Global Literacy Practices?
Cultural Perspectives on the World Wide Web

Communication-Information Technology and First-Language Teaching:
The International Experience

Dr. Cynthia L. Selfe
Michigan Technological University
Houghton, Michigan 49930
cyselfe@mtu.edu

Generally, when people get together to explore technology issues in language teaching, they *really* want to talk about change. They want to talk about progress, about how the world is becoming a better place in which to live because of the contributions of computer technology.

This is common sense, of course, when the introduction and integration of computers into curricula has become such a focus of our national and educational hopes; when teachers in such a range of subject areas write about technology as an effective instructional ally; when the media reports on the growing influence of computer technology in the spheres of commerce, banking, governmental affairs, manufacturing, information exchange; when businesses, governments and industries all over the world pour millions of dollars into educational computing efforts; when students and their families tell us about their desire to learn to use technology and their belief that this knowledge is going to provide them the personal advancement and economic prosperity they seek; when we all observe, first-hand, how e-mail has brought individuals together across geopolitical borders, how the World-Wide Web has provided an environment for global communication exchange, how change-seemingly impelled by technology-happens overnight.

But a belief in technology as an agent of social change, even as a precursor for educational progress, is not one that I want to encourage today. In fact, I want to challenge that belief and provide a cautionary tale for countries that are in the process of integrating computer technology into their educational efforts. Technological change, I will argue, does *not* necessarily lead to productive social change or educational progress; the integration of technology into classrooms does not necessarily solve educational problems-sometimes, indeed, if technology is not used carefully and with a critical understanding of its effects, it exacerbates persistent and longstanding educational problems in the teaching of language and literacy. This is my message today.

To make my point, I will tell you a tory, and, for this story, I will draw on experiences within the American educational system since 1974, during a period of rapid and vigorous technological integration when the first fully assembled microcomputers began entering American language-study classrooms. In the early days of personal computers-somewhere around 1979-the enthusiasm for these machines as educational allies ran high. Teachers in English/language arts hoped not only that they could help us grade and evaluate student writing (Marling, 1984; Jobst, 1984), but also that they could provide effective grammar instruction (Holdstein, 1983; Falk, 1985), identify stylistic problems (Neuwirth, Kaufer, and Geisler, 1984; Reid and Findlay, 1986), check spelling (Zimmer, 1985; Harris and Cheek, 1984), teach sentence combining (McCann, 1984), and help students improve the quality of their first-language skills (Duling, 1985; King, Birnbaum, and Wageman, 1984; Montague, 1990). Even more important than these specific content-based goals for English classes, however, was the broader educational hope that computers could, somehow, help solve some of the larger problems that had been plaguing American classrooms, and, indeed American society, for years: among these, persistent patterns of illiteracy, poverty, and the lack of democratic opportunity-all of which are aligned clearly in our country along the related axes of race and class.

As the culturally informed reasoning went, if the nation could put enough computers into enough schools, then all students-regardless of socio-economic status, race, or gender-would have access to technology and, thus, access to those avenues of economic and social success within the technologically supported power structures of our culture. As C. Paul Olsen described the reasoning in 1987, increasing technology integration would

...lead to greater individual freedom, [the] breakdown of authoritarianism and standardized classrooms (and mentalities), [thus] extending literacy, economic opportunity and decentralizing social control while increasing individual opportunity. (p. 181).

Importantly, the effort to integrate computers into American schools in the 1980s was prompted by at least two key realizations: first, that our country and the world at large would be increasingly dependent on technology in the next century; and, second, that we were *not* providing equitable opportunities to all students within the existing educational system.

Unfortunately, when computers were introduced into schools during the subsequent decade, however, the expected changes were only partial, and the resulting reforms no more than minimal. In fact, by the end of the 1980s, a number of educators (Cole and Griffin, 1987; Sheingold, Martin, and Endreweit, 1987) were noting alarming trends in connection with race and poverty associated with computers. These patterns were described by Mary Louise Gomez who summarized the findings of a 1987 report authored by Cole and Griffin. Gomez noted that although more computers had been pumped into the educational system, in general, and into language and literacy classroms, more specifically, they were far from evenly distributed across that system. As a report by Cole and Griffin report showed:

- more computers...were being placed in the hands of middle- and upper-class children than poor children;
- when computers...[were] placed in the schools of poor children, they...[were] used for rote drill and practice instead of the "cognitive enrichment" that they provide[d] for middle- and upper-class students. (p. 43-44)

By the end of the 1980s, as this information suggests, computers were indeed present in many schools, but they were being used in ways that sustained rather than changed the existing educational trends and approaches to language teaching. Although teachers perceived a range of benefits to computer-assisted instruction, poor and nonwhite students, who most needed the benefits of enhanced educational opportunities, of improved literacy programs, were not getting them in terms of computer-supported education.

