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# Technoliteracy and the New Professor\*

Margaret A. Miller

**C**OMMENT MADE by an irate Frenchman to an American somewhere in the Greek islands, fifteen years ago: “Vous les américains! Vous avez le pétrole, mais nous avons les idées!” (You Americans! You’ve got the gas, but we’ve got the ideas!). Fifteen years ago, America could count on gas and not ideas for its expansion. Recently, however, the United States in general and higher education in particular have been running low on fuel. Public higher education in America is suffering its first reductions in public financial support in modern times. And those reductions, sometimes labeled a “crisis,” are no temporary aberration; like periodic earthquakes in California, decreased state support and slowed tuition increases are realities with which higher education probably must deal for the foreseeable future.

So it has become necessary, to a degree that it has never been before, to have ideas. Those outside of colleges and universities, but responsible for them in some degree—legislators and bureaucrats—have the idea that institutions of higher education should use new telecommunications and computer technologies to multiply the teaching power of faculty.

Those who propose that solution, among others, to the problem of decreased resources often have little knowledge of information theory or experience in using the new teaching tools. At one level, they seem to be in the grip of the technological utopianism that is so venerable a tradition in American culture. But at another, they have an urgent and legitimate desire to solve the problem of educating more people with less money, without degradation of quality. And they clearly understand that, since salaries are the single biggest cost in the universities—accounting for up to eighty percent of educational budgets—and since faculty salaries constitute the main portion of that expenditure, any solution must involve extending the reach of faculty.

\*An earlier version of this paper was presented at a conference on undergraduate education at the University of Virginia’s Commonwealth Center for Literary and Cultural Change. It is a collaborative product, benefitting from the many substantive suggestions and editing help of Alan B. Howard, as well as from conversations with other pioneers in using the new teaching technologies in Virginia and elsewhere. Although the examples are drawn from Virginia, similar approaches are being initiated across the country.

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Other attempts to increase teaching productivity have been tried: increasing class size without changing instructional format, increasing the proportion of courses taught by teaching assistants or adjunct faculty, and reducing the availability of courses central to the curriculum. But most educators would agree that these approaches have generally led to a loss of quality that they, not to mention the tuition-paying public, find increasingly unacceptable. The imposition of mandatory teaching assignments for faculty, under consideration in a number of states and instituted in some, is a particularly misguided attempt to increase learning by raising faculty time spent teaching,

The new technologies are appealing for important reasons beyond merely extending the reach of faculty, though. The world from which college students come and into which they move is increasingly permeated with information technology. The capacity to manipulate that technology may very well be the most important ticket to the middle and professional classes to which higher education has long promised access. The dystopian version of this story is that as the gulf between the two nations in America widens, technological literacy will allow some people to have access to the upper class, when otherwise they might well fall into the underclass. The utopian hope is that if the general population masters the new technologies, national prosperity will increase and the gulf will narrow.

Another reason to consider technology as a necessary part of higher education's future is that students are changing. As an example from one state, less than a third of the enrollments in Virginia's state-supported institutions in 1993–1994 were full-time, degree-seeking eighteen to twenty-three-year-olds. Higher education is attracting more and more older students, who are generally place-bound and cannot afford to be cloistered for four or more years or to travel long distances to get the education that they see as the key to a better future. Colleges and universities will need to reach beyond their walls in order to serve those people whom they have recently begun so successfully to recruit. They must also respond to society's larger demand that its citizens have access to education throughout their lives, another necessary condition of national prosperity. Eliminating constraints of time and space, one of the promises of the new technologies, enables higher education to meet those needs to a degree that has not been possible before.

As colleges move into this brave new world that is opening in such disturbing and exciting ways, elite institutions will no longer be defined as those that teach privileged eighteen- to twenty-three-year-olds on manicured campuses. Rather they will resemble Virginia Woolf's "cheap college," which she describes in *Three Guineas*: "It must be an experimen-

tal college, an adventurous college. Let it be built on lines of its own. It must be built not of carved stone and stained glass, but of some cheap, easily combustible material which does not hoard dust and perpetuate traditions. Do not have chapels. Do not have museums and libraries with chained books and first editions under glass cases. Let the pictures and the books be new and always changing."<sup>1</sup>

In Virginia, Old Dominion University's proposed TELETECHNET will deliver, primarily by interactive television, Internet, and e-mail instruction, the last two years of undergraduate education to students who begin it at a community college. It is a contemporary embodiment of Woolf's idea, largely dispensing with the traditional campus and relying to some degree on a "virtual library," in which the books and pictures will be new and always changing in a way Woolf could not have imagined. The walls of the cloister have begun the irreversible process of crumbling.

