



Whither Educational Technology?

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One of the first educational technologies was writing, and like every subsequent educational technology, it had its critics. Plato, most famously, denounced the medium for its inability to recreate the give and take of spoken discourse. Writing is analogous to painting, he has Socrates argue in *The Phaedrus* (a text that, fittingly, depicts an intimate conversation between teacher and student).¹

The painters' products stand before us as though they were alive, but if you question them, they maintain the most majestic silence. It is the same with written words; they seem to talk to you as though they were intelligent, but if you ask them anything about what they say, from a desire to be instructed, they go on telling you just the same thing forever (1961, p. 521).

In short, Plato holds that the technology of writing has the power to destroy the dialogic relationship that ought to occur between teacher and student. As he sees it, the medium in which we communicate determines the quality of our interactions. But this is a deeply flawed view, as many contemporary scholars have argued. Rather, the social impact of technology depends on how it is *designed* and *used*. Writing can lend itself to ongoing dialogues between teachers and students, and speech can easily become one-sided.

However, while Plato may have made an unfair generalization about writing, his critique still had merit in at least one respect: it's worth keeping in mind that whenever a new educational technology is introduced, we ought to be wary lest reformers configure it in a way that closes off the process of intellectual exchange. There is something about dialogue, and the active involvement of the teacher, that is fundamental to the educational process and that must be woven into the design of any new instructional tool. Educational technologies that lack an interactive component, such as televised courses and computer-aided instruction, have never succeeded in displacing teachers from the front of the classroom.³

THE DESKILLING OF THE TEACHER?

In fact, this ideal has inspired many educators since the early 1980s, and considerable progress has been made in using computer technology to develop new forms of dialogic interaction among teachers and students (Harasim et al., 1995, chap. 3; Berge, 1999). On-line distance learning, in particular, holds tremendous promise in this regard, offering the potential

for great improvements over previous models. Correspondence schools, for example, have always achieved some success at using the mail to maintain written interactions, but the process is slow and unwieldy. With the Internet, for the first time, we have an educational technology that supports rapid and convenient communication, and there's every reason to think that Socratic dialogue can flourish in this medium.

Unfortunately, though, the current rage for computerized instruction tends to emphasize a quite different set of possibilities for the Internet. We have seen a new round of interest in 'teacherless education,' or the automation of key parts of the teaching-learning process. Neither television nor stand-alone computers ever managed to accomplish this feat, but many believe that such possibilities wait for us just a few miles down the information superhighway.

The idea of replacing teachers by computers is an old one, but until recently few educational technologists and administrators were convinced. The ideal of automated education is no doubt still a minority view, but it has gained sufficient plausibility from advances in computing and the Internet to occupy a considerable space in public discourse regarding education. To the extent that earlier attempts failed for purely technical reasons, the Internet does show promise. In its ability to transmit graphically exciting materials, programs, and text, it represents a considerable advance over earlier means of delivering information. It can even offer crude imitations of teacher-intensive tasks, such as answering questions using FAQs (Frequently Asked Question lists) and 'Ask the Expert' help programs. 'Intelligent agents' can adapt computer-based programs to students' learning styles (Kearsley, 1993). And, incredibly enough, it may even be possible to automate the grading of essay tests, as Peter Foltz and Thomas Landauer claim in describing their 'Intelligent Essay Assessor,' based on a technique called 'Latent Semantic Analysis' (Foltz, 1996). According to a Coopers & Lybrand white paper, this kind of software will soon have a radical impact upon the daily realities of higher education. '[A] mere 25 courses' of packaged instructional software could handle 80% of enrollment in core undergraduate courses; a 24-hour help desk would add a personal touch (Coopers & Lybrand, 1997). Whether all this works well is less important than the place it occupies in the imagination of certain educational reformers.

Why would we want to automate highly skilled educational tasks? Some may argue that technology can deliver certain kinds of education more effectively than can faculty. Others would claim that automated instruction offers 'consumer-friendly' options for working adults. But in the final analysis, the main reason for automating is obvious: to cut costs. Skilled workers are expensive, and automation is a time-honored strategy for reducing the need for them. The story begins in the early 19th-century, when textile manufacturers in northern England discovered that they could lower costs by mechanizing and replacing skilled with unskilled labor. The whole history of the Industrial Revolution is dominated by this strategy.