The challenges associated with the unequal distribution and use of computer technology in schools-especially along the related axes of race and socio-economic status-were to prove embarrassingly persistent. In 1996, for example, Secretary of Education Richard Riley issued *Getting America's Students Ready for the 21st Century; Meeting the Technology Literacy Challenge, A Report to the Nation on Technology and Literacy*. That report, citing a 1995 General Accounting Office survey, noted that

...half of all schools do not have adequate wiring (such as outlets) to handle their technology needs. More than half do not have sufficient telephone lines and 60 percent consider the number of conduits for network cable unsatisfactory. Schools that have all of these infrastructure elements are clearly the exception to the rule. Strikingly, schools in large central cities are even less equipped to meet the demands of technology than other schools; more than 40 percent do not even have enough electrical power to use computers on a regular basis....Classrooms in older buildings, for example, may require expensive renovations to improve electrical systems before computers and networks can be installed, discouraging the community from making a commitment. (p. 35).

Additionally, the report noted a differential ownership of computers by households according to race and socio-economic status:

...[H]ousehold possession and use of computers and network services is...reflective of the digital divide: it is heavily skewed toward middle and upper-class homes. Low income citizens and black and Hispanic Americans, urban and rural [poor] are much less likely to own a computer than others....[W]hite Americans are two to three times as likely to own a computers as black or Hispanic citizens and six times as likely to own them than the rural poor, whatever their background (*Getting America's Students Ready for the 21st Century,* 1996, p. 36).

And so in 1996, the Clinton administration, sensing the failure of past efforts and the need for educational and social progress, initiated a large-scale, government-sponsored literacy program called the Technology Literacy Challenge. (*Getting America's Students Ready*, 1996). This national project, which continues today, has the goal of creating a citizenry comfortable in using computers *not only* for the purposes of calculating, programming, and designing, but also for the purposes of *reading, writing, and communicating*. It provides an excellent case study of a national literacy project because off the tremendous scope, significance, currency, and cost associated with such goals.

And my story focuses on this large-scale literacy project. According to its sponsors, this national project was to provide *all* Americans equal access to an education rich in opportunities to use and learn about technology as a medium for language practices. With such an education, the project's sponsors claimed further, graduates would gain the qualifications needed for high tech, high-paying jobs, and thus, to upward social mobility and economic prosperity within an increasingly technological culture. The benefits were to accrue to *all* citizens.

To achieve this goal, American schools had to commit to helping "*all* children to become technologically literate" [emphasis mine] by providing them the ability to use, communication technologies, specifically computers, in the practice of reading and writing effectively. The deadline for creating such a citizenry-one that understands literacy practices primarily in terms of technological contexts-was "early in the 21st century" (*Getting America's Children Ready*, 1996, p. 3). Expenditures projected for the national literacy project run up to $109 billion dollars-averaging either $11 billion annually for a decade or between $10 and $20 billion annually for five years-from a variety of sources at the national, state, and local levels (*Getting America's Students Ready*, 1996, p. 6). And this amount was over and above the costs associated with the maintaining and improving the NII-the national computer network designed to serve as the foundation for technological literacy practices-estimated at an additional $1-2 billion annually (*The National Information Infrastructure*, 1993, p. 6).

And the effects of this large-scale literacy program instituted in 1993 and viewed from the perspective of 1999? There have been many-and some of them are good-technology, for instance, is now an accepted part of most English language courses, and many students use technology to create their written compositions, to conduct research, to converse with teachers and tutors, to work in groups and respond to each others written papers, to discuss and respond to class readings, to design and to compose multimedia texts. But there are also serious difficulties accompanying the increased integration of technology as well. I would like to concentrate on three of more problematic and far reaching legacies of this project, those that have resulted not in change and progress, but rather in stasis and continuing inequities.