But it is not just that higher education is increasingly serving a new population of "nontraditional" students; the traditional undergraduate population too is changing. According to Charles Schroeder, the largest group of the new generation of college students—about half of them—are "concrete active learners." These students learn best from direct experience that engages their various senses; structured and sequential teaching; and learning that begins with practice and ends with theory, rather than the other way around. They are "at a disadvantage on any timed examination that focuses on the ability to quickly manipulate symbols and see patterns in relationships between words and concepts."<sup>2</sup> Since they have emerged from a school system that generally rewards more abstract learners, they prosper in an environment rich with immediate feedback and in collaborative learning situations. To these students, the virtual classroom is likely to feel much more like home than the lecture hall with bolted-down seats and a passive audience of hundreds. The virtual classroom also can exploit the full range of ways in which these students learn; teach through a variety of visual and auditory modes; permit interactions, not just between professor and students, but among students; and be entered on students' own time, at their own pace, and from the comfort of their own homes or dormitory rooms.

Educational researchers are convinced that active learning works better than the passive variety for all students. There is anecdotal evidence, too, that some students want to be more fully in charge of their education. At a conference held at Syracuse University, a group of student writers made their preferences clear. "Students eloquently urged instructors to develop more fully a partnership with students as

agents in their writing studios: to make them negotiating partners in selecting topics of inquiry, developing writing assignments, responding to papers, grading, and every other aspect of the course.”<sup>9</sup>

Of course, the technological revolution in the academy will be stalled unless the faculty’s immense intellectual resources are brought to bear on realizing the promise of technology; left to legislators and newspaper columnists, an opportunity to rethink and reinvigorate institutions of higher learning will be lost, buried beneath statutes and clippings. The faculty’s willingness to assume responsibility for the nature and direction of technological change is therefore critical. And that willingness depends primarily on the faculty’s capacity to be deeply self-reflective, to master its anxiety that these changes threaten the professor’s traditional role and status. Some of those anxieties will prove to be unfounded, but the shift in modes of teaching and thinking implicit in the new technologies will nevertheless pose very real challenges.

One concern often expressed about technology is that students will, by using machines, somehow become machinelike. This concern is partially due to the misuse of early forms of passive technology like the overhead projector and the videotape, although nothing is actually more likely to turn most students into automatons than the average 250-person lecture. And partly it is due to a particular kind of technophobia—prevalent in America, especially among humanists—which sees machines not as tools but as beings possessing the magical power to infect humans with their machine nature. Sally Johnstone, of the Western Cooperative for Educational Telecommunications, has an early typewriter ad on the wall of her office, enumerating various concerns people had about the on-rushing world of the “teletypist.” The last concern listed on the poster is that using a typewriter would destroy students’ ability to create original stories.

Probably the most prevalent reaction to any proposal to rely on new technologies for teaching is that they do not save money—that on the contrary, they only add to the costs of instruction. And the initial investment in the technologies is indeed significant. It is also true that technology will cost more than traditional modes of instruction even in the long run if it is used merely to supplement them, instead of as a way to free faculty to do what only they can do. The crucial decision to be made is when technology can be used for instruction and when nothing will substitute for a professor on one end of a log, even when it is a virtual log, and a student on the other. In Virginia, for instance, Radford University has developed interactive multimedia instructional modules in oral communication. These provide what their authors describe as “individualized, self-paced, active instruction in the fundamentals of oral

communication,” which “frees speech instructors to provide more performance feedback to more students, thus improving the quality of instruction as well as providing cost-effective instruction in oral communication to more students.”<sup>4</sup> But this necessitates rethinking the role of the professor.

This connects to another anxiety, that technology will actually supplant the professor. It may indeed supplant certain professorial functions, like simple information transmittal. But the professor becomes indispensable in other functions, providing students with a sense of the whole, with a rubric of essential questions and possible paths to follow in seeking their answers. Rather than standing at the front of the class as the complete, perfected knower, the professor surfs alongside students, sharing curiosity, delight, and tumbles—not a repository of answers but a model questioner and problem-solver. The teacher’s job, in this brave new world, is not primarily to convey the information contained in, say, the *Norton Anthology of English Literature* but to model, teach, and provide students the opportunity to practice the processes of judgment that went into its creation.

