England academics who had converged on Boston to hear Dede and other experts speak on higher education in the virtual era were keenly aware that the proliferation of the Internet and advances in technologies such as desktop video would increasingly enable New England students to pursue college-level programs without leaving their hometowns — or even their homes.

Some understandably viewed the whole matter with a good bit of trepidation. The mere mention of technology-based higher education ventures such as Mind Extension University or the University of Phoenix still raises goosebumps under many a tweed jacket. And to be sure, distance education, from the start, has promised winners and losers.

The winners certainly include students who are "placebound" for one reason or another, as well as students who feel more comfortable asserting themselves in a virtual classroom and those who would never have had the opportunity to rub shoulders with Professor Jones on a real campus anyway.

Technologically savvy faculty who can adapt to new roles as facilitators or learning coaches also seem poised to flourish under the new model, to say nothing of telecommunications companies who will collect handsome fees for all the hook-ups that will be needed and copyright lawyers facing a bonanza of "fair use" cases.

But there are also potential losers, chief among them: faculty — and students — at institutions who wrongly see distance education primarily as a labor-saving strategy; states and institutions saddled with *yesterday's* telecommunications infrastructure; and purveyors of traditional campus services — cyberstudents can eat at home.

Still, Dede's model would seem to bring out the best that educational technologies and distance education have to offer, while preserving the indisputable role of thoughtful faculty and human interaction. Distributed learning promises to be more than just another catchphrase.

John O. Harney *is executive editor of* CONNECTION.

A Faculty Salary Gap

Critics of big government like to portray public college and university professors as overpaid fat cats. Just one problem: faculty at public institutions earn far less on average than their counterparts at private institutions. And the gap is widening, according to a recent study by David J. Berg, former director of planning and analysis at the University of Minnesota.

From 1970 through 1984, faculty at private campuses earned between 1 percent and 3 percent more than faculty at public campuses. But by 1996, the differential had grown to 14 percent, according to Berg's analysis published in the newsletter *Postsecondary Education Opportunity.*

Warns Berg: "On the assumption that higher compensation levels will eventually attract the best faculty, continued large and increasing compensation disparity between public and independent institutions suggests a trend toward a two-level higher education system in which, eventually, one level is priced much higher and is indisputably superior in quality."

Full professors at New England public universities earned an average of $66,455 in 1995, compared with $92,343 for professors at the region's independent universities, according to U.S. Department of Education data.

At the University of Massachusetts, for example, professors went from 1992 through 1995 without a raise, before winning annual increases of less than 3 percent, rising to 4.25 percent next year.

In an earlier study, public college presidents surveyed by the American Association of State Colleges and Universities ranked "faculty recruitment" second only to "access" among areas most damaged by years of erosion in state support for higher education.

Testing

At least 21 four-year colleges and universities in New England no longer require SAT or ACT scores from applicants to bachelor's degree programs, according to a new study by the Cambridge, Mass.-based National Center for Fair & Open Testing.

Nationally, at least 280 four-year colleges and universities no longer require the scores, up by about 100 since 1994. Hundreds of other institutions have de-emphasized test scores in their admissions processes, according to the center, which contends that the standardized admissions tests are biased and unreliable.

The New England institutions that do not require SAT or ACT scores of applicants include: Charter Oak State College; the Boston Architectural Center, Cambridge, Endicott, Hampshire, Hebrew, Mount Ida, Wheaton, Bates, Bowdoin and Unity colleges, College of the Atlantic, the University of Maine campuses at Farmington and Augusta, Johnson & Wales University, and Burlington, Goddard and Southern Vermont colleges. Becker College requires test scores only for certain programs, and Middlebury and Connecticut colleges require only SAT-II exams, formerly known as "achievement tests."

Culture War?

The ongoing battle in Washington over the future of the national arts and humanities endowments carries especially high stakes in New England where federal arts and humanities grants invigorate the economy as well as the soul.

Though New England represents just 5 percent of the U.S. population, the region's museums, cultural organizations, educational institutions, scholars, and artists accounted for 13 percent of funds awarded by the National Endowment for the Humanities (NEH) and 8 percent of funds awarded by the National Endowment of the Arts (NEA) during the past five years.

But Republicans in Congress have been beating on the endowments. The NEH budget shrank from $172 million in 1995 to $110 million in 1997 — a 36 percent drop, while the NEA's dropped by nearly 40 percent from $162 million in 1995 to $99 million in 1997. And in July, the House voted to eliminate funding for the NEA, which provides matching grants for arts groups and state arts organizations. The Senate, slightly more generous, recommended a modest $100 million.

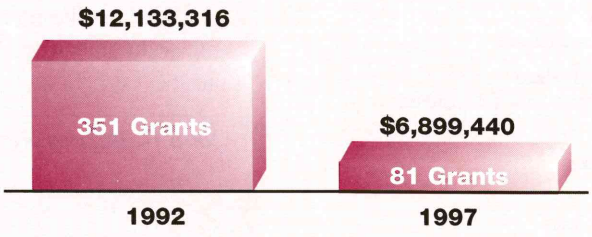
Federal Arts and Humanities Funds to New England Institutions and Individuals, 1992-1996

	National Endowment for the Humanities	National Endowment for the Arts
Connecticut	$20,600,000	$9,426,195
Maine	$5,800,000	$4,327,856
Massachusetts	$58,400,000	$25,747,646
New Hampshire	$7,900,000	$4,249,682
Rhode Island	$8,300,000	$4,158,211
Vermont	$5,000,000	$4,619,786
New England	**$106,000,000**	**$52,529,376**
U.S. Total	**$813,000,000***	**$667,140,092**
New England as % of Total	**13%**	**8%**

**includes administrative funds*

National Endowment for the Arts Grants to New England: 1992 vs. 1997

Total Funds and Number of Grants



Lifelong Learning

Andover College in Portland, Maine, offers students a new deal: complete our associate degree program without interruption and you can come back and audit additional Andover courses whenever you want without paying tuition.

Under the college's "Education for Life" program, eligible students may take a virtually unlimited number of courses without paying tuition.

Students are responsible for fees and other expenses, and no credits are earned. Still, officials at Andover, which enrolls about 650 students, say the initiative could provide added incentive for employers to offer their workers tuition reimbursement. Reason: companies would pay *once* to keep employees continually current in their fields.

Add/Drop?

The Olin Foundation recently unveiled plans to build a new engineering college in Needham, Mass. The new International Institute of Culinary Arts of Fall River, Mass., enrolled its first class in a two-year certificate program. Meanwhile, Mount Sacred Heart College, a Catholic women's college in Hamden, Conn., with single-digit enrollment of late, asked Connecticut officials for a suspension of its college program due to lack of students.

Not exactly a shakeout. But those few changes are notable in an industry where openings and closings are rare. Through the entire 1980s, just two New England colleges closed, compared with 26 closings in the 1970s. And only four new colleges opened during the '80s, compared with 25 — 12 of them state institutions — in the '70s.

A few other recent changes to the region's high education landscape:

- The Massachusetts Board of Education approved a plan to open "Commonwealth College," a new honors college at the University of Massachusetts at Amherst. The new college, expected to open by fall 1998 and eventually enroll 3,200 students, will draw on faculty from private institutions such as Amherst and Smith colleges.
- North Adams State College was renamed the Massachusetts College of Liberal Arts. On the chopping block just six years ago, the college has attempted to reinvent itself as the Bay State's premier public liberal arts college.

Regional Med Students

Beginning in fall 1998, residents of Maine, New Hampshire and Rhode Island may attend the University of Connecticut School of Medicine and pay reduced tuition under the New England Regional Student Program (RSP).

The 40-year old New England Board of Higher Education program enables New England residents to pay significantly reduced tuition at out-of-state public colleges and universities in the six-state region if they pursue certain academic programs not offered by their home-state public institutions.

Last academic year, more than 7,000 New England students saved an average of $4,000 each on their tuition bills for a total of more than $28 million.

Residents of Maine, New Hampshire and Rhode Island — where there are no public medical schools — will save about 30 percent on tuition at UConn's highly competitive medical school.

The RSP also saves taxpayers millions of dollars by helping the six New England states avoid duplicating high-cost academic programs — like medical schools.

Fish Story

New England's vaunted academic-medical centers gave the region a crucial competitive advantage in the emerging biotechnology industry of the 1980s. Around the same time, nationally prominent environmental research helped create New England's environmental technology industry. Which industry is New England's preeminent research enterprise likely to spawn next?

Student Migration in New England: A Clarification

A table in the Spring 1997 issue of CONNECTION needs clarification. Table 1 accompanying *Talent Flows: A Look at Student Migration in New England* by Joseph Zikmund II and Thomas D. Ringenberg of the Connecticut Department of Higher Education, should have noted the *total* number of first-time freshmen from the state, not the number leaving New England as was indicated. A revised table follows:

Migration of First-Time Freshmen to and from New England, 1994

State of Origin	Total Freshmen *from* State	Destination State: Conn.	Maine	Mass.	N.H.	R.I.	Vt.	Total Enrolling in New England
Connecticut	25,661	14,699	221	2,694	616	772	375	19,377
Maine	9,283	159	5,893	977	621	113	242	8,005
Massachusetts	55,720	1,179	601	42,892	1,779	1,815	739	49,005
New Hampshire	9,275	143	235	1,447	5,569	156	308	7,858
Rhode Island	7,958	199	75	957	173	5,524	86	7,014
Vermont	4,616	63	119	458	284	69	2,603	3,596
Total from New England	112,513	16,442	7,114	49,425	9,042	8,449	4,353	94,855
Total In-Migration		21,525	8,102	65,768	11,373	12,645	6,132	125,545

Note: *77,180 New England residents enrolled as first-time freshmen in their home states.*

Comings and Goings

Former New Hampshire Gov. **Walter Peterson** was named interim commissioner of the New Hampshire Community-Technical College system. After two terms as governor, Peterson served as president of Franklin Pierce College for 20 years, then as interim president of the University of New Hampshire.

Barbara Pickard Sirvis, formerly vice president for academic affairs at the State University of New York's College at Brockport, became president of Southern Vermont College.

Scott Knapp, former chief operating officer of the Terre Haute campus of Indiana's Ivy Tech State College, was named president of Central Maine Technical College.

William J. Flahive, former dean of continuing education at Southern Maine Technical College, was named president of Washington County Technical College after serving for a year as interim president.

Rivier College professor, administrator and alumna, **Sr. Lucille C. Thibodeau**, became president of Rivier.

University of Hartford President **Humphrey Tonkin** announced he would step down in June 1998.

Rita Nakashima Brock, a scholar of feminist theology and women's studies who has held an endowed chair at Hamline University in Minnesota since 1990, became director of the Bunting Institute at Radcliffe College.

René A. Drouin, formerly vice president of the New Hampshire Higher Education Assistance Foundation, became president of the Concord, N.H.-based student loan agency, replacing **Mildred L. Dustin**, who retired.

Young P. Dawkins III, formerly vice president for development and alumni affairs at Oberlin College and director of major gifts at Dartmouth College, was named president of the University of New Hampshire Foundation, an independent organization responsible for developing private support for UNH.

Association of American Colleges and Universities President **Paula P. Brownlee** announced her retirement, effective January 1998.

Many observers are betting on aquaculture.

New England produced nearly $127 million in farm-raised shellfish and finfish in 1995, according to the Northeastern Regional Aquaculture Center at the University of Massachusetts at Dartmouth. And though aquaculture — the farming of fish and aquatic plants — accounts for less than 15 percent of U.S. seafood production, it is expected to grow along with increased demand for seafood and depletion of traditional fishing areas.

New England's concentration of topnotch marine science programs and longstanding fishing tradition make the region particularly well-suited to lead in the industry.

But if aquaculture is to thrive in the region, more New Englanders must have the technical skills demanded by the field. Earlier this summer, the New England Board of Higher Education launched an initiative to help ensure that New England prepares the skilled workforce needed to support a growing regional aquaculture industry.

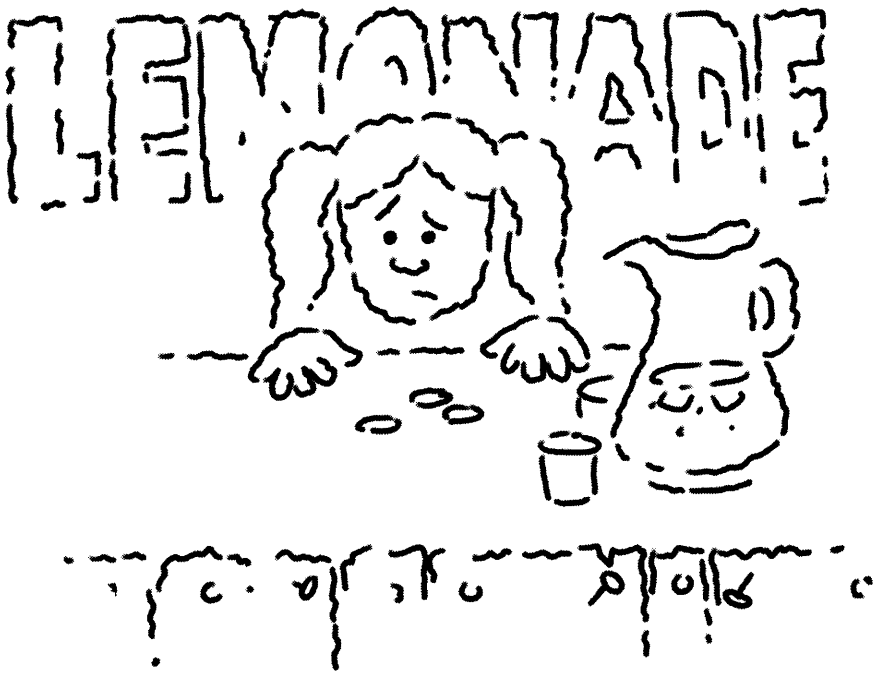
The new NEBHE initiative — supported by a two-year, $450,000 grant from the National Science Foundation (NSF) — will provide New England college faculty with current knowledge of aquaculture curricula and laboratory methodology, and help develop "articulated" aquaculture programs, so students can move smoothly from one level of education to another as they prepare for careers in the field.

Meanwhile, the region's aquaculture research is flourishing. The most recent catch: a $1.7 million NSF grant to help the University of Maine purchase aquaculture-related research equipment, support new faculty members at the School of Marine Sciences, fund student assistantships and improve aquaculture labs.

DATA CONNECTION

- Voting rate in 1994 presidential election among Americans with advanced college degrees: **75%**
- Among Americans with bachelor's degrees: **64%**
- Among Americans with associate degrees or "some college": **52%**
- Among Americans with no high school diploma: **31%**
- Increase in number of high school dropouts between 1990 and 1995: **57%**
- Percentage of White 18- to 24-year-olds who have not completed high school: **18%**
- Percentage of African-American 18- to 24-year-olds who have not: **23%**
- Percentage of Hispanic 18- to 24-year-olds who have not: **41%**
- New England summer camps as a percentage of all summer camps in the United States: **30%**
- Approximate percentage of campers at New England summer "sleepaway" camps who come from outside New England: **70%**
- New England colleges and universities as a percentage of all U.S. colleges and universities: **7%**
- Approximate percentage of freshmen at New England colleges and universities who come from outside New England: **21%**
- Nationwide change in state government employment, 1991-1996: **+1.37%**
- Change in Massachusetts state government employment: **-0.61%**
- In Maine state government employment: **-1.02%**
- In Rhode Island state government employment: **-2.27%**
- Amount federal agencies spent on news clipping services to monitor their media coverage in fiscal 1996: **$7,709,000**
- Rank of Department of Defense among federal agencies in spending on clipping services: **1**
- Year in which Wesleyan College of Georgia became the first to grant a bachelor's degree to a woman: **1840**
- Numbers of years later that Wesleyan College appointed its first woman president: **157**
- Percentage of U.S. college and university presidents who are women: **17%**
- Percentage of U.S. college undergraduates who are women: **54%**
- Approximate change in population of veterans in Massachusetts during past 15 years: **-20%**
- Change in population of veterans in Arizona during same period: **+25%**
- Number of people employed directly by Connecticut independent colleges and universities: **17,864**
- Number of additional jobs generated in other sectors by Connecticut independent colleges and universities: **33,214**
- Estimated economic impact of Connecticut independent colleges and universities on the state's economy: **$3,500,000,000**
- Ratio of New York institutions to New England institutions among *Money* magazine's "best buys in the Northeast" for 1998: **2-to-1**

Sources: 1,2,3,4,5 *Postsecondary Education Opportunity*; 6,7,8 American Council on Education; 9,10 National Camp Association; 11,12 NEBHE analysis of U.S. Department of Education data; 13,14,15,16 State Policy Reports; 17,18 U.S. General Accounting Office; 19,20 Wesleyan College; 21 American Council on Education; 22 The College Board; 23,24 Harvard Medical School; 25,26,27 Connecticut Independent College and University Institute for Research & Public Service; 28 NEBHE analysis of *Money* magazine data.



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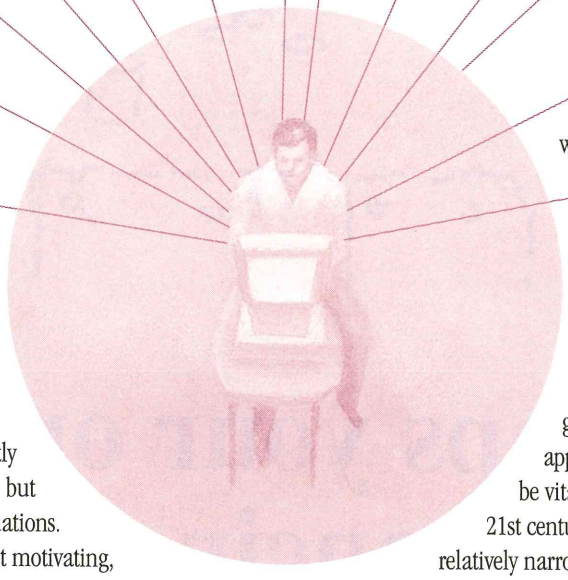
Distributed Learning

How New Technologies Promise a Richer Educational Experience

CHRIS DEDE



Studies have demonstrated that teaching-by-telling and learning-by-listening have many flaws. Material may be remembered and regurgitated a week later for a test, but it often isn't deeply understood. It's not remembered a year or two later, so it has to be re-taught. It's typically applied exactly as it was presented by the teacher, but not easily transferred to other situations. And teaching-by-telling often isn't motivating, so there's a loss of the natural curiosity and engagement that students come in with. Other than those problems, teaching-by-telling works pretty well. It's relatively easy to design, develop, deliver and measure and it's relatively affordable.

Still, research increasingly suggests that other types of teaching and learning are much more powerful. These include: guided, inquiry-based, learning-by-doing that allows learners to actively construct their knowledge; collaborative learning that allows the social exploration and interpretation of complex situations from many different perspectives; and apprenticeship and mentoring relationships, especially when they're situated in real-world contexts.

These alternatives are also more motivating than teaching-by-telling. Students retain and are able to transfer more of what they learn to other situations. But the alternatives are also expensive, because typically they require lower ratios of learners to teachers. Plus, the instruction is harder to design, implement and assess, because it aims to communicate not just basic skills, but also skills in learning how to learn, which are meta-cognitive, a sense of self-efficacy, which depends upon affective domain skills, and the ability to act as a leader or collaborator, which is a psychosocial skill.

We need to consider the contrast between the old pedagogy and the alternative approaches, because the latter will be vital to work and citizenship in the 21st century. In the industrial workplace, relatively narrow expertise, simple skills and the ability to work alone were fine. But increasingly, we need a broad range of knowledge to do our jobs, because so many things interact with one another. We need teamwork skills, because most work is not isolated, but done in groups.

Beyond the school reform movement, one may wonder how this applies to adults. In the workplace after all, adults already have the chance to learn-by-doing and, in many cases, to work with mentors. So for adult learners, shouldn't it be sufficient to present some theory, some examples and some interpretive information — to teach-by-telling?

Not really. It's true that adults can make more sense of presentational instruction than kids can. But research suggests that for most people, some mixture of teaching-by-telling and other modes of instruction is the most effective way to get ideas across.

The dilemma is particularly interesting in the context of distance education because of all the forms of instruction, distance education seems at first glance to be the least amenable to incorporating alternative models, such as mentoring and

apprenticeship, learning-by-doing and collaboration. To make matters worse, when teaching-by-telling is delivered via telecommunications technologies, not only does it lack the effectiveness of alternative kinds of instruction, but the medium itself removes some of the beneficial give-and-take of classroom learning.