The first cluster of effects has to do with the persistence of inter-generational cycles of illiteracy and poverty in the United States, especially as these cycles are related to race. If the project to expand technological literacy is justified as a means of achieving positive social change and new opportunity for individuals who have traditionally suffered from impoverishment, or inequitable treatment, to date it has failed. Indeed, in the American school system as a whole, computers continue to be distributed differentially along the related axes of race and socio-

economic status and this distribution contributes to ongoing patterns of racism and to the continuation of poverty and to gender inequity.

It is a fact, for instance, that schools primarily serving students of color and poor students continue to have less access to computers, and access to less sophisticated computer equipment than do schools primarily serving more affluent students or white students. And it is a fact that schools primarily serving students of color and poor students continue to have *less* access to the Internet, *less* access to multimedia equipment, *less* access to CD-ROM equipment, *less* access to local area networks, *less* access to videodisc technology than do schools primarily serving more affluent and white students. (Coley, Crandler, & Engler, 1997, p. 3)

This data, which is profoundly disturbing, becomes all the more problematic if we trace the effects of the technology-literacy linkage into the country's workplaces and homes. There, too, the latest census figures indicate, the linkage is strongly correlated to both race and socio-economic status. It is a fact, for example, that Black employees are *less* likely than White employees to use a range of computer applications in their workplace environments. It is also a fact that employees who have not graduated from high school are *less* likely to use a range of computer applications than are employees who have a high school degree or have some college experience. (*The Digest of Educational Statistics 1996*, 1996, p. 458). And it is a fact that families of color and families with low incomes are *less* likely to own and use computers at home, or to have access to the WWW at home, than do white families and families with higher incomes. (cf., *The Condition of Education 1997*, 1997, p. 212; *The Digest of Educational Statistics 1996*, 1996, p. 458; *Getting America's Children Ready*, 1996, p. 36); Hoffman and Novak, 1998, p. 390-391)

In other words, the poorer individuals are and the less educated they are in our country-both of which conditions continue to be closely correlated with race-the less likely they are to have access to computers for their language and literacy practices and to high-paying, high-tech jobs in the American workplace.

In these terms, then, the national project to expand technological literacy has *not r*esulted in a better life or more democratic opportunities or an enriched educational experiences for *all* Americans, as most of us might wish for in the abstract. Rather, it has served to improve the education only for *some* Americans.

In a formulation that literacy educators will feel most keenly, the project to expand technological literacy implicates literacy and illiteracy-in their officially defined forms-in the continued reproduction of poverty and racism. And it implicates us, as well, despite our best intentions.

What we did not understand when our country began this project is that computer technology, like our educational system in general, is an artifact of a larger social system. As such, technology is part of an over-determined web of effects and formations that align themselves-in a seemingly natural way-along the axes of existing social values. These formations, in concert and by force of habit, exert great tendential force on the way we structure our worlds. Hence, if a society values racism and classism, then technology, as an artifact of that society, will also tend to support those values-especially in the absence of critical and informed work by teachers, governments, parents, and students.

Now how and why does such situation come about? How does it work? The answer lies with the over-determined system I have described to you. Americans might decide to put more computers into school systems, but poorer schools might not be in a position to take advantage of this investment. Schools with high populations of economically disadvantaged students and students of color, are often housed in outdated buildings that contain older, less reliable wiring

systems and physical plants that won't support newer and more powerful computer equipment;. Such schools, moreover, which frequently exist in less attractive and even dangerous neighborhoods, often have difficulty attracting the best prepared teachers-those who are, not coincidentally. also the most likely to have extensive skills with technology or experience in using computers in meaningful ways. And school districts with high percentages of poor students and students of color and lower tax bases may also have less money available for the professional in-service work that helps teachers gain these new skills. Such schools may also have less money available to hire technically competent staff members who can support technology-based teaching. And, in these schools, students of color and poor students are less likely to have computers at home so that they can work on computer-based assignments outside of class, and they are less like to have parents who are computer literate themselves and can help with such homework assignments.

It is also important to note that even when technology *is* integrated into such schools, teachers must work in educational contexts characterized by low expectations and under-prepared students, and must struggle with non-existant support systems. And, because less is expected of students and teachers in these schools-because expectations for their achievement are so minimal-efforts to introduce technological literacy are often interpreted in terms of an overly narrow and restrictive functional literacy. Thus, computers are frequently used to help poor students and students of color acquire an impoverished set of vocational skills that suits them only for low-tech, low-wage jobs. In such cases, preparation in more robust forms of critical literacy practices and understandings are often ignored (Weglinsky, 1998).