But will something be lost in this switch—status, power, control? Faculty discussing these issues in Virginia characteristically respond to descriptions of the technological classroom with the assertion that “I want to filter and chunk and shape the material for my students.” That response ignores the degree to which faculty have already ceded that control, to technologies that are so familiar that they are not even recognized by the user—to books and even to some of the older, nonmalleable contemporary technologies such as videotape and film. In Hungary, where faculty/student ratios are as low as one to six, faculty often spend as much time in class each week as professors at American research institutions, since students go to class twenty-five to thirty hours a week. Why is this necessary? Because students have no easy access to books, the means by which in more affluent countries information is already chunked and filtered for students. Books are a labor-saving technology that has been rendered invisible by its very omnipresence.

The new professor will retain control as the architect of the virtual classroom, the mapmaker of the virtual world, the teacher of the navigational skills that will be critical as students process masses of information during and after college, the poser of questions, the legislator and judge. In fact, the real danger may be that the new technologies permit control to assume even subtler, more invisible forms. The professor who creates a virtual classroom may be, in a sense, “like God in his universe, everywhere present but nowhere visible,” as Flaubert said about his narrator. Although it is more spacious than a traditional classroom, and the student is freer to move around in it, that

freedom is to some degree spurious, since the author sets the boundaries and the laws of nature that obtain within that domain. So it is important to keep those boundaries and laws visible and open to challenge. The architecture of the virtual classroom should be like that of the Centre Georges Pompidou, with its pipes and mechanical systems showing.

But the professor will undoubtedly give up other kinds of control. George Teschner, who teaches philosophy through e-mail at Christopher Newport University, has commented that the larger the class the better, since more students provide more opportunities for interaction. That is true only if all exchanges among students no longer need to flow through, and be mediated by, the instructor. To work cost effectively, the professor in the new classroom must cede some teaching to students. Undergraduates, whom the Nobel physicist Kenneth Wilson calls the most underutilized teaching resource in the university, are likely to welcome this development. In one survey, more than eight in ten students involved in e-mail instruction found the quality of their interactions with each other as good as or better than in the traditional classroom.<sup>5</sup>

Some faculty, on the other hand, will undoubtedly hope that these changes can be delayed until they themselves reach the safe harbor of emerithood. Some will be uncomfortable giving up, in the electronic classroom, traditional markers of authority such as age, clothing, and the capacity to grant or withhold permission to speak. Some will also dislike relinquishing the privilege of physical position and relative comfort, of standing and moving freely in front of a group of seated students who must look up and who are imprisoned in that place, time, and uncomfortable seats, their bodies' natural motility arrested. In this environment, the professor cannot even rely on being the smartest person in the "room." Those "slow" concrete-active students described earlier might well be more comfortable with the new ways of learning than introverted, abstract thinkers who have been rewarded all their lives for being "quick." The students will almost certainly be more comfortable with the technology itself than the professor is, the way a person who learns to drive at thirteen will always be more comfortable behind a wheel than one who learns to do so at thirty.

To make these changes work, the new generation of graduate students may need to be selected by modified criteria and socialized differently. Within the academic profession, rewarded behavior will also have to change, along with too-long unexamined notions of what constitute "first-rate," "nationally visible" people and institutions. Robert Heterick, president of EDUCOM, has pointed out that it takes about as long to create a good piece of instructional software as it does to write a book.<sup>6</sup>

Unless institutions recognize and reward people for that work and for teaching in these new formats, they risk letting the “cyberwonks” shape the transformational potential of what may come to be a critical instructional mode.

Because the move to new forms of information storage and communication does have the power to be transformational, not only of teaching but of thinking, it seems reasonable to look at a similar critical juncture in intellectual history. The descriptions by Walter Ong, Eric Havelock, and others of the effect of the last great shift in information processing, the one from orality to literacy as mediated by the technology of the alphabet, are instructive. Those descriptions, while not universally accepted, suggest the ways in which the shift to postliteracy, or technoliteracy, might affect structures of communication and thought.

Primary orality, according to Havelock and Marshall McLuhan, differed from literacy in three important respects: in the role of memory, in the degree to which the text was both fixed and linear, and in the relationship between both the knower and the text and the knower and the audience.<sup>7</sup> First, in primary orality—that is, orality that alone carries for a society the culture’s code of behavior and essential information—the singer relies on rhythm, repetition, and narrative (among other mnemonic devices) to remember large stores of cultural information. In literacy, where the written work takes over the tasks of memory, those mental energies are freed for other functions. Socrates’ laments about the destruction of memory by writing are echoed today by teachers who are worried that information technology will make students even less likely to retain in their heads information about their exponentially growing disciplines. In either case, the “reader” relies on an artifact, the book or computer, to retain the information for him.