Here is how the 19th century 'philosopher of manufactures' Andrew Ure described the goal in 1835:

By the infirmity of human nature it happens, that the more skillful the workman, the more self-willed and intractable he is apt to become, and, of course, the less fit a component of a mechanical system, in which, by occasional irregularities, he may do great damage to the whole. The grand object therefore of the modern manufacturer is, through the union of capital and science, to reduce the task of his work-people to the exercise of vigilance and dexterity (p. 18).

Attempts to similarly de-skill teaching have never been very successful in the past, but many observers are beginning to believe that new technologies can do the trick. Perhaps it will be possible to create a system whereby a variety of educational tools are delivered over the Internet and supplemented by the recorded performances of a few star professors. Then, low-level staff will perform the last few remaining tasks, such as notifying students of the availability of materials or of tests and deadlines.

Is such a gloomy version of the future really plausible? Is it likely that 'self-willed and intractable' professors will disappear as have weavers, shoemakers, and typesetters? Probably not, but whether our uses of technology are about to lead to the wholesale deskilling of the professoriate is less important than the fact that this idea occupies a key place in the imagination of some educational reformers. Much of today's reform rhetoric, with its appeals to the revolutionary potential of virtual universities and competency-based degrees, hints at the obsolescence of the traditional campus and its teaching methods, arousing suspicion among faculty that technology will be used against them. Perhaps this is what is most at stake in our present debates about the computer's role in shaping the future of higher education: in making plans for the use of our new media, do we threaten to delegitimize faculty's control of the educational process?²

A THIRD WAY FOR EDUCATIONAL TECHNOLOGY

Ironically, contemporary thinking (if not always practice) in the business world has long since left behind the industrial era's fascination with deskilling. Over the last two decades, a good deal of business literature has been devoted to exploring a third way, an alternative to the opposition of 'man' vs. 'machine.' Starting with Peters and Waterman's 1982 best seller *In Search of Excellence*, Frederick Taylor's old model of de-skilled labor and hierarchical management was blamed for everything that ailed American business. The lesson has been hammered home in dozens of similar books since then.

Harvard business professor Shoshanna Zuboff made a particularly persuasive contribution to the field with her book *In the Age of the Smart Machine* (1988). As she sees it, we can continue to de-skill and automate production, or we can choose to take a new path, one that leads to what she calls 'informating,' or the cooperation of skilled workers and computers

in ways that enhance the productivity of each. Zuboff's work emphasizes the *complementarity* of human and computer capabilities. While humans are best at dealing with unexpected situations and responding to novelty, computers can organize and represent the vast amount of data required by modern production processes. A similar complementarity is at work in education: the teacher manages the complex and unpredictable communication of the classroom, while data is delivered in textbooks (and now by computers as well).

Zuboff's view contrasts sharply with technological determinism, the belief that innovations cause unique patterns of social change. The determinist view is increasingly challenged in technology studies by social explanations of technological development (Pinch & Bijker, 1987; Feenberg, 1999b). However, this new approach is far from obvious. The conflictual process of social decision-making about paths of technological development is quickly forgotten. Each new situation is confronted afresh by actors who assume that their preferred option is uniquely rational. It is this ready forgetfulness which gives rise to the illusion of technological determinism. But historical and sociological research shows that innovations confront us with *choices*, not with a single destiny.

The specifics of the business literature are not always directly relevant to colleges and universities, but Zuboff and others' emphasis on technological choice is right on the mark. Unfortunately, though, higher education hasn't entirely gotten the message. Many college presidents continue to sell their constituents on the *inevitability* of computerization, as though the very existence of these new devices sets the reform agenda in some clear-cut and unambiguous way. And there still exists plenty of faculty opposition to the supposed *consequences* of the new media, as though their impact were pre-determined (Feenberg, 1999a; Farber, 1998).

But the computer is the least likely candidate for a determinist philosophy of technology. It has undergone such major changes so recently that we can easily penetrate behind the veil to view the social dimension of its development.

Not long ago, computers were assumed to be calculating and information storage devices, and their occasional application to other arenas seemed irrelevant or wasteful in the eyes of most computer specialists. It was only in the 1980s that electronic communications exploded, first in France, where the Minitel system quickly attracted millions of users, and soon afterwards on the Internet. It was mainly non-professionals (or professionals not associated with the design and management of the systems) who pioneered such uses of the new electronic technologies. And they succeeded because ordinary people wanted computers to serve their personal goals and not just the official functions emphasized by experts (Feenberg, 1995; chap. 7).