Given the tendential force of this overdetermined system, then, rich and poor students can both have access to technology, but their educations remain far from equitable. The technological literacy instruction given to students who are economically well off and white-often involves a more richly textured set of sophisticated skills and understandings: designing and composing multimedia documents, conducting research using the WWW, using e-mail to track and analyze online conversations of professional societies, studying the global effects of technology's spread, understanding the complex relationship between technological success and economic success. And the instruction for students who are poor or of color in America often centers more narrowly on skills-based activities: typing speed and data entry, for example, use of a spelling checker, completion of online grammar drills, use a limited range of word-processing functions. Within such contexts, as Knoblauch and Brannon (1993) point out, "workers at the bottom of the economic hierarchy " are "merely "prepared' for their niches rather than educated in critical discourse..." (p. 90).

And this point about literacy brings me to the second major problem that I think the Technology Literacy Challenge has helped exacerbate in the Unites States. The project has enjoyed such broad support from parents, students, the corporate sector, government, and educators, it has now defined a dominant version or definition of literacy in this country, an "official" version of technologically-based literacy, that now rests at the center of our educational efforts. Such a situation, as Brian Street (1995) points out, contains the seed of a paradox at its center. Let me explain.

Countries design, fund, and undertake such expensive, large-scale, government-sponsored literacy projects in the hopes that they will help address certain problems persistently associated with illiteracy, usually among a minority population-unemployment, poverty, and social deprivation, for instance. Most of these large-scale, government-sponsored literacy programs are based on a single, *official* version of literacy-one generally congruent with the literacy practices and values of a dominant, educated, and privileged population in a country, and it is leaders, educators, politicians from this group who most frequently call for, design, and undertake large-scale literacy projects. Such official versions of literacy are not at all descriptive of the literacy experiences, educations, and values of the very citizens the project is designed to help. Moreover, the set of skills and understandings required for such official literacy

competencies are not generally acquired in poor or understanffed schools, but, rather, in robust and challenging instructional environments that are expensive to maintain. In general, only privileged citizens have access to such educational environments.

And so, ironically, these large-scale literacy programs-because they focus on one official privileged literacy, one official language standard, and because they cannot ensure that all citizens have the educational environments conducive to acquiring such literacy-generally fail to help the very people they are designed to help. Worse, these projects may actually ensure continued levels of illiteracy among poor students and students of color.

Let me provide you with a case-study example of this paradox in the case of technological literacy. In the United States, the National Council of Teachers of English has identified a set of literacy standards (*Standards for English Language Art, 1996*) that state all students should know how take full advantage of "the resources that technology offers" and that they should be "prepared for the demands that will face them in the future"; that students should learn "how to use an array of technologies, from computers and computer networks to electronic mail, interactive video, and CD-ROMs"; that they should know how to delve into the "tremendous assortment of information, ideas, and images" that technology makes available; and that they should use technology to "assume greater responsibility for their own learning ." (p. 39-40). These standards describe-for the National Council of Teachers of English- "what students should know about language and be able to do with language" (*Standards for the English Language Arts*, 1996, p.1) in order to be prepared for "the literacy requirements of the future as well as the present. (*Standards for the English Language Arts*, 1996,p. 2).

These standards constitute a description of our countries official version of literacy. From the statistics I have provided you, however, it should be clear that only a limited number of students in the United States can hope to receive an education in which such literacy skills and understandings are effctively taught. The kind of instruction I have just listed requires a rich and robust, critical engagement with, and understanding of technology, rather than a narrowly functional and vocationally-limited approach to using computers. It depends on up-to-date equipment, well prepared teachers, and the luxuries of modern infrastructure and extensive parental and home support. Other students-those who go to schools with lower expectations, less effective infrastructures, more impoverished support systems, and fewer dollars for the professional development of teachers-can expect to receive an education that is much less critical and much less robust in its approach, one that transmits a skills-oriented and functional literacy that is impoverished in comparison to the standards described above.

Given these dynamics, the Technology Literacy Challenge, like most large-scale literacy programs, cannot help but fail the American people. The project maintains a value on the literacies of a privileged group and discredits the literacies of a minority group. It cannot deliver the positive educational outcomes we desire because we cannot provide all students access to equitable educational environments.