This current concern is probably as well-founded as Plato’s, who predicted correctly the loss of the capacity to memorize large bodies of acoustical material. But one of the reasons that such memorization was possible in the first place was because, compared to the postknowledge-explosion world, in Greece in its oral and even early literate phases there was relatively less data to master. The new technologies greatly increase access to what are already almost unmanageable amounts of necessary and even larger amounts of useless and unintelligible information. At the same time they increase the capacity to leave the memory-of-content function to machines that are so much more capacious than books. The job of educators, then, is to teach the conceptual frameworks, essential information, and technical skills that make retrieval, organization, and use of that information possible.

The field of accounting provides an interesting case in point. The Big Six accounting firms have declared, in their white paper on accounting



education, that no one can master the content of their discipline in an undergraduate education.<sup>8</sup> In fact, the rules governing the profession are so numerous and change so fast that accountants must be prepared to continuously learn and relearn them throughout their professional lives. The firms seem to have returned to A. N. Whitehead's notion that the aim of education is not knowledge accumulation but "mental cultivation": "the satisfactory way in which the mind will function when it is poked up into activity."<sup>9</sup> Consequently, they ask that colleges and universities give them graduates, not who know everything, but who have the capacity to learn. That is, they want employees equipped with the conceptual schema and information-access skills that will enable them to swim without drowning up the information stream. Of course, some content knowledge will be necessary too, first, because people learn by accumulating stories and comparing present constructs to the ones in those stories and second, because of the demands of the profession. Tax accountants must keep, now, a fairly detailed knowledge of ten years worth of tax law in their heads in order to respond quickly to client needs (a period set by tax law rather than by the limits of memory). But every year, they have to dump some of that information and replace it with the newest version of the story.

A second way in which the move to technoliteracy could change thought itself resides in the structures of information. To return to Ong, Havelock, and Socrates, an oral performance is episodic and recursive. The written text—although it can be scanned backwards, parts of it can be arranged and compared visually, and it can contain "complex relational structures"<sup>10</sup>—is fundamentally linear. Hypertexts and certain kinds of computer-aided instruction, though, more closely resemble episodic Greek oral texts in their fragmentation, recursiveness, and variability. As Ross Atkinson says, "Hypertext . . . permits any text or group of texts to be reduced to its constituent elements, so that these elements can be rearranged or reconstituted in new sequences."<sup>11</sup> The challenge for educators using such new technology is one that does not face them when assigning a book: it is to help students discover those paths through the text which yield, for each of them, optimal learning.

Finally, the relationship between the knower, the known, and the audience shifts in interactive computer instruction. In oral recitation, the singer is, in some sense, the song, and the audience in an oral culture also participates by chanting and moving their bodies in concert with the singer's. Literacy makes the word and text into an artifact, fixed and separate from the writer, who is also separated in space and time from the audience. Socrates complains that writing is fixed and nondialectic: "You would imagine that they [books] had intelligence, but if you require any explanation of something that has been said, they

preserve one unvarying meaning." But in word processing, particularly when the products are submitted to the manipulations of an electronic work group, the text is much more fluid and collaborative. Socrates also lamented the separation of author and reader in books, which "are tumbled about anywhere, all alike, among those who understand them and among strangers, and do not know to whom they should or should not reply." In interactive hypertext, readers can not only query the text but create the experienced text by finding their own paths through it. In this context, the concept of "reader" response takes on new life.<sup>12</sup> The task for educators then becomes to teach students to be good, responsible, creative, and collaborative audiences/readers/authors. In order to do that, of course, the educators themselves must become those things, first by treating students as coauthors.

These changes are very dislocating; they create the need to break old habits and revise old and venerable ways of teaching. For instance Lone Rangers of the classroom now may find that they need to be part of an instructional team that includes technical support people, librarians, and pedagogy experts. Too, faculty will need to assess student learning in these new environments. As Heterick has pointed out, "for the first time since Gutenberg's invention of movable type, we have the opportunity and the technology that will permit us to break with the credit-for-contact model and consider alternatives to lecture as a delivery mode."<sup>13</sup> Despite its appeal as an accounting mechanism, the credit hour has long been a debased currency; self-paced instruction and nonclassroom modes of teaching should deal it its death blow. Then faculty will need to find other ways to certify student learning. This will entail more serious and public consideration of what they want students to know and be able to do when they finish a "course" and how that fits into the larger goals of the program, as well as the development of more valid, reliable, publicly credible, and authentic ways of assessing that learning.