Just twenty years ago, few imagined what the future would hold for apparently trivial applications such as email. But it seems obvious today that the computer serves as a vital medium of communication, and not

just as a calculating and information storage device. Its *definition* has changed in a direction determined by a social process. And the story is not yet over. The computer is not yet a finished product. It is still in flux, its evolution subject to a wide range of social influences and demands.

Just as twenty years ago the deterministic discourse of the computing and business community failed to anticipate the most important line of development of the devices they controlled, so today 'technology' cannot determine whether teaching will be automated or informed. Computers by themselves do not hold such power. On the contrary, we must ourselves make the decisions that will steer the future development of educational technology. And this is precisely why it is so very important for higher education to include a wide range of actors in technological design (Wilson, 1999). Students and faculty bring a number of considerations to the table, including the desire to create tools that support human interaction, a desire that has already manifested itself forcefully in the earlier evolution of the computer. To resist the automating trend in education is not simply to wallow in an old-fashioned Mr. Chips sentimentality. Rather, it is to open a space for arguments supporting alternative lines of technological development. The danger is that we might listen so attentively to our technology gurus that we end up ignoring these other voices.

THE PROMISE OF ON-LINE DISTANCE LEARNING

The relevance of alternatives to automation may be most pressing in the field of online distance learning, a field that I helped to create in the early 1980s (Feenberg, 1993). In 1981 and 1982, I worked with the Western Behavioral Sciences Institute (WBSI) in La Jolla, California, on the creation of a new type of distance learning school. Our goal was to enable busy executives to participate in a humanistic educational experience despite job demands that made it impossible for them to attend regular university classes. The only way to do this at that time was the old-fashioned correspondence course, the reputation of which had fallen so low in the US we did not envisage it. Instead, we opted for computer networking, a still experimental technology available primarily in a few large computer companies and universities, and on small publicly accessible host machines such as the Electronic Information Exchange System (EIES) at the New Jersey Institute of Technology. These were the obscure forerunners of the Internet as we know it today. Despite technical and pedagogical difficulties, our experiment succeeded well, and today is recognized as the first educational program delivered online.

At WBSI, the emphasis was on human communication by computer, precisely the opposite of the usual correspondence school experience. Online discussion, such as we practiced at WBSI, is best organized 'asynchronously,' that is, through an exchange of messages stored on a central computer for delivery at the convenience of the recipient. This leaves time

for reflection and composition and supports intellectually challenging collaborative learning. It is essential to distinguish such legitimate and well tested pedagogical practices from experiments with pre-packaged, automated 'courseware' now widely identified with online education.

As our example shows, online education was originally conceived in a break with the correspondence school model. Traditionally, correspondence schools fed written documents or TV and radio broadcasts to isolated students studying in their home. Given the economies of scale in the production of documents and broadcasts, this model yields tremendous cost savings when compared to classroom education. Essentially, labor costs approach zero as the school acquires a body of reusable materials. But note the social condition for these economies: the isolation of the student.

The Internet now promises to raise the level of correspondence education, and it promises to do so inexpensively, by improving the materials available to the student. Not only does it replace the Post Office, television, and radio as means of delivery, but it can also carry out new tasks, delivering film, audio, and automated educational programs quickly and conveniently. However, the Internet can do more than merely improve the traditional correspondence course; it can also be used to add human contact to an educational model that has always been relatively impersonal. Using email and computer conferencing, groups of students can be assembled in online communities where they can participate in classroom discussion with teachers on a regular basis. The gap between correspondence education and online learning as we implemented it twenty years ago can now be erased.

An automated system of online education does not take advantage of this new potential of the Internet but perpetuates the old correspondence school model. It simply extends the economies of scale associated with the distribution of written materials into the wide range of media supported by the Internet (Agre, 1999). On the other hand a system that *also* includes live interaction does so at a price: a qualified teacher must be in attendance at every iteration of the course. The one thing that will never be successfully automated is the unpredictable course of human conversation, however it is technically mediated. Thus an online course based on a discussion format will need the teacher's continuing presence throughout. Institutions may save money on building costs but not on educational labor, the single largest item in most university budgets.