There is one more important reason why large-scale literacy programs fail, however-and this leads me to the third cluster of problems that I associate with the Technology Literacy Challenge. Most large-scale literacy programs are built on the assumption that the acquisition of literacy, of standard English, in and of itself, will lead *autonomously* to future success, better "job prospects,", "social mobility," and "personal achievement" (p. 17).

As Brian Street (1993) reminds us, however, the reality

...is more complex, is harder to face politically... Recent studies have shown... that when it comes to job acquisition, the level of literacy is less important than issues of class, gender, and

ethnicity; lack of literacy is more likely to be a symptom of poverty and deprivation than a cause (Grave, 1979). (p. 18)

Because they foster belief in an autonomous model of literacy, large-scale literacy programs "deflect attention from the complexity and real political difficulties" of literacy instruction (Street, 1995, p. 17). The ultimate effect is an overly narrow understanding of literacy-usually in terms of a single official literacy-and the development of what Street (1995) describes as "patronizing assumptions about what it means to have difficulties with reading and writing in contemporary society" (p. 17), to be labeled as *illiterate*.

Thus, as Street (1995) continues, large-scale literacy programs do not serve to make more people literate; rather, they feed governments' "...tendency to blame the victims" and to shift attention "away from the lack of jobs and onto peoples' own supposed lack of fitness for work." (p. 18).

How is this paradox played out in the United States in the case of technological literacy and language learning? First, technology has become so deeply sedimented in our official definition of literacy that we no longer consider people truly literate *unless* they know how to read and write and navigate in electronic contexts. Technological literacy has, in other words, become the dominant, official definition of "literacy" in our culture and, as such, it has formed the basis for the Technology Literacy Challenge. The very visible and public rhetoric associated with this program tells us that it will give "all of our children" the skills they need to become "technologically literate" (*Getting America's Students Ready*, p. 3)

The potency of this public rhetoric-and our hopeful investment in it-keeps educators from even seeing the truth: only *some* students have adequate access to technology-and, too often, they are white and well off. Other students, especially those who are poor and of color, all too often do not have such access. Between 1995 and 1998, for example, the difference in computer use by ethnic groups in the United States *widened* rather than narrowed (*Human Development Report 1999*, p. 62), despite the money poured into the Technology Literacy Challenge. Because we are seduced by the public rhetoric surrounding this literacy project, because we *want* the discourse to be true, we blame failure on the victims. When students do not succeed in acquiring a sophisticated set of technological literacy skills, we blame them. And we ignore our own culpability and involvement.

The Technology Literacy Challenge is producing not just a continuing supply of individuals who are highly *literate* in terms of technological knowledge, but also a ongoing supply of individuals who fail to acquire technological literacy and language skills, those who are then termed *illiterate* according to the official definition. And because we do not acknowledge the differential educational opportunities these students receive, their differential access to technology, we blame this population for their own illiteracy. These citizens-as you might expect-are those with the least power to effect a change in this system. They come from families who attend the poorest schools; and they attend schools with the highest populations of students of color. In part because of their educational experiences, such individuals, when they do graduate, are often hired into less desirable, lower-paid positions that demand fewer official technological literacy skills. I n this way, poor people and people of color are punished for their illiteracy, and this punishment continues to be visited on their children in a shameful inter-generational cycle.

Now, the real question you might be asking is this: Does the situation in America provide any lessons for Greece or for the rest of the world? Can we extrapolate from this situation to that of other countries-or is it only the United States that faces these challenges and difficulties? Well, we do know that the technology that America has exported-the World-Wide Web, the global information infrastructure, high-speed networks, hardware and software components-are *systems* of technology that support and require certain social formations and epistemological understandings in order to flourish. As our own Vice President Gore has pointed out, for

example, successful national computer networks require, among other things the support of increased levels of "private sector investment" (p. 9), "competition" for information, telecommunication services, and markets (p. 11-13); and "flexible regulatory environments" (Global Information Infrastructure, 1995, p. 16). Large-scale national networks can't work, in other words, unless privatization, free-market capitalism, minimal governmental regulation, competition, and even the English language are also imported along with the hardware. In 1999, for example, English was used in 80% of the world's web sites, even though fewer than 1 in 10 people worldwide speak that language ("The Facts of Global Life," *Human Development Report 1999*, 1999). These systems-systems composed of technology and ideology and the language which surrounds and shapes and provides a medium for them-change, in radical ways, the global environments within which they operate, as Manuel Castells (1996, 1997, 1998) has noted.