Yet, learning across distance and time is increasingly vital. Distance education is no longer designed primarily for convenience or for people who lack physical access to campuses. All kinds of students increasingly want learning just-in-time, anyplace, on demand. And they want collaborative learning orchestrated across campuses and homes and workplaces and community centers, because such *distributed learning* more closely matches their work and citizenship responsibilities and because they realize that being able to tap varied resources across barriers of distance and time provides a richer experience than what any single instructor could offer in a classroom.

Medium as container

In education, new technological capabilities — including interactivity, rich production values, sophisticated representations of data, remote access and new tools for collaboration — make it possible for the first time to think about distributed learning in a truly meaningful way.

In part, a medium is a channel, and a channel determines whom we can reach. For example, one thing we know about Abraham Lincoln is that he had a loud voice, and in fact, all politicians at that time had to have loud voices, because that was the channel through which they reached constituents. They would stand on a stump and shout at the top of their lungs to the people who had gathered around. Part of the excitement we now feel about these new media is that they give us a way to reach almost everyone, just-in-time, anyplace.

But a medium is also a *representational container*. It determines not only whom we can reach, but what we can say. It shapes its content. As Marshall McLuhan said, "The medium is the message." If I want to give you a sense of what my office looks like, I can spend 20 minutes giving you a verbal description. Or I can put up a slide, and in two seconds, you'd *know* what my office looks like. Some media are better at communicating some forms of meaning than others are.

A few emerging representational containers seem to open up new possibilities for distributed learning. First, the now-familiar knowledge webs like the World Wide Web can complement texts and instructors and libraries and archives as sources of information. Second, experiences in shared synthetic environments can increasingly complement learning-by-doing in the real world. And third, virtual communities complement the face-to-face relationships we're accustomed to in classroom settings.

Knowledge webs

Knowledge webs such as the Internet and the World Wide Web extend vast presentational information and open up a variety of archives beyond the sort people have been used to. But the power of webs is their linkages. Rather than accessing isolated bits of data on a database, users actually navigate between interconnections and can begin to comprehend how data are integrated into knowledge.

Moreover, because the webs have been developed by millions of individuals creating their own web sites and linking together, they represent a sort of shared mental model for society. And the addition of multimedia capabilities speaks to multiple learning styles.

Still, in many ways, knowledge webs just amplify conventional instruction. They are predominantly presentational unless enhanced by other forms of pedagogy.

Synthetic environments

The second kind of representational container is more of a departure from traditional instruction. Shared synthetic environments created by the new media are not just ways to send messages, but virtual places to *be* and to *create*. The generation now entering higher education already spends a great deal of time in this "cyberspace" as opposed to the real world. Experiences in these shared environments can complement learning-by-doing in the real world.

Synthetic environments, for example, provide sensory immersion. Anyone who has experienced motion sickness in an IMAX theater — such as the one at the Air and Space Museum in Washington, D.C. —

People who are shy, people who like a little time to reflect before they answer, people who like a little emotional distance from others, all feel empowered to participate in virtual environments, whereas in face-to-face environments, whoever is quick at answering, whoever is aggressive, whoever has the power, tends to dominate the discussion.

The entertainment industry will give cyberspace both the best and the worst attributes of all prior media.

knows that when we fool our senses, our consciousness tends to follow. Along these lines, the National Science Foundation (NSF) is studying how the synthetic environments produced using virtual reality equipment similarly manipulate the senses and the consciousness. With 360 degrees of full three-dimensional vision, three-dimensional sound and some limited touch and feel, a person has the sensation of diving into an ocean, rather than looking through the side of an aquarium.

This is important to the NSF because it could help us teach. Most of the brain is not set up for symbolic processing, but for sensory processing and pattern recognition. Yet, scientific research has found that if very complex, abstract concepts are mapped into sensory stimuli, the brain can much more quickly find patterns. We're developing alternative worlds in which learners can experience phenomena that are remote from everyday experience — such as quantum mechanics or relativity. In fact, sensory immersion can deal with many kinds of abstract subject matter, including health-related issues and even financial matters.

Part of the power of this sensory immersion stems from the fact that the next generation of learners is a *visual* generation, raised on television, Nintendo and home computers. For better or for worse, they don't go into educational settings as readers or symbolic thinkers. We want them to leave that way, but we have to begin where they are.

Right now, creating this type of virtual reality is very expensive, requiring about a half-million dollars worth of equipment to put people into a virtual world. Bear in mind, however, that today's Nintendo 64 computer was a several-hundred-thousand-dollar graphic supercomputer only a decade ago. So eventually, in rich homes and poor homes, in urban areas and rural areas, there will be a very interesting mix of technologies — video games, Web TV and so on. The question is what will be developed beyond Super Mario that might have some educational power.

Lessons of war

Another variation of synthetic environments has even more profound implications for distance education. *Distributed simulation* is a mature technology in some ways. Indeed, it was developed with tax money in the late 1980s, and is now used routinely by the military essentially as a dial-a-war system. It allows military personnel scattered across the country to use telecommunications lines to dial into a shared virtual battlefield, complete with helicopter pilots flying simulated helicopters and tank drivers cruising around in simulated tanks. For military planners, the system provides a very rich, immersive learning experience — a war — but one they can stop and start, rewind and re-fight in a nondangerous way.

Distributed simulation is motivational and authentic. It's also fairly inexpensive, because the learners themselves create the learning situation, rather than using preprogrammed, highly produced multimedia.

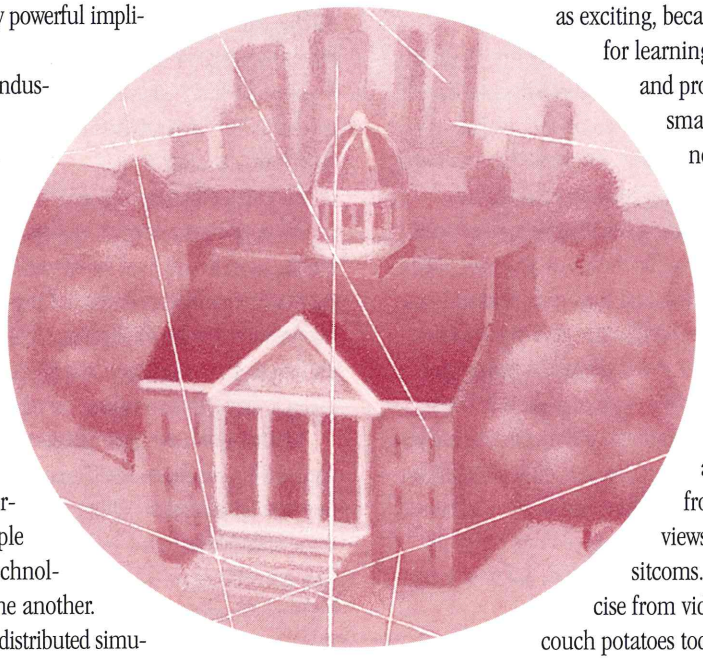
A simpler example of distributed simulation is seen in the various text-based virtual worlds already available on the Internet. These environments grew out of on-line adventure games, but there are educational applications as well. Rather than being a spectator inside somebody else's fantasy world, the user shapes his own character and the environment around him. And when he returns to the environment after leaving it for a while, it has changed because of other people's interactions.

Interestingly, in environments ranging from the military's simulated wars to corporate decision-making systems, broader participation and discussion takes place in the virtual setting than in face-to-face settings. People who are shy, people

Chris Dede was the keynote speaker at a May 1997 New England Board of Higher Education conference on distance learning. Since 1994, NEBHE's Regional Project on Telecommunications and Distance Learning, headed by former Worcester Polytechnic Institute President Edmund T. Cranch, has aimed to assess activity in the field of distance learning, including the impact of educational technology upon accreditation policies, the effect of new federal copyright legislation on electronic delivery systems and the possibilities of collaboration in distance learning among New England colleges and universities.

who like a little time to reflect before they answer, people who like a little emotional distance from others, all feel empowered to participate in these virtual environments, whereas in face-to-face environments, whoever is quick at answering, whoever is aggressive, whoever has the power, tends to dominate the discussion.

People have always assumed somehow that you were most personally *authentic* when you were face-to-face with somebody, interacting directly with them. But we're seeing that many people feel more authentic when they can wear the mask of a technology than when they're face-to-face. Distributed simulation environments are a little like costume parties where people will try things that they wouldn't try otherwise. That may have very powerful implications for learning.



The entertainment industry, meanwhile, is very interested in distributed simulation, because it's running out of new ways to make a little animated character like Super Mario chase something around a screen. To stay profitable, the industry has to create richer environments, perhaps ones in which people can wear the mask of technology and interact with one another.

Ten years from now, distributed simulation may allow a student — finished with homework assignments, bored with regular television — to switch to a special channel, say a Star Trek channel, but not the ordinary kind of Star Trek an earlier generation watched passively.

A computer graphic representation of you — your avatar — appears on the deck of the Starship Enterprise. Elsewhere in this synthetic universe are the avatars of all the other people worldwide who are logged onto the channel. This provides interesting learning opportunities.

You can go down to the transporter room and talk to Klingons who have just beamed in. The Klingons all happen to be natural German speakers, so there's a contextualized language learning environment driven by motivation from the entertainment industry. In the navigation section, the Enterprise is about to do a hyperspace jump. There's some mathematics to be mastered to make that happen. In the science area, the Enterprise is going to scoop some material out of the corona of a star. You have to understand some relativistic physics to help do that. You could go down to the engine room and help Scotty in engineering. Or you can go down to the bar, have a few virtual drinks, rap with some of the aliens and learn something about biology and anthropology. In short, distributed simulation offers learning-by-doing and the other alternative pedagogies in an intriguing and motivating setting.

We might similarly imagine virtual factories, virtual stockbrokers' offices, virtual retail settings and virtual hospitals.

Shaping minds

True, virtual environments are frightening as well as exciting, because they're not only good for learning, but also for escapism and propaganda. Even with the small-screen, non-immersive, non-interactive medium of television, some people feel closer to David Letterman than to their next-door neighbor. I know people whose concept of justice comes from police shows, whose ideas about sexuality come from soap operas and whose views on family life come from sitcoms. Some even get their exercise from video games. If we have couch potatoes today, just imagine when people can go home at night, put on their computerized clothing and become interactive participants in three-dimensional soap operas.

Educators should ask not only how a medium shapes its messages, but how it shapes users. Telephones create conversationalists. Books create imaginers, people who can construct a very rich mental world from a sparse set of symbols. Television and broadcast forms of distance education too often create passive observers. Now we have cyberspace, a profoundly immersive, shared virtual nervous system that civilization is building for itself.

The entertainment industry will give cyberspace both the best and the worst attributes of all prior media. If we don't want to lose a generation to Super Mario and the kind of mindless fantasy world it creates, we need to think carefully about how to use these kinds of environments for distributed learning.

Virtual communities

Some of the concern about virtual environments is alleviated by the third representational container that's part of the distributed learning mix: virtual communities and relationships that complement the kinds of face-to-face classroom interactions we're used to.

We have become used to something that was magical a century ago — sending data across distance and time. But it's always been purely cognitive, because conveying emotion depends on more bandwidth than we ever had. The key to this third representational container is a new technological development called telepresence: the ability to have an affective interaction, an emotional relationship, a communal experience, across distance and time.

Reading this article gives you some sense of my ideas, but really very little sense of me, because print is a flat medium. If you saw my gestures, my facial expressions and my body posture, and heard the tone of my voice, you would have a clearer idea of me. In the same way, as technology expands the amount of content that can flow along channels, people can send not only their ideas across the wires, but also their personalities. They share common joys and trials and ideas and experiences, humor and fellowship and solace. And that creates a very powerful vehicle for some of the alternative pedagogies.

One application involves tele-apprenticeships and tele-mentoring. We know apprenticeships and mentoring are very effective in school-to-work efforts. But it is difficult to create and manage physical apprenticeships and to persuade busy people to visit classrooms and serve as mentors, especially because the mentoring relationship involves not only a cognitive dimension, but an affective dimension.

An NSF-funded project called Co-Vis, which is being developed at Northwestern University's Institute for Learning Sciences, uses tele-apprenticeships and tele-mentoring, as well as visualization to teach complex ideas about meteorology to secondary school students. As a representational container, this approach opens up some much broader possibilities.

In addition, Co-Vis has moved away from relatively expensive technologies like ISDN-based videoconferencing into relatively inexpensive technologies like CU-See-Me over the Internet. The Co-Vis project is helping determine how to make the benefits of mentoring available to large numbers of students. Certainly, having a single expert handle many, many students becomes impractical. One possible solution is a model of cascading expertise, in which, for example, fourth-graders are mentored by eighth-graders, who are mentored by 12th-graders, who are mentored by college seniors, who are mentored by a Ph.D. scientist. In fact, this may be more effective than having a research scientist try to explain to an eighth-grader something for which they lack a common vocabulary.

Change coming

By diminishing the importance of geographic location, virtual communities also carry an interesting sort of threat. For example, my students at George Mason University, a state-run commuter campus in Virginia, don't like driving through rush-hour traffic, fighting for parking spaces and walking to a dingy classroom to meet at a time that's convenient for me rather than them. They'd rather meet in their own environment at a time convenient to them.

I suspect that within five years, representatives of Stanford University or an equivalent institution will go to the Virginia state Legislature, with an offer: "We can teach Psych 101 and all the equivalent courses cheaper than your own local institutions can. We'll do it with one of the top 10 people in the country instead of Dr. Joe Blow on your campus, we'll have 24-hour on-line help, we'll have psychosocial-mediated guided social constructivism, we'll have this, we'll have that, we'll have the other thing."

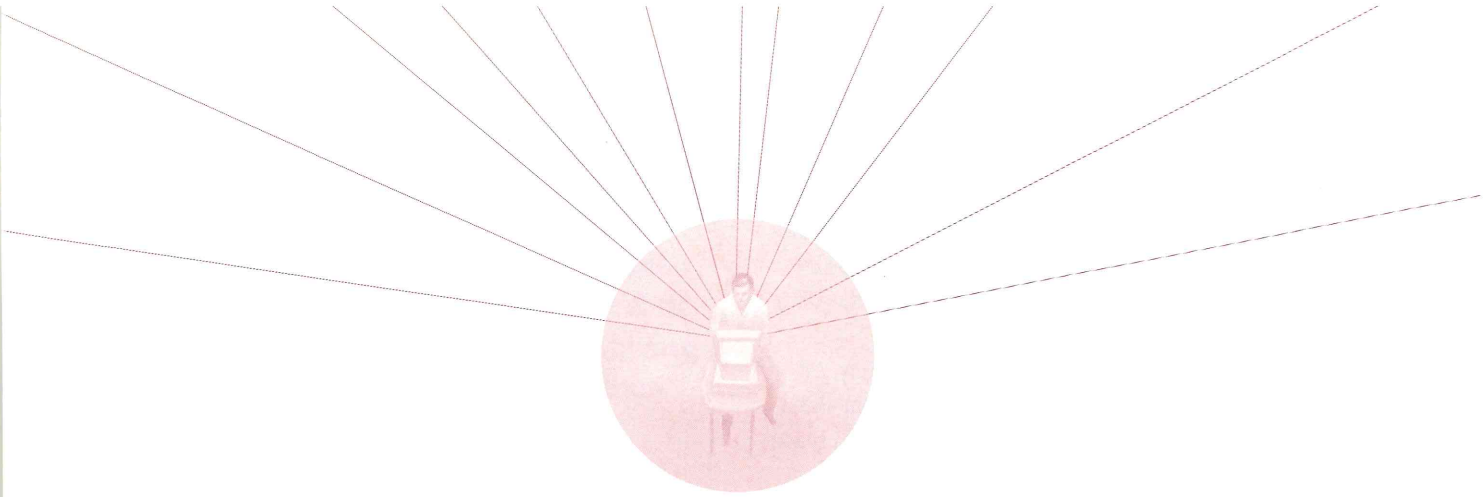
And the politicians will say: "If it's cheaper, let's do it."

We're going to see more change in higher education during the next decade than we've seen in the past two centuries, because of this kind of erosion of regional monopolies. If we're not prepared for the implications of this transformation, both for face-to-face instruction and for distance education, we're going to have things imposed on us that we may not care for.

Furthermore, the term *distance education* will be outmoded 10 years from now. There won't be any such thing as face-to-face education, either. There's just going to be something called distributed learning, which is sometimes face-to-face, sometimes across distance and sometimes involves teaching-by-telling, but often involves other kinds of pedagogy that aren't now part of our repertoire, yet are needed to prepare people for the incredibly chaotic knowledge-based society we seem to be moving into.

To realize these visions, we have to implement two infrastructures at the same time. One is the increasingly familiar physical and technical infrastructure, including all the telecommunications vendors and all the government spending. A second is the human infrastructure of creative, well-educated people who understand the new messages and meanings that these new media make possible — the skilled people who can keep this physical infrastructure from becoming a gigantic mechanism for propaganda and escapism.

Chris Dede *is a professor at the School of Information Technology and Engineering and the School of Education at George Mason University in Virginia. He is on leave from the university to serve as senior program director at the National Science Foundation. His Web site is www.virtual.gmu.edu.*



Towards a "Student-centric" Culture: Some Options for New England

GEORGE P. CONNICK

Higher education, as we know it today, was created during the lifetime of people born since 1945. The greatest expansion of public higher education took place after World War II with the return of military personnel to civilian life, the enactment of the G.I. Bill and the great baby boom of the late 1940s through the early 1960s. Across America, hundreds of new colleges were created, and hundreds of others expanded. The planners used the only model of higher education they knew — it was campus-based and labor-intensive.

In 1950, approximately 90 percent of college students were between ages 18 and 21. Most attended college full-time and a large percentage lived in campus residence halls. The campus-as-small-city model, offering a plethora of services for students, made sense through the 1960s.

But by the '70s, major changes were underway in American society. The industrial economy was being replaced by a service and information economy. And the number of 18-year-olds began leveling off. To bolster enrollment, colleges began to recruit adults. Today, only 52 percent of college students are ages 18 to 21, and less than 15 percent fit the profile of the young, full-time, residential student for whom most campuses were built.

As a result, the United States now approaches the 21st century with more than 3,600 accredited institutions that were built in a different era, for a different student population with a very different set of economic realities. And these institutions reflect their industrial era roots. They are organized around centralized structures (similar to the factory model) and their mode of operation is to aggregate workers (faculty and students) at a particular place (the campus) at a particular time (the academic calendar).

Just as the American economy has moved away from the industrial model to one which is information-based, technology-intensive and decentralized, so too will education have to change.

Transformation

At the beginning of the 21st century, higher education is likely to be in the midst of a profound transformation, as a range of providers use information technologies and telecommunications to extend educational access to the general population. Education will be available anywhere and anytime the consumer wants it. And most importantly, customers will have the option of enrolling in courses and degree programs at multiple institutions without ever leaving their hometowns or, more likely, without leaving their homes.

Furthermore, students will be able to convert their knowledge — whether acquired through formal schooling, self-instruction, military training, corporate seminars or in some other way — into certified competencies. At this point, the control of education will have shifted from the provider to the consumer. The future for most institutions will be determined by the extent to which they provide the consumer with an educational product conveniently and at a competitive cost.

In short, our centuries-old educational culture —

campus-based, classroom-based, teaching-based and time specific — is being challenged. A new culture based on the dynamic nature of information technologies and telecommunications makes it possible to deliver virtually any education, anywhere, anytime to anyone.

For the first time, education consumers have very real choices regarding what, when, where, how and from whom they can secure an education. And those choices will expand at an exponential rate.

The location of a campus will offer little competitive advantage. Prospective students will shop for those institutions that provide the most efficient and student-centered services, whenever the student needs them and wherever he or she may be located. In fact, the historical *raison d'etre* for campuses — the need to concentrate people and physical resources at a single location at a specific time — must be re-assessed.

New reality

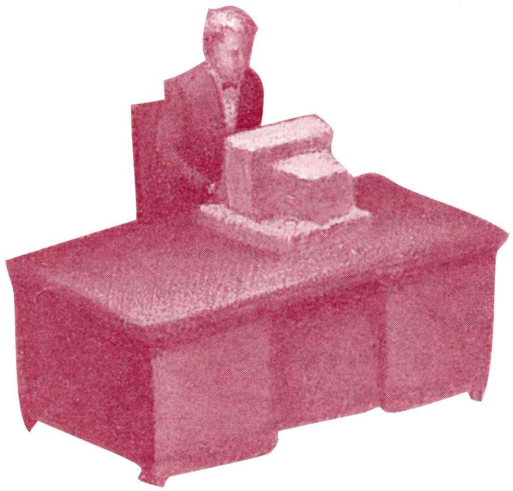
A cartoon on the World Wide Web shows a girl walking with her grandfather, asking: "Tell me again, grandpa, what was a classroom for?"

Understandably, the new reality of an educational structure that is freed from the constraints of time and place is difficult to comprehend for some educators and enormously threatening to others. For at least a decade, most campuses have treated the new technologies as something they must contend with on campus. They have created computer labs, for example, but the computer has not been woven into the fabric of the curriculum. Generally, campuses have seen technology as a fringe function of the instructional process.

But clear evidence indicates that the synthesis of distance education, information technology and telecommunications has catalyzed an educational paradigm shift.

New England educators have an opportunity to assume a leadership role in applying powerful new information and telecommunications technologies to restructure education to serve learners better and more cost-effectively. Mediated learning networks, which reach students at convenient locations and times, can offer streamlined services that meet each learner's needs. And the labor- and facilities-intensive structure of campuses need not be duplicated in a distance education structure. Ironically, L.L. Bean, Maine's billion-dollar direct mail company, with its vast teleservice center, provides a better example than any campus of the way distance learning services will be provided in the future.

The control of education will shift from the provider to the consumer.



At the same time, failure to make the structural changes to increase access and serve a wider range of students cost effectively is likely to invite increasing criticism of the academy and possibly result in change being imposed upon it from outside.

Writing in *The Futurist*, former Colorado Gov. Richard D. Lamm quoted Nobel economist Joseph Schumpeter's observation that "all human institutions eventually become smug, self-satisfied, incestuous, bureaucratic, inefficient and risk-averse. Time and past success cause them to lose the cutting-edge vitality that made them great institutions in the first place."

Indeed, frustration with that type of institutional sclerosis led to an event that is likely to be viewed in future years as a defining moment in the history of higher education: the summer 1996 agreement to launch the Western Governors University (WGU).

WGU — initially established by 10 western governors and now counting 14 member states — will truly be a new kind of institution. It is separately incorporated, with the governors of each of the participating states sitting on the board, and it is designed to generate substantial profits within five years. A fully accredited, degree-granting "university," WGU will draw on the course offerings and faculty of numerous institutions (public and independent, educational and corporate) to provide learners with broad access to education at a distance. Moreover, a range of student services — such as an on-line "smart" catalog, a centralized bookstore for the western region and a center in each state for advising and other services — will be provided through electronic and other nontraditional means.

Most significantly, WGU signals a shift in emphasis from "inputs" to "outcomes." WGU will not be focused on the number of traditional credit courses a student accumulates, but rather on certifying that learning outcomes have been achieved. Thus, a student may develop competency in a variety of ways, such as self-instruction and military training in addition to traditional credit courses.

On a parallel track, California Gov. Pete Wilson has announced plans to launch a "Virtual University" in his state, with planning input from all California colleges and universities, both public and private, as well as business.

A cultural challenge

Nicholas Negroponte, who heads the Media Lab at the Massachusetts Institute of Technology, has observed that "computers, in the next few years, will be freed from the confines of keyboards and screens — they will become objects that we talk to, drive with, touch or even wear."

In other words, the digital age allows us to move images of every sort far more efficiently than moving people. We will be able to connect students and others to the educational experience they need both synchronously (interactively, in real time) and asynchronously (at the individual student's time and pace), regardless of whether the experience is in the form of voice, video or data. Technically, the barriers to change are falling rapidly.

The most critical issue affecting the role of higher education in the next decade is not technological. The real issue is cultural. Will higher education be able to shift from an Industrial Age culture to an Information Age culture?

The most critical issue affecting the role of higher education in the next decade is not technological. In fact, access to telecommunications and information technologies will be pervasive. The real issue is cultural. Will higher education be able to shift from an Industrial Age culture to an Information Age culture?

For example, how will we calculate faculty workload (and compensation) when a faculty member teaches a course online and no longer goes into a classroom three times a week for 15 weeks as the typical three-credit course currently requires? How will we view student courseloads — for graduation or financial aid — when the three-credit course may be taken at home over a computer? Will the course still be worth three credits even if it doesn't require 45 hours of "seat time?"

Embedded cultures have difficulty achieving rapid or fundamental change. Yet, the new forces make change inevitable. That is a sure formula for a period of controversy and conflict in higher education.

The models for totally reconfigured educational approaches using technology are being forged regionally in the western United States and in a number of individual states. New England higher education must begin to determine its role in the virtual world of the future or risk losing its historical prominence.

One possible approach is for an appropriate entity — perhaps the New England Board of Higher Education (NEBHE) or the New England Governors' Conference — to create a WGU clone for New England. Such a centralized accredited institution would offer comprehensive student services and academic programs, using the courses of participating New England colleges and universities, and award its own degrees.

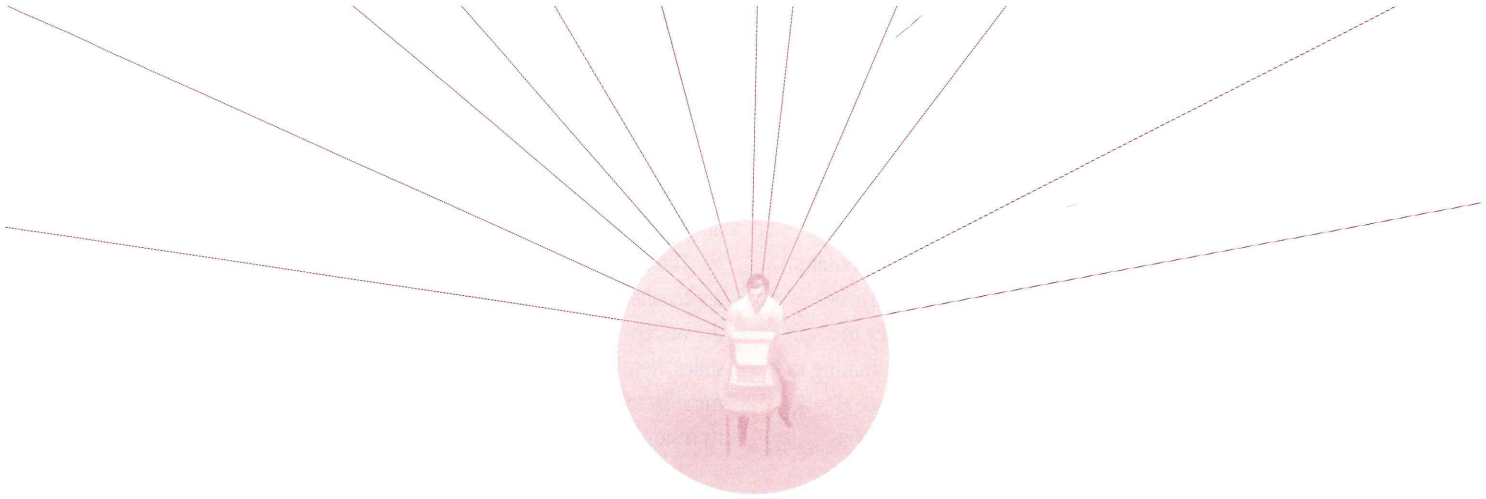
A more decentralized approach would be for NEBHE or another appropriate entity to coordinate New England educational and corporate institutions wishing to work together cooperatively in delivering distance education.

We live in a campus-centric educational culture, whether in higher education or at the K-12 level. Education at all levels in this country has always been local, and institutions have a long history of operating autonomously. Campuses had captive audiences because most students were relatively placebound and had few local alternatives.

But Information Age technologies eliminate barriers of distance and time, so students now are able to choose from a cornucopia of educational providers — again, without leaving home. We are moving, therefore, from a campus-centric to a student-centric culture.

In that new educational world, consumers will look for those institutions that can bundle a wide variety of programs and services into one seamless process that meets their educational needs. They will look for organizations that can make sense out of the myriad of educational opportunities available. The Western Governors University is one such model. Like other regions of the country, New England must decide soon how it will participate in this brave new world of education.

George P. Connick *is former president of the Education Network of Maine.*



Distance Learning Tests America's Higher Education Dominance

MARK A. EMMERT

At the close of the 20th century, we can take comfort in the fact that American colleges and universities are the unchallenged world leaders in higher education. Or can we?

True, students and scholars from around the globe continue to travel to U.S. institutions in huge numbers — more than 450,000 last year. And there is no doubt that an American degree is the educational coin of the realm. But as we enjoy our current success, it may be too easy to forget that not so long ago, the European universities were the dominant force internationally in both research and teaching, and drew many of the best and the brightest from our country to their campuses. Our shining success is, historically speaking, quite recent. It also could leave us as rapidly as it arrived.

More specifically, technology-based distance education — by reducing or eliminating geographic and temporal barriers — will open up higher education markets to new global competitors. Information technology and distance learning are exciting developments in higher education. They provide extraordinary opportunities to transform the when, where and how of what we teach. But they also have the potential to dramatically alter the nature of the higher education marketplace.

While Peter Drucker overstated the case when he recently proclaimed in *Fortune* magazine that the traditional residential campus would be dead within 30 years, there can be little doubt that distance education will visit great change upon our institutions of learning.

As both student and educator become increasingly comfortable with technology-based learning, those institutions that master the use of information technology will be well-positioned to take advantage of a substantial segment of the education marketplace. This is especially likely for the most rapidly growing student population: the nontraditional, location-bound, continuing education student. In those cases where it is easier and cheaper to transport the classroom to the student, rather than the student to the classroom, technology-driven learning will grow dramatically.

Mega-universities

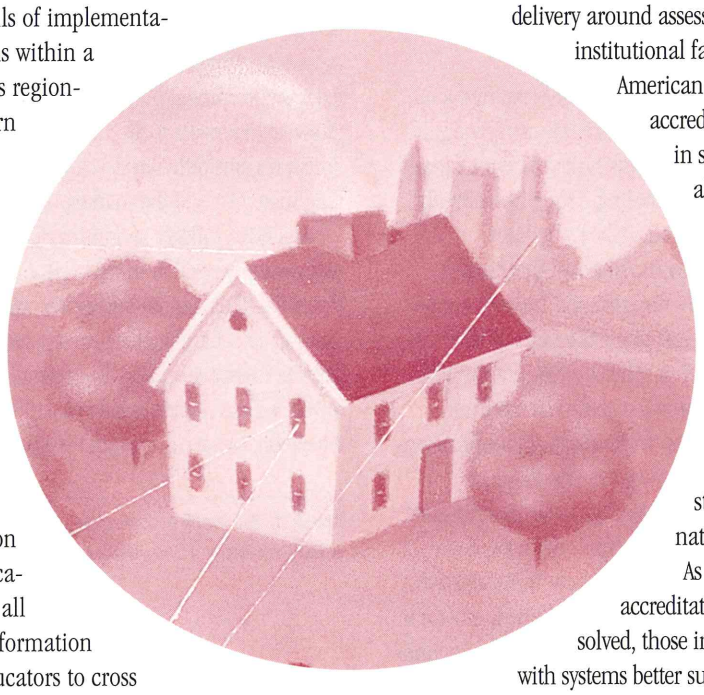
An interesting portent of the future of distance education has been offered by Sir John Daniel, rector of the United Kingdom's Open University. At the first International Forum for World Leaders in Higher Education, held in Hong Kong in July, Daniel described the emergence of "mega-universities" — institutions with more than 100,000 students. These unique entities share two important

An agreement to use competency-based assessment models is a critical step toward the exchange of distance learning courses — not just among American institutions and various states — but also across national boundaries.

traits: all but one are in developing countries and, because they are targeted at nontraditional students, they rely heavily upon distance education.

These institutions reflect the enormous demand in both industrial and developing countries for technology-based higher education. Moreover, in recognition of this demand, institutions such as the Open University are now beginning to reach out for students beyond their national borders. In fact, one-tenth of the students of the Open University live outside the United Kingdom. At the Hong Kong meetings, 40 higher education leaders from traditional research universities around the globe shared a common reaction to the predicted impact of international distance education: anxiety.

In the United States, discussion of distance education tends to focus on details of implementation and collaborations within a single state, or perhaps regionally, as with the Western Governors University. Most often, conversations conclude with a litany of the obstacles to technology-based education. The issue of international competition is rarely considered. Yet, one does not need much imagination to envision technology-based education beaming in from all points of the globe. Information technologies allow educators to cross national boundaries with ease. Indeed, distance education may well become an internationally traded commodity early in the 21st Century.



Currently, there are few obstacles to rapid internationalization of distance education. The prevalence of English as the language of commerce, particularly among the young, will allow the development of instructional materials with relatively high international transferability. Moreover, as the quality of visual materials improves, the most complex and expensive aspects of educational programs will be readily adaptable in multiple languages.

Quality control

One hindrance to globalization of higher education markets is the issue of quality control — an area in which U.S. institutions begin with a disadvantage.

Today, quality in American higher education is assessed by a complex, some say arcane, system of accreditation. The American accreditation system relies heavily upon the assessment of proxies for educational quality, such as hours spent in classrooms, student-to-faculty ratios, availability of facilities and total resources spent on each student. Many other nations, particularly in Europe, approach quality control through competency examinations for each discipline. Such competency assessment de-emphasizes time to degree, instruction mode and the reputation of the institution providing the instruction. These nations therefore may be better positioned to adopt quality control in distance education.

Recognizing this fact, the Western Governors University plans to base quality control of its shared distance learning delivery around assessments of students, not institutional factors. A number of American regional and specialized accrediting bodies are moving in similar directions, although they have a long way to go. An agreement to use competency-based assessment models is a critical step toward the exchange of distance learning courses — not just among American institutions and various states — but also across national boundaries.

As the issues of common accreditation practices remain unresolved, those institutions and nations with systems better suited to distance education will have a substantial advantage in their development.

The end of this century thus brings a convergence of factors creating global markets for distance learning systems — in particular, the explosive growth of information and telecommunications technologies and the increasing demand among all nations for higher education for the nontraditional student. These forces — along with the rise of mega-universities and the increasing acceptance of international quality control programs — create exceptional opportunities for American higher education, but also challenges to its global dominance.

A response

American universities must take advantage of their already established reputations as intellectual leaders and respond to new opportunities. How might we meet this challenge?

Opening up the education market should not lead to a lowering of academic standards any more than a free trade agreement would permit a nation to trade dairy products that do not meet mandatory health standards.

First, we must begin from a seemingly contradictory position, recognizing the inherent weaknesses of technology-based education as well as its potential. Information and telecommunications technologies can help us accomplish a great deal, but they were not intended to fully replace face-to-face human interaction.

One new state-of-the-art stock and bond trading facility I recently visited includes both an extraordinarily complex computing and telecommunications system and an equally complex, and expensive, open trading floor within which all the traders can see each other. Asked why both approaches were needed, one official noted that traders would never rely solely on the information transmitted on their monitors, but also needed to see the faces of their colleagues and "feel" the mood of other traders. Information technology has limits that we must recognize up front.

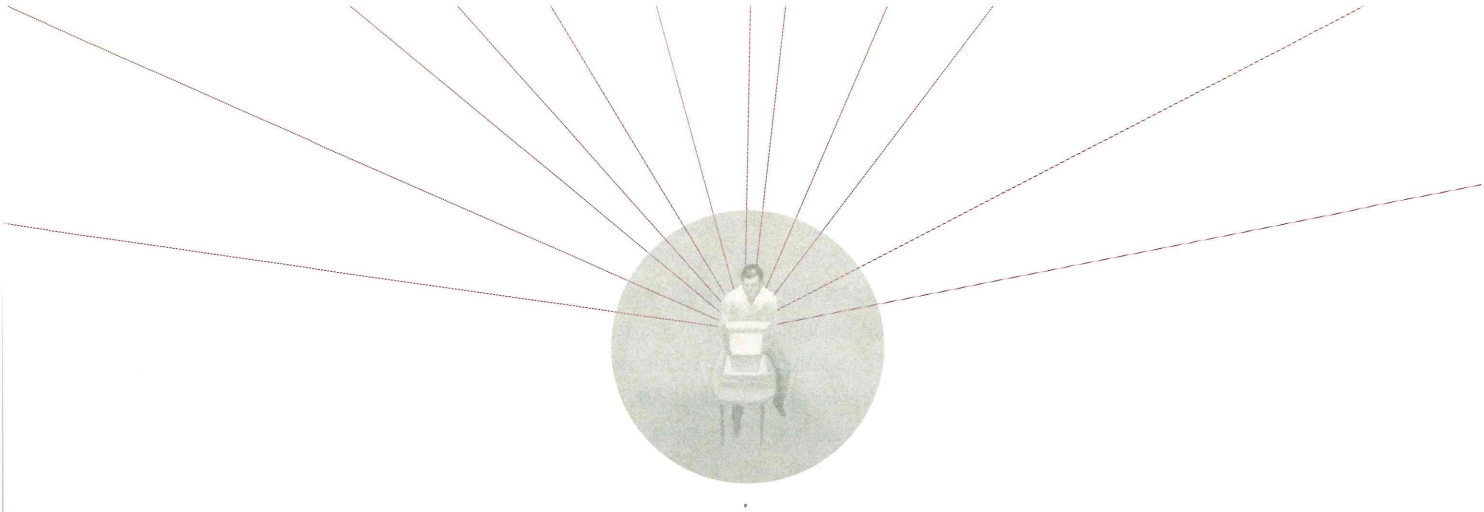
Second, we need to develop truly world-class educational materials. As the distance education marketplace becomes global, the level of competition will become keen. The quality of instruction must be up to the task. Too much of what we deliver today is mediocre in its creative use of technology, and is not critically evaluated. American universities need to be leaders in creating excellent technological academic programs.

We also should consider the creation of international distance education agreements along the lines of the North American Free Trade Agreement — fully mutual agreements that allow a free exchange of higher education across borders. Our current approach to accreditation serves much like a system of trade barriers. Opening up the education market, however, should not lead to a lowering of academic standards any more than a free trade agreement would, for example, permit a nation to trade dairy products that do not meet mandatory health standards. If we can create competency-based standards, we can then move toward a free exchange of education programs.

Finally, in preparing to compete in the global distance education market, American higher education should build on its own unique strengths — and primary among them is its system of self-regulation. Former Harvard University President Derek Bok, among others, has pointed to U.S. higher education's independent governing boards, which are free from intrusive governmental control, as important factors America's academic leadership. Whatever mechanism we develop for regulating quality and increasing coordination among institutions, it should not be centralized in state or federal government bureaucracies. Resisting the urge to allow governments to do the job for them, universities should accept responsibility for developing standards to meet the legitimate needs of the marketplace.

American colleges and universities have established an extraordinary position in world education — a leading role that serves the national interest very well. Converging forces, however, are changing the face of a large and important segment of higher education. By responding thoughtfully and creatively, we can maintain a dominant role in the era of distance education. Or we can wait and watch as others replace us.

Mark A. Emmert *is chancellor and provost for university affairs at the University of Connecticut.*



Lifelong Learning in the Workplace

Keeping Professionals Current

ROBERT GOLDBERG

Some experts have observed that the half-life of knowledge is about five months, so a half year or so into a job, even the best-prepared college graduates are no longer current. For IBM and other technology companies, the key question is: How do you keep the technical professional current in a world that's changing very quickly?

For an organization whose people are spread across the world's time zones, education and training has to be globally accessible — available to workers whether they're in Japan or Vermont. At IBM, we want individualized learner control and just-in-time learning. And of course, we want professionals to retain what they learn. Increasingly, that means replacing the old model of an instructor talking and students taking notes with collaborative strategies in which students work together.

At the same time, IBM, like many major corporations facing cost pressures, has shifted resources and reduced its global workforce. So, minimizing the costs of travel time and time away from the job is crucial.

The more specialized the topic, the fewer the students at any one location. Two alternatives are available. We can bring perhaps 30 people from all over the world to a central location — or we can bring the classes to the students. The latter is certainly a lot less expensive. One way to bring the classes to the students is through some form of learning technology, more specifically, through distributed learning.

The IBM Desktop University, for example, allows any student to access a large library of computer-based training aids. Employees are choosing this method of learning in far greater numbers than we had anticipated because they are becoming accustomed to learning in this fashion.

Array of offerings

There is no single solution to keeping professionals current. IBM offers tuition reimbursement in continuing education, and individual IBM labs contract with institutions like Rensselaer Polytechnic Institute and Stanford University for courses that company employees can receive via remote broadcast, delivery over a computer network or live courses face-to-face with faculty.

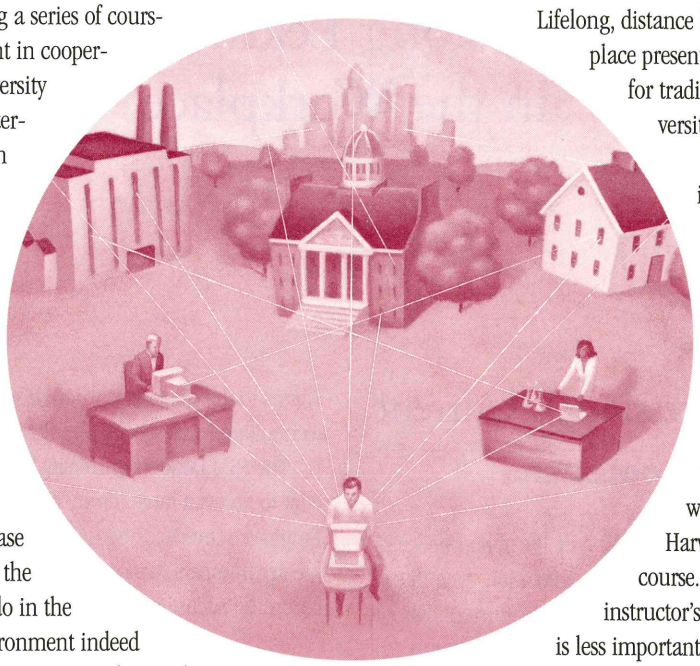
IBM is also the largest single user of the National Technological University (NTU), contracting for about 50,000 hours worth of NTU's video-based education in one year. Employees like being able to watch NTU videotapes at times of their choosing and enjoy being able to rewind the tapes and review the points they are most interested in.

IBM is also moving aggressively into technology delivery. The Desktop University is now available through the Internet and a Global Campus delivers network courses to IBM's Global Services organization worldwide.

IBM employees have been networking through main-

frame applications for decades. E-mail and associate applications have been the primary means of exchanging information. The company is now converting this large portfolio of applications to be driven through a Lotus Notes infrastructure. As a first step, we offered a single six-hour broadcast via NTU. Employees ordered more than 1,000 copies of this tape within nine months. We are now planning to offer an update on the next release of Lotus Notes. Clearly, the transition to Notes will require the use of many forms of distance education to train IBM's hundreds of thousands of people worldwide, as it opens up new avenues for technology-based education.

We are also developing a series of courses on project management in cooperation with New York University using Lotus Notes and interconnected databases in an education framework called Lotus Learning Space. These instructor-led programs provide an opportunity for team-based learning and student support. Eventually, technology will be in place to allow students to work collaboratively on case studies in preparation for the team-based work they'll do in the future. The learning environment indeed is a model for the cooperation required to work with team members who may be located anywhere around the globe.



Role in education

IBM also outsources educational programs to many other corporations. For example, a recent IBM program related to Year 2000 computer problems was broadcast over NTU to at least 11 non-IBM facilities.

Are we in competition with colleges and universities? Absolutely not. If you want to learn how to do application development, come to us. If you want to learn object-oriented programming in the complex environment of a functioning enterprise, come to us. Network computing? Come to us. But if you want a bachelor's degree in computer science, don't come to us.

We do provide certification that our professionals have achieved the level of competence we require, and we offer recertification to ensure that professionals stay on top of their fields. Higher education officials should consider whether such a system of certification and recertification has implications for the way colleges and universities grant degrees. Should some degrees, for example, have termination dates and perhaps requirements that graduates take periodic refresher courses to certify the currency of their knowledge?

Moonlighters

Lifelong, distance learning in the workplace presents other important issues for traditional colleges and universities to consider.

First, in certain specialized fields, a university's own faculty increasingly will compete directly against the institution by individually subcontracting courses to companies like IBM. True, it would be nice to be able to say we're working with Stanford or Harvard or MIT on a given course. But ultimately, the instructor's institutional affiliation is less important than her or his competence. Also of great importance is the need to provide the course just-in-time and without the overhead costs associated with sharing with sponsoring institutions.

Secondly, as major universities invest more in distance education, the squeeze on local, smaller institutions by larger institutions will be intense. Students enrolling in institutions of higher learning have two goals. Certainly, the student wants to get the best education possible, but additionally the student wants the best possible credential. Will students continue to choose local four-year colleges when they could earn a degree, via telecommunications and without any specific restrictions, from Harvard or Yale?

Robert Goldberg *is global market segment manager at IBM Corp.*

Brokering Knowledge

ROBERT J. HERMANN

In 1991, United Technologies Corp. launched an initiative now known as the Learning Institute to make education available to its technical employees. Today, all 170,000 UTC employees, working in all but eight countries in the world, can take advantage of the institute's offerings.

Prior to establishing the institute, UTC conducted benchmarking research to find out what other high-quality corporations were doing in terms of workforce education. Motorola was an exemplar, providing 100 to 120 hours of education and training per employee per year. We were providing between 10 and 40 hours. Clearly, we were not doing enough.

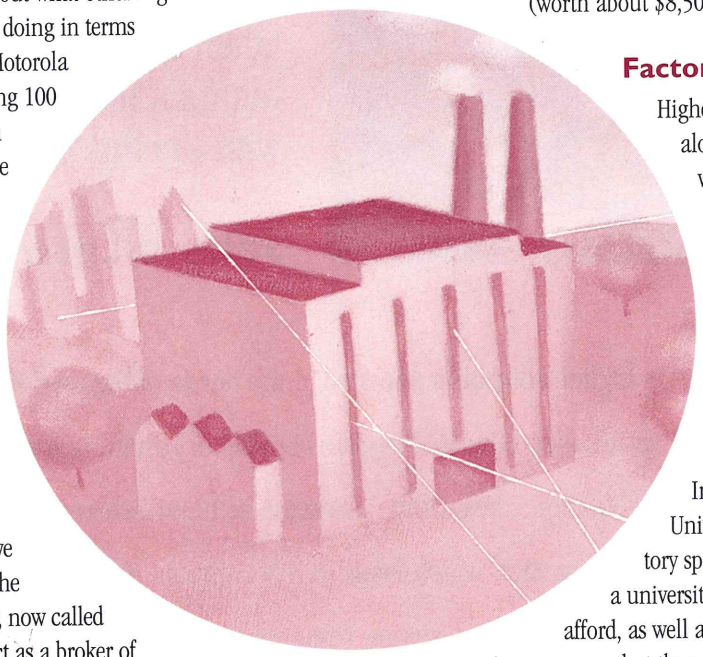
Moreover, we found that colleges and universities were not structured to provide the continuing education that would match UTC's specific needs. So we decided to contract with the Hartford Graduate Center, now called Rensselaer Hartford, to act as a broker of educational programs for our workforce. In essence, Rensselaer Hartford matches educational offerings from a range of providers to the needs of UTC employees.

UTC now accounts for 90 percent of traffic through Rensselaer Hartford's brokering activity. We hope that as other companies such as U.S. Health also begin to use Rensselaer Hartford as a broker of education services, duplication will be reduced and the services will become more efficient.

Just two years ago, UTC's education programs reached between 1,700 and 2,000 employees per year. Now, nearly 3,000 employees benefit from an array of delivery systems, including live courses at Rensselaer Hartford or other facilities, interactive compressed video and satellite delivery.

We still don't reach as much of our workforce as we should. But we have established the infrastructure of accredited universities and other educational vendors to build a comprehensive education program. And this education program has the great virtue of being financially self-sufficient in that UTC divisions pay a modest margin on the services.

In addition, about a year and a half ago, UTC established an employee scholarship program that pays 100 percent of tuition and fees for any accredited college course, and splits the cost of time off. If an employee takes off six hours for a course, the company pays for three hours. Employees who earn degrees receive UTC stock: 50 shares for an associate degree, 100 shares for higher degrees (worth about $8,500 today).



Factory space

Higher education institutions alone are unable to provide education in the context required by UTC divisions, but collaborative solutions are in the works. For example, Pratt & Whitney provides universities such as Worcester Polytechnic Institute and Harvard University with access to factory space and equipment that a university couldn't possibly afford, as well as financial and operating processes that the university couldn't possibly simulate. Consequently, students and faculty benefit from a real case study, while UTC benefits from fresh ideas.

Similarly, a UTC facility with very high-precision milling machines that a university probably can't afford, could be made available between midnight and 7 a.m. In this setting, students and faculty could reorganize factory operations as part of their studies. Similarly, management students could study and perhaps improve existing cost-accounting processes.

In short, industry-higher education cooperation presents opportunities to give students and faculty a real taste of modern industrial life.

Robert J. Hermann *is senior vice president at United Technologies Corp.*

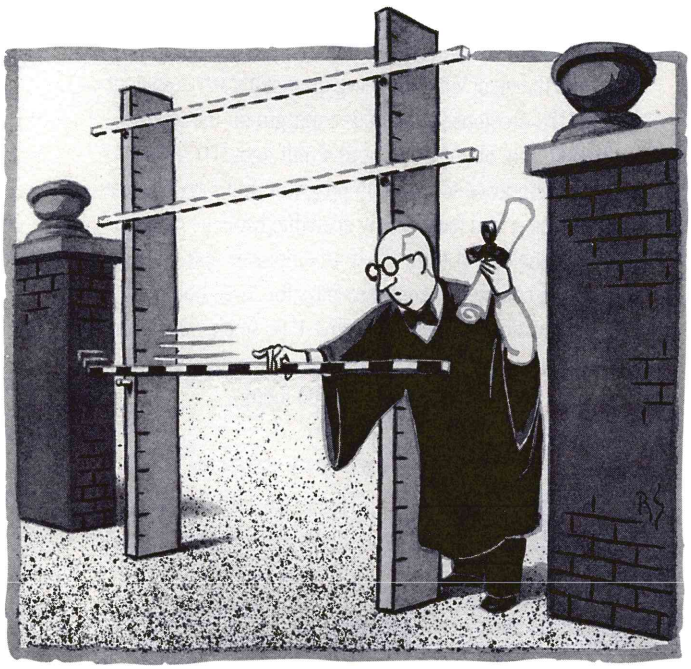


Illustration by Rob Saunders.

The Mortarboard and the Anvil

Higher education creates talent and knowledge, but fails the workforce with declining standards

JOHN SILBER

Is higher education addressing the needs of the workforce? Yes and no. Yes, in graduating educated people capable of assuming highly demanding jobs and professions. Yes, in the provision of basic research. And yes, in the development of technology transfer, which leads to job creation. But no, in our failure to adequately support public schools by setting reasonable standards of admission to our own programs and thereby helping secondary school administrators to insist on high standards in their schools. And no, by failing to limit access to the teaching profession to those individuals who are capable of raising the standards of schools.

Far too many colleges and universities compete for students whose principal qualification is a body temperature approximating 98.6 degrees Fahrenheit.

Unless all colleges and universities, public and independent, insist on reasonable standards of admission, it will be difficult, if not impossible, for principals and teachers in secondary schools to raise standards. And if secondary schools can't raise standards, it will be difficult to raise them in the primary schools. As long as underprepared high school seniors continue to be admitted to colleges, public school administrators trying to raise their standards will be opposed by complacent parents who say: "Don't argue with success. If my child has been accepted by the university, how dare you tell me that my child can't have a high school diploma?"

Higher education, by lowering *its* standards, is in major part responsible for the accelerating failure of public schools. The chief victims of that failure are those students who will never go to college and who, through an inability to read, write and do simple mathematics, drop out of school and are largely unemployable.

Corporations like IBM and Motorola no longer expect schools to turn out students who are fully prepared to work for them. Like most major corporations, they have massive and highly effective education programs designed not merely to prepare employees for entry-level jobs, but to provide continuing education in a field where today's training may be obsolete tomorrow. What IBM and Motorola do expect — and resent not getting — are educated students who have basic competence in reading, writing and math.

Providing basic education should not be an employer's responsibility. But in self-defense, these companies must spend massive sums of money on remedial education programs to finish the job left undone by the most expensive public schools in the world.

We must regain the level of basic education we had in this country a century ago, but we are largely ignoring this challenge in favor of grandiose plans for expanding higher education. In the movie *Mr. Smith Goes to Washington*, a politician promises voters that, if elected, he will send every man, woman and child in America through Harvard. President Clinton may have had this promise in mind in proposing to make it possible for every American child to go to college.

That all persons are born equally intelligent is a doctrine that the Founding Fathers never accepted. We should recognize that not all children should go on to college. Those who should are of both sexes, all colors, all ethnicities and all economic backgrounds. But we must recognize the importance and respect the dignity of those who do not *choose* to go to college, either for lack of ability or lack of interest. There has to be a dignified place for them to work and a sense of personal fulfillment for them, even though college is not their route.

Moreover, when open admissions leads to open retention and open graduation, all justification for higher education is lost. The City College of New York was once one of the greatest colleges in the United States. Open admissions quickly devastated not only its reputation, but the educational achievements that lay behind its reputation.

Of course, no qualified student should be denied a college education because of sex, race, religion or economic status. But when every high school graduate can and does go on to college, higher education will no longer be "higher" than anything, and the term "postsecondary education" will finally become indispensable.

ediocre ed schools

ace have standards slipped as in schools ation. In 1996, the average combined d math score on the SAT (on the orig--centered scale) for all students was t of a possible 1600. The average intending to major in education is a sobering statistic. Those planning to become teachers are not of better-than-average quality or even of average quality. The average aspiring teacher is not quite so intelligent as the average student.

An optimist might hope that the colleges themselves would impose higher standards by limiting admission to their education programs to those students worthy of the profession of teaching. But the evidence from Massachusetts provides no such hope. In 1995, the most recent year for which data are available, the Massachusetts state colleges that released figures reported an average combined SAT score of 861 for students preparing to be teachers. At one school, the minimum score was 500 — not 500 verbal and 500 math, but 500 *total*. Even football coaches do not go after students of such modest ability.

When every high school graduate can and does go on to college, higher education will no longer be "higher" than anything, and the term "postsecondary education" will finally become indispensable.

One may fairly ask whether Boston University is guilty along with the rest. At BU's School of Education, the average combined SAT score is 1147 — 286 points higher than the state college average. Indeed, even if UMass-Amherst is folded in with the state colleges, the state schools' average rises to only 876, still well below the national average.

BU did not achieve its scores simply by attracting a more gifted admissions pool. It did so by screening that pool carefully, deliberately imposing higher standards and limiting admission to able students.

BU accepted smaller education school classes, resulting in a substantial loss of tuition income. Between 1970 and 1996, the number of freshmen at the School of Education dropped from 489 to 98, while the average SAT score rose from 1048 to 1147. This cost us $35 million in tuition — a very heavy price for a university with a small endowment, but a small price to pay for academic integrity and a school of education that is part of the solution rather than part of the problem facing public schools.

It is a shocking fact that taxpayer-supported institutions are not willing to follow this example. They are far better situated to enforce quality. The overwhelming preponderance of their budgets is provided by state and federal taxpayers. They do not depend on maintaining enrollment to ensure that income equals outgo. With rare exceptions, failing state institutions will always be bailed out by taxpayers. In return, taxpayers have a right to expect academic integrity.

In addition, schools of education often repel persons with an interest in teaching who simply refuse to subject themselves to the negative intelligence test of the typical education school curriculum. As long as schools of education enjoy a virtual monopoly on the supply of teachers, we cannot sustain current standards, much less regain the very high standards we once enjoyed.

I am not attacking teachers. Most teachers are competent and dedicated. And today, almost all teachers labor under conditions so difficult that it is a wonder our education situation is not worse.

In fact, the general failure of education schools is not to be found in all teachers or even most teachers. We can take encouragement from the fact that 50 percent enter schools of education with higher-than-average test scores. But the failure is glaringly present in those teachers at the bottom of the scale of competence and learning.

In most colleges, students and faculties of education schools are the weakest in the institution and are held in relatively low esteem, often in outright contempt. Teachers have shared this contempt. It now seems hardly believable that at the 1912 Democratic convention, the orator nominating Woodrow Wilson, coming to the climax of his speech, called his candidate "the Princeton schoolmaster," and the band played *School Days*. That was a measure of the respect in which teachers were held 85 years ago. For them to regain that respect, we must restore the standards that the schools once routinely met: teaching children to read at the second-grade level before promoting them to the second grade, for example, and making sure students could read at the 12th-grade level before they received high school diplomas.

Any high school graduate should be able to pass at least the GED, the examination used to assess whether students who did not graduate

from high school have nevertheless attained equivalent skills and knowledge on their own. In a nationwide survey in the 1980s, however, fully 30 percent of the high school graduates tested could not pass the GED. A 30 percent failure rate in surgical operations, for example, or in bridge-building or in cab-driving, would be justly recognized as an immense scandal. It is only in education that such a failure rate is accepted as normal.

Americans are less well-educated than they were in the mid-19th century, a time when most Americans were farmers, and education was far more important as a means of producing competent citizens and fulfilled individuals than it was as vocational preparation. Most Americans got their vocational education at home, helping their parents and siblings run the family farm.

We still need competent citizens and fulfilled individuals, but now we also need workers adapted for a world in which unskilled, semiskilled and even skilled work is becoming more fully automated each day. One man operating an electric crane lifts pallets of sheetrock three to 10 stories from a truck in the street and deposits them on the floor through an open window. He performs a task that once required several manual laborers. On the railroads, freight brakeman are replaced by sensors mounted on the rearmost coupling. In factories, welders have been succeeded by robots. Increasingly, our most important resource is human intelligence — and educated workers.

There remain, however, skilled and unskilled jobs for which no machines are competent, and the individuals who perform these jobs need to be compensated appropriate to their needs and dignity. Teaching, by the way, is one of those professions for which we need not expect machines to provide a substitute.

It is essential that colleges and universities — by maintaining admissions standards and by educating teachers who are more, not less, able and learned than the average student — provide the necessary conditions for training a workforce for high-technology industries.

Developing technology

Higher education also has a key role to play in developing technologies that will employ the students we educate. That is, we must engage in basic research and then in the technology transfer that will transform research ideas into new products and thus create businesses that provide new jobs. Europe and Japan are far ahead of us in integrating the work of universities and industries in such endeavors.

It seemed for a time that the United States had finally decided to pursue high technology in an intelligent fashion when the federal government approved development of the Superconducting Supercollider, better known as the SSC. The legislation was far from perfect, because Congress specified that a large part of the project would have to be subsidized by foreign countries, which would then share in the fruits of the research. To go it alone, the United States would have had to put up $10 billion, which would hardly have been a great burden for our country. In the context of a $300 billion military budget, this was something we could readily afford. And the research done to build the SSC — as well as the research that might be undertaken afterwards — would clearly be of benefit to the military.

A 30 percent failure rate in surgical operations or in bridge-building or in cab-driving would be justly recognized as an immense scandal. It is only in education that such a failure rate is accepted as normal.

More importantly, the SSC provided an opportunity for scientific breakthroughs on the fundamental nature of the universe. It would have created collisions that simulate the state of the universe a millisecond after the Big Bang. It would have allowed us to see whether the four forces now known to exist were once a single force. That is, the SSC would have allowed us either to answer some of the most important questions remaining in physics or to vastly increase our knowledge while failing in that effort.

All that scientific discovery aside, the nation would have profited technologically and economically from the discoveries required just to build the SSC. These discoveries would have put the United States decades ahead technologically and ensured our growing prosperity in an increasingly competitive world for the next 50 years.

The SSC would have created immense side benefits. The tunneling industry, for example, would have been transformed. (Chicago spent $1 billion — one-tenth the cost of the entire SSC — just to re-tunnel some of its basic water mains.) New elevators would have to be conceived; magnetic technology would be substantially advanced; air conditioning technology transformed. We would have had to learn ways to level out electrical current, which would have resulted in savings in the provision of electrical power throughout the country.

To align the circle of magnets involved in the SSC, we would have had to use lasers of greatly enhanced capacity. In the process, we would have made major improvements in superconducting magnet technology that would have been profoundly useful in developing magnetic-levitation trains. We would have had to develop supercomputers well beyond anything we currently have. In short, we would have changed the technology of this country and put thousands of people to work in the process. In Massachusetts alone, 300 companies were working on the SSC when it was canceled. Moreover, New England would have been very well-placed to win a $1.5 billion contract for SSC magnets.

Why was the SSC canceled? Partly out of political expediency. The SSC was being built in Texas, and when Rep. Jim Wright of Texas stepped down as speaker of the House, the project lost its best friend. And the Democrats decided to punish Texas for electing a Republican senator. Incredibly, despite the involvement of so many Massachusetts colleges and universities, companies and individuals, just one member of the Bay State's congressional delegation, Rep. Peter Blute, voted for the SSC. Soon after, the voters retired him.

Other forces also worked against the S
Many scientists, working on relatively small
jects, feared that the SSC would be a cor
for National Science Foundation mon
in the manger, they failed to consider
dreds of young physicists put to work
the SSC, then left stranded by the ca
the project. These unemployed ph

sent intellectual capital that we cannot afford to waste. But scientists pursuing their own selfish, parochial interests went to Washington to testify against the SSC. And the shortsighted contractors who were building it were delighted to lobby for — and receive — an $800 million bonanza for the project's cancellation.

Here, the nation's interests and long-term goals were forfeited. The fruits of Yankee ingenuity were simply cast aside for petty short-term, small-bore financial gains. We lost a part of our future — innumerable jobs and immeasurable financial returns — and contributed to continued transfer of American technologies to overseas businesses.

A bright spot

One bright spot in U.S. technological development is photonics, a field in which the United States still has a shot at world leadership. Photonics is analogous to electronics: the photon, or particle of light, is the basic particle in photonics, just as the electron is in electronics. An apt definition of photonics is *the use of light particles to make money*. Photonic devices are increasingly present in our daily lives, the best-known being the laser, which makes possible fiber optics and bar codes.

Already one-fifth of U.S. photonics companies are in New England; one-tenth in Massachusetts alone. Photonics — projected to be a $300 billion industry within 10 years — presents New England with the chance to develop a new industry that could become as dominant and as prosperous as textiles, shoes and computers once were.

The U.S Navy has sponsored the construction of a Photonics Center at Boston University, where university researchers and regional companies are making a major effort to encourage photonics development throughout New England.

Boston University also has formed an association with the Fraunhofer Institute of Germany to establish a state-of-the-art manufacturing laboratory, where local and regional entrepreneurs can use the latest high-technology manufacturing techniques without having to come up with the capital to buy these extraordinary instruments. An entrepreneur who has a useful idea, but does not know how to make it into a product, can consult with engineers and scientists at BU and use the Fraunhofer Institute's $10 million worth of advanced equipment and machinery to make a prototype. Through engineering, computing and scientific expertise, the marriage of photonic processes and plastics, a prototype that would have required months to develop with old technologies can be produced in only a few weeks.

With access to this expertise and these expensive machines, a startup company can save perhaps $2 million and more than a year's time in developing a basic idea into a commercial product. This boost to technology transfer shortens the difficult time before startup companies can finance further development through initial public offerings. This acceleration in the development of companies is a direct contribution by universities to the region's workforce. It helps create jobs and thus supports the workforce.

Shortsighted contractors who were building the Superconducting Supercollider were delighted to lobby for — and receive — an $800 million bonanza for the project's cancellation.

The United States, without such support from colleges and universities, will continue to be a textbook case of the folly by which brilliant innovations, conceived in this country, have been brought to market not here, but elsewhere. The VCR is an American invention, but a Japanese commodity. Magnetic-levitation trains were invented in the United States, and this country, with its vast and empty distances, is ideally suited to mag-lev technology. But the technology is being developed in Germany and Japan. Through initiatives such as the Photonics Center and the Fraunhofer Institute, Boston University aims to avert such dreadful examples in the future.

Another area in which New England has an edge is biotechnology. New England's billion-dollar biotech industry is second only to that of the San Francisco area. In recent years, the industry's revenues have increased by more than 50 percent annually. In Massachusetts alone, 160 biotech firms employ 16,000 people. These companies are transforming medicine, food production and indeed human existence. New England, with the world's greatest concentration of educational institutions, should be the center of this remarkable wave of transformation.

As that wave progresses, universities will play an essential part. But we shall need much more help from industries in defining what they require in their workforces. As chairman of the Massachusetts Board of Education, I want to see industry after industry tell us, in specific terms, what they want their employees at all levels to know and be able to do, so we can design curricula and standards to help achieve those objectives.

For the Board of Education alone to invent a series of curricula and standards to meet the diverse needs of industry would be extraordinarily expensive and time-consuming and would likely produce a totally inadequate result. But if we listen to those who each day make a success of our complex industrial society, we can, in a comparatively short time and at modest expense, come up with first-class blueprints for educating the workforce we need.

Work ahead

In some respects, higher education serves the needs of the workforce very well. We train the intelligences that account for America's lead in technological innovation. Even though the United States has become a magnet for future scientists and engineers from around the world, there can be little doubt that if we were forced into an educational autarchy, we would retain our extraordinary intellectual base. We lead the world in the production of physicians. We also turn out an oversupply of lawyers. And we prepare more than ample numbers of writers, performers, television cameramen, production personnel and journalists.

Higher education also performs the basic scientific research that creates tomorrow's industry's and jobs.

But we fail the workforce by not insisting on high standards for admission into colleges and universities and by tolerating mediocrity in our education schools.

It will be very difficult for us to improve on what we already do best, but it would be very easy for us to do better in the areas in which we currently fail. Our work is cut out for us.

John Silber *is chancellor of Boston University and chair of the Massachusetts Board of Education.*

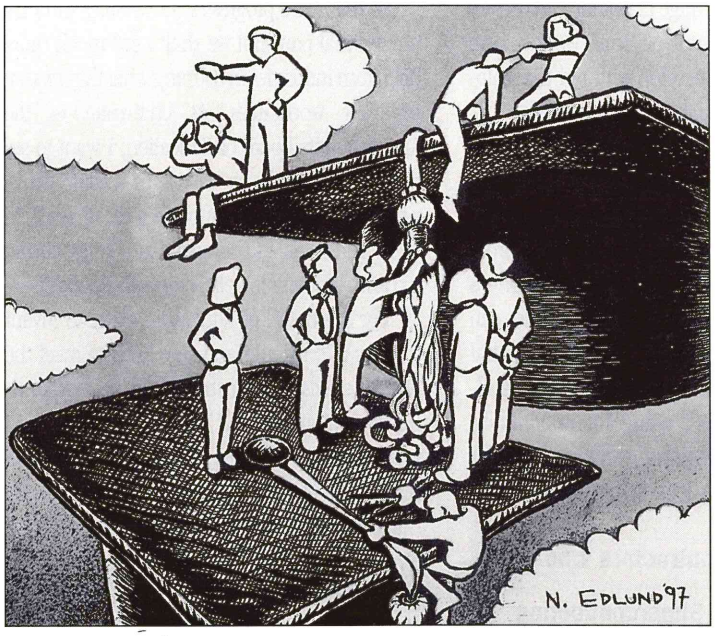


Illustration by Nick Edlund.

Transfer articulation and dual acceptance agreements aimed at easing transfer between community colleges and four-year institutions provide a logical educational continuum in a region whose economy demands ever-increasing levels of educational attainment. And they help cut the cost of earning a bachelor's degree.

Baccalaureate Bound

ELEANOR M. MCMAHON

Collaboration among schools, community colleges, four-year colleges and graduate schools has emerged as a key strategy in higher education. Easing the transition of diverse student populations from one level of education to another expands access to higher education in a period when the great majority of new jobs will require at least two years of college.

More specifically, as we move into the 21st century, a central challenge facing higher education is to enhance the transferability of students from community colleges, typified by open admissions and low cost, to four-year institutions.

By spending the first two years of bachelor's degree study at a community college, a student can significantly reduce overall college costs. And because community colleges typically enroll larger percentages of disadvantaged and minority students than other kinds of institutions, expanding transferability from two- to four-year institutions will also expand access among underrepresented groups.

The Community College of Rhode Island, New England's largest two-year college, has taken a leadership role in transfer articulation.

More than 15 years ago, the Rhode Island Board of Governors for Higher Education adopted a policy for articulation and transfer among the state's three public higher education institutions. While the initial purpose of the Rhode Island Articulation-Transfer Agreement was to facilitate transfer from the Community College of Rhode Island to Rhode Island College and the University of Rhode Island, the process has in fact significantly smoothed transfer to other four-year institutions — both within the state and beyond.

Each of the state's three public institutions has an officer who coordinates all activities related to articulation-transfer and serves on an interinstitutional Articulation-Transfer Committee. The committee is composed of 10 members, three from each of the three public institutions, and a chairperson from the Office of Higher Education. The committee is responsible for continually evaluating and reviewing institutional programs, policies, procedures and interinstitutional relationships that affect the transfer of students, as well as updating the *Transfer Guide for Students*. The guide, reissued annually, categorizes all courses as equivalent to either an identical course in the receiving institution, a department elective fulfilling requirements of a major or minor, a free elective or a general education requirement.

How successful is the Rhode Island Articulation-Transfer Agreement? In 1995, 1,201 CCRI graduates transferred to a four-year college or university, and the self-reported transfer

rate among 1995 CCRI graduates was 38 percent — roughly twice the national average.

Articulate

Building on that base, CCRI in the fall of 1995 initiated the Baccalaureate Bound program specifically designed to appeal to college-prep high school students who plan to earn at least a bachelor's degree after graduation.

Baccalaureate Bound offers qualified students the opportunity to pursue the first two years of a bachelor's degree at the low-cost CCRI with the promise of smooth transfer to a four-year institution.

When Baccalaureate Bound was initiated in 1995, 34 students enrolled. Last year, the college introduced more rigorous entrance requirements designed to attract the more qualified high school senior who might not ordinarily choose the community college, and the program accepted 15 students.

To qualify, students must be nominated by high school guidance counselors and have an overall high school grade point average of 2.75 or a combined SAT score of at least 900. Once at CCRI, Baccalaureate Bound students must attend full-time, qualify for special honors classes and maintain a minimum GPA of 2.75 to 3.00, depending on the requirement of the four-year institution to which they are headed.

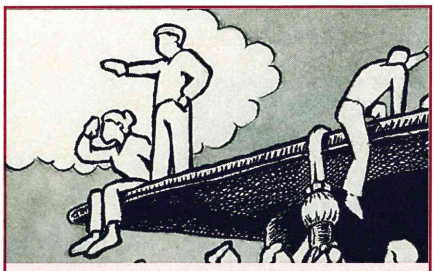
The transfer process begins as soon as the student is accepted into the program and identifies the four-year college or university with which CCRI has an agreement that he or she wishes to attend.

Each student is assigned to a faculty mentor in his or her career field. And Baccalaureate Bound students are expected to undertake honors projects in their courses and participate in extracurricular enrichment activities such as community service.

CCRI has dual acceptance agreements with 54 colleges and universities in New England and beyond, as well as pending agreements with an additional 19. In most instances, transfer of credit is guaranteed as long as the student complies with agreed-upon criteria, such as the maintenance of a specified GPA and enrollment in certain required courses.

Four-year institutions that have entered into such agreements include Boston University, Bridgewater State College, Regis College, Stonehill College, the University of Massachusetts at Amherst, Worcester Polytechnic Institute, Southern Connecticut State University, New York Institute of Technology and Virginia Union University, as well as Rhode Island's state college and university and Bryant College, Providence College, Salve Regina University, the New England Institute of Technology, Johnson & Wales University and Roger Williams University.

If a student expresses an interest in a four-year college or university that has not entered into a transfer agreement with CCRI, Baccalaureate Bound program administrators contact the institution in an effort to arrange an individualized guarantee of acceptance.



Transferring...

More than 40 percent of students who began their postsecondary studies at two-year institutions in 1989-90 had transferred to another school by 1994, according to an American Council on Education analysis of U.S. Department of Education data. But just over 20 percent transferred to four-year institutions.

The analysis also revealed that community college students who transferred to four-year institutions spent 20 months on average at their first school and took 21 months off before enrolling in the four-year institution.

Massachusetts Tuition Advantage

In Massachusetts, the Joint Admissions Tuition Advantage program provides a 33 percent tuition discount to eligible community college graduates who transfer to selected programs in state colleges and the campuses of the University of Massachusetts.

A student at Bristol Community College, for example, can complete a two-year associate degree program in elementary education for about $2,400 a year in tuition and mandatory fees. As long as the student maintains a B average, he can transfer, for example, to Bridgewater State College's elementary education program as a full junior and benefit from an $850 discount off the state college's $3,400 in tuition and fees.

Some UMass trustees expressed reservations about signing on to the program, noting that students who had entered UMass as freshmen and maintained B averages would not enjoy the same tuition discount.

A Two-Year Start

One in every 10 science and engineering doctorates awarded between 1991 and 1995 went to students who began their undergraduate studies at two-year colleges, according to the National Science Foundation. Notably, 16 percent of Native Americans and 14 percent of Hispanics who earned Ph.D.s in science and engineering fields started out at community colleges.

Benefits

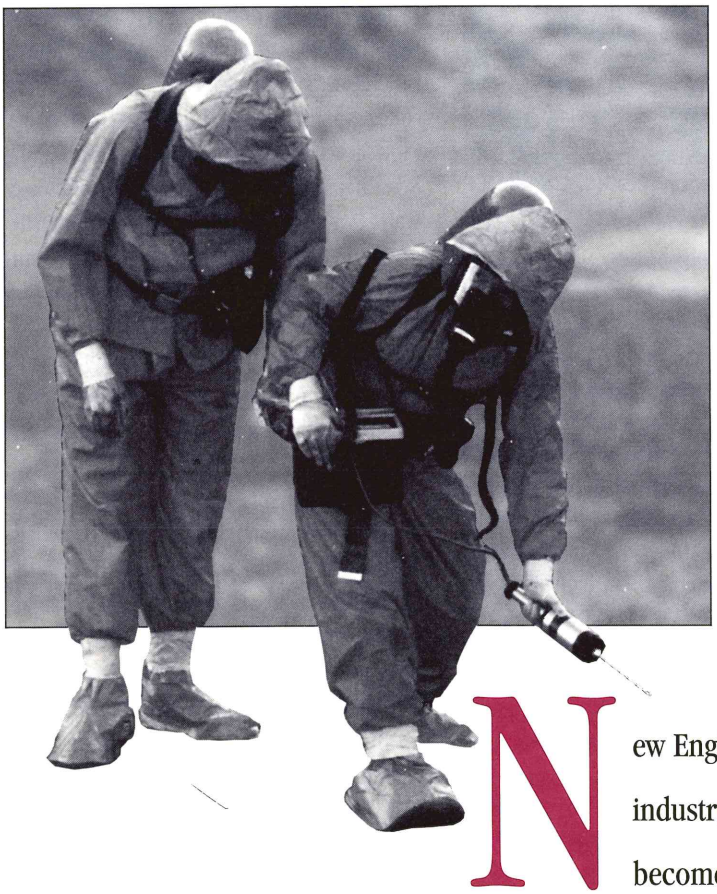
In a period in which the high cost of a college education is of major concern, the Baccalaureate Bound program is extraordinarily attractive. In most instances, the program will result in at least a 40 percent reduction in the cost of earning a bachelor's degree.

In addition, "late bloomers" receive special help at the community college level, which in many instances, enables them to enter a college or university that otherwise would not be accessible to them as high school seniors.

Four-year institutions benefit by admitting students who are well-prepared and focused and who, in many cases, fill gaps in the junior and senior classes. Indeed, many of the cooperating institutions earmark scholarships ranging from $1,000 to $5,000 to CCRI graduates.

Finally, the program fosters unprecedented levels of communication and cooperation among faculty at secondary schools, CCRI and four-year colleges and universities. Baccalaureate Bound founder John J. Sbrega, former associate dean for academic affairs at CCRI, observes that it is indeed rewarding to find "secondary school faculty nominating outstanding students in specific fields to CCRI faculty." It is equally rewarding to know that such interinstitutional cooperation and dialogue will continue through the four-year college level and that the students involved are therefore — truly — Baccalaureate Bound.

Eleanor M. McMahon *is a distinguished professor at the Taubman Center for Public Policy and American Institutions at Brown University and chair of the New England Board of Higher Education.*



New College Grads Could Clean Up: Landing a Job in Environmental Consulting

CHARLES ANDERSON

New England's $300 million environmental consulting industry is going through significant change as its services become less of a mystery, and its customers seek more for less. As this new competitiveness forces environmental companies to reformulate their business, it also provides an opportunity for entry-level workers.

In the late 1980s, environmental companies such as Groundwater Technology of Massachusetts, didn't need entry-level people; they needed experienced project managers. Anyone with 10 or 15 years experience could name his or her price and go anywhere in the industry. Today, these same people have bull's-eyes on their backs. Firms are asking, "How many experienced people can we pay for?" Or more aptly: "How many experienced people will my customers pay for?"

In the old days, a customer would be delighted to hear that a geologist and a professional engineer would be assigned to manage his project full-time. Today's customer asks: "How many hours are you going to charge me for this consultant?" As a result, some project managers juggle 10 or 15 projects at a time, spending two or three hours a week on each, because that's all the customers can afford.

Today, no matter how good the environmental firm, its bid must be within 2 or 3 percent of the low bid on any given project or it won't get the job.

This consumerism makes it incumbent upon environmental firms to find the right people for the right jobs, including entry-level people. In fact, companies that want to stay in business will have to swap experienced people for entry-level workers as a matter of economics. The industry could not be called robust — we're certainly not talking hundreds of thousands of jobs — but the number of entry-level positions will increase, even as higher-level people will be laid off.

Hard science

What does the environmental industry look for in entry-level people? Primarily science skills. Hard sciences — chemistry, biology, geology — and engineering are generally preferable to environmental science. If a student is majoring in environmental science, he should minor in a hard science, because there's a perception among people in the industry that environmental science programs are soft sciences — that environmental science majors don't want the rigor of a hard science. Clearly, completing courses such as physical chemistry will bolster the young environmental scientist's effectiveness — and job prospects.

Entry-level professionals also need strong computer skills, including facility with word processing, database management and spreadsheets, as well as familiarity with the Internet, where an increasing amount of environmental business is conducted. TRC Companies, for example, uses the Internet to communicate with customers and gather project information that can make its proposals more competitive. Colleges and universities should require students to learn computer skills, because without them, graduates won't be hired.

Teamwork and communication skills are also crucial. Nobody closes the door and spends all day working in the confines of his office. We're constantly dealing with one another and with clients. There's no room for prima donnas in the industry anymore. Indeed, environmental service companies are looking to hire not only good scientists, but more importantly, people who can talk to customers, who can listen to them and offer solutions to their problems. College environmental programs should encourage students to work in teams in the classroom because that's what happens in the real world.

Little training

Moreover, environmental consulting companies don't "train" people in the traditional sense. Yet, the surest way to keep talented employees is to help them move up in their careers. The best strategy is to have an entry-level worker learn at the side of an experienced professional who knows the ins and outs of the business. Other strategies are needed too. TRC offers employees tuition reimbursement for approved courses and cross-training, so employees learn to do a variety of things: site work, lab work or supervising. We mix it up, so employees eventually have a portfolio of skills that allows them to be employable anywhere. There's always the risk that they will leave, but they don't, because they are challenged, appreciated and afforded the opportunity to work on diverse jobs.

Moreover, an entry-level job applicant who wants to be taken seriously in the environmental industry should have completed the 40-hour Occupational Safety and Health Administration (OSHA) program. People can't work on-site without this OSHA certification, and if they can't go on site, they're useless to an environmental firm. Why would a firm spend $1,000 to put a new employee through the OSHA program while paying his salary, when the company could hire somebody who already has gone through the program and could start earning his pay on Monday? Higher education institutions should make the 40-hour OSHA program a requirement — preferably during sophomore year as the University of Massachusetts at Amherst has. That way, students can get jobs during the summers following sophomore and junior year.

New environmental professionals also should be flexible, because first-year workers in the environmental industry do what nobody else wants to do: run water samples, test wells, watch drillers and so on. Even professionals with Ph.D.s should expect to spend time in the field if they expect to become good project managers. Fieldwork teaches people to anticipate and plan for contingencies, such as what to do when that flat place where the plans call for a concrete pad turns out to be a hill.

Entry-level workers should be willing to do anything. All environmental firms are understaffed, so there are a lot of things to be done. If you want to get ahead, raise your hand. "Can I do that? Can I try this?"

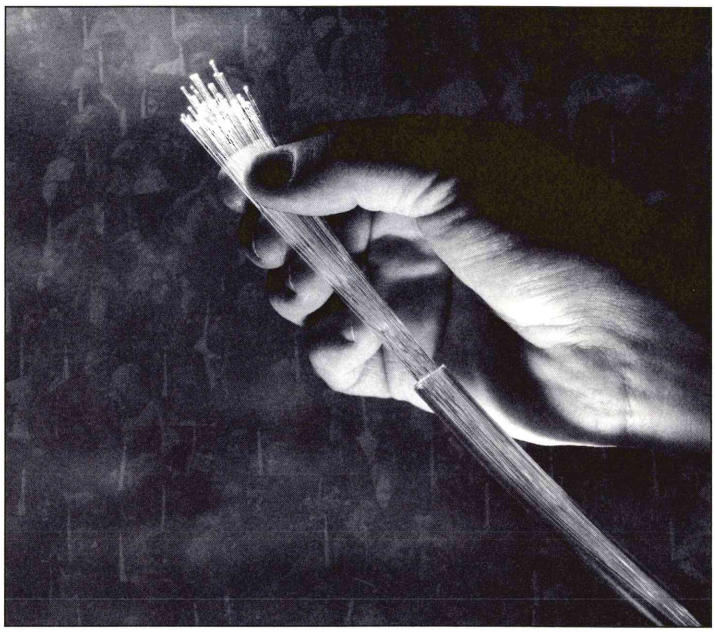
Landing a job

How do you get a job? An internship or cooperative education experience is one way. Previous experience with state agencies is also a big plus. State agencies historically have hired entry-level people and provided them with good formal training opportunities. Many environmental professionals have used the state experience as a jumping-off point.

Above all, people interested in environmental careers need to persevere. We hire people, not resumés. We hire that spark that comes through when someone says, "Give me a chance, I'll show you I can do it." Successful organizations make such "opportunistic hires" if they have a feeling that somebody can really add fire and spark.

Indeed, even experienced workers can withstand the new pressures on them by following the beginner's course of action: volunteer, show flexibility, express a willingness to expand job responsibilities, and above all, demonstrate a focus on the customer.

Charles Anderson *is vice president for human resources at TRC Companies Inc., and chair of the Human Resources Committee of the Environmental Business Council of New England.*



FOTEP: Initiative Teaches Teachers while it Bolsters an Emerging Industry

FENNA HANES

Through history, each new wave of information technology has overtaken the last. Wire telephony replaced wire telegraphy, coaxial cable replaced copper wire, satellites overtook coaxial cable and now, in many instances, fiber optics is superseding satellites. No one knows the full potential of fiber optics technology. But one thing appears certain: fiber optics and related telecommunications and photonics industries are poised for growth.

Today, a single fiber optic line can provide all the essential capacity for an array of communications functions from telephones and faxes to security alarms and computer data links. The lightweight cable also has important applications in television, electric power generation, transmission and distribution of energy, broadcasting and medicine.

Doctors use fiber optic instruments to look into previously inaccessible areas of the body, and laser surgery, dependent in large part on fiber optics, is now commonplace. The military, with its special requirements for security, ruggedness and reliability, uses fiber optics in aircraft, ships and tanks, and in devices that make wiretapping and eavesdropping more difficult. Stock markets take advantage of fiber's increased communications capacity and reliability to reduce the risk of debilitating disruptions in financial markets. Automobiles increasingly use the lightweight fiber to illuminate dashboard components. Bar code readers at check-out counters are a more familiar application.

Moreover, because light transmission through fiber is affected by external changes in heat or pressure, fiber optic components can act as very effective sensors. Fiber optic sensors make possible a range of applications, such as highly accurate, real-time measurements of oxygen and carbon dioxide in blood.

Job generation

Clearly, fiber optic technology has profound implications for New England's economy.

In Massachusetts alone, the related telecommunications industry grew from about $11 billion in sales in 1993 to nearly $43 billion in 1996, according to a study conducted for the Massachusetts Telecommunications Council by Craig Moore, a professor of finance and operations management at the University of Massachusetts at Amherst.

During that period, telecommunications businesses added 34,465 new jobs in Massachusetts — nearly one of

every five new jobs created in the Bay State — bringing total employment in the industry to 90,876, according to the study. At least 30,000 additional Bay Staters manage telecommunications networks or provide telecommunications services though they work in other industries.

Nationally, demand for technicians in the photonics industry, of which fiber optics is a subset, is projected to grow from today's approximately 345,000 employees to 743,000 by the year 2000, according to a 1994 survey by the Center for Occupational Research and Development, a Texas-based national organization involved in training and retraining.

Educating educators

As the 1990s dawned, less than a handful of New England colleges offered any curricula in fiber optics. Where would the fast-growing industry find skilled technicians?

In 1995, the New England Board of Higher Education (NEBHE) received National Science Foundation (NSF) support for the Fiber Optic Technology Education Project, or FOTEP. The goal: to support the burgeoning New England fiber optics and photonics industries by helping high school teachers and two-year and four-year college and university faculty introduce new fiber optics curricula into existing educational programs.

The FOTEP concept was to "teach teachers" through a combination of weekend introductory workshops followed by week-long workshops over a three-year period.

FOTEP workshops featured lectures, technical instruction through laboratory exercises, product demonstrations by industry representatives and industry site visits.

Professional development

From the start, FOTEP was designed to be a fully collaborative effort. Three experienced faculty members drawn from a four-year college, a technical-community college, and an institute of technology, formed the nucleus of the project team and served as FOTEP instructors, with assistance from a representative of the education committee of the New England Fiber Optic Council, a regional trade association.

The first step was to overcome the problem of educators' severely lacking professional development budgets. It is not uncommon for three-day technical workshops to charge registration fees of $2,000 for more — out of reach for many New England teachers and faculty. (At one Massachusetts vocational technical high school, a paltry $190 was allocated for each teacher's outside training per year. Massachusetts community college instructors, meanwhile, are eligible for professional development stipends worth 2.5 percent of their salaries. But this amounts to just $1,040 over two-and-a-half years for the average instructor. And in any case, many instructors are not aware of the stipend program.)

Recognizing the bleak professional development budget picture, FOTEP charged no registration fee for workshops, and the NSF grant covered participants' accommodations. The only requirement for participants was a commitment of personal time to upgrading technical skills and a demonstrated ability to integrate what they learned from the project into their existing curriculum. Twenty-four high school teachers and 24 two-year and four-year college instructors were selected from a New England-wide applicant pool of more than 100 individuals.

The first four introductory workshops were held at community-technical colleges in Maine, Connecticut and Massachusetts during the fall of 1995 and spring of 1996. In the summer of 1996, Wentworth Institute of Technology, which has one of the region's best-equipped fiber optics laboratories, hosted two one-week workshops. Springfield Technical Community College's state-of-the-art laser electro-optics laboratory was the site for the two advanced week-long workshops in summer 1997.

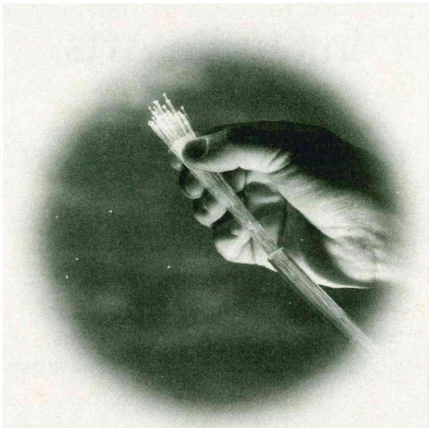
To help participants implement what they learned in the workshops, FOTEP instructors provided technical assistance throughout the duration of the project.

Affordable equipment

In addition, maintaining and upgrading laboratories is a major challenge for many colleges and universities. And getting the first donation is the most difficult.

Nicholas Massa, FOTEP principal investigator and director of the Laser Electro-Optics program at Springfield Technical Community College, notes that companies are more likely to donate equipment to technical education programs with solid reputations and established track records, so a commitment to build and maintain a state-of-the-art technology laboratory requires perseverance and time.

FOTEP offered participants' institutions a jumpstart. The NSF funding provided $2,000 for equipment, but required each FOTEP participant's campus to match the grant for a total



Son of FOTEP?

FOTEP and telecommunications initiatives at New England institutions such as Springfield Technical Community College have borne fruit.

In September 1997, the National Science Foundation approved a three-year, $3 million grant to create a new Northeast Center for Telecommunications Technology to develop new curricula and teaching materials for associate and bachelor's degree programs in telecommunications technology.

The center — a partnership among NEBHE, Springfield Technical Community College, Hudson Valley Community College in New York, Minuteman Regional Technical High School in Massachusetts and Bell Atlantic Corp. — will be housed at the Springfield campus.

The center will work with five four-year colleges and universities, 14 community-technical colleges and 14 high schools in New England and New York, as well as private telecommunications companies, to develop curricula in the fast-growing field.

of $4,000. The equipment then became the permanent property of the participant's institution.

Project outcomes

FOTEP alumni offer glowing assessments of the program. John Campbell, professor of electronics technology at New Hampshire Technical College at Nashua and retired IBM systems engineer, says FOTEP gave him an opportunity to increase his theoretical knowledge of fiber optics technology.

Campbell, who initiated New England's only existing daytime associate degree program in telecommunications, notes that theory is important in getting students to conceptualize and isolate problems — skills that are in high demand in industry. With his new theoretical knowledge, Campbell is expanding his course at the college from four weeks to eight weeks and has plans for a 16-week unit.

Another retired engineer, Joe Casazza, now an electrical technology instructor at Essex Junction Technical Center in Vermont, met requirements toward his final teaching certification through FOTEP participation. He plans to introduce new curricula into his telecommunications course. Moreover, the Essex Junction Center was included as a secondary participant in another major NSF-funded project, the Northeast Center for Telecommunications Technology. (See sidebar.)

Judith Donnelly, a member of the physics faculty at Three Rivers Community-Technical College in Norwich, Conn., used her FOTEP experience to create an accredited associate degree program in photonics technology — and the state's fast-growing photonics industry is, by all accounts, impressed.

At the Southeastern Vermont Technical Center, meanwhile, FOTEP alumn Jeff Renard worked with industry to develop a fiber optics technician certification program, leading the Vermont Department of Education to name Renard's electronics program the best in the state.

Multiply the accomplishments of these four educators by 12, and you begin to see the scope of FOTEP's impact on New England's education and economic environment.

Fenna Hanes *is project director of NEBHE's New England Technical Education Partnership.*

Photo by Caroline Kelly.

A Ticket to Ride: Campuses Look to Forge Public Transit Links

ALAN R. EARLS

College administrators and public transportation officials increasingly find themselves sharing an interlocking set of interests. When college students have easy access to buses and trains, they use them — and transit systems succeed or fail based on ridership. Also, good transit links connect students to their host communities, enrich college life — and may even help institutions attract full- and part-time students. After all, for many students, tuition charges are high enough, without the added cost of buying and maintaining a car.

Not surprisingly, many campuses and transit authorities are making connections. Among the most substantive initiatives, a partnership among Florida State University, Florida A&M and the Tallahassee municipal transit system features "free ride" zones for college students with valid identification.

And last year, Marquette University and the Milwaukee County Transit Systems signed an agreement to provide a universal bus pass to all full-time undergraduates. Marquette officials say the impact of the "UPass" program, providing unlimited travel on the system's buses, has been phenomenal. In 1995, 60 percent of Marquette students reported that they *never* rode the bus. In 1996, a few months into the UPass program, 70 percent of students reported riding the bus at least once a week, many of them riding to and from jobs.

Various town-grown-transit initiatives are in place in New England, as well. In the mid-1980s, the University of Vermont, Trinity and Champlain colleges, and a university-affiliated medical center teamed up with the City of Burlington to form the Campus Area Transportation Management Association, whose mission includes not only public transit, but also coordinated land use and joint planning and management of parking facilities.

In western Massachusetts, a bus system operated jointly by the Five Colleges Consortium and the local Pioneer Valley Transportation Authority tightly links the campuses of Mount Holyoke, Smith, Amherst and Hampshire colleges and the University of Massachusetts at Amherst. Merrimack College in North Andover, Mass., meanwhile, has forged an agreement with the Merrimack Valley Regional Transit Authority to provide direct service onto the college campus.

Transportation Resources

Following is a partial listing of New England transit authorities and other organizations involved in public transportation.

Connecticut

Bristol Transit District
Bristol, Conn.

Capitol Region Council of Governments
Hartford, Conn.

Connecticut Department of Transportation
Newington, Conn.

CT Transit
Stamford, Conn.

Greater Bridgeport Transit District
Bridgeport, Conn.

Greater Hartford Transit District
Hartford, Conn.

Greater New Haven Transit District
Hamden, Conn.

Greater Waterbury Transit District
Waterbury, Conn.

Housatonic Area Regional Transit Authority
Danbury, Conn.

Middletown Transit District
Middletown, Conn.

Milford Transit District
Milford, Conn.

New Britain Transportation Co.
New Britain, Conn.

Northeast Transit Co.
Meriden, Conn.

Northwestern Connecticut Transit District
Torrington, Conn.

Norwalk Transit District
Norwalk, Conn.

Scooter Transit
Hartford, Conn.

Southeast Area Transit
Norwich, Conn.

Windham Regional Transit District
Willimantic, Conn.

Maine

Bangor Area Comprehensive Transportation Study
Bangor, Maine

Greater Portland Transit District
Portland, Maine

Lewiston-Auburn Transit Committee
Auburn, Maine

Maine Department of Transportation
Augusta, Maine

South Portland Bus Service
South Portland, Maine

Southern Maine Regional Planning Council
Sanford, Maine

Massachusetts

Berkshire Regional Transit Authority
Pittsfield, Mass.

Brockton Area Transit Authority
Brockton, Mass.

Cape Ann Transportation Authority
Gloucester, Mass.

Cape Cod Regional Transit Authority
Dennis, Mass.

Franklin Regional Transit Authority
Greenfield, Mass.

Greater Attleboro-Taunton Regional Transit Authority
Attleboro, Mass.

Greenfield Montague Transportation Authority
Greenfield, Mass.

Lowell Regional Transit Authority
Lowell, Mass.

Martha's Vineyard Transit Authority
Edgartown, Mass.

Massachusetts Bay Transportation Authority
Boston, Mass.

Massachusetts Executive Office of Transportation and Construction
Boston, Mass.

Merrimack Valley Regional Transit Authority
Bradford, Mass.

Metropolitan Area Planning Council
Boston, Mass.

Montachusett Regional Transit Authority
Fitchburg, Mass.

Nantucket Area Transit Authority
Nantucket, Mass.

Pioneer Valley Transit Authority
Springfield, Mass.

Southeastern Regional Transit Authority
New Bedford, Mass.

Worcester Regional Transit Authority
Worcester, Mass.

New Hampshire

Cooperative Alliance for Seacoast Transportation
Durham, N.H.

Manchester Transit Authority
Manchester, N.H.

Nashua Transit System
Nashua, N.H.

New Hampshire Department of Transportation
Concord, N.H.

Rhode Island

Rhode Island Department of Transportation
Providence, R.I.

Rhode Island Public Transit Authority
Providence, R.I.

Vermont

Advance Transit
Wilder, Vt.

Town of Brattleboro
Brattleboro, Vt.

Chittenden County Transportation Authority
Burlington, Vt.

Marble Valley Regional Transit Authority
Rutland, Vt.

Vermont Agency of Transportation
Burlington, Vt.

Regional

Center for Transportation Studies
Massachusetts Institute of Technology
Cambridge, Mass.
Transportation policy institute

National Corridors Initiative
(formerly Northeast Corridor Initiative)
Providence, R.I.
Advocates of expanded rail transportation

New England University Transportation Center
Massachusetts Institute of Technology
Cambridge, Mass.
Transportation policy research consortium affiliated with U.S. Department of Transportation

Northern New England Passenger Rail Authority
Augusta, Maine
Maine agency working on expanded rail transportation between Boston and Portland

TrainRiders Northeast
Portland, Maine
Advocates of expanded rail transportation

Transportation Institute
University of Connecticut
Storrs, Conn.
Transportation policy institute

John Volpe National Transportation Systems Center
U.S. Department of Transportation
Cambridge, Mass.
U.S. Department of Transportation Center

A T party?

Ironically, the campus-intensive Boston area, which is served by the region's largest transit system — the Massachusetts Bay Transportation Authority (MBTA) — has been largely devoid of campus-oriented public transportation initiatives. But the MBTA's new general manager, Robert Prince, says the "T," as the system is known, is ready, willing and able to "make a deal."

Already, trolley service along the tendrils of the MBTA Green Line links stations serving — and indeed bearing the names of — Boston University, Boston College and Northeastern University. And the Green Line fare structure helps students travel back and forth to class with rides free in one direction within certain zones.

But Prince says there are more opportunities to meld college and transit resources. "If Harvard or any other college came to us and said that they could guarantee a certain number of passes, we would be glad to provide a special rate to them." On the other side of the coin, says Prince, Harvard and other institutions should consider entering into "adopt-a-station" arrangements with the T as part of their community relations efforts.

Meanwhile, campus-transit system relations are chugging forward along the MBTA's outer fringes.

For example, the thousands of commuters using the busy MBTA Commuter Rail station in Franklin, Mass., have long presented an enticing potential market for Dean College's continuing education programs. In cooperation with the T, Dean in the early 1990s offered for-credit classes aboard regularly scheduled commuter trains making the 50-minute trip between Franklin and Boston. That experiment was abandoned due to overcrowding on the trains.

But earlier this year, the two-year college struck another deal with the T: Dean set aside 50 parking spaces on its campus for MBTA commuters, and in return, the local station was renamed for the college, enhancing Dean's visibility throughout Greater Boston.

Recalls Dean President Paula Rooney: "Someone said, 'Northeastern has a station, why can't we?' — and I said, 'Why not?'"

Welfare to Work — How?

Suppose jobs become available for large numbers of former welfare recipients forced off the rolls by the end of welfare-as-we-know-it. How will these new workers, many without cars, get to jobs that are increasingly located along New England's highways? Inadequate public transportation is one of the key problems facing welfare–to–work programs, according to a study by a staffer at the U.S. Department of Transportation's John Volpe National Transportation Systems Center in Cambridge, Mass. And New England, says the study's author, has been particularly slow in planning ways to bring former welfare recipients to new jobs.

Transit Map

A geographic information system developed by the Federal Transportation Administration and Bridgewater State College contains comprehensive, computerized maps of the rail lines, bus routes and other fixed transit routes of more than 500 transit systems across the United States. The collaborative now aims to create a GIS database of "dial-a-ride" services for the elderly and disabled, and perhaps special programs for students.

Training

How might three-hour train service between Boston and New York City affect traffic at the region's airports?

Amtrak currently accounts for just 10 percent of ticketed traffic between Boston and New York, but 40 percent of ticketed traffic between New York to Washington, where the three-hour trip is already a reality, according to the National Corridors Initiative.

Similarly, a new Commuter Rail line includes a Bridgewater State College station — located on college property.

Heading north

The larger question of regionwide transit connections among New England's college towns and commercial centers also needs reexamination.

As recently as the early 1950s, the New York, New Haven & Hartford Railroad and the Boston & Maine provided rail access to most areas of the six-state region, and runs between Boston and Vermont, New Hampshire and Maine were a feature of daily life.

More recently, the Portland, Maine-based TrainRiders Northeast, has waged a seemingly quixotic campaign to resurrect train service from Boston to the New Hampshire Seacoast and southern Maine. Now, after a decade of fighting red tape, Wayne Davis, the chairman of TrainRiders Northeast, says a plan to extend Amtrak service to Portland is nearing its final hurdles. Among the beneficiaries: the University of New Hampshire, which has at times argued hard for rail connections to its Durham campus.

Davis observes that rail connections to UNH or the University of Southern Maine — and perhaps someday to Bates, Bowdoin and Colby colleges — would add a cosmopolitan dimension to campus life in northern New England, enabling students and faculty to travel from campus to virtually anywhere in the United States. But he concedes, that the connections will need to be forged one link at a time.

***Alan R. Earls** is a writer based in Franklin, Mass. He is the former editor of Industry magazine.*

Photo of Minority Doctoral Scholars and future faculty by Paula Lerner.

Minority Enrollment in New England: Progress amid Threats

JOHN O. HARNEY

Minority participation in higher education increased dramatically in the first half of the 1990s. Between 1990 and 1995, African-American college enrollment grew by 18 percent nationally and by 25 percent in New England, according to a New England Board of Higher Education (NEBHE) analysis of federal figures. Hispanic enrollment grew by 40 percent nationally and by 45 percent in New England. Native American enrollment grew by 15 percent nationally and by 55 percent in the six states. To be sure, the region's historically "underrepresented" groups have posted big enrollment gains. But hold the applause.

New England's approximately 75,000 African-American, Hispanic and Native American students still represent just 9 percent of the region's total college enrollment — well below their share of New England's 18- to-24-year-old population, which was 12 percent in 1990 and growing. The groups that were underrepresented on New England campuses in 1990 are still underrepresented today, as Table 1 indicates.

Indeed, some of the enrollment gains are the result of demographics, plain and simple. The U.S. population of Hispanic 18- to 24-year-olds surged by 31 percent between 1990 and 1995, and the number of African-American 18- to 24-year-olds grew by 3 percent, while the population of Whites in this "traditional college age" group declined or remained steady.

(Because Asian-Americans, broadly speaking, have not been underrepresented in higher education, they are not included in much of this analysis. Notably, however, the American Council on Education and others have warned that educational attainment varies significantly among Asian-American subgroups, and very high percentages of Cambodian, Hmong and Laotian students have not completed high school.)

In addition, minority underrepresentation has been particularly persistent in certain critical fields. For example, African-Americans, Hispanics and Native Americans com-

TABLE 1
Minority Enrollment: New England vs. the United States, 1986 to 1995

(Percentages indicate share of all enrolled students.)

New England

	1986	1988	1990	1991	1992	1993	1994	1995	As % of 18- to 24-Year-Old Population 1980	1990
African-American*	27,891	30,057	32,326	34,017	36,353	37,578	39,575	40,352	4.3	5.5
	3.6%	3.7%	3.9%	4.1%	4.4%	4.6%	4.9%	5.0%		
Asian-American*	16,103	19,906	24,291	27,053	30,287	31,213	33,500	35,342	0.8	2.5
	2.1%	2.5%	3.0%	3.3%	3.7%	3.8%	4.2%	4.4%		
Hispanic	15,412	18,686	20,989	23,110	25,611	26,716	28,397	30,388	2.8	5.8
	2.0%	2.3%	2.6%	2.8%	3.1%	3.3%	3.5%	3.8%		
Native American*	1,473	2,303	2,610	2,928	3,585	3,233	3,402	4,046	0.2	0.3
	0.2%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.5%		
Minority Total	60,879	70,952	80,216	87,108	95,836	98,740	104,874	110,128	8.3	14.4
	7.8%	8.8%	9.8%	10.6%	11.6%	12.1%	13.0%	13.7%		
Total Enrollment	**777,965**	**805,732**	**818,756**	**823,573**	**828,239**	**816,586**	**807,099**	**802,390**		

United States

	1986	1988	1990	1991	1992	1993	1994	1995	As % of 18- to 24-Year-Old Population 1980	1990
African-American*	1,080,326	1,129,580	1,247,112	1,335,388	1,393,483	1,405,485	1,443,800	1,473,672	12.8	13.5
	8.7%	8.7%	9.0%	9.3%	9.6%	9.9%	10.1%	10.3%		
Asian-American*	447,736	496,688	572,528	637,151	696,812	721,914	773,918	797,359	1.5	3.2
	3.6%	3.8%	4.1%	4.4%	4.8%	5.1%	5.4%	5.6%		
Hispanic	616,521	679,962	782,597	866,572	954,422	985,217	1,056,562	1,093,839	7.4	11.9
	4.9%	5.2%	5.7%	6.0%	6.6%	6.9%	7.4%	7.7%		
Native American*	90,097	92,534	102,786	113,713	118,845	121,167	126,855	131,304	0.7	0.8
	0.7%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	0.9%		
Minority Total	2,234,680	2,398,764	2,705,023	2,952,824	3,163,562	3,233,783	3,401,135	3,496,174	22.6	29.5
	17.9%	18.4%	19.6%	20.6%	21.8%	22.7%	23.8%	24.5%		
Total Enrollment	**12,489,142**	**13,043,118**	**13,819,522**	**14,358,953**	**14,491,226**	**14,253,011**	**14,278,790**	**14,261,781**		

** Non-Hispanic*

Note: Minority totals include only the four groups enumerated in this table. Minority totals from the U.S. Census Bureau include small portions of the population that are classified as non-White but do not fall into the categories listed above. Table does not include enrollment at military academies.

bined earned just 6 percent of the nearly 4,000 bachelor's degrees awarded in engineering by New England institutions in 1995, according to data compiled by the National Action Council for Minorities in Engineering (NACME).

And though the number of engineering bachelor's degrees awarded nationally to minorities reached a record 6,331 in academic year 1995-96, up 7 percent from a year earlier, NACME officials say the rise will not be sustained. The problem is that engineering enrollment among minority freshmen has dropped by 10 percent since peaking in academic year 1992-93.

Unless "retention" is improved, these smaller freshman engineering classes will lead to a drop in minority engineering graduates between 1998 and the year 2000.

NACME attributes the decline in freshman engineering enrollment among minorities to the high costs of an engineering education and the fact that just 6 percent of minority students graduate from high school with the sequence of math and science courses required to enroll in engineering schools. In that sense, lagging minority participation remains a "pipeline" problem, tightly connected to the myriad problems of K-12 education and particularly, the inequality of state funding from one school district to another.

Moreover, a new threat looms. College Board President Donald M. Stewart recently observed: "Common sense suggests that affirmative action policies are making the difference for minority enrollment at four-year colleges and universities." Now, those very policies are under assault.

A federal court ruling banning affirmative action at Texas universities and a California state policy barring consideration of race in graduate admissions at public campuses have had an immediate and chilling effect on admissions of African-American and Hispanic students in certain programs. For example, the University of California at Berkeley School of Law recorded an 81 percent drop in African-American admissions and a 50 percent drop in Hispanic admissions in the first year following elimination of affirmative action (with negligible increases in average qualifications). The California law will affect undergraduate admissions starting next year.

The urban-based, low-cost community colleges of Connecticut and Massachusetts dominate the list of institutions where African-Americans and Hispanics account for the most significant enrollment shares.

Some commentators have suggested that the Clinton administration, which supports affirmative action rhetorically, withhold some of the vast federal support enjoyed by those systems. But no serious threat has been issued by the White House. Administrators in the states have been left to devise creative ways to encourage minority participation within the confines of the law.

New England trends

Tables 2, 3 and 4 show the 50 institutions (among New England's approximately 260) with the largest enrollments of African-Americans, Hispanics and Native Americans *as*

TABLE 2
50 New England Colleges and Universities with the Largest Percentage of African-American Enrollment in 1995
(compared with 1990)

	African-Americans as a % of total enrollment	
	1995	**1990**
Roxbury Community College (Mass.-P)	48.9	66.3
Capital Community-Technical College (Conn.-P)	35.2	25.4
Atlantic Union College (Mass.-I)	30.1	18.4
Cambridge College (Mass.-I)	28.5	22.5
Housatonic Community-Technical College (Conn.-P)	27.1	21.5
Franklin Institute of Boston (Mass.-I)	24.4	9.2
Bunker Hill Community College (Mass.-P)	22.8	14.9
Laboure College (Mass.-I)	19.1	14.4
Gateway Community-Technical College (Conn.-P)	18.8	15.4
Bay State College (Mass.-I)	17.2	5.7
Norwalk Community-Technical College (Conn.-P)	16.1	14.6
Katharine Gibbs School (Mass.-I)	15.5	2.4
Albertus Magnus College (Conn.-I)	13.7	11.2
Mount Ida College (Mass.-I)	13.6	6.4
Castle College (N.H.-I)	13.6	1.4
Aquinas College at Newton (Mass.-I)	13.5	7.9
Hartford Seminary (Conn.-I)	13.2	19.0
University of Bridgeport (Conn.-I)	13.0	8.5
University of Massachusetts at Boston (Mass.-P)	12.6	9.7
Massachusetts Bay Community College (Mass.-P)	12.3	6.2
American International College (Mass.-I)	12.0	6.1
Asnuntuck Community-Technical College (Conn.-P)	11.5	5.4
Mitchell College (Conn.-I)	10.5	4.7
Pine Manor College (Mass.-I)	10.5	3.6
Johnson & Wales University (R.I.-I)	10.4	7.7
Quincy College (Mass.-P)	9.9	6.0
Hesser College (N.H.-I)	9.9	3.4
Springfield College (Mass.-I)	9.5	4.9
Springfield Technical Community College (Mass.-P)	9.1	9.5
Newbury College (Mass.-I)	8.8	14.0
Southern Connecticut State University (Conn.-P)	8.6	5.9
Manchester Community Technical College Conn.-P)	8.4	5.4
Wentworth Institute of Technology (Mass.-I)	8.3	8.0
Andover Newton Theological School (Mass.-I)	8.2	5.0
Lasell College (Mass.-I)	7.9	1.3
Emmanuel College (Mass.-I)	7.9	11.0
University of Connecticut School of Medicine and Dentistry (Conn.-P)	7.8	3.7
Wesleyan University (Conn.-I)	7.6	7.2
Amherst College (Mass.-I)	7.6	6.1
Wellesley College (Mass.-I)	7.4	7.1
Massasoit Community College (Mass.-P)	7.3	6.0
Harvard University (Mass.-I)	7.1	4.9
Yale University (Conn.-I)	7.1	5.9
Fisher College (Mass.-I)	7.0	8.4
University of New Haven (Conn.-I)	7.0	6.5
Wheelock College (Mass.-I)	6.8	7.4
Briarwood College (Conn.-I)	6.7	12.5
Northeastern University (Mass.-I)	6.3	5.7
Naugatuck Valley Community-Technical College (Conn.-P)	6.3	4.4
Aquinas College at Milton (Mass.-I)	6.3	2.1
New England Total	***5.0***	***3.9***
U.S. Total	***10.3***	***9.0***

I = Independent, P = Public
Source: U.S. Department of Education.

TABLE 3

50 New England Colleges and Universities with the Largest Percentage of Hispanic Enrollment in 1995

(compared with 1990)

	Hispanics as a % of total enrollment	
	1995	**1990**
Housatonic Community-Technical College (Conn.-P)	21.8	15.0
Capital Community-Technical College (Conn.-P)	18.5	14.1
Atlantic Union College (Mass.-I)	18.1	12.6
Roxbury Community College (Mass.-P)	18.1	12.7
Bunker Hill Community College (Mass.-P)	12.7	6.1
Northern Essex Community College (Mass.-P)	12.5	8.4
Newbury College (Mass.-I)	11.4	15.3
Aquinas College at Newton (Mass.-I)	10.6	5.8
Holyoke Community College (Mass.-P)	10.5	4.7
Norwalk Community-Technical College (Conn.-P)	10.2	9.6
North Shore Community College (Mass.-P)	9.6	6.2
Bay State College (Mass.-I)	9.4	6.0
Amherst College (Mass.-I)	9.1	7.1
Springfield Technical Community College (Mass.-P)	9.0	7.3
Marian Court Junior College (Mass.-I)	8.2	2.6
Curry College (Mass.-I)	8.2	1.4
Katharine Gibbs School (Mass.-I)	7.6	0.8
Hesser College (N.H.-I)	7.5	0.9
Cambridge College (Mass.-I)	7.5	3.3
Naugatuck Valley Community-Technical College (Conn.-P)	7.4	3.7
Quinsigamond Community College (Mass.-P)	7.3	5.2
Gateway Community-Technical College (Conn.-P)	7.2	6.3
Franklin Institute of Boston (Mass.-I)	7.1	3.4
Harvard University (Mass.-I)	6.8	3.5
Williams College (Mass.-I)	6.7	4.3
Mount Ida College (Mass.-I)	6.6	2.5
Wellesley College (Mass.-I)	6.3	4.0
University of Bridgeport (Conn.-I)	6.1	3.1
Quinebaug Valley Community-Technical College (Conn.-P)	6.0	6.1
Wesleyan University (Conn.-I)	5.9	3.0
Bradford College (Mass.-I)	5.9	2.3
Community College of Rhode Island (R.I.-P)	5.8	3.2
Briarwood College (Conn.-I)	5.7	1.5
Lasell College (Mass.-I)	5.7	4.3
Episcopal Divinity School (Mass.-I)	5.6	2.0
Manchester Community-Technical College (Conn.-P)	5.5	2.8
Springfield College (Mass.-I)	5.3	2.3
College of Our Lady of the Elms (Mass.-I)	5.2	3.0
Massachusetts Institute of Technology (Mass.-I)	5.1	4.4
Yale University (Conn.-I)	5.0	4.0
Johnson & Wales University (R.I.-I)	5.0	2.4
Middlesex Community College (Conn.-P)	4.9	2.8
Massachusetts School of Professional Psychology (Mass.-I)	4.9	0.0
Sacred Heart University (Conn.-I)	4.8	4.5
Middlesex Community College (Mass.-P)	4.8	3.4
Weston School of Theology (Mass.-I)	4.7	0.0
Saint John's Seminary (Mass.-I)	4.6	3.3
Mitchell College (Conn.-I)	4.6	3.5
University of Massachusetts at Boston (Mass.-P)	4.6	3.5
Mount Wachusett Community College (Mass.-P)	4.5	3.4
New England Total	***3.8***	***2.6***
U.S. Total	***7.7***	***5.7***

I = Independent, P = Public

Source: U.S. Department of Education.

a percentage of total enrollment in 1995.

The urban-based, low-cost community colleges of Connecticut and Massachusetts dominate the list of institutions where African-Americans and Hispanics account for the most significant enrollment shares, while Maine and Vermont institutions lead the list of New England institutions with the highest percentages of Native American students.

The tables also show the change in enrollment share at these institutions between 1990 and 1995. It should be noted, however, that because minority enrollment is so low at some institutions, an increase or decrease of just a few minority students may result in significant percentage changes.

Nationally, 82 percent of minority students enrolled in public institutions, compared with 77 percent of White students. But minority enrollment patterns within the public sector vary. For example, minorities accounted for 17 percent of 1995 enrollment at the University of Massachusetts and 20 percent at Bay State community colleges, but just 9 percent at Massachusetts state colleges, according to a recent study by the Massachusetts Board of Higher Education.

In addition, independent institutions have increased their minority enrollments slightly faster than their public counterparts. Wellesley College and Wesleyan, Harvard and Yale universities are among the handful of prestigious institutions appearing among the top 50 in terms of minority enrollment share.

Encouraging success

Some of New England's progress in minority enrollment can be attributed to outreach and recruitment programs ranging from Vermont Law School's three-year-old First Nations Environmental Law Fellowship program — which provides up to a year of tuition and help with living expenses to Native Americans who pursue master's degree in environmental law and demonstrate a commitment to help their nations manage environmental programs — to NEBHE's larger-scale Equity and Pluralism Action Program.

The seven-year-old Equity and Pluralism Action Program is a comprehensive initiative to increase the number and success of under-represented minority students and faculty at

New England colleges and universities. The program connects students with one another and with attentive, accomplished advisors and mentors, both minority and White, through a system of support networks.

In 1994, NEBHE added a new component to the program to redress a severe underrepresentation of U.S. minorities in the college faculty ranks. NEBHE's Doctoral and Dissertation Scholars Program aims to increase the number of Black, Hispanic and Native American graduate students who complete doctorates and become college professors. This initiative, together with comparable ones started in other regions by the Southern Regional Education Board and the Western Interstate Commission for Higher Education, make up the national "Compact for Faculty Diversity" underwritten by the Pew Charitable Trusts, the Ford Foundation, participating states and participating doctoral departments.

The University of California at Berkeley School of Law recorded an 81 percent drop in African-American admissions and a 50 percent drop in Hispanic admissions in the first year following elimination of affirmative action.

Such programs hold the promise of achieving *full* participation of minorities in New England higher education and in a regional economy built on skilled labor. When that promise is fulfilled, the applause can begin.

***John O. Harney** is executive editor of CONNECTION.*

TABLE 4

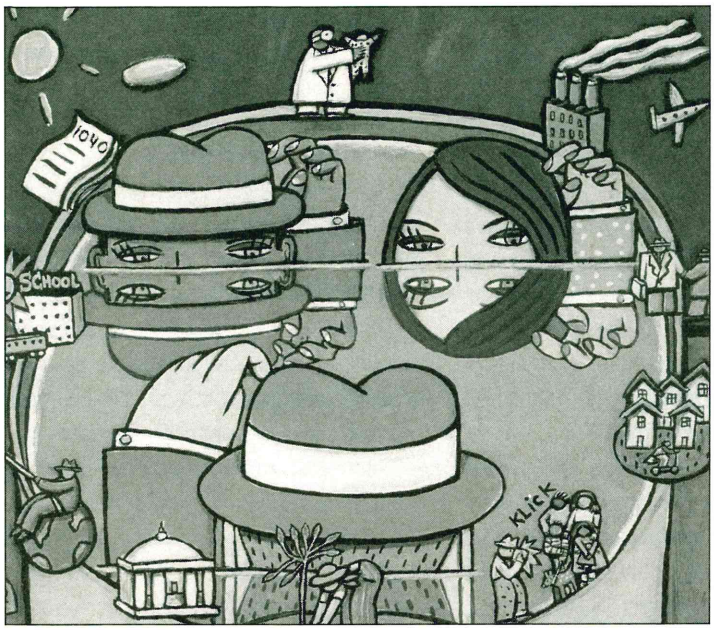
50 New England Colleges and Universities with the Largest Percentage of Native American Enrollment in 1995

(compared with 1990)

	Native Americans as a % of total enrollment	
	1995	**1990**
Washington County Technical College (Maine-P)	13.0	5.6
Champlain College (Vt.-I)	11.3	0.2
Burlington College (Vt.-I)	4.9	1.2
Bangor Theological Seminary (Maine-I)	4.1	0.0
University of Maine (Maine-P)	3.8	1.1
Curry College (Mass.-I)	3.8	0.1
University of Maine at Machias (Maine-P)	3.8	2.5
Northern Maine Technical College (Maine-P)	2.6	3.5
University of Maine at Augusta (Maine-P)	2.4	0.4
University of Connecticut School of Medicine and Dentistry (Conn.-P)	2.4	0.6
Mitchell College (Conn.-I)	2.0	0.2
Dartmouth College (N.H.-I)	2.0	2.1
Johnson State College (Vt.-P)	2.0	0.1
Trinity College of Vermont (Vt.-I)	1.7	0.2
Mount Ida College (Mass.-I)	1.4	1.0
University of Maine at Presque Isle (Maine-P)	1.3	0.8
Three Rivers Community-Technical College (Conn.-P)	1.2	0.6
Eastern Maine Technical College (Maine-P)	1.2	1.4
Wellesley College (Mass.-I)	1.1	0.4
Endicott College (Mass.-I)	1.1	0.3
Salem State College (Mass.-P)	1.0	0.4
Southern Maine Technical College (Maine-P)	1.0	0.5
Massachusetts College of Art (Mass.-P)	1.0	0.3
Cape Cod Community College (Mass.-P)	1.0	0.8
Norwich University (Vt.-I)	1.0	0.9
Fisher College (Mass.-I)	1.0	0.5
Springfield Technical Community College (Mass.-P)	1.0	0.7
University of Maine at Farmington (Maine-P)	0.9	0.2
Eastern Connecticut State University (Conn.-P)	0.9	0.7
University of Maine at Fort Kent (Maine-P)	0.9	0.5
University of Southern Maine (Maine-P)	0.9	0.5
Husson College (Maine-I)	0.9	0.9
Atlantic Union College (Mass.-I)	0.9	0.1
College for Lifelong Learning (N.H.-P)	0.8	0.4
Berklee College of Music (Mass.-I)	0.8	1.1
Smith College (Mass.-I)	0.8	0.3
Bennington College (Vt.-I)	0.8	0.2
Community College of Rhode Island (R.I.-P)	0.8	0.6
Westbrook College (Maine-I)	0.7	0.0
Castleton State College (Vt.-I)	0.7	0.1
Bradford College (Mass.-I)	0.7	0.0
Massachusetts College of Pharmacy & Allied Health Sciences (Mass.-I)	0.7	0.4
Castle College (N.H.-I)	0.7	0.0
Maine College of Art (Maine-I)	0.7	0.3
Dean College (Mass.-I)	0.6	0.1
New England School of Acupuncture (Mass.-I)	0.6	0.0
Bunker Hill Community College (Mass.-P)	0.6	0.3
Rivier College (N.H.-I)	0.6	0.0
Holyoke Community College (Mass.-P)	0.6	0.7
Charter Oak State College (Conn.-P)	0.6	0.7
New England Total	***0.5***	***0.3***
U.S. Total	***0.9***	***0.7***

I = Independent, P = Public

Source: U.S. Department of Education.



Artwork by Carolina Arentsen.

Think Tanks: A New England Public Policy Collaborative Takes Shape

LAURA CHRISTENSEN

While *60 Minutes* served up a scathing expose on Boston's $10 billion-plus Big Dig construction project budget, researchers at the McCormack Institute of Public Affairs, based at the University of Massachusetts at Boston, were assessing the facts behind the story and searching for cost-saving changes in project procedures. It's a classic example of a New England policy research center — a think tank — attempting to offer sound analysis of a politically charged, easily sensationalized policy issue.

On the other side of the Charles River, researchers at the Radcliffe Public Policy Institute were assessing the particular workforce dilemmas facing aging baby boomers, while scholars at Harvard University's new Hauser Center for Nonprofit Institutions were establishing themselves as resources on all manner of nonprofit issues.

Around the same time: the University of Maine's Margaret Chase Smith Center for Public Policy teamed up with local trade organizations to conduct interviews and focus groups with nonprofit leaders to determine how Maine's nonprofit sector can cope with environmental shifts and survive into the 21st century. ... The Josiah Bartlett Center for Public Policy convened university researchers, politicians and others to explore the question of whether New Hampshire's economy is built on "Granite or Quicksand." ... The Pioneer Institute for Public Policy in Boston issued a broadside against a proposed convention center for Boston. ... The Massachusetts Institute for New Commonwealth (MassINC) convened politicians and educators to assess the state of K-12 education.

All around New England, campus-based and freestanding policy centers and institutes are churning out findings and recommendations and convening meetings aimed at helping policymakers grapple with pressing policy issues.

Pressure of devolution

New England's vibrant assortment of policy think tanks — perhaps 200 strong — will be increasingly in demand as the process of devolution shifts more and more government responsibilities from Washington D.C., to states and municipalities that lack the research capacity and staff support to deal with them.

Yet, because no nonpartisan, regional forum exists to coordinate the efforts of the policy research centers and institutes, New England's think tanks plug away independently, sometimes duplicating one another's efforts and squandering opportunities.

Reasoning that many pressing policy questions transcend political boundaries, the New England Board of Higher Education (NEBHE) has begun developing a New England Public Policy Collaborative to provide a framework for sharing information and building upon the region's vast policy research capacity.

Priorities

A preliminary NEBHE survey of research centers and institutes reveals that "economic development," "international affairs" and "energy and the environment" top the list of priorities for New England think tanks, though most of the institutes deal with a variety of issues.

The NEBHE survey also suggests that there is ample interest among the region's research organizations in collaboration. Several policy researchers noted that collaboration would benefit their organizations by enhancing research and building networks around common issues. Some noted that collaboration would help the region become more competitive in an increasingly global economy.

"With the decline of regional policy analysis and planning agencies since the Reagan years, there are clearly many regional policy issues which, with resources, might be addressed and ameliorated through cooperation," observes Richard Barringer, former director of the Edmund S. Muskie Institute of Public Affairs at the University of Southern Maine.

Albert E. Beaton, director of the Center for the Study of Testing, Evaluation & Educational Policy at Boston College, sees collaboration as a way to "draw attention to the wealth of knowledge and expertise in the region, and to enhance the region's reputation as an area of scholarship, research and practice in the field of education and public policy."

To be sure, the region offers some modest examples of collaboration in policy issues. In the spring, for example, the Annenberg Institute for School Reform at Brown University joined forces with the Coalition of Essential Schools at Brown, the Yale University Child Study Center, Harvard's Project Zero and the Education Development Center in Newton, Mass., to broadcast a national videoconference on education reform. The five participating organizations are members of the so-called ATLAS Communities, a collaboration developed in response to the America 2000 call for "break-the-mold" school designs.

McCormack researchers have explored collaboration with several institutes on issues ranging from welfare reform to utility deregulation.

Moreover, many grantmakers increasingly favor collaborative policy research partnerships over independent projects.

Still, cooperation among the region's think tanks is spotty.

Fostering collaboration

NEBHE's New England Public Policy Collaborative aims to bring together New England policy researchers — sometimes along with policy research "consumers" such as state legislators — to establish networks, assess current and future priorities and explore ways to share resources, exchange relevant research and improve public access to information and policy alternatives.

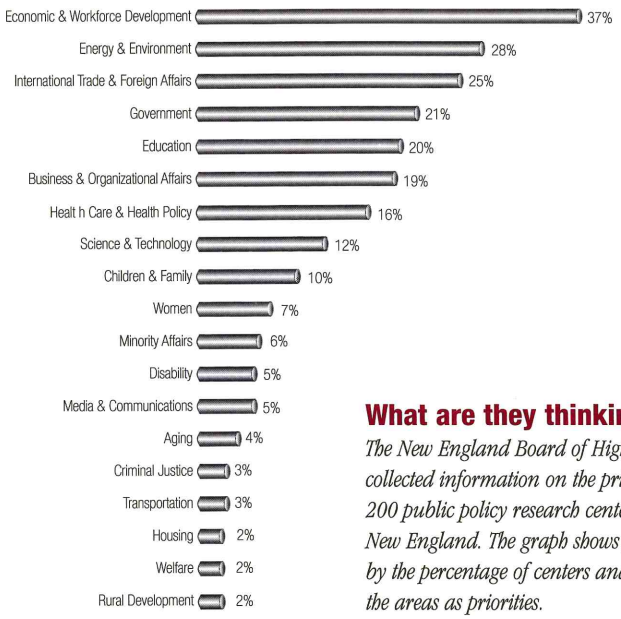
Among other initiatives, the NEBHE collaborative will include a World Wide Web site linking New England policy research centers and institutes. Visitors to the Web site will have access to information on policy research at the click of a finger as well as access to Web-based forums on specific priority topics.

NEBHE also has begun planning the first *New England Directory of Public Policy Institutes,* a detailed desktop reference on New England's public policy institutes.

Ulitmately, the initiative's goals are straightforward: open communication, heightened cooperation and policy innovation.

Laura Christensen *is a NEBHE research assistant.*

New England Policy Think Tanks: Priorities

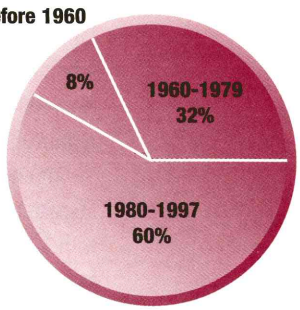


What are they thinking about?

The New England Board of Higher Education has collected information on the priorities of nearly 200 public policy research centers and institutes in New England. The graph shows policy areas ranked by the percentage of centers and institutes that cite the areas as priorities.

Growth of Think Tanks

New England policy research centers and institutes founded...



Many of today's think tanks grew out of the social welfare imperatives of the 1960s and '70s. Even more were formed during higher education's expansion in the 1980s. The chart groups New England policy centers and institutes based on the year they were founded.

WORCESTER, MASS. — The College of the Holy Cross was awarded a three-year $350,000 grant by the Andrew W. Mellon Foundation to launch a project in which students will help faculty become proficient in using educational technologies. Each semester, about 20 highly qualified students will help faculty members understand and adopt educational technologies. The program aims to ensure that every Holy Cross faculty member has a standardized World Wide Web homepage, including: personal video introduction, biographical information; e-mail distribution list and interactive sections for all courses.

AMHERST, MASS. — The University of Massachusetts at Amherst's School of Management received a $6 million gift from alumnus and businessman Eugene Isenberg and his wife Ronnie. The gift will support new facilities and an endowed professorship at the school of management, which will be renamed in honor of the Isenbergs. Eugene Isenberg, who earned a bachelor's degree in economics from UMass in 1950, is the chairman and CEO of Nabors Industries, a Houston-based oil and gas drilling contractor.

MARLBORO, VT. — Marlboro College received the first installment of a $1.2 million anonymous gift to create a state-of-the-art graduate center in Brattleboro and launch two technology-oriented master's degree programs. Beginning in January 1998, the college will offer a three-semester master's program in teaching with Internet technologies and a one-year master's in Internet strategy management.

NEW HAVEN, CONN. — Albertus Magnus College introduced Connecticut's first master's degree program in art therapy. The program is designed to prepare skilled mental health clinicians who use various art media and interpretation of art as a way to understand feelings.

BAR HARBOR, MAINE — College of the Atlantic was awarded $20,000 by the Libra Foundation of Portland and $20,000 by the Stephen and Tabitha King Foundation of Bangor to renovate and expand the former Acadia National Park headquarters building. The structure, which was moved to the campus last fall, will serve as the new home of the college's 15-year-old Natural History Museum.

AMHERST, MASS. — The University of Massachusetts at Amherst and Western New England College School of Law in nearby Springfield launched a joint program in regional planning and law. Under the combined four-year program, graduate students may complete a master's degree in regional planning at UMass while earning a law degree at Western New England College. Expertise in planning and law is often required for positions such as municipal attorney or planning director.

NASHUA, N.H. — Rivier College was awarded a three-year, $465,418 grant by the Lilly Endowment to study the connection between service learning and mission effectiveness at church-related colleges and universities. The grant will support a student and faculty survey on student service to be administered at 20 U.S. campuses, as well as case studies on service learning at five church-related institutions, including Rivier.

RUTLAND, VT. — The College of St. Joseph was awarded a five-year, $50,000 grant from the Agnes M. Lindsay Trust to support scholarships for needy students from rural New England.

WEST BARNSTABLE, MASS. — An environmental technology program administered jointly by Cape Cod Community College, the University of Massachusetts at Dartmouth and the Massachusetts Maritime Academy was awarded a $42,353 grant by the National Science Foundation to buy scientific instruments for performing water, soil and air analysis, as well as software to create wastewater simulation and operate geographic information systems.

FAIRFIELD, CONN. — Fairfield University reached agreement with the Universidad Politecnia Salesiana Sede Quito in Ecuador to collaborate on programs to train future marriage and family therapists. The agreement calls for clinical and administrative consultation between the two Catholic colleges, followed by exchange of graduate students and joint research projects. A Fairfield professor played a key role in developing the Ecuadoran university's master's degree program.

PROVIDENCE, R.I. — Brown University created a new scholarship to be awarded each year to a Brown student interested in conducting research or undertaking a project aimed at improving life in Providence. The Vincent A. Cianci Jr. Urban Scholarship, named for the city's mayor, will provide a $2,500 stipend to support the student's work.

BOSTON, MASS. — Suffolk University Law School began building a $65 million state-of-the-art law school facility in downtown Boston. The seven-story building under construction near key Boston legal institutions will feature amphitheater-style classrooms and moot court rooms with advanced multimedia equipment, as well as a large library. Suffolk officials note that evening classes will have a positive impact on the city's Downtown Crossing area.

STORRS, CONN. — The University of Connecticut's School of Business Administration announced that incoming, full-time MBA students would be required to bring a laptop computer to class, beginning in September 1997. School officials developed a set of recommended features for the computers, but will not be involved in the purchase.

WORCESTER, MASS. — Worcester Polytechnic Institute and the University of Massachusetts Medical Center established a joint doctoral program in biomedical engineering. The program will feature shared courses and allow students to do thesis work at either institution.

AMHERST, MASS. — Amherst College was awarded a five-year, $377,268 grant from the Henry Luce Foundation to fund a professorship for a woman faculty member in

environmental science. The new Clare Booth Luce Professorship is designed to encourage women to pursue sciences and strengthen the environmental science component of Amherst's geology department.

AUBURN, MAINE — Central Maine Technical College introduced an associate degree program in computer technology in response to growing demand from area businesses. College officials say graduates will learn to install equipment, interface software and hardware, troubleshoot and evaluate computers, train new computer users and work with computer networks.

MANCHESTER, N.H. — Notre Dame College unveiled New Hampshire's first master's degree program for physician assistants. The college also introduced programs in environmental studies and exercise sciences as part of a new emphasis on health science programs.

NEW HAVEN, CONN. — Yale University's Peabody Museum of Natural History was awarded a four-year, $350,000 grant from the Howard Hughes Medical Institute to fund a science education program for New Haven teachers, schoolchildren and their families. The program will feature workshops and seminars on biological diversity for elementary school teachers, a mobile lab allowing hands-on learning, museum visits and curriculum development.

AMHERST, MASS. — An assistant professor of chemistry at the University of Massachusetts at Amherst won a four-year, $240,000 CAREER award from the National Science Foundation to continue research on porous glasses, which could be used as environmentally friendly chemical catalysts. The chemist, Vincent M. Rotello, also won a prestigious five-year, $60,000 Camille Dreyfus Teacher-Scholar Award, which is designed to support young faculty members and bolster undergraduate education.

HAMDEN, CONN. — Quinnipiac College received $20,000 worth of interactive software that will allow health sciences students to observe the human body's inner workings. The software, provided by Animated Dissection of Anatomy for Medicine Software Inc., of Atlanta, will be used as a reference tool in applying anatomical and physiological principles to clinical situations.

GARDNER, MASS. — Mount Wachusett Community College conducted a series of lectures and workshops in Oryol, Russia, during the summer, focusing on the American criminal justice system. Criminal justice Professor Bonnie Toothaker spent three weeks in Russia teaching faculty and teenage students at the National Police Academy in Oryol.

FAIRFIELD, CONN. — Sacred Heart University and Systran Corp. of Ohio were awarded $100,000 by the U.S. Department of Health and Human Services to help make medical and health-care information more accessible to the average computer user. Venu Dasigi, an associate professor of computer science at Sacred Heart, is developing systems that will allow users to find information on new medicines, for example, without necessarily using a single key word as current computerized systems require.

NEW HAVEN, CONN. — Yale University was awarded $1 million by the U.S. State Department to continue studying and documenting atrocities carried out by the Khmer Rouge regime in Cambodia during the 1970s. The information collected by Yale's Cambodian Genocide Program may be used by governments that pursue legal sanctions against the Khmer Rouge for war crimes.

WALTHAM, MASS. — Bentley College was awarded a $9 million low-interest loan by the Massachusetts Health and Educational Facilities Authority to make various capital improvements aimed at enhancing the academic success and retention of freshmen. As part of its First-Year Initiative, Bentley will convert campus apartments to more contemporary suites, remodel and update its cafeteria and expand space to accommodate more faculty advisors.

WATERVILLE, MAINE — Colby College received a $6.25 million gift from the Oak Foundation of Switzerland. The college's largest-ever gift will fund scholarships for international students, including victims of political oppression, and support establishment of the Oak Institute for International Human Rights on campus.

SOUTH ROYALTON, VT. — Vermont Law School launched cooperative programs with Dartmouth College and the University of Vermont. Under the new collaborative initiatives, five courses at Dartmouth's Thayer School of Engineering are open to VLS students, while seven VLS course are open to students in Thayer's master's program in environmental engineering. The joint program with UVM allows students to earn a bachelor's degree from UVM and a law degree from VLS in six years, instead of the usual seven.

BRISTOL, R.I. — Roger Williams University received $1.5 million from philanthropist Alan Shawn Feinstein and the Feinstein Foundation to establish a community service requirement for every student, beginning in fall 1998. Roger Williams is the fifth Rhode Island college to make the Feinstein Enriching America Program a requisite for graduation. The for-credit program will involve classroom discussion of community service issues, as well as active service with an emphasis on tutoring and mentoring students in local school districts.

BOSTON, MASS. — Emerson College created an endowed scholarship fund in honor of S. James Coppersmith, the retired president of WCVB-TV in Boston and chair of Emerson's board of trustees. Coppersmith scholarships will be awarded annually to communications students on the basis of financial need, motivation and grades.

DOVER, N.H. — McIntosh College signed an agreement permitting Plymouth State College to offer its master's program in business administration program on the private college's Dover campus. All courses in the evening MBA program will be taught by full-time business faculty members from Plymouth State.

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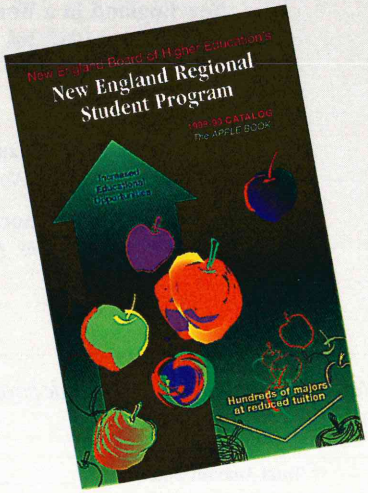

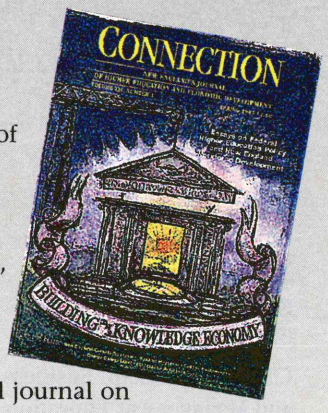

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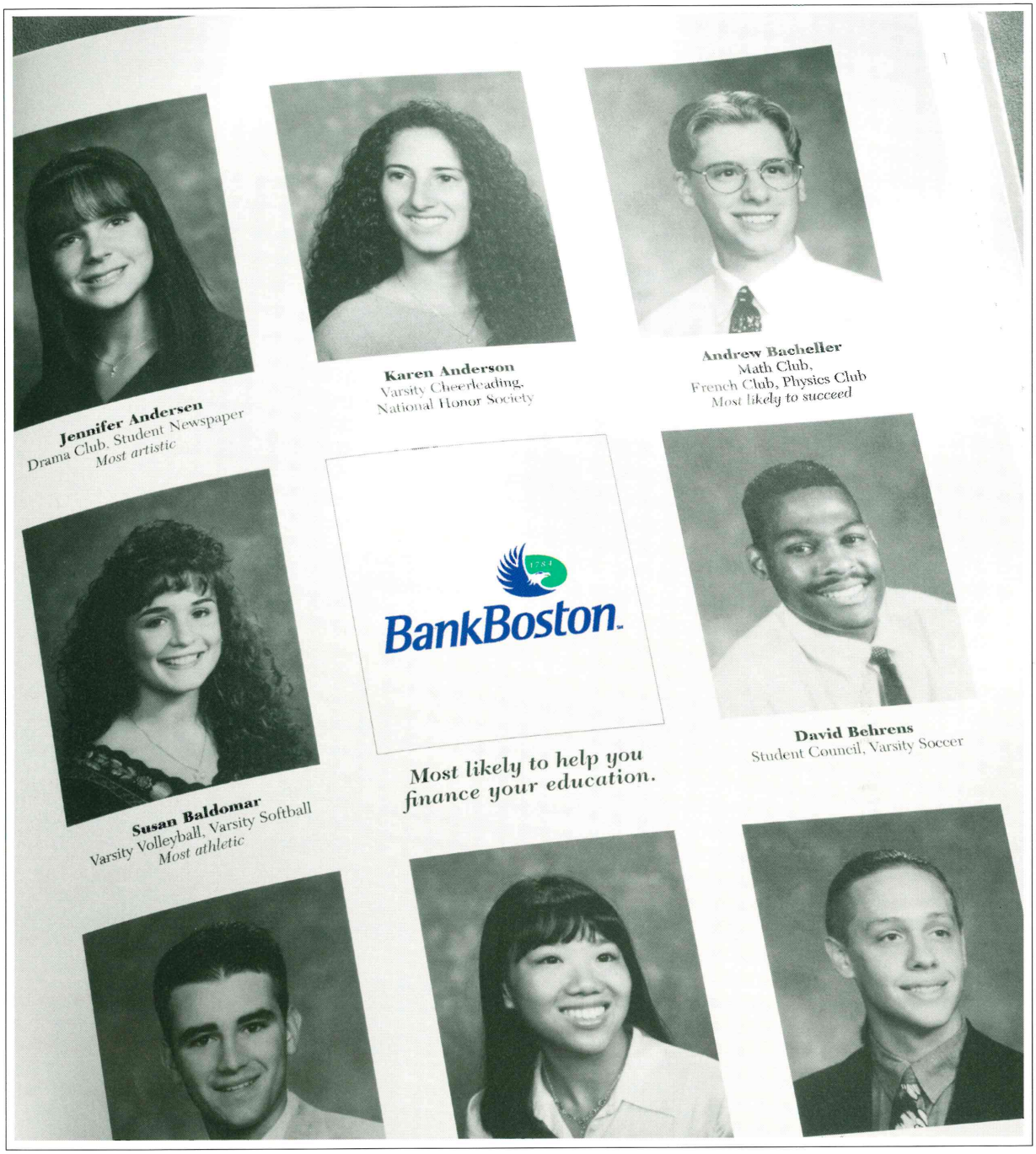

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