There are further implications for the design of courses. Automated products will tend to be quite elaborate, since they must rely entirely on the computer to dramatize their message and motivate the student. Courseware designers and producers will manage the work of star faculty who can offer a polished performance in the new medium. Predictably, educational technology will evolve to Hollywood levels of complexity.

By contrast, courses animated by a live professor will generally be designed under his or her control in relatively simple and flexible formats.

No computer professionals need be involved. As in the conventional classroom, much of the interest of the product will lie in the interaction among students and between students and teachers. As far as techniques of presentation are concerned, a certain healthy amateurism is to be expected. Prepackaged computer-based materials will not replace the teacher but supplement his or her efforts, much as do textbooks today. Software designers will pursue user-friendliness and simplicity to serve faculty needs.

The confusion between these two models has disastrous effects both on online teaching and public debate over online education. On the one hand, new teachers may think that 'course conversion' is complete when a batch of materials is ready for uploading, without exploring the dialogic potential of the medium. On the other hand, critics of online education may dismiss it reflexively as just another attempt to get rid of teachers without considering the full range of options. In sum, there is no one thing properly described as 'online education.' There are two alternative models

— an interactive dialogic model and an automated model — with quite different pedagogical and financial structures.

SHAPING THE FUTURE OF EDUCATIONAL TECHNOLOGY

The field of on-line distance learning faces precisely the same choice between automating and informing that businesses face as they confront the challenge of the computer. And, surely, we ought to make this choice on educational grounds. We already have a base of experience with interactive forms of on-line education, and the evidence seems clear, at least to those who have tried it: written dialogue works. Using computer conferencing software, faculty in many universities have for years now been working to bring the excitement of classroom discussion to an electronic setting. Such on-line discussions are not the same as face-to-face interactions, of course, but they have their own advantages. For the instantaneous back and forth of real-time discussion, they substitute a slower but still engaging day to day rhythm. With time to think and compose questions and answers, students who might never have participated in a face-to-face setting bring forward their ideas. The use of writing imposes a discipline and helps focus thinking. Faculty learn to grasp students' ideas at a much deeper level as they engage with them on line. Innovative pedagogical techniques have been adapted to the Internet and new forms of interaction invented (Harasim et al., 1995, chap. 6). In successful experiments, small classes are the rule: twenty is a good working number. From an educational standpoint, there is little doubt that competent teachers under these conditions can be effective at sustaining a true equivalent of classroom interaction.

But in shaping the future of our technologies, economic and political realities now look to play the leading roles. Higher education seems increasingly

enamored with corporate rather than professional models of organization. The erosion of traditional faculty status continues apace in innovative institutions serving adult learners, now half the students in higher education. Even the older universities that now teach a declining fraction of students employ more and more part timers in the search for 'flexibility.' And it is becoming more difficult to resist arguments against tenure, arguments that carry conviction with the public if not with most members of the university community. In short, there exists a great deal of temptation to think of technology as a managerial tool for centralizing the university. And if we are not careful, something like this may actually happen in the confusing environment created by technological change. Bad decisions will be locked in technically and difficult to reverse.

The quality of college education is at stake not in *whether* we use computers but in *how* we use them. This is the real problem distorted in the current debates *for* and *against* technology. It is time to get beyond that frozen opposition to focus on the deeper social issues underlying our technological choices. The debate over educational technology must be framed in a broader context because the issues are not primarily technical. It reflects the changing relation of management and professionalism, which in turn concerns issues of career patterns, standardization, quality, and control. The resolution of these issues and the evolution of educational technology will go hand in hand.

Fortunately, how we design our new technologies is still an open question; the answer will decide *which* benefits and *which* limitations we end up with. Indeed, that choice will decide who the 'we' are that peoples the educational institutions of the future, since our models of computerized instruction will define the future identities and roles of students and teachers. If we can resist simplistic appeals to managerial efficiency and focus our efforts on sustaining the dialogue that has always been at the heart of the educational experience, then technology holds great promise; if not, then we face a great threat.

NOTES

1. Ironically, Plato used a *written* text as the vehicle for his critique of writing, setting a precedent that we continue to follow in present-day debates about educational technology: many of the most vociferous attacks on web-based media circulate *on the Internet* (Noble, 1997).
2. It is true that combining the telephone with live television yields an interactive system, much better than either by itself, but the two technologies are not integrated and the resulting combination is fairly clumsy.
3. Perhaps the quality of the debate is improving. See the Report of the University of Illinois (1999).

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