In such a globally networked environment, as Castells also points out, there are clear winners and losers. The rise of the networked society is linked directly, he maintains, to the "rise of inequality, social polarization, poverty, and misery in most of the world" (1998, p. 161). Those global regions and countries and individuals who cannot capitalize on technological change find themselves unable to compete for increasingly scarce resources. As a 1999 report on human development, researched and published by the United Nations points out,

A 40-page document can be sent from Madagascar to Cote d'Ivorie, for example, by five-day courier for $75, by 30-minute fax for $45 or by two-minute e-mail for less than 20 cents-and the e-mail can go to hundreds of people for no extra charge. The choice is easy if the choice is there. (*Human Development Report*, 1999, p. 58).

In other words, the more technology a country now has, and the more sophisticated that technology is, the more access its people have generally to the global systems needed for economic and further technological development. And so countries have increased their investment in this global system, recognizing its pragmatic value for citizens. However, built into this system are those social values I mentioned earlier-more competition among the technological "haves" and "have nots", a lack of regulations that ensure a level playing field, the encouragement of free-market capitalism. Within such systems, then, those who are rich tend to get more access to technology, more opportunities, and those who are poor tend to get less access to technology, fewer opportunities. Access to technology becomes a gateway to advanced educations, literacies, and further economic prosperity.

Nor is the situation likely to change in the near future because education, it is clear, is a key factor in gaining access to a high tech world. And the lack of a robust education has intergenerational effects. Within this context, consider the following statistics from that same United Nations' report, which indicated, in 1995, that

adult literacy was less than 40% in 16 countries, and primary school enrollments less than 80% in 24 countries. In Benin, for example, more than 60% of the population is illiterate [according to the UN's definition], so the possibilities of expanding access beyond today's 2,000 Internet users are heavily constrained....Globally, 20% of [Internet] users have at least one university degree-in the United Kingdom it is 50%, in China almost 60%, in Mexico 67%, and in Ireland almost 70%. (p. 62)

Increasing a country's level of technological expertise is most difficult to accomplish when the infrastructure needed for a technological education is not fully in place-when the schools and the teachers, and the support systems are not available. In Sweden, for example, 6.81 people out of every 1000 are scientists and technicians, people who can provide the support required for a technologically-robust infrastructure and educational environments; in Finland, 4.8 people per 1000 are scientists and technicians; in the United States, 3.6; in Greece, 1.08; while those

countries termed "developing" average only 0.4 scientists and technicians per thousand. (Education Profile, *UN Human Development Report, 1998*).

The outcome? The United Nations report summarizes it eloquently,

The network society is creating parallel communication systems: one for those with incomes, education, and-literally-connections, giving plentiful information at low cost and high speed; the other for those without connections, blocked by high barriers of time, cost, and uncertainty and dependent on outdated information. With people living in these two systems living and competing side by side, the advantages of connection are overpowering. The voices and concerns of people already living in human poverty-lacking incomes, education and access to public institutions-are being increasingly marginalized. (p. 63)

In this light, the lessons from our past experiences in the United States seem even more insistently clear, and so do the responsibilities.

Every language educator who sees these figures and understands their significance, I believe, will feel some obligation to take on the responsibility of *paying attention to technology*-whether or not technology is traditionally considered a focus of their subject matter. And, as a part of this effort, I think that all educators who understand the current linkage between technology and the inter-generational cycles of illiteracy and poverty-the ties between the inequitable distribution of technology and race-will recognize an obligation to communicate this situation to parents and students and school officials and politicians, so that they too can develop a more critical understanding of the human face of technology distribution and use. In addition, I believe that around the globe and within our own home countries, we need to take on the responsibility of making sure that educational computing is shaped by humanistic values as extensively as it is now shaped by technological, economic, or political values. We cannot, any longer, content ourselves with leaving technology to the technicians or the computer scientists or the engineers or the politicians. And we cannot simply teach students how to *use* technology without also teaching them how to *understand* the power of those social systems within which technology is based and which it helps to shape. Without such instruction, we are simply producing consumers of technology, not educating individuals who can really help make the world a better place than we ourselves have managed to do with the "help" of technology.

Thank you.

Works Cited

Becker, Henry J. (1987), Using Computers for Instruction. *BYTE*, p. 149-162.

Castells, Manuel (1996). *The Rise of the Network Society*. (Volume I *in The Information Age: Economy, Society, and Culture*). Malden, MA: Blackwell.

Castells, Manuel (1997). *The Power of Identity*. (Volume II *in The Information Age: Economy, Society, and Culture*). Malden, MA: Blackwell.

Castells, Manuel (1998). *End of the Millennium*. (Volume III *in The Information Age: Economy, Society, and Culture*). Malden, MA: Blackwell.

Cole, Michael, and Griffin, Peg (1987). *Contextual Factors in Education: Improving Science and Mathematics Education for Minorities and Women*. Madison, WI: Wisconsin Center for Education Research, University of Wisconsin-Madison.

Coley, R. J.; Crandler, J.; & Engle, P. (1997). *Computers and Classrooms: The Status of Technology in U.S. Schools* No. Educational Testing Service, Policy Information Center. Princeton, NJ: ETS.

Digest of Education Statistics 1996 (November 1996). National Center for Educational Statistics, Office of Educational Research and Improvement, U.S. Department of Education. NCES 96-133.

Digest of Education Statistics 1987(1987). National Center for Educational Statistics, Office of Educational Research and Improvement, U.S. Department of Education.

"Education Profile," (1998) *Human Development Report, 1998* <http://www.undp.org/hdro/ieduc.htm>

Gerver, Elizabeth (1989). "Computers and Gender." In T. Forester (Ed.), *Computers in the Human Context: Information Technology, Productivity, and People.* Cambridge, MA: Massachusetts Institute of Technology, p. 481-501.

Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge, A Report to the Nation on Technology and Education (1996). A Report from the U.S. Department of Education, Washington, D.C.

Global Information Infrastructure: Agenda for Cooperation (31 January 1995). Issued by Al Gore, Vice President of the United States, and Ronald H. Brown, Secretary of Commerce, Information Infrastructure Task Force, U.S. Department of Commerce. Washington, D.C.: Government Printing Office.

Gomez, Mary Louise (1991). "The Equitable Teaching of Composition." In G. E. Hawisher & C. L. Selfe (Eds.), *Evolving Perspectives on Computers and Composition Studies* (p. 318-335). Urbana, IL and Houghton, MI: The National Council of Teachers of English and Computers and Composition Press.

Grave, H. J. (1987). *The Legacy of Literacy: Continuities and Contradictions in Western Culture and Society*. Bloomington, IN: Indiana University Press.

Hawkins, J. (1985). "Computers and Girls: Rethinking the Issues." *Sex Roles*, *13*, p. 165-180.

Hoffman, Donna L. and Novak, Thomas P. (17 April 1998). "Bridging the Racial Divide on the Internet," *Science*, *280*, p. 390-391.

Human Development Report 1999: Globalization with a Human Face. (1999) Cary, NC: Oxford University Press.

Jessup, Emily (1991). "Feminism and Computers in Composition Instruction. "In G. E. Hawisher and C. L. Selfe (Eds.), *Evolving Perspectives on Computers and Composition Studies: Questions for the 1990s* . Urbana, IL and Houghton, MI: The National Council of Teachers of English and Computers and Composition Press, p. 336-355.

Knoblauch, C. H. and Brannon, L. (1993). *Critical Teaching and the Idea of Literacy*. Boynton/Cook Publishers. Portsmouth, NH.

Olson, C. Paul (1987). "Who Computes?" In David Livingstone (Ed.), *Critical Pedagogy and Cultural Power*. South Hadley, MA: Bergin and Garvey Publishers, Inc., p. 179-204.

Sheingold, K., Martin, L. M. W., and Endreweit, M. W. (1987). "Preparing Urban Teachers for the Technological Future." In R. D. Pea & K. Sheingold (Eds.), *Mirrors of the Mind: Patterns of Experience in Educational Computing.* Norwood, NJ: Ablex, p. 67-85.

Standards for the English Language Arts (1996). Newark, DL and Urbana IL: International Reading Association and the National Council of Teachers of English.

Street, B. V. (1995). *Social Literacies: Critical Approaches to Literacy in Development, Ethnography, and Education*. London: Longman.

The Condition of Education 1987 (J1987). National Center for Education Statistics. U.S. Department of Education. Washington DC.

"The Facts of Global Life" (1999), *Human Development Report 1999* http://www.undp.org/hdro/E5.html.

Weglinsky, Harold (1998). Does It Compute? *The Relationship Between Educational Technology and Student Achievement in Mathematics*. Policy Information Center, Educational Testing Service, Princeton, NJ.