Of course use of the new technologies will differ by discipline and level of instruction. In many cases, though, they promise to fit better with the practice of the discipline than traditional teaching modes do. In the humanities, for instance, there is growing recognition of the congruence of two apparently unrelated disciplines, computing and literary theory. As George Landow, one of the most experienced and articulate observers of this phenomenon, puts it, Theodor Nelson and Andries Van Dam in computing and Jacques Derrida and Roland Barthes in theory seem to be examples of that happy convergence of disciplines in which each discovers in the other a shared body of concerns, assumptions, and even metaphors. "All four, like many others who write on hypertext or literary theory, argue that we must abandon

conceptual systems founded upon ideas of center, margin, hierarchy, and linearity and replace them with ones of multilinearity, nodes, links, and networks."<sup>14</sup> Understanding this convergence, harnessing it to humane ends, and exploiting its positive potential will constitute the major challenge for the university in the foreseeable future.

The speed and completeness of change is always difficult to predict. In Greece, the movement from literacy to orality took several hundred years. Print—even if it is print on screen—will probably never be replaced for some things, like extended argumentation, since “the fragmentation effect in hypertext . . . is likely to make it more difficult for the learner to perceive the author’s intended argument structure.”<sup>15</sup> But granting all their uncertainty and partiality, all their dangers and risks, the new technologies have the power to reinvigorate our intellectual and institutional life. The period in which Havelock claims orality and literacy overlapped was one of the richest in human culture, the period of the great Greek dramas and the development of Greek philosophy. In the midst of the dislocations that accompany the shift from literacy to whatever amalgam of media that will follow it, we know neither what treasures the new modes of thinking will yield nor what price we will pay for them. But no one ever said that the life of the mind, with all its extraordinary pleasures, was comfortable or risk-free. It is only by periodically shattering all received ideas, our own included, that our minds, like seeds, can grow.

#### STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA

#### NOTES

- 1 Virginia Woolf, *Three Guineas* (New York, 1966), pp. 33–34.
- 2 Charles C. Schroeder, “New Students—New Learning Styles,” *Change* (September/October 1993), 25.
- 3 Louise Wetherbee Phelps, “A Constrained Vision of the Writing Classroom,” Modern Language Association, *Profession 93* (New York, 1993), 51.
- 4 Michael Cronin, “Teaching Listening Skills Via Interactive Videodisc,” *Technological Horizons in Education Journal* (December 1993), 66.
- 5 Sally Johnstone et al., “Student and Faculty Survey Responses and Analysis,” *New Pathways to a Degree: Technology Opens the College*, ed. Richard A. Markwood and Sally M. Johnstone (Boulder, 1994), pp. 139–40.
- 6 Robert C. Heterick, Jr., *Re-engineering Teaching and Learning in Higher Education: Sheltered Groves, Camelot, Windmills, and Malls*, CAUSE Professional Paper Series 10 (Boulder, 1993), p. 3.
- 7 The argument summarized here is developed by Eric E. Havelock, *The Literate Revolution in Greece and Its Cultural Consequences* (Princeton, 1982).
- 8 Duane R. Kulberg (Arthur Anderson & Co.) et al., “Perspectives on Education: Capabilities for Success in The Accounting Profession,” n.d.
- 9 Alfred North Whitehead, *The Aims of Education and Other Essays* (New York, 1929), p. 42.

- 10 Peter Whalley, "An Alternative Rhetoric for Hypertext," in *Hypertext: A Psychological Perspective*, ed. C. McKnight et al. (New York, 1993), p. 9.
- 11 Ross Atkinson, "Networks, Hypertext, and Academic Information Services: Some Long-Range Implications," *College and Research Libraries* (May 1993), 203.
- 12 Socrates' complaints about writing can be found in *Phaedrus* (275 A-D). The translation used here is by Benjamin Jowett, in *The Dialogues of Plato*, 4th ed. (Oxford, 1953), vol. III, pp. 184–85.
- 13 Heterick, *Re-engineering Teaching and Learning in Higher Education*, p. 1.
- 14 George P. Landow, *Hypertext: The Convergence of Continental Critical Theory and Technology* (Baltimore, 1992), p. 2.
- 15 Whalley, "An Alternative Rhetoric for Hypertext," p. 11. Atkinson registers a worry about the loss of authority: "Hypertext's . . . infinite flexibility could create an environment in which the original expression of the author could become obscured or lost altogether" (p. 203).