Proximity Learning - the combination of traditional, face-to-face classroom experiences with modern information technologies that enhance access to information and people

Proximity learning is a technologically enhanced version of what teacher-scholars have done for centuries in the best Socratic traditions. Proximity learning is not a new concept, so why do we define it anew? We define proximity learning to bring balance to the current debates about the roles of technology in learning, debates that often emphasize distance learning. We hope to bring attention to proximity learning in order to remind us all that there are valuable, new approaches to learning other than those involving learning at a distance.

We are not taking up arms against distance learning. Distance learning is important to many faculty members and institutions whose goals are met well by online curricula. For their goals, distance learning can be even more effective than traditional, location-specific classes. We are convinced, however, that face-to-face learning supplemented with technology will grow in importance to the future of both residential colleges offering the traditional baccalaureate and research institutions focused on research apprenticeships.

We invite you to read more about the assumptions that round out our definition of proximity learning. We believe that we learn from differences and that the best, most engaged, active learning cannot take place without regular face-to-face meetings.

We report here our experiences in teaching at Kenyon College a small, highly-selective, residential college in central Ohio. The Kenyon experience balances discovery, change and tradition. The intellectual and social lives of our students are changed in their four years in this community of scholars that travels pathways of discovery about the world, about each other, about self. We are all learners - faculty and staff as well as students. Kenyon, like many other institutions in the Consortium of Liberal Arts Colleges, is not about technology or this week's new teaching paradigm. Kenyon is about intellectual and social growth of our learners in a residential setting. We believe that our blending of interpersonal contact with judicious uses of new learning technologies has transformed the classroom experience and enhanced learning.

From 1993 through 1996, with generous funding from the Pew Charitable Trusts' program titled "Strengthening Teaching and Learning" (STL), our faculty, librarians and technologists explored opportunities for information access, communication and collaboration with technology. Our series of "Summer Institutes" for faculty were recognized nationally and set our early adopting faculty on a course of experimentation that produced redesigned and new courses. Throughout the Pew-funded program, and now in our new collaborative efforts with Denison University funded by the Andrew W. Mellon Foundation, early adopters of learning technologies were often challenged by other members of the faculty who shared a concern that information technology would replace interpersonal contact between faculty and students. To quote Professor David Marcey, one of the participants in the Institutes and successful adopter of many new approaches to teaching,

"We believe that IT-based distance learning will have many useful applications, but that the core of quality higher education will remain the intensive student-faculty interactions that occur in a physically tangible community of learning in college and university settings. John Seely Brown and Paul Dugid (Change, July/Aug., 1996) have provided cogent arguments for maintaining the physical continuity of learning communities in the digital age. We find that one irony of the emphasis on distance learning is that some of its proponents foresee the use of advanced IT to teach in fundamentally traditional ways, e.g. the "best" lecturers delivering information to virtual classrooms. In contrast, we posit that some of the best uses of IT engage students in novel ways of learning not possible by traditional means, and that this engagement requires student-faculty collaboration, i.e. proximity learning."

We invite you to read the contributions of this web that discuss proximity learning, and we especially invite you to participate in the discussion of appropriate roles for technology in learning. Through this process, we hope to create a valuable virtual space for discussion and to refine our thinking. Naturally, we're particularly interested in support and challenges to our notions of the roles of technology in the undergraduate experience; this is an open forum and we welcome all thoughtful comments.

Scott E. Siddall
(siddall@kenyon.edu)
Program Director
Pew-funded 'STL' Program at Kenyon
Mellon-funded Program at Kenyon and Denison

More on our definition....

Proximity learning at its best is filled with the excitement of discovery and the enthusiasm of exchanged viewpoints. It assumes that learning is a highly social process in which individual talents and distributive cognition are enhanced by guided access to the richness of both print and online information resources.

Proximity learning includes the active exploration of information resources guided by someone with experience. This resource guide is often a faculty member, but in these settings, where the authority of the classroom is often shifted away from the instructor, the content specialist may also be a librarian, a technologist, or even a student with experience relevant to the topic. Proximity learning takes place often in small classes, lab sessions and seminars, or in gatherings of learners outside of class. Imagine a classroom in which twenty undergraduates, focused on a collaborative class project, use networked computers to search for pertinent information, guided by their instructor, while intensely involved in overlapping conversations that seek to evaluate and understand new concepts. Imagine the contagious motivation of the students as their faculty partner provides a scholar's perspective for their race to find meaning.

Some of us have turned to technology to communicate with our students, to extend the intellectual exchanges beyond the classroom, to replace lectures with student-created, collaborative projects. We are enthusiastic about the promises of learning technologies, and continue to experiment with new methods in our teaching in hopes that we can enhance our students' learning. Many of us have frequent first-hand experience with such sessions that emphasize active, constructivist approaches to learning, that alter the "balance of power" in the classroom, and that genuinely transform our students' learning.

For some of our colleagues, however, the risks of reliance on technology appear to outweigh the gains, and they gladly emphasize close, interpersonal teaching experiences with little if any involvement of technology.

"There is no electronic interface that duplicates the mentoring process. The strength of a college or university lies in its face-to-face mentoring process" (Bothun, 1999 in CAUSE/EFFECT 21(2)). In support of selective uses of online learning, Bothun continues to note that "…the physical lecture for large, information-oriented survey courses may add no value to the student." Both distance and proximity learning have their places.

No single approach to learning is universally applicable. We can be thankful that the needs of learners, interests of faculties and missions of institutions of higher education in the United States are diverse and dynamic. For many of these institutions, and for corporations as well, new information technologies offer the opportunity to reach new learners with new products. These emerging uses of network technology to support distance learning are without question important. For many other institutions, new information technologies offer the opportunity to reach traditional learners with improved classroom experiences. Face-to-face experiences can be enhanced, even transformed, by information technologies that are carefully selected to meet specific pedagogical goals. It is to this relatively small sector of the higher education community, populated by residential colleges and universities, that we address the issue of proximity learning.

Proximity

Proximity is easily defined for purposes of this argument. Proximity learning requires that learners have regular, face-to-face contact with each other. They are proximate to each other. This implies that the full range of human interaction, unmediated by any technology, is important in the process. To quote technology critic David Noble (Education column of the New York Times, January 6, 1999), "Education is about self-knowledge and you don't get that sitting at a computer. You get it through other human beings." On the other hand, proximity learning also requires that learners are proximate to sources of information. In today's world of networked information, this makes technology an integral part of our definition, for it is through the computer that information is located and retrieved. It is also through the networked computer that online discussions take place with remote content specialists.

We believe that this quality of engaged, active learning cannot take place without regular face-to-face meetings. While learning certainly takes place during the intervals between face-to-face meetings, many students "coast" in between. Assignments usually ensure that academic work continues in these intervals, but we have also found great value in selected technologies (web-based discussions, listservers, etc.) that sustain engagement with the content outside of class meetings. The Chronicle of Higher Education (January 15, 1999) reported on the success of Ohio University's online M.B.A. program in part because of regular face to face meetings. Michael Brint, writing in the Proximity Learning web, agrees suggesting that "Rather than becoming less so, the physical and social environment may become more important as distance learning tools become more available."

We learn from differences

Each time we encounter a situation that is different from our previous experience, we seek to account for those differences. If the difference is slight, we may learn little for we have had to reconcile little difference from prior experience. If the difference is great, we may not be able to contextualize and reconcile the situation without help from other sources, or at all. Commonly, we learn well from steady, small increments that build upon prior understanding, taking steps at a pace that each of us finds comfortable.

We learn from differences in experience. Sameness and homogeneity reinforce what we already know about our world and about ourselves. Authentic engagement with others of different experience is a common basis for intellectual growth. Content specialists summarize and convey to students years of work in a discipline. Colleagues share expertise to create value in interdisciplinary programs. Students share cognitive processes in study groups. Many of these interactions involve face-to-face contact.

We learn from differences in culture. Social as well as intellectual growth prepares us to lead worthwhile lives. Genuine social growth is rarely achieved through isolated readings and study,

or from cultural sameness. Social growth is based often on the direct experience of diversity; face-to-face engagement with differences in culture, values and beliefs.

Learning takes place for many reasons. The goal of acquiring a specific set of technical skills is quite different from the goal of earning a four-year degree in the liberal arts, or from the diverse goals of a postdoctoral apprenticeship in research. Different approaches are more suitable for some learning goals than others. Much, but not all, of our learning is a social process that is based on face-to-face exchanges of experience, therefore not all learning goals are served best by proximity learning.

Each of our academic institutions has a mission that defines a community of learners with similar goals. Within each community of learners there is great variability in skills and experience, styles and needs, but generally, each institution attracts learners with consonant educational goals.

There are nearly as many approaches to learning as there are individuals. When confronted by differences, some of us prefer to move to the next level of understanding on our own. Others learn well by studying relevant examples, or listening to an experienced voice. Still others learn best by sharing their learning process with other learners. Thus for some, face-to-face contact is not a necessary element of their learning, while for others it is.

In November of 1998, Donald Kennedy, former president of Stanford University, led a weekend seminar in which ten presidents of Canada's major research universities discussed what they were struggling with the most. Reports Maclean's magazine, the renewal of the learning experience '..according to Kennedy, comes from abandoning what he calls the "400-year-old business of distance education" -- namely, the lecture. "The most interesting thing that came out of our weekend," says [McGill University President Bernard] Shapiro, "was the focus on proximity learning." '

In more formally defining proximity learning, we contend that the missions of residential colleges and universities are well served by learning in close, physical proximity. These institutions include the residential colleges that focus largely on baccalaureate degrees, as well as large research universities that provide extended apprenticeships in research and creative work. These are the institutions that Arthur E. Levine, now President of Columbia University's Teachers College, predicted would survive the tumultuous changes in higher education as we enter the new millennium (presented as a video clip on the web site). We also believe that institutions of higher education with goals other than the residential baccalaureate or research apprenticeship will thrive as well because educational markets are diversifying in ways that Mr. Levine may not have predicted.

Faculty essays on issues related to Proximity Learning

"Being Digitally Educated, Dewey, Technology, and Distance Learning"

Michael Brint (brintm@kenyon.edu)
Associate Professor and Director, Integrated Program in Humane Studies

> Michael Brint reminds us of Nicholas Negroponte's emphasis on experiential (learn by doing) and constructivist (creating one's own bases of understanding) approaches. Michael connects Negroponte's comments to the positions on education held by John Dewey earlier in this century, and claims that many modern educators do not embrace Dewey's notion that learning is very social and relational in nature. Michael suggests that local community and small college systems might best be supplemented with workplace learning centers, and that "…the physical proximity of students and faculty would help to embody learning and knowledge as a social process."

"The Visual Arts, the Liberal Arts and Information Technology"

Claudia J. Esslinger (esslinge@kenyon.edu)
Professor of Studio Art

> Claudia Esslinger tells us how information technologies can enhance interdisciplinary approaches, especially for students of the arts who are skillful visual learners. Claudia echoes Dewey in claiming that visual art projects are social and political in nature, often involving a certain playfulness in problem-solving as a mode of inquiry. "Teachers are forever students and together we are partners in inquiry." She predicts that distance learning may preclude the much needed development of a culture of learning.

"TIRED: distance learning - WIRED: proximity learning"

David Marcey (marcey@kenyon.edu)
Associate Professor of Biology

> David Marcey gives us examples of proximity learning in modern biology courses where undergraduate research, collaboration and co-publication are staples of coursework. He also claims that he finds "adsurd the notion that IT-mediated distance learning will largely replace the interactions that occur between me and my students as they come to understand the macrcomolecular machinery that runs the chemistry of life."

"Proximity Learning, Electronic Orality, and an Ergonomics of the Mind"

Timothy B. Shutt (shutt@kenyon.edu)
Associate Professor of English

Tim Shutt notes the importance of non-linear presentation of texts and suggests that alternate forms - even digitally recorded speech - are deserving of much deeper consideration in our literature. Tim suggests that technology and indeed even literacy are tools, not ends. "We are all hard wired to speak and to listen...proficient reading and writing are rare."

"Women, Lost in Cyberspace?"

Laurie A. Finke (finkel@kenyon.edu)
Professor of Women's and Gender Studies

Laurie Finke admonishes us not to abstract our new technologies from the social networks that create and use them. New technologies may give us the chance to break free of the constraints set by hierarchies and inequities, in particular along lines of gender.

Being Digitally Educated, Dewey, Technology, and Distance Learning

Michael Brint
Associate Professor and Director, Integrated Program in Humane Studies
Kenyon College, Gambier, Ohio

I. The Experience of Education in Digital Life

In his 1995 book, Being Digital, Nicholas Negroponte signals what many believe to be a paradigm shift from "atoms" to "bits"--from an "atomic" orientation to the world consumed by material interactions to an orientation unburdened by such impediments as space, time and atomic weight. Racing unfettered at blinding speed over vast distances of space, the bit, the smallest unit in the "DNA of information," [1] has done more than help usher in the post-industrial age of information. According to Negroponte, it has become the basic commodity of interaction in the post-information age--an age in which the possibility of digital living has become increasingly viable:

> "The industrial age, very much an age of atoms, gave us the concept of mass production, with the economies that come from manufacturing with uniform and repetitious methods in any one given space and time. The information age, the age of computers, showed us the same economies of scale, but with less regard for space and time... [By contrast,] in the post-information age, we often have an audience the size of one. Everything is made to order and information is extremely personalized.... The post-information age is about machines' understanding individuals with the same degree of subtlety (or more than) we can expect from other human beings. Such customized digital living entails more asynchronistic communications (like e-mail), billions of bits of information on demand (in such forms as TV programs, videos, music, and news), and less and less dependence on being in a specific place at a specific time."[2]

In examining the educational implications of living digitally, Negroponte captures many of the central pedagogical points now being advanced by prominent policy analysts urging the development of distance learning opportunities.[3] In most instances, such approaches consist in the creation of highly individualized asynchronistic learning programs accessible on demand. This form of delivery is said to particularly aid the growing numbers of non-traditional students whose lives require that learning be less and less dependent on one's ability to be in a specific place at a specific time.

Whether delivered to a classroom, laboratory, workplace or home, learning digitally as an experience is said to be one of individual exploration, experimentation, and expression. Emphasizing the benefits of computers as learning tools, Negroponte notes that

> "While a significant part of learning certainly comes from teaching--but good teaching and by good teachers--a major measure comes from *exploration*, from reinventing the wheel and *finding out for oneself*. Until the computer the technology for teaching was limited to audiovisual devices and distance learning by television, which simply amplified the activity of teachers and the passivity of children. The computer changed this balance radically. All of a sudden, *learning by doing* became the rule rather than the exception. Since computer simulation of just about anything is now possible, one need not learn about a frog by dissecting it. Instead, children can be asked to design frogs, to build an animal with frog-like behavior, to modify that behavior, to simulate the muscles, *to play* with the frog. *By playing with information*, especially abstract subjects, the material assumes more meaning. [...] Anecdotal evidence and careful testing results reveal that this constructivist approach is an extraordinarily rich means of learning, across a *wide range of cognitive and behavioral styles*. [4]

"Learning by doing," "finding out for oneself," "playing with information,"--Negroponte's orientation sounds a lot like an updated version of John Dewey's educational approach. Stressing similar ideas, Carol Twigg, a senior analyst for EDUCOM and one of the leading advocates of distance learning, claims that "what we know about high-quality learning, cooperative learning, and discovery learning-implies a learning-by-doing model rather than the passive, classroom-based model that typifies the teaching infrastructure."[5] Against such passive learning, Dewey notoriously stressed the importance of experience as an active process. "To 'learn from experience' is to make a backward and forward connection between what we do to things and what we enjoy or suffer from things in consequences. Under such conditions, doing becomes a trying; an experiment with the world to find out what it is like; the undergoing becomes instruction--discovery of the connection of things."[6]

In a similar vein, discovery labs for physics and other natural sciences (like the CUPLE program developed at the Rensselaer Polytechnic Institute) stress the experience of discovery through exploration and experimentation. By using a studio approach to learning, computer simulations allow students to discover scientific principles through their own active engagement. Jack M. Wilson, Director of the Anderson Center for Innovation in Undergraduate Education, explains the basic premise underlying such initiatives: "The focus is on student problem solving and projects," he tells us, "and not on presentation of materials. The emphasis is on learning rather than teaching." [7]

While the CUPLE program uses multimedia tools authored by experts for student use in the discovery, experimentation and exploration of science, multimedia offers new domains of student expression as well. "We are entering an era when expression can be more participatory and alive," Negroponte tells us. "We have the opportunity to distribute and experience rich sensory signals in ways that are different from looking at the page of a book and more accessible than traveling to the Louvre." [8]

Rather than simply interacting with a designed exercise, students can become their own authors--designing and architecting multimedia projects that integrate both different disciplines and media.

CITYSCAPES at Kenyon College is just one example of a course developed to focus on the student as the creative agent of learning.[9] From a literary walk through the neighborhoods of Buenos Aires to an analysis of the role of women in the agricultural economy of Nairobi, students in this course become authors of multimedia projects that focus on specific themes related to particular cities or regions of the world. In addition to the Internet and library resources, these projects, currently produced as a CD-ROM, combine videos, photographs, recordings, interviews, and journals made by the students themselves. As authors guided by both local scholars and distant experts in various fields related to their study, students become increasingly fluid in coherently drawing together and creatively comingling function and form, method and subject, narrative and design.

Along with their expressive and experiential potentials, many see the greatest advantage of computer learning environments in terms of their potential for customization. Course materials can be delivered to fit the different learning styles of students and developed to help students realize their unique potentials and capacities. According to Massy and Zemsky, the two most fundamental advantages of information technology are the new "economies of scale" it offers and its ability to provide what they term, "mass customization." "Technology allows faculty to accommodate individual differences in student goals, learning styles, and abilities, while providing improved convenience for both students and faculty on an 'any time, any place' basis." [10]

In the post-information age, most surmise, the advent of sophisticated and customized simulations across the curriculum will increasingly provide the basis of experience for engaged learning. Many who are helping to lay the foundation for the future of information technology and education advocate the creation of a National Learning Infrastructure that could deliver these sophisticated simulations "anytime, anywhere, to anyone." [11] If these trends continue, the experience of education in digital life may well be one of more convenient asynchronistic communication, customized educational services on demand, and less and less dependence on being at a specific place at a specific time. Yet, for all of the Deweyean-sounding practices that are supposed to accompany these educational delivery services--learning by doing, exploration and experimentation, play and discovery--I doubt it is time to begin celebrating the realization of Dewey's educational philosophy in the post-information age.

II. Learning as a Social Environment

If many proponents of distance learning follow Dewey's lead in emphasizing experiential and constructivist models of education, few follow his views regarding the inexorably social and relational nature of learning. Most of their accounts portray distance learning (at least at the level of higher education) as a highly individualized process of self-development, driven by the student's own initiative toward the successful acquisition of specifiable skills.[12]

For Dewey, no matter how individualized or customized the material that is being explored, learning is not an isolated enterprise that takes place within the self or between the individual's mind and the material it confronts, but a social activity that takes place within the context of a social environment. "As matter of fact," Dewey tells us,

> "...every individual has grown up, and always must grow up, in a social medium. His responses grow intelligent, or gain meaning, simply because he lives and acts in a medium of accepted meanings and values. Through social intercourse, through sharing in the activities embodying beliefs, individuals gradually acquires a mind of their own. The conception of mind as a purely isolated possession of the self is at the very antipodes of the truth. The self achieves mind in the degree in which knowledge of things is incarnate in the life about him; the self is not a separate mind building up knowledge anew on its own account." [13]

From Dewey's point of view, even the ideal of education as self-development must be understood as a social process achieved through interaction and relation with others. Rather than fostering this ideal, advocates of distance learning, particularly those who stress self-paced, independent study, tend to reinforce individual isolation. "The effort at isolated intellectual learning contradicts it own aim," Dewey claimed, for it "precludes the social sense which comes from sharing in an activity of common concern and value." [14] In examining the economic efficiencies gained by computer innovations, Massy and Zemsky tellingly report that without a supportive social environment, "the students who would most benefit from self-paced learning have the least motivation to do so." [15]

The prevailing attitude toward teaching is also particularly telling on this point. In Twigg's words: "Because of the widespread availability of self-paced learning materials, direct faculty intervention throughout the learning process will lessen." [16] Like a small country being invaded by a foreign power, the idea of faculty interaction is not said to be condemned simply because of the enormous costs of the labor involved (although one suspects that this is the most significant issue). Rather advocates of information technology assume a notion of independent learners at the center of the enterprise who simply do not depend on faculty as the primary source of their learning. While Dewey was among those to argue against a teaching-centered model of education, he would certainly reject the radically asocial dimension of distance learning as it is currently being discussed. [17]

Once again, Dewey's position is that the social environment--the interdependence and engagement of individuals in the performative acts of learning--is a necessary condition for developing the unique capacities of individuals. Even if such a model as the National Learning Infrastructure could develop an individual's dispositions for distance learning; in its current direction toward individualization, it would be difficult to account for the experience of sharing in a common activity that is central to Dewey's understanding of both the social environment of learning and the social aims of democracy.

In contrast to Dewey's concentration on the social functions of education, the individual ends of distance learning are most frequently described in terms of the acquisition of definable skills. "It seems to me," Carol Twigg writes,

> "...that our definition of learning is changing in a number of ways... Increasingly, viewing a college education as mastery of a body of knowledge is becoming outmoded. Instead we recognize that graduates need to have acquired skills... along with such abilities as finding needed information and working well with others." [18]

With this emphasis on acquired skills, we are also beginning to see more stress placed on educational outcomes. "Because of its capacity to focus on individual assessment," Massy and Zemsky note, information technology "will make the teaching and learning enterprise much more outcome-oriented." [19] In large measure this growing emphasis on skills and outcomes is related to a greater consumer orientation to education. Increasingly students are looking "for increased competition between higher education providers to work to their advantage as consumers." [20]

While Dewey too understood the importance of acquiring skills, he would no doubt be disturbed by the instrumental and pecuniary ends of distance learning. In his essay, Individualism, Old and New, he claimed that "the development of a civilization that is outwardly corporate--or rapidly becoming so--has been accompanied by the prevailing mentality of the 'business mind'" and the prevailing standards of value derived from pecuniary success alone. [21] On the educational front, the ability to buy economic success is understood in terms of the acquisition of skills of technical mastery sold at the best price. Yet paradoxically, Dewey argued, even if these skills are quite broad and fluid, such narrowly conceived individualist attempts to find economic security in an increasingly insecure economic world produces the conditions under which individuals become increasingly lost, unable to "find support and contentment in the fact that they are sustaining and sustained members of a social whole." [22]

For Dewey, a highly individualistic or libertarian model of learning severely narrows and restricts the meaning and practical effects of education's social function. In his view, the purposes of education in a democracy are necessarily both individual and collective in nature. They consist in developing individuals' natural capacities and acquisition of skills in concert with their preparation for the activities of engaged citizenship and reflective thought. Indeed, without pathological effect, the growth of the individual--the unique development of the individual's talents and skills-- cannot be separated from the social environment of shared activities, values and common interests within which the individual is sustained and grows.

Although information technology has the potential "to increase learning productivity in the areas of codified knowledge and algorithmic skills," [23] it may not serve these larger social purposes. Indeed, even if one could argue that sharing in common activities that are primarily non-algorithmic can take place within the social environment of distance learning, Dewey would strongly criticize the disembodied nature of such a "social" environment.

For Dewey, learning digitally may well push Cartesian dualism to new heights as minds connect over vast distances without the inconveniences of time, place and body. In his view, the separation of body and mind culminates "in a sharp demarcation of individual minds from the world, and hence from one another... [This] dualistic philosophy of mind and the world implies an erroneous conception of the relationship between knowledge and social interests, and between individuality or freedom and social control and authority." [24] In educational practice, it often assumes the form of a body of knowledge distinct from its social purposes and a mind free from its social context and physical constraints. As Sidney Hook explains, a dualistic theory of mind and body, according to Dewey, "converts functional distinctions in the 'moving unities of experience' into separations of existence. Thus mind is considered separate from the body, whose activity is viewed as an alien influence on how the mind learns and the self is divided from its environing physical and social world." [25]

Even as a real time-interactive-talking heads-model, being digitally educated decontextualizes the experience of learning and realizes in practice what Descartes only separated philosophically: Minds communicate through bits, bodies move through atoms. The most elemental dualism of the post-information age is thoroughly Cartesian. Detached from the motion of our bodies and disengaged from our local physical and social surroundings, education in the post-information age does not connect, but separates the self from the world, and thus from others. Rather than fulfilling its promise, learning digitally seems only to compromise the most significant elements of Dewey's educational philosophy.

III. Learn Locally, Think Globally

Although information technology, like the printing press, opens up radically new options for education, Dewey would remind us that computers are, after all, tools. And, like all other tools, they provide ways of getting around and fulfilling one's purposes in one's environment. The question is how can we best use the tools of information technology for our educational purposes and aims?

In terms of delivery, advocates of digital learning often argue that information technology provides a better option than the traditional university. With its relatively fixed economy of scale and centralized location, the university has become a legacy of the industrial age. In Twigg's words: "Our institutions of higher education are reminiscent of other kinds of industrial age organizations such as the factory and the department store--characterized by size and centralization--in contrast to the distributed, networked organization and mail-order shopping services of the 1990s." [26] Twigg predicts that the ability to transmit through networked organization high quality learning tools customized for the individual student will begin to replace the traditional (teacher-centered) functions of the university. While there will still be a role for faculty and institutions of higher education in terms of certification, student services, and some collaborative experiences, she suggests, its centrality in the process of learning will significantly change as students become more independent and self-reliant and as physical contact becomes "less important to them." [27]

Although Twigg may well be correct in arguing that the industrial designed university no longer

provides the best option for educational delivery, her vision of the future predicated on independent learning, as we have seen, is not without its serious defects. In analyzing the profound implications of the printing press in America, Dewey noted that localism with its infinite variations and specific contexts tends to become stronger as the world (or at least information about it and our connection to it) grows closer. [28] And just as industry and politics are witnessing a tendency toward both decentralization and globalization, the best option for educational delivery may well be the more local community and small college system with new neighborhood and workplace learning centers further developed to meet the educational needs of both traditional and non-traditional students. Within these small colleges and decentralized institutions, the physical proximity of students and faculty would help to embody learning and knowledge as a social process.

To learn locally and think globally, students must have access to the tools of technology. Information retrieval, communication systems, and independent and collaborative learning tools are now necessary and even elemental parts of learning. But they are not sufficient. They must be contextualized within a learning environment. As most agree, learning tools can "stand in" for a physical and social environment, but they cannot replace it. One simply cannot replace the direct and palpable gravity of social interaction that is intrinsic to the atomic weight of learning with weightless bits traveling at blinding speed through thin fine fibers of glass.

As global communication systems eviscerate time and space, digital learning may transform the mode of educational production and delivery. It may even make the traditional university and large state institution obsolete. But as our access to the tools of technology become less dependent on space and time, as distance learning increases, the proximity of social interaction in the process of learning should increase proportionally: The more distant the means of delivery, the more proximate the learning experience should be in terms of the intensity, relation, and quality (if not quantity) of interactions between faculty and students. Rather than becoming less so, the physical and social environment may become more important as distant learning tools become more available. As in the case of localism and globalism, physical proximity and intensive social interaction may both compliment and counterbalance distance in learning. Although learning digitally may promise to make us less dependent on time and space, it is only within a social environment of learning that we can begin to celebrate the experimentation, exploration, and expression--the idea of learning by doing--central to the spirit of John Dewey.

Notes

[1] Nicholas Negroponte, Being Digital, (New York: Borzoi-Knopf, 1995), 14.
[2] Ibid., 163-65.
[3] For example, see William F. Massy and Robert Zemsky, "Using Information Technology to Enhance Academic Productivity" 4. (www.educause.edu/ir/library/abstracts/nli0004.html)
[4] Ibid., 199f.
[5] Carol Twigg, "The Need for a National Learning Infrastructure" 5.

(www.educause.edu/ir/library/abstracts/nli0001.html)

[6] Dewey, Democracy and Education, in John Dewey, The Middle Works, 1899-1924, ed. Jo Ann Boydston (Carbondale and Edwardsville: Southern Illinois University Press, 1980), 147.

[7] Jack M. Wilson, "The CUPLE Physics Studio," The Physics Teacher.

[8] Nicholas Negroponte, Being Digital, 224.

[9] A description of CITYSCAPES can be found in "Strengthening Teaching and Learning in the First Two Years," PEW Charitable Trusts (Number 9, January 1996), 4.

[10] Massy and Zemsky, Using Information Technology to Enhance Academic Productivity," 2. (www.educause.edu/ir/library/abstracts/nli0004.html)

[11] Carol Twigg, "The Need for a National Learning Infrastructure." (www.educause.edu/ir/library/abstracts/nli0001.html)

[12] Although one of these skills may involve collaboration, it is nevertheless described as a kind of "pull yourself up by your own boot straps" social environment of independent learning.

[13] Hook, "Introduction to Democracy and Education," 304.

[14] Hook, "Introduction to Democracy and Education," 44.

[15] Massy and Zemsky, "Using Information Technology to Enhance Academic Productivity," 4.

[16] Carol Twigg, "The Need for a National Learning Infrastructure," 8.

[17] On the role of the teacher and the social purposes of education, see Dewey's The School and Society in The Middle Works, vol. 1.

[18] Carol Twigg, "The Need for a National Infrastructure," 1. See also, Jeremy Shapiro and Shelley Hughes, "Information Technology as a Liberal Art," Educom Review (March/April):31-35.

[19] Massy and Zemsky, "Using Information Technology to Enhance Academic Productivity," 3.

[20] Carol Twigg, "The Need for a National Infrastructure," 4.

[21] Individualism, Old and New in John Dewey: The Later Works, vol 5, p. 67f.

[22] Ibid.

[23] Massy and Zemsky, "Using Information Technology to Enhance Academic Productivity," 2.

[24] Hook, "Introduction to Democracy and Education," 300.

[25] Hook, "Introduction to Democracy and Education," x.

[26] Carol Twigg, "The Need for a National Learning Infrastructure," 5.

[27] Ibid., 8.

[28] See "Americanism and Localism" in John Dewey: The Middle Works, vol. 12, p.12-16.

The Visual Arts, The Liberal Arts, and Information Technology

Claudia J. Esslinger
Professor of Art
Kenyon College, Gambier, Ohio

The Need for Interdependence

Increases in the use of Information Technology in the Liberal Arts College calls for a greater interdependence of the divisions of the college, specifically a further integration of the modes of inquiry taught in the Visual Arts. Training in studio art includes practice in visual perception and research, creative problem solving, personal expressions and physical manipulations of design elements and tools, all done in a community of learning. These are all methods that are increasingly useful for other disciplines because they enhance student ability to use electronic media which in turn is a perfect enhancement for an interdisciplinary model for teaching. The interdisciplinary approaches that are increasing on the college level would occur with or without information technology, but the capabilities of the information age allow a greater flowering of the product of these alliances.

Historically the visual arts were one of the last areas to be accepted as a course of study at Kenyon. They were deemed too practical, too vocational. Apparently the thinking was that painting and drawing were an interesting aside to a life of rigorous intellectual development, but the methods of inquiry in the visual arts were not essential to a liberal education. The reason for inclusion in the curriculum rests on the profound difference in the nature of visual inquiry. The visually educated individual is able to perceive more clearly their surroundings, develop creative approaches to problem solving, and express themselves visually. These are tools all students should have the opportunity to develop.

This argument is strengthened by research since that time in different modes of learning (kinesthetic/tactile, visual and auditory) and multiple intelligences (linguistic, logical/mathematical, spacial, musical, bodily/kinesthetic, interpersonal, intra personal) [1]. The variety in human aptitude is also part of the argument for including technologies in our curriculum.[2] It is also part of the educational philosophies advanced by Dewey and others that bring student centered learning into focus. [3] In the era of the information superhighway, multimedia processing and video production, the need for visual/kinesthetic modes of learning is clear. The practice of studio art addresses the needs of students previously unreached. Visual arts training makes minds more flexible and capable for other disciplines, and the skills to manipulate imagery are necessary for the full realization of the technological product.

Conversely, the visual arts need the interpretive discourse and research skills used in other disciplines to complete projects which are increasingly social and political in nature. In the field of Video Art, for example, many works approach social and political subjects through personal experience. Although the purpose and goals of this inquiry are different from sociology, some research skills remain the same. Artists choose whether or not to apply an interpretive -artistic filter, and may color the meanings of the research to serve their own goals. Ideas about

objectivity, subjectivity, authorship and appropriation are all essential elements of the artists palette and are informed by the critical discourse of other disciplines.

Modes of Inquiry in the Visual Arts and Their Relationship to Interdisciplinary Information Technologies

One of the first attributes developed in studio classes is that of learning to see. ***Visual Perception*** involves seeing in a way that takes in details that are often overlooked; looking for similarities or differences in visual forms, looking for shapes between forms, seeing the whole image as interrelated. It allows one to be both specific and abstract, to fragment or synthesize or transform. It works in conjunction with the unconscious to encourage the imagination and awaken deep concentration. Drawing is a fundamental way to increase visual perceptiveness. "Drawing turns the creative mind to expose its workings. Drawing discloses the heart of visual thought, coalesces spirit and perception, conjures imagination; drawing is an act of meditation."[4]

Perception skills increase ones ability to gather the most from research and access which visual information might be compelling for presentation. They help break down stereotypes and interpret unspoken information. People who are visually perceptive often have an ability to remember unusual details which might be pertinent to a subject. A visual style of research is similar to keeping a sketchbook, though it can be done with a video camera or even descriptive words. The compilation of images on tape or film can later be sorted and edited. It is a loose gathering of fragments in a style like weaving or quilting in that it is non-linear and web-like. It will be even more so as students use digital cameras.

The history of technology indicates causative changes in our collective perceptions. The creation of the linear perspective system in the Renaissance placed the viewer at the center of every painting's universe. The invention of photography flattened space, presented us with visuals hailed as truth. Film gave us multiple viewpoints and fragmented time. Printing technology brought us reproductions of beautiful landscapes available as postcards, offering idyllic points of view and skewed, dotted colors. Television technology broke color into luminous lines. The image was flattened, idealized and somewhat fuzzy. Computers offer us the opportunity to interact and choose (within available choices) our next visual image. As these technologies have changed, the nature of our perceptions have changed with them. It is hard to really see that Caribbean beach scene in real life without conjuring the postcard image and conflating the two. Thus we must be trained to see. Learning first hand visual acuity from drawing will give us a standard by which to critique the media.

Hands on learning is the way in which artists process visual information. The kinesthetic/tactile approach is combined with visual perceptiveness to develop personal expressions. This involves the use of a variety of tools as intermediaries while manipulating the visual elements. Therefore the *use of tools* is common for the visual artist and in that way, using new technologies is just a variation on a theme. Often a new tool will influence the content of the work because of the new capabilities and problems it presents. Artists are used to trying new tools, gaining some mastery, but allowing the tool to have a voice in the process. They are used to allowing the integrity of the

process to influence the content. The tools we are most familiar with, those we no longer need to think about how to use such as the pencil and paintbrush, the word processor and copier, are tools we would consider *direct* in their interpretation of what we intended of them. Tools that have more variables, partly because of complexity and partly because of our lack of familiarity become *indirect* in that we most often act upon the tool in one way and have it come out a different way in the product. I am comfortable with that process as a printmaker/ videographer. There are so many variables and steps in each of these processes that I count on the things that occur in the in-between land of intention and result. I can always make a choice to edit it out later, but often the voice of the machine in dialog with my own is more magical than my presuppositions.

A danger in this dialog may lurk in the programming options for some CAD systems. The similarity in options can lead to work that is visually redundant. Thus the visual art training which encourages one to take risks and push the limits of the process are even more important to extend to all of the liberal arts.

A problem for artists specifically related to use of computers is the nature of computer programs. Originated by linear, logical and sequential thinkers, the environment and methods can be alien to many users, including artists who need to see in order to manipulate rather than remember linguistic/numerical commands. Kinesthetic/ tactile learning styles should be taken into account in computer design in order to increase user friendliness. Ergonomics for people who learn with their bodily movement should be employed. Touch pads and screens, a variety of mouse styles, virtual gloves and sketchbook style pads that read handwriting are steps toward fulfilling this need.

Technological innovations have brought unimagined options to all disciplines. The electronic tools of today simulate brain functions in much the same way as the tools of the industrial revolution simulated muscle functions. There were worries then about the machine eclipsing our humanity, parallel to current concerns. The constant in all of this change is the need for us to be able to use the new tool and still maintain our humanity. The probability is that we will make a fair amount of art work about precisely the interaction of the two. Historically this happens while machines are not yet matured in society.

Hands on development of *design skills* taught in the visual arts are needed for the quality of product expected in multimedia productions, visually compelling Web pages, and unified video presentations. This includes a knowledge of the elements of visual language (line, shape, color, texture, value) and the principles used to organize them (unity, focal points, balance, scale, rhythm, illusion of space and motion, *etc*.) The visual and manual skills developed in learning these principles will enhance a student's understanding of how to manipulate them on the computer. This is perhaps the most obvious need from the point of view of the other disciplines, but is modified and accomplished partly through the development of perception, problem solving and personal expression. Artists learn to break the rules as soon as they learn what they are.

Problem solving in the visual arts is often non-linear and intuitive. Rather than reading the manual and following steps A-Z , the visual thinker often brainstorms many options, thinking

simultaneously of possible solutions, and willingly tries them out even if they are not logical. They may rely on the leaps of insight that occur during the physical manipulation of the tool rather than the pre-thinking of a course of action. They may visualize a result and the way to get there without being able to verbalize it. To a visual thinker it is clear that "... you cannot replace intuition, judgement, imagination and creativity with logic, equations, formats and rules" (Munoz, p.48)

Taking risks in an attitude of *playfulness* is an overarching attitude in problem solving and in the development of the imagination that is too often overlooked in our drive to create a product. Playfulness is the core attitude that allows problem solving to occur, imagination to flourish and intuitive insights to succeed. It allows the association of two or three radically different elements to feed each other creating vibrant new implications. Playfulness is the mode of inquiry that keeps us in the studio late at night, or at least keeps us able to enjoy it. It is the part of visual inquiry that is easiest to lose, given the pressures we face, yet it is the element that we most need to keep our work fresh and exciting. Once basic technologies are conquered, playfulness is easier than ever as we are able to try out several design elements with the click of the mouse. We can change this color, or that texture, we have so much choice, at such speed that it increases our tendencies to try them all.

Personal expression is the process and product of the methods used in visual inquiry. Though artists may strive for a degree of objectivity and universality in some work to suit a purpose, there is no question about the fact that nothing can be objective, and the work must have personal resonance to have integrity. Though the romantic notions of artist as genius are no longer supportable, the honesty of choosing a subject one is personally familiar with allows for a passion to pursue the project to its end. Personal experience also affords insights and a "litmus test" for the arguments advanced by others. It allows dreams to influence the work and sees a full exploration of metaphors as equal in value to the original subject. This aspect is true of other arts including creative writing, music composition, improvisations, etc. Trusting this approach could be a gift of the arts to academia. Questioning it could be the gift of academia to the arts.

The influence of technological innovations on personal expression can be both liberating and constrictive. The liberation comes from the possibilities opened which were unapproachable before. An example of this is the increasing use of enveloping installations with moving images and sound. This provides the appropriate artist with a more saturated way to express their personal vision. This could become more intense with increasing use of virtual reality, holographic, and laser technologies that approximate the artist's own experience/vision in a more complete way than ever before. The constriction comes from the learning curve needed to utilize these tools, the lack of training immediately accessible, and the cost of that training both in financial and personal terms. The profound dedication it takes to come in on the cutting edge of new technologies can blur an artist's concept. Often the work must be at least in part about the technology used to create it. Sometimes the early work in a medium is dry or thin, though technically virtuous. One has to ask the question about how this work will fare in the long run. Will it be merely an example of "Early Laser Art", or will it be significant on conceptual and aesthetic levels as well? Despite all of these detractions, it is the involvement of artists early in technology development that is crucial overcoming them.

Proximity learning is the only way to approach the teaching of visual art making. We may be technically able to present examples of previous work, exhibit technical skills, and present assignments to a group in remote ways, but the learning comes from doing and assessing and doing again in concert with these presentations. In addition, the nature of the presentation changes with the nature of the group, their questions and size, etc. The more complex the tools, the more one-on-one teaching needs to take place. The more abstract or difficult the concept, the more personal discussions need to take place. In fact working with students in the expressive arts can create an unusual intimacy between teacher and student and the class as a whole. Working in a group aids the education and development of the students, as they are willing to share information and ideas. The critical forum for the visual arts class is open "critique". This is a place where students put their personal investment on the line in a very public way. The nature of the student/ teacher and inter-student relationship is important for the success of this style of learning. They must learn how to analyze and communicate verbally in a helpful way what they perceive from the visual product.

The speed of burgeoning new technologies and the fact that students have grown up with and are more familiar with some technologies than we are makes this clear: teachers are forever students and together we are partners in inquiry. This attitude toward learning helps students to be more willing to solve problems on their own, develop their confidence and be able to function without the structure of a class.

Some Specific Uses of Information Technology in Studio Art

The opportunities offered by information technology that the Kenyon Art Department has explored to varying degrees include: video processing, photographic manipulation, simple negative manipulations for photo-mechanical processes in printmaking, research on the WWW, E-mail, and early computer imaging techniques (1980s). The bulk of my time with technology has been spent investigating the options of video for the visual artist. I have used it in simple form with a beginning level class called "Thematic Studio" and in depth with an intermediate level class entitled "Video Art".

Video Art on the Beginning and Intermediate Level

The projects we have explored help the students develop some of the abilities especially important in the visual arts, as mentioned in the first part of this paper: visual perception and research, creative problem solving, personal expressions, and physical manipulation of design elements and tools through proximity learning. In addition, there are special problems we address in these assignments that are relevant to other disciplines. These include in part elements of time progression, and the integration of audio, narrative sequencing and text. They also include critical analysis of our purpose with television and film and a comfort with themselves as performers. All of these are new elements for visual artists. The type of tools change, but the comfort of using the body in kinesthetic/ tactile learning remains familiar.

In the intermediate level class which focuses on video, students get to explore essentials of video more deeply and in some ways are even more interdisciplinary . All of the above issues are dealt with more throughly and more refinement is expected. More emphasis is placed on context, of understanding the concepts behind television, film and video art. Awareness and criticism of popular culture is addressed throughout the course as the students become informed producers, rather than consumers. They also have more sophisticated processing options on this level available through a computer controlled editing center. Here they can create special visual and aural effects that can layer art projects with more meaning. (Negatives, polarizations, color shifts, distortions, more text options, etc.)

One element of the video revolution is its affordability which places it in the hands of those who are normally voiceless. Students are encouraged to realize this power. Groups that have made use of this opportunity in the context of video art and cable TV options include gay and lesbian groups, those in a variety of racial groups, feminists, etc. In addition the proliferation of consumer grade camcorders has changed forever the nature of courtroom evidence and television entertainment.

Is there something inherently valuable about this mode of visual inquiry that we have been missing without it? First of all, the basic processes are quick, allowing instant image feedback. In addition students have appreciated the direct connections this creates between their visual work and the rest of their lives, both personal and academic. There is palpable excitement in this class partly because of these connections, partly due to the nature of a new technology, and probably initially due to the hype of Hollywood, which students soon realize is very far from what we are after.

One danger in using television technology is that an over use of special effects is tempting and can look shallow. This is due to familiarity by the student with popular culture use of these technologies such as MTV as well as the wealth of options available. Their intuition can be so saturated with the knowledge of these cultural icons that it takes a while to crawl into fresh territory.

There is also the issue of the learning curve, as with all new technologies. How much do you have to learn before you can produce something? How long does it take to work intuitively? How solid is the software? If it is unproven, students and faculty may spend an inordinate amount of time on something that may not work well in the end. A good deal of technical support from training and maintenance of equipment is essential for class and professional research use of these tools. This is difficult in any situation, but in a small liberal arts college, decisions must be made about what to support, how quickly to bring in new technology, and how broadly to disseminate it. Both faculty and administration must be part of this discussion.

Computer Imaging and Printmaking

Another area of information technology we are exploring is that of computer manipulation of still images for the purpose of printmaking, photography, etc. Our work in this area has been minimal, and we have been interested in having the output from these be prints and photographs

rather than the image on the computer screen. The advantages for this application for printmaking, to which I can speak more directly, includes the ability to understand color separation by playing with layers of color in Photoshop. One can also create images or type, or video frames, output them onto acetate and use them to create a photo-silkscreen, litho or etching. Printmakers in the larger world are investigating techniques in output such as luminous IRIS prints, wax/ ink prints and color inkjet plotters. It is natural for printmakers to be involved in this type of technology, for the whole history of printmaking as a fine art is that of an alliance with commercial processes. Alois Senefelder, the father of Lithography was involved in finding a cheaper way to print music when he stumbled on the grease and water principles that still sustain the basis of our commercial printing industry.

The resurgence of printmaking in the United States in the 1960's was related in part to the idea of democratizing art, making it available for those who previously could not afford it. The idea that multiples could be created by painters put less emphasis on the preciousness of the painting. Many painters and sculptors were guests at printing ateliers and made wonderful prints. This was synchronous with the rise of conceptual/ performance and video art as non- object oriented art. It was an anti "High Art" stand.

However especially in printmaking, that idea was easy to corrupt. Some painters had printing technicians photographically reproduce a favorite painting rather than using the qualities unique to the print process and reveling in their capabilities. The approach of just reproducing a painting is repugnant to printmakers, who are inspired by the peculiarities of the process, who seek the same for computer manipulated imagery. To be true to its nature, the computer aided image should not try to look like something it is not, video should not try to be film, but use the unique properties available to each media as the basis for image making.

The complications about using these technologies in Printmaking include the pixelization of the image output for use in the print. In addition, the size and orientation of the computer screen is difficult to work with and movable monitors are too costly. The color qualities on a luminous screen are very different from that of ink on a white page, and therefore students must learn to make adjustments. Use of some of the computer options can appear "gimmicky" or "slick" since they are created for the commercial press and must be used very carefully. In addition the cost to the individual student for processing images in a way we can't accommodate here can be quite high. The last but probably most important issue is technical support. Things can and do go wrong all the time. If they can't be fixed quickly, projects will be delayed and plans for the class can collapse.

Research on the World Wide Web

One option which appears promising, though is full of problems at this point is the World Wide Web. For artists who are in a location where museums are not plentiful, seeing reproductions of artwork, even digitally reproduced, is better than nothing. Most major museums offer sites on the Web, and therefore access to some images in their collection and educational materials. Some of these are reproduced in printed form, and I prefer these when available, but the speed of publication on the Web allows for simultaneous viewing while a show is on exhibit. In addition,

there are many on-line galleries, associations and independent artists who have pages on the Web, all with the most current work. It is hard to get reproductions of a wide range of current visual work, and therefore the potential for students of contemporary art is great. Portions of video work can even be accessed this way. There is simply no other source this current, multi-sensory and available.

There are problems with the Web for artistic research of course, related to problems everyone else has. The largest issue for me is the unedited nature of the work. One can spend vast amounts of time looking at junk and only finding a few gems. Of course this isn't much different from a physical trip to Soho in my experience, and costs far less. Directories of proven sites published in trusted magazines are a partial relief from this problem. The flip side of this is the fact that even I or my students could publish on the Web without too much cost or trouble. We could have a class portfolio, under the Kenyon Home page to help prospective students understand the quality of the work done here.

The learning curve is another omnipresent issue. Until surfing the net is easier than programming one's VCR, it won't become a universal tool. User friendly interfaces are helping this, but in all technological areas, this needs to improve to the degree that most consumers are comfortable with.

The issue of copyright and the nature of protection of intellectual property will have to be dealt with more thoroughly. Some museums have small images of entire works that are highly pixilated and only sections in clear detail, to avoid piracy. Some artists won't take the chance, and others would rather their work be seen than protected. This issue will only increase as laws are made, regulations applied.

Access is another issue. At this point, the difficulties of access keep me from a full use of this tool. When it is on every desk, and everyone is well versed in using it, it will be much easier to assign tasks on the Web. The issue of access can also be critiqued on a larger scale, where access and knowledge are still reserved for those who can afford it. This creates an even further division between rich and poor. Those with access will have an unfair advantage in classes. There are arguments for a less expensive education through the use of the Web for distance learning, for those who cannot afford to attend a residential school. I find this idea lacking because distance learning would preclude developing a culture of learning that includes some of the methods of visual inquiry. [2] [5]

Conclusion

Throughout the development of technologies, artists have been on the forefront of exploration. Joining with scientists and inventors, they have been willing to brave the learning curve, playing with new tools as a means of discovery and conceptual development. Teachers of art have long been facilitators within communities of learners who are willing to risk their personal expressions with each other in critical discourse. This student centered, hands-on learning style is now being embraced by other disciplines in the Liberal Arts. This change is in keeping with the new information technologies, and is an asset to learning in as much as it is reliable,

approachable and accessible. In this way we are preparing students to be flexible, life long learners, a long standing goal of a Liberal Education.

Notes

[1] Gardner, Howard, White, N, and Blythe, T. If Minds Matter:A Foreward to the Future, Vol.II Skylight Pub. 1992

[2] Twigg, Carol "The Need for a National Learning Infrastructure" Educom Review, Vol. 29, No. 4,5,6, 1994 (www.educause.edu/ir/library/abstracts/nli0001.html)

[3] Brint, Michael "Being Digitally Educated, Dewey, Technology, and Distance Learning" in this volume

[4] Hill, Edward, The Language of Drawing, Englewood Cliffs, NJ, Prentice-Hall, 1966

[5] Brown, J. and Duguid, P. "Universities in the Digital Age", Change, July/Aug 1996

Bibliography

Adams, James L. Conceptual Blockbusting, Addison Wesley, Reading, MA, 1986

Atkins, Robert "The Art World and I go on line" Art in America, Dec. 1995

Brint, Michael "Being Digitally Educated, Dewey, Technology, and Distance Learning" in this volume.

Brown, J and Duguid, P "Universities in the Digital Age", Change, July/Aug 1996

Edwards, Betty Drawing of the Right Side of the Brain, J.P Tarcher, Inc. Los Angeles, 1979

Elkins, James, "Art History and the Criticisim of Computer - Generated Images," Leonardo, Vol. 27, No. 4 pp. 335-342

Gardner, Howard, White, N, and Blythe, T. If Minds Matter:A Foreward to the Future, Vol.II Skylight Pub. 1992

Hagen, Charles, "The Fabulous Chameleon Video Art," Art News, Summer, 1989, p. 118

Hanhardt, John G., & Hall, Doug and Fifer, Sally Jo, Illuminating Video:An Essential Guide to Video Art, Aperture, BAVC

Hanhardt, John, ed. Video Culture A Critical Investigation, Visual Studies Workshop Press, 1986.

Hill, Edward, The Language of Drawing, Englewood Cliffs, NJ, Prentice-Hall, 1966

Judson, William D.,"Bill Viola Allegories in Subjective Perception," Art Journal, Winter, 1995

Kanter, B "Finding Art on the Internet" High Performance Vol. 18, Num. ½, 1995 p.84

Kelly, Kevin, "Eno, Gossip is Philosophy," Wired, May, 1995, pp. 148f

Lauer, David Design Basics, Holt, Rinehart & Winston, Chicago, 1990

Lovejoy, Margot, Postmodern Currents, Art and Artists in the Age of Electronic Media, UMI Research Press, 1989

Lurins, Sandra, "Common . Dreams / Unique . Visions," HOW, August, 1996, p. 94f

Madoff, Steven Henry, "Art in Cyberspace: Can it Live Without a Body," The New York Times, Jan. 21, 1996, p34

McCorduck, Pamela, "America's Multi-mediatrix," WIRED, March 1994, pp 84f

Mellencamp, Patricia, "The Old and the New Nam June Paik," Art Journal, Winter, 1995

Mensing, Margo, "Electronic Textiles: New Possibilities," Fiberarts, Summer, 1996, p 42 - 45

Popper, Frank, "The Artist and Advanced Technology," Leonardo, Vol. 28, No. 1 pp. 27-33, 1995

Seipel, Joe,"Reshaping Education," Sculpture, September, 1996, p. 22f

Sieling, Neil, ed. The Techno/logical Imagination: Machines in the Garden of Art Intermedia Arts Association, 1989

Truckenbrod, Joan Creative Computer Imaging, Prentice Hall, Englewood Cliffs, NJ 1988

Twigg, Carol "The Need for a National Learning Infrastructure" Educom Review, Vol. 29, No. 4,5,6, 1994

Villasenor, Maria C., "Video/Media Culture of the Late Twentieth Century," Art Journal, Winter, 1995

TIRED: distance learning - WIRED: proximity learning

David J. Marcey
Associate Professor of Biology
Kenyon College, Gambier, Ohio

Let me start by saying that I am an enthusuastic proponent of the use of information technology (IT) in academic settings. I use IT intensively and in varied contexts in my classes. I believe that IT significantly enhances communication and collaboration between me and my students (and among students) and empowers student learning in ways not possible with conventional means. As teachers, we sometimes forget that the most important ongoing activity in our classes is not teaching, but learning, and I believe that IT is dramatically improving the learning experience of our students. I use IT with three pedagogical goals in mind: 1) to improve communication and collaboration in my classes; 2) to aid my students in information discovery, and; 3) to empower students to learn using a variety of resources. Brief descriptions follow.

Communication and Collaboration

I use electronic conferencing to generate discussions on a variety of topics outside of class. Participants can open threads of discussion to which others can respond. The e-conference for a particular course has many different topics under discussion at any one time. One course in which I employ e-conferencing extensively is "Introduction to Genetics and Development", a core course in our biology curriculum for first- and second-year students (typical enrollments of ~100 students). I find that the electronic conferencing format stimulates students who otherwise might be reticent to speak up in such a large class to raise questions and enter into discussions on a variety of topics outside of class. I often post questions for analysis or discussion, and find, quite contrary to some views of computer culture as an isolating experience, that groups of students will work collaboratively in posting replies or in raising new questions of their own.

In terms of information discovery, I am using existing resources on the World Wide Web to provide a means for my students to garner information dealing with molecular biology. I have built web pages to provide web links that will launch student inquiries in particular directions. This focuses student explorations and generates useful searches. This approach minimizes a common problem voiced by some critics, that the web contains a lot of "junk" information. I also utilize some of the molecular biology databases in my laboratory class, "Principles of Gene Manipulation" to search for and analyze gene sequence homologies. These information discovery approaches are used in addition to having my students employ traditional literature search engines provided by our library.

Graphical Resources

Molecular graphics are especially important in teaching current biology, because so much about the chemistry of biological molecules can be conveyed with molecular models. I employ several programs that I have acquired from Internet sites to build and display models of complex, sometimes interacting macromolecules. I have constructed tutorials which allow student-generated exploration of important molecules in three dimensions. I have also made animations

of important molecules which are shown in class. I have produced W3 pages that contain these molecular graphics (including movies) so that students can access them outside of class at any computer classroom on campus. **Most importantly**, I now require students to construct their own molecular tutorials. For examples of student-centered learning in my molecular biology class, you are invited to visit our molecular tutorial pages (http://www.kenyon.edu/depts/bmb/chime.htm). Any of the above models plus scanned images from the research literature can be put into a digital slide show. I use these digitized slides often in class. In a sense, they have replaced old overheads, with two important improvements: 1) full color graphics to illustrate important points, and; 2) students have access to the slide show for a particular lecture anytime from any computerized classroom on campus. Thus, students can revisit AV aids projected in class anytime.

Why then the title? Do I really think that distance learning is "tired"? No, but I do find absurd the notion that IT-mediated distance learning will largely replace the interactions that occur between me and my students as they come to understand the macromolecular machinery that runs the chemistry of life. Analysis of research papers and learning to approach new ideas with a healthy, critical skepticism through logical dissection are two activities that are essential if students are to understand the experimental underpinnings of current models of cellular mechanisms. Although IT allows us to approach these activities at a higher level than otherwise possible, I am quite skeptical that virtual classrooms will ever be able to supplant the intense student-faculty collaborations that facilitate these activities.

Proposals for virtual universities and colleges grow naturally from the tremendous impact that IT has already had on education. My skepticism about these visions arises from a conviction that that learning is a multi-faceted and complex process, deeply dependent on personal interactions between students and faculty and among students themselves. This is not to say there are not many ways that IT can enhance these interactions. Also, for some topics, remedial mathematics, for example, exclusive use of IT-based distance approaches may be entirely appropriate.

John Seely Brown and Paul Dugid writing in Change (July/Aug., 1996) have provided many cogent arguments for maintaining the physical continuity of colleges and universities in the digital age. Foremost among these is that higher education at its best involves the "enculturation" of students into learning communities, something that distance learning is not good at. While distance learning pursues access to information, it may ignore fundamentally important access to communities engaged in scholarly activity:

> "If...learning requires genuine participation, distance learning often provides its illusion only, while actually keeping students at a disempowering distance"

Instead of a progressive march towards IT-based "virtuality", we favor the thorough incorporation of IT into curricula, so as to enrich and improve the proximity learning that is at the core of a quality undergraduate education. Proximity learning.....it's WIRED!

Proximity Learning, Electronic Orality, and an Ergonomics of the Mind

Timothy Baker Shutt
Associate Professor of English
Kenyon College, Gambier, Ohio

Our general topic in this series of essays is information technology and what my colleague David Marcey has characterized as "proximity learning." He coined the term in response to the writings of Massey and Zemsky (1995) and other education theorists who have advocated "distance learning" as a cost-effective and efficient use of information technology to minimize the need for what Marcey has termed the "intensive"--and expensive--"student-faculty interactions that occur in a physically tangible community of learning in college and university settings." Under the rubric of "proximity learning," Marcey and the rest of my colleagues think of a series of innovative modes of employing information technology to facilitate learning within those "physically tangible" communities of learning which, expensive as they are, represent one of the happiest and most valuable legacies of traditional liberal arts instruction.

My own central focus here is upon a particular mode of "proximity learning," one traditionally seen as preceding and undergirding collegiate instruction--instruction in the humanities and social sciences, certainly, and to a lesser degree, instruction in the natural sciences and the arts as well. My focus is a reconfiguration of the intimate relation between reader and text.

Let me begin, if I may, with an observation. Texts are, in a sense, intrinsically linear. We read sentence by sentence, phrase by phrase, word by word. What texts seek to convey, though, is not linear, or is not linear in quite the same sense. Texts seek by a sequence of words to convey a mode of understanding. They move sequentially (in mindtime) to evoke patterns (in mindspace), to evoke by one-channel processes multivalent, multi-leveled states of mind. Such states of mind may, and often do, include or presuppose a series of more or less linear arguments, but ordinarily will include them as constitutive parts of larger and more complicated patterns, and often employ them in at least partly affective or ironized ways which to greater or lesser degree compromise and complicate even such seeming linearity as they bear by virtue of being explicit and sequential arguments. I would thus maintain that what texts seek to convey is, to coin a phrase, more nearly "reticular" than linear: more like a net or web than like a line--even a line of argument.

The text, phrase by phrase and word by word, seeks to weave the web in the mind of reader. The web itself, though, is not linear. It is reticular. Were there a medium that could transmit the web in its full "reticularity"--at least in potential, all at once--then such a medium would not only stand in closer structural accord with what it conveyed, with its message than does, say, a book; it might also allow for easier and fuller learning, for better communication, if only because those on the receiving end of the transmission or communication--readers in traditional terms--would not have to reconstitute the message piece by piece, bit by bit, phrase by phrase, as a reactive webmakers in their own right. Or even if they did have to reconstitute the message bit by bit, they could, perhaps, do so not in the order chosen by the "transmitter" or text-maker, but in an order an order of their own choosing, suited to their own cognitive styles.

That, I will argue, is what information technology can begin to do. And it can do more than even that. I think that by providing alternative modes of information retrieval relying upon digitized oral presentations of information which is now "stored" in print--by relying upon what would be, in effect, electronic oral libraries--information technology could in large measure free us from the social necessity of seeking to attain universal literacy. And freedom from that necessity would be, I think, a very good thing, because, despite really vast expenditures of effort and expense, we have not in this area yet been able to achieve our goals.

This would be most dispiriting were universal literacy an essential goal for us in its own right. Fortunately, though, that is not the case: we value universal literacy as a means, not an end. The end is social equality and equal access to knowledge, both for the purpose of social advancement and empowerment and for the purpose of contemplative and intellectual joy. None of these last, in an electronic world, need depend directly on literacy. And so--or so I hope and imagine--we may soon be able to abandon our costly search for universal literacy in favor of other more productive and attainable goals.

It is in this sense, perhaps more than any other, that the transition from print-based to electronic media is not to be feared but to be welcomed. A quarter century as a teacher of English has unavoidably suggested to me that, however rewarding the process, neither reading nor writing is easy to learn--or for that matter, easy to teach. What I would like to explore in the pages to follow is why reading and writing are so hard, and why electronic media may help us, if not so much in overcoming those difficulties, then perhaps in showing us how to get past them by offering us the prospect of learning at least a substantial part of what we need to know in easier and more natural ways than ordinarily lie open to us at present.

My attention was first directed to these questions by the Pew Charitable Trusts-funded Summer Institute of 1995 at Kenyon College, Gambier, Ohio, which provided me with the opportunity to become acquainted with hypertext markup language (HTML) and more broadly with the possibilities of posting multimedia projects and presentations on the Internet. Some of these possibilities were later brought to fruition by students affiliated with Kenyon's Integrated Program in Humane Studies (IPHS), in which I have been privileged to work to since 1992. This past year, indeed, I worked as one of three instructors in the introductory IPHS seminar, one requirement of which was the production--most often in groups of two or three--of a multimedia project making use of the Macromedia's "Authorware" program.

These projects varied considerably in sophistication, but in their very diversity they suggested that electronic media might provide the paradigm for a mode of learning in some respects at least very different from that which has been normative in the West during the age of print, but much in accord with that which had held sway, in one sense or another, for centuries, if not millennia before. Work with my students in conjunction with my colleague Michael Brint suggested to me that multimedia specifically, and information technology in general, might offer the hope of a way out of what has been in some respects a cultural nightmare--the dependence of culture upon print media.

My fundamental claim in this regard is that computers--or more precisely, Mac-based or Windows-based information technology systems--are in several significant senses more user-friendly than books. They are, in just those senses, easier to use than books, because they work,

in general, more in accord with the way we are biologically primed to learn than do books. A corollary follows: people who are worried that computers will in some sense replace books and that data-banks, or Internet access, will finally replace not only libraries, but museums and concert halls as well, are worried about a state of affairs which, should it transpire, would in most senses, if not all, be a good thing rather than a bad.

It would be a good thing precisely because reading is so difficult and because, on just that account, a culture based upon reading necessarily excludes from full participation a substantial proportion of its members. Reading is, indeed, unnatural, not in the sense that no one can do it--many of us read very well indeed--but in the sense that no one can do it without training, and many people, perhaps most people, do it badly even after training. Things that we do naturally, by contrast--things like walking and talking, for instance--virtually everyone does well as long as health allows, and virtually everyone does without formal training before what we term "school age."

Hence, if computers call, as they do, upon more natural learning channels, and upon a wider array of channels than those called upon by print, called upon by books, then education will very likely be an easier, more enjoyable, and more successful process, and perhaps (let us dream for a moment) the vast differential between educated and uneducated or ill-educated will shrink, with social benefits following in train.

Hunter-gatherer culture does not require formal education, and to the best of my knowledge, hunter-gatherer societies do not have an undereducated underclass. One of our own cultural ideals has been, for the last two centuries at least, the attainment of the same sort of near-universal cultural competence seemingly enjoyed by, say, the Inuit or the San. That, as I take it, is what the ideal of universal education is about. But we have been to some considerable degree thwarted by the intrinsic difficulty of reading. Learning to read, it appears, is less like learning to walk than it is like learning to walk a tightrope. The case with Windows-based and Mac-based computer programs seems fundamentally different. Such programs may be at least initially difficult to master for those long anchored in a print-based world, and confirmed technophobes may not even attempt to learn how to use them. But with children the case stands otherwise. They take to the Mac/Windows environment easily, and in many computerized homes, they soon find themselves instructing their parents. Children self-teach computer literacy, given the chance. Few children, by contrast, teach themselves how to read. This is no accident. Software interfaces are designed with ever-increasing success for user-friendliness. The conventions of print transmission have historically been governed by different imperatives.

But let me reiterate, for a moment, with a view toward clarifying the situation at issue here. The cultural importance of print media, coupled with a growing commitment to the notions of political equality and democracy, issued during the nineteenth century in the ideal of universal education--which meant above all, universal literacy. Nothing like this had ever been attempted. Literacy, however valuable, and however central to the functioning of a given society, had always been, up until that time, to greater or lesser extent the attainment of a particular social group. In such situations literacy was a concomitant of political and economic power, and in that sense of great social importance, but there was no cultural expectation that the attainment of literacy should be universal, any more than that any other socially useful but difficult skill should be universal. The position of the literate in such cultures was rather like that of the engineer in our

own. Society depended in all sorts of ways upon the knowledge commanded by the guild of scribes and scholars, and the guild enjoyed the rewards of its knowledge. It was no more to be expected, though, that everyone could read and write, than it is now expected that everyone can do calculus--indeed, probably less to be expected.

The ideal of universal education--and universal literacy--has changed all that, however, and the ubiquity and familiarity of the efforts we have undertaken in service of that end have, I think, to some degree blinded us both to their extensiveness and their poor success. We spend more tax dollars on education than on health care, defense, or anