

By Kenneth C. Green

Computing

For those of us who “do” technology, reviewing the literature on IT in higher education can be a potentially painful experience: the literature provides a paper trail (now a digital trail?) of our aspirations and expectations, of our projections and, at times, our follies, regarding the role and trajectory of IT in the campus community. The literature tracks our sins of omission, commission, expectation, and hyperbole.

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So it was with these concerns that I recently revisited some of my own “literature,” specifically a 1986 article, coauthored with then-EDUCOM Vice President Steven W. Gilbert and titled “The New Computing in Higher Education.” The article, published in *Change*, an academic periodical intended primarily for president, provosts, and other *academic* administrators, was written during the mid-1980s bubble of campus enthusiasm for the wave of newly arriving microcomputers that were raising aspirations and changing the campus conversations about the role of computing and computers in undergraduate education, curriculum, and the campus experience. It was a period of early change and great hyperbole, a period that some even described as “the computer revolution in higher education.”

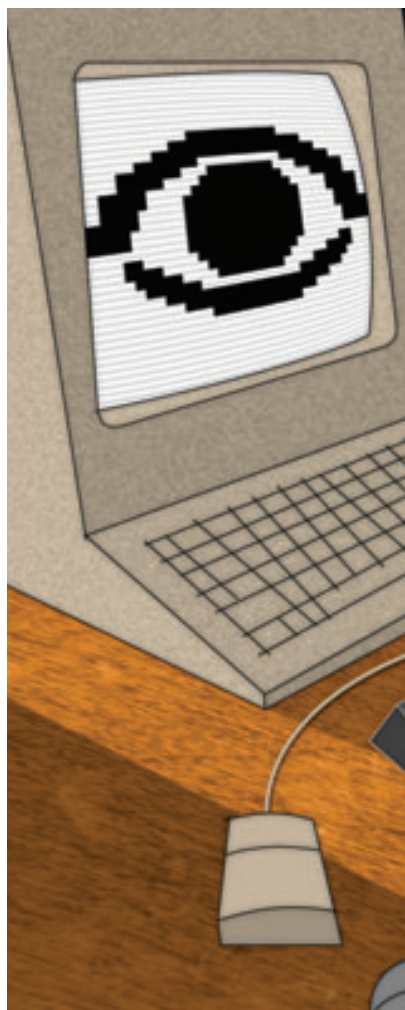
Our goal with the “New Computing” article was to help others in academe—particularly presidents, provosts, and deans—understand that the arriving microcomputers were the catalyst for a new kind of computing, a computing experience far removed from the past experience of punch cards, green screens, and COBOL or Pascal.

Clearly something different and significant was happening—or was about to happen. The numbers of faculty and students drawn by the power and potential of word-processing, financial modeling, graphics, and other “desktop applications” were striking. With unabashed confidence Steve and I wrote: “Thousands of faculty members and administrators have decided that 1986 is the year that they will have a personal relationship with computing.... [M]ost academics now getting started on computing are professionals who haven’t been computer users before and who will never think of themselves as computer experts. What they realize is that they are embarking on a journey they can no longer delay.”¹

In the words of the Grateful Dead, what a long strange trip it’s been. Rereading the “New Computing” article in the fall of 2002, I was pleasantly surprised to find that Steve and I, with “perfect” hindsight, raised many of the right issues and asked many of the right questions that continue to challenge the campus community today:

- What will be the educational consequences of all the individual efforts and institutional investment in technology?
- What do we do with faculty after the introductory IT workshops are over?
- What do we do when we can’t find the staff, evaluate or (even) afford the staff necessary ... to maintain our equipment and help people with the software?
- How do we decide how much to spend on academic computing?
- And how do we integrate computing into the curriculum?²

The “New Computing” article also identified equity issues that today we discuss in the context of the “Digital Divide”: rich and poor departments, affluent and less-resourced students, faculty, and institutions. Discussing the costs of computers in the context of universal access,



we boldly proclaimed: “Any [price] greater than \$1000 per system precludes universal access (let alone widespread individual purchase) within higher education.”³

Overall, and with the benefit of more than sixteen years of perfect hindsight, I think we did pretty well. Yes, like others, we succumbed to some of the passion and the hype. But we also raised issues that are part of the continuing campus conversation about IT planning and policy and about the role of IT in teaching, learning, and instruction.

That said, there are also issues we missed in the “New Computing” article and others that have emerged over the years. So it is in this context that it seems appropriate to revisit the “New Computing,” to explore some of the continuing as well as some of the new technology challenges that confront higher education.

Convergence: Be Careful What You Wish For

The “New Computing” reflects one dimension of higher education’s fascination with technology: the hope and expectation that new technologies—initially radio and then film and television, followed by computers—would benefit education and the educational experience of students. Indeed, over the last forty years, those in the higher education community have had three great wishes and broad aspirations for higher education in the United States. Today, we confront a classic example of the consequences of what happens when wishes come true.

The first broad aspiration was for increased *access*: more people should go on to college. Low and behold, more *are* going on to college. The postsecondary matriculation rate is now almost two-thirds of all high school graduates, up from 50 percent two decades ago. This increase occurred during both good times and bad times economically, even though the conventional wisdom is that students go to college during bad times but not during good times (i.e., they act rationally in the economic marketplace). But access is up, and it’s up dramatically; moreover, it’s up across all populations.

Another great wish or aspiration involved *lifelong learning*. The “traditional student”—going off/away to college, residing in a dorm—now represents less

than 20 percent of the campus population. Five of every eleven individuals taking courses from U.S. colleges are twenty-five years old or older. Today the number of students age thirty-two and over almost equals the number of “traditional” students age eighteen and under. And although the portrait of the “typical” U.S. college student, as reflected in the various college guides, is still that of the full-time undergraduate who lives on or adjacent to campus, the modal student is someone between twenty-seven and thirty-two years old who drives to campus—most likely a community college—for one or two classes a week. Adults are coming, or coming back, to campus for a full array of educational services: to begin or complete undergraduate degrees, to pursue master’s degrees, and to take individual courses—in accounting, corporate strategy, Java, marketing, Web design, and .XML—that will help them in their current jobs. In sum, lifelong learning is now a core campus service and serves a key (and growing) constituency of U.S. higher education.

The third great wish concerned the *promise of IT*: the aspirations and expectations for developments leading to more, better, and less expensive technology for teaching, learning, and instruction.

Lo and behold, these developments have—indeed *are*—happening: we do have more, better, and less expensive technology for teaching, learning, and instruction—and more is coming.

We could argue that these three wishes converged around the year 2000—increased access, more lifelong learning, better technology. Access is up. Lifelong learning is here. The technology is amazing.

Whenever it happened, all three wishes have come true, but now we’re not quite sure what to do. How should we address the impact and converging consequences of access, lifelong learning, and improved IT? At times we seem clueless about the consequences of this convergence: how do we come to terms with the fact that on individual campuses and across the campus community, students—some 16 million and rising, ages seventeen to sixty-seven—come to cam-

pus (or to a campus Web site) to learn about and to learn with technology?

Moreover, what distinguishes technology from access and lifelong learning is that the access and lifelong learning are delegated functions: someone else, some other office on campus, handles these issues. Yet for faculty, technology is not a delegated function. It involves personal decisions about teaching: What’s the value of IT instruction? Do I think technology will make a difference in what I teach and the way I teach? And can I do this—can I do the technology stuff and not look foolish in front of my students?

The Productivity Conundrum

The aspirations and hype surrounding the “New Computing” have helped to foster a *productivity conundrum*—an assumption that a simple model of textbook economics can be applied to “academic” productivity.

Revolution, the textbook model links technology to productivity: investments in technology improve productivity.

But how does this notion of productivity apply to the campus community and, specifically, to instruction? What is “academic” productivity? And who gets to decide on this definition?

In a period of budget cuts, perhaps the appropriate definition (or goal) of “academic” productivity is to reduce the cost of instruction. If so, then some simple (admittedly undesirable) solutions would be to reduce faculty salaries, hire more part-time faculty, or increase class size. Though not desirable choices, any (or all) of these three strategies would improve “academic” productivity by lowering the cost of delivering instruction.

What about productivity as reflected by increased quality? Does technology contribute to the quality of the educational experience and learning

The “New Computing” reflects one dimension of higher education’s fascination with technology: the hope and expectation that new technologies would benefit education and the educational experience of students.

According to the economics textbooks, there are three conditions for productivity: (a) the cost of producing a product or providing a service decreases while the quality remains constant; (b) the quality increases while the cost remains constant; and (c) the cost decreases *and* the quality improves. Option C, of course, is the ideal outcome. And indeed, we see numerous examples of Option C in the computer and electronics industry: consumer products such as notebook computers, cell phones, CD burners, PDAs, and large-screen digital televisions that continue to cost less and do more.

Drawing on two hundred years of experience gained during the Industrial

outcomes? Today, faculty can demonstrate three-dimensional chemical modeling. Students in the social sciences learn statistics by doing real statistical analysis using large databases rather than by listening to professors explain theory and proofs—as was the all-too-common experience thirty years ago. The Web is rich with sites, often maintained by scholars, that offer rich, annotated resources on specific topics. The daily *New York Times* arrives by e-mail at six A.M. and can be incorporated into a classroom discussion at nine A.M., regardless of the time zone.

Yet tension remains about who defines productivity in the academic community: The state legislature? The

regents or board of trustees? Presidents? Provosts? Faculty union officials? Individual faculty?

Moreover, in higher education and in K-12 education, there is growing public discussion about the ROI—the return on investment—for technology in the classroom. Do students learn more and perform better on tests because of the billions invested in technology over the past two decades? Unfortunately, forty years of research into the impact of all kinds of technologies in education fails to provide a comprehensive answer, a definitive sound bite, that can support advocates and silence critics. The research literature remains ambiguous, not definitive.

Perhaps those in the campus community can take some (small) comfort in knowing that for more than a decade economists failed to find productivity gains linked to the corporate investment in IT. Indeed, despite the billions that U.S. corporations invested in IT—in computers, training, networks, etc.—during the 1980s and the early 1990s, it was not until the late 1990s that Federal Reserve Board Chairman Alan Greenspan and other economists could link the corporate investment in IT with productivity gains in the U.S. economy. In other words, the corporate sector required significant and sustained investment to create a significant and sustained infrastructure in order to reap productivity benefits from IT investments.

Of course, one key difference between the campus and the corporate sectors is that there is broad agreement in the corporate community about how to define productivity and how to measure ROI—the return on investment.

We in the campus community need to change the tone and tenor of the campus and public policy conversation about technology and ROI. The campus community needs to look at the *benefits* of investment, a process that may include a traditional ROI assessment but that may also reflect other kinds of outcomes.

For example, consider the faculty member who posts a course on the Web, perhaps using a course management sys-

tem. Do the hot links to other Web resources and threaded conversations among students contribute to “academic productivity” and improved learning outcomes? If so, what are the specific benefits that accrue to the significant investment

what campuses do, and not just on how (if at all) the technology saves money.

Oedipal Aggression

The “New Computing” has fostered a rising level of Oedipal aggression in the

The community must inform members of institutional boards and state legislatures that the discussion about technology must focus on the benefits of investment, on how technology aids and improves what campuses do, and not just on how (if at all) the technology saves money.

of individual time and institutional resources? Do students “learn more”? Do students offer more complete and compelling assessments and analysis of concepts and issues?

As another example, what about the campus that launches a student portal? Yes, some campuses can document “hard cash” savings linked to their portal implementation. But equally important are the enhanced student services that yield other institutional benefits: the portal serves students who will come to the institution because they can register for courses and add/drop classes online and who in other ways will find that there is a service mentality to complement the educational commitment and the quality of the courses. This benefit is hard to measure financially, but it clearly benefits students and, by extension, the institution. Is the appropriate “financial” measure the number of student hours saved by *not* traveling to campus for registration?

Again, the campus community must take control of this conversation. The community must inform members of institutional boards and state legislatures that the discussion about technology must focus on the *benefits* of investment, on how technology aids and improves

classroom. Admittedly, there have always been those students who take great joy in mocking academic attire or behavior or in “politely” bringing attention to what they view as faculty errors in facts or reasoning.

Yet the Web has contributed to a new level of Oedipal aggression. Many faculty would probably concede that many of their students, young and old, are far more comfortable and conversant with the technology than they are. But the new Oedipal aggression is not about technology—it is about content.

For example, let’s say that in my Thursday afternoon seminar I inform my students—undergraduates or graduates—that they are to read an article by Professor Susan Jones from Acme University for our next class, on Tuesday. In the closing moments, I make some quick comments about the Jones paper, explaining its significance not only in the context of the reading for the class but also as an important contribution to the literature. At office hours before the class on Tuesday, one of the students comes to see me:

“Dr. Green, you know that article by Professor Jones was really interesting.”
“Great.”

"And I really liked it."

"Well, that's great."

"Yeah, I even went to the library to see if I could find another article or two by Jones and also to read one or two of the references she cites in her article."

"Great!" Like faculty everywhere, I'm delighted that a student finds an assigned reading interesting, and I'm impressed that he went to the library to search for more information.

"And uh, yeah, I had some questions about this stuff, but you said you were going to be out of town for the weekend, that you're not very comfortable with the e-mail stuff, and leaving messages on your voice-mail has not been effective. Anyway, because I could not get in touch with you, I figured I'd go find Professor Jones on the Internet."

"Pardon me?"

"Yeah, well, the article says that Jones is a faculty member at Acme

University, and so I went on the Web to Acme.edu, found her e-mail address, and said—you know—I'm a student in Green's class, and he assigned your paper. Green's not around this weekend, but I hope you don't mind—I've got a couple of questions I'd like to ask you."

"You contacted Jones? I've never met Susan Jones."

"Yeah, in fact, she wrote back."

"You got an e-mail back from Susan Jones? She never answers my e-mail."

"Yeah, uh—and so she had some questions about the class, and she wanted to see the syllabus because of the way I tried to describe it. So anyway, since the syllabus wasn't on the Web, I scanned it and sent the syllabus to her as a PDF. Yeah, anyway, here's the printout of my e-mail with Jones over the weekend. Look, I don't know how to tell you this, but Susan Jones says you're full of crap. Here—on page 2—she says

that the syllabus looks to be about five or six years old. And based on what I said about your comments on her paper—I hope I accurately represented your summary—Jones says here, on page 3, that you may have misrepresented her work and she wonders how they let you teach here."

Another example involves *BusinessWeek* magazine, which hits the Web in full-text format on Thursday evening. In Friday classes, in case-study discussions in business schools across the United States and around the globe, both undergraduate and MBA students come to class having read online the relevant portions of *BusinessWeek*—articles and information that faculty may not see for several days, or weeks!

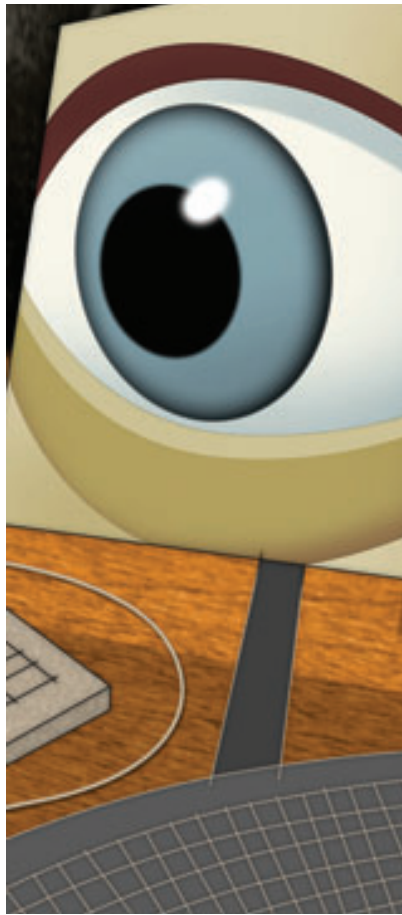
This is a new world order for many in academe. It was not part of the "coming of academic age" experience of today's middle-age, midcareer faculty and administrators. Yet today students of all ages come

to campus and online classes with expectations about IT as an instructional resource and with IT skills that may equal or surpass faculty IT skills. Consequently, the role of faculty will have to change to accommodate students' needs, students' expectations, and students' use of IT resources.

Infrastructure and Visualization

The experience of the "New Computing" has raised questions about the campus IT infrastructure and the role of infrastructure in instructional integration and faculty visualization. On campuses and in the literature, many have engaged in a continuing debate about "early adopters" versus instructional infrastructure.

Some have argued that the optimal path to instructional integration is to support the early adopters and that they, by example, will "infect" their colleagues. Others (myself included) believe strongly that infrastructure fosters integration, that the early adopters more often intimidate, rather than "infect," their lagging colleagues.



Indeed, drawing on the early experience with "user-friendly DOS," the campus community, like other sectors, has learned that user support is an essential component for the effective use of technology resources—both in administrative offices and in classrooms. Key to this process is visualization: Can I see—can I visualize—myself doing this? Can I "do" this technology stuff in the classroom, do it effectively, and not look foolish in front of my students?

One way to understand the visualization issue is in the context of a common consumer experience: shopping for clothes. We visualize ourselves in certain attire: is it the right color, is the style too fashion-forward, or is it maybe just dull?

I have similar visualization questions as I prepare for conference presentations. What are my clothing options? I could be conventional and wear a suit and tie—almost always a safe choice. Or, since I'm a nominal academic, I could choose classroom attire, khakis and a jacket. As the vice-president of a now-dead dot-com, I

could also opt for Internet noire, basic black. Then again, I could wear a red dress.

But that last choice—the red dress—clearly does not work for me: As a fifty-something male, I'm not comfortable wearing a red dress, especially in a classroom. I would feel exposed and vulnerable, not to mention stupid and silly.

And for many faculty, using technology is like wearing a red dress in the classroom. So the challenge is to build the campus infrastructure so that faculty don't feel exposed to the world as if they were wearing a red dress.

Disruptive Technology

The "New Computing" acknowledges that the disruptions posed by IT frequently challenge organizational policy, practice, and process. Concurrently, technology also challenges individual preferences and behaviors. The key—for individual colleges and for individual college professors and administrators—is to look beyond the issue of disruption, beyond what some perceive to be competitive threat, and to see the real benefits of disruption.

Admittedly, the response to disruptive technologies is easy to predict. First, we *deny* that change is needed. We don't want to install the new Student Information System, to pay the license-fee increase demanded by Acme Technologies for the software upgrade, or to migrate to the new word-processing program. We can continue to use the old software. Everybody is comfortable with the old program; we'll simply extend it for a little while longer.

Second, we get *angry* when somebody tells us we have to make the change. The old software is going away. It won't be fully supported. It can't be fixed. The documentation is lost. We get mad.

Third, we *negotiate*. "You give me some user support, and I'll migrate my files. I can't do this on June 30 when everybody will be cut off from the old system, but I promise I'll do it when I come back at the end of the summer." Summer merges into fall, and fall slips into winter. We don't have the money to do it. We'll do it next year. We negotiate. We bargain—

sometimes with success, sometimes not.

Fourth, we get *depressed* when we come to terms with the impending reality, viewing the mandated task or demanded change as huge, overwhelming: "I've got to migrate my files; I've got to do something different; I've got to put all of my courses on the Web." The task seems daunting and overwhelming—both for individuals and for organizations.

Fifth and finally, we *accept* the change: we come to recognize that there is no alternative. We come to accept the disruption, come to accept the new technology that we feel that has been imposed on us.

This outline may seem familiar. It should, since it is derived from Elisabeth Kübler-Ross's acclaimed work, *On Death and Dying*.⁴ The response, individually and collectively, to the disruptions linked to technology really is similar to the patterns outlined in the Kübler-Ross research. We often go through a process of denial, anger, negotiation, depression, and finally, acceptance. Many faculty and

tained) as best as possible. At other campuses, microcomputers offered great promise for a new kind of computing and a new kind of computing experience for students and faculty. Admittedly, we see less of this product-versus-promise tension today. But there is a legacy, as reflected in the sometimes painful transition from IT leadership based on product-centered problems to IT leadership based on service-centered challenges.

During the 1960s, 1970s, 1980s, and even somewhat into the 1990s, campus technology organizations often focused on solving the problems caused by the new technology products that were showing up on campuses. The campus response to IT issues—IT problems—was often to find and hire the most able computer person around, typically someone with a computer science or engineering background ("heavy metal" guys).

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administrators, and many institutions, would be far better off if they undertook one trial learning, moving quickly to accept the disruptions associated with technology, since in many—if not most—contexts, the changes are inevitable.

IT Leadership and the New Computing

It is with perfect hindsight that we can recall two distinct interpretations of how campuses responded to the arrival of microcomputers in the early and mid-1980s. At some institutions, the microcomputers were yet another technology product, one to be managed (i.e., controlled and con-

In this context, the hard issues are not about products but focus on people and policy issues.

We see this transition in a new generation of campus technology leaders who have emerged within their own institutions and in the higher education community over the past ten to fifteen years. As faculty started "doing" computing on their own—from their desktops as opposed to sitting in campus labs and computing centers—many of the key campus issues involving IT and instructional integration focused on pedagogy and user support, not product selection and

containment. Many of the “heavy metal” leaders were not prepared for this new environment or for the frequent faculty challenges to their positions, opinions, and expertise.

Consequently, one of the most interesting and significant changes under way in IT leadership is the emergence of CIOs

lege freshmen was going to the bookstore or computer center during orientation to buy a computer.

What do we know about the coming-of-age-in-academe experience of the first cohort of aspiring academics to be offered “personal computing” as part of their undergraduate experience? Those 1984

expect, that their engagement with technology—in the classroom, as part of the curriculum, as a resource for scholarship, and as a component of their portfolios—would distinguish their work from the activities of some of their older colleagues.

So let’s ask: has technology made a difference in the careers of today’s thirty-something academics? Are the classrooms that they experienced as undergraduates fourteen to eighteen years ago so different from the classrooms they served as graduate teaching assistants in the early 1990s or the classrooms they direct today as college professors?

As the French say, *plus ça change*—the more things change, the more things stay the same. Though many things have changed in the classroom, many things seem very much the same. For example, even though technology may be ubiquitous on

college campuses today, classroom instruction seems very much as it was one or three or even five decades ago, except that overhead projectors have been replaced with LCDs that display PowerPoint presentations and Web pages. Textbooks remain the most common source of curriculum content for lower-division undergraduate courses, even though predictions about the “death of the textbook” have been heard throughout academe on many occasions over the past three decades.

That said, there have also been some significant gains. Desktop and notebook computers and the Web provide an incredible level of self-sufficiency and independence that offsets the absence of the institutional support services that were once common at many institutions. Moreover, the Web offers a rich, amazing, and constantly growing array of content: time and place no longer determine availability or restrict access.

Admittedly, some academic traditions that should die will die hard. Today’s most senior faculty, who received what retrospectively appears to be comparatively early and easy tenure in the seller’s market of the 1960s, will soon retire, to be replaced by their younger colleagues who have had firsthand experience in the dire

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and of personnel in the CIO pipeline who are (or once were) faculty, not computer science people or IT managers. One of the distinctive characteristics of this rising generation of CIOs is the number of women who have come to campus computing, not as a result of their formal technology training but from their own interest in the power and potential of IT.

The members of this new generation of emerging CIOs are firmly grounded as academics, have a commitment to the potential of technology as a resource in instruction and institutional management, and work as part of teams. Theirs is often a more collaborative leadership, reflecting the new IT challenges in instruction and institutional operations (e.g., enterprise resource planning and implementation)—challenges that require the cooperation of all campus constituencies.

Coming of Age in Academe

The *digerati* will recall that Apple launched the Macintosh in January 1984. And the fall of 1984 was when a small number of colleges across the United States began selling personal computers at substantial discount to students and faculty. Thus in the fall of 1984, and for several years after, a unique aspect of the “going to college” experience for tens of thousands of col-

legians was going to the bookstore or computer center during orientation to buy a computer. freshmen are today’s “thirty-something” faculty. Many have survived the trials and tribulations of graduate school, along with the quest for a tenure-track academic position and the purgatory of assistant professorhood. The survivors are the newly appointed and newly tenured associate and full professors at colleges and universities across the country.

Our “thirty-something” colleagues—once the freshman classes of 1984–89—were the first to participate in the much-hyped “computer revolution in higher education.” Implicitly, they were promised a different kind of college experience: a better, technology-enhanced curriculum and a “new” computing that was decidedly different from the experience of trudging off to a windowless room in a campus computer center to write code in COBOL, Fortran, or PL1 or to run statistics using SAS or SPSS.

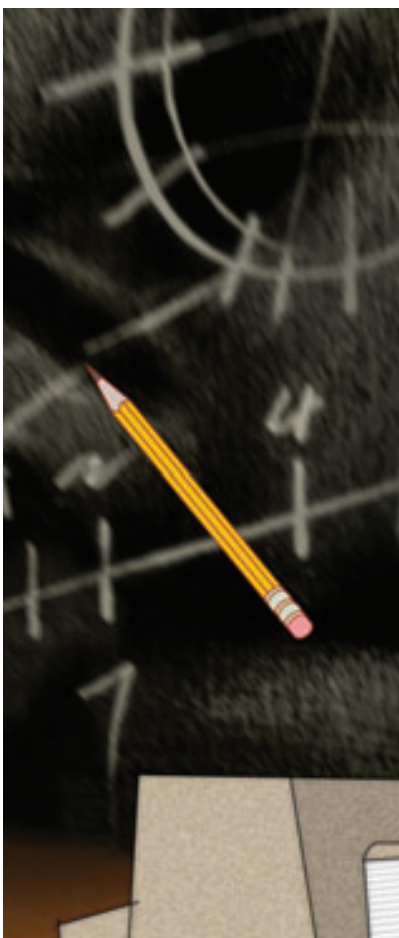
Too, for those mid-to-late-1980s undergraduates who were encouraged to attend graduate school in the humanities, sciences, and social sciences and were then recruited into the ranks of academe, there was an implied promise that this *new* computing would change curricula, enhance teaching and learning, and enrich scholarship. Today’s thirty-something faculty had good reason to hope, indeed to

academic market of the next three decades. The thirty-somethings now migrating into the middle ranks of academe, those who purchased their first computers as undergraduates in the mid-1980s, should begin to make slow but significant changes in the review of academic work and in the appropriate assessment of technology in the academic portfolio.

All of us in higher education must commit—individually and institutionally—to offer more than the implicit (or inferred) promise for the potential of technology in instruction and scholarship. We must realize our collective aspirations and, concurrently, recognize and reward the individual efforts of those who include technology in their academic portfolios.

Technology by Osmosis

There was no computer revolution in higher education or in education in the mid-1980s; rather, over the past two decades, technology has slowly migrated into instructional activities, scholarship, and institutional operations.



The technology challenges reflected in the continuing evolution of the “New Computing”—challenges that began with the arrival of the microcomputers in the mid-1980s—are not about products, and they are not about technology. Rather, the hard questions focus on programs, policy, and people. The difficult IT challenges we continue to confront in higher education involve how technology serves as a resource for students, faculty, and institutions and how we use technology to improve institutional services and enhance the learning experience. *e*

Notes

This article is based on a presentation delivered at the EDUCAUSE Annual Conference, October 3, 2002, Atlanta, Georgia. The archived video of that presentation is available online at <www.educause.edu/asp/doelib/abstract.asp?ID=EDU0211>.

1. Steve W. Gilbert and Kenneth C. Green, “The New Computing in Higher Education,” *Change*, May/June 1986, 33.
2. *Ibid.*, 34–35.
3. *Ibid.*, 47 (emphasis in the original).
4. Elisabeth Kübler-Ross, *On Death and Dying* (New York: Simon Schuster/Touchstone, 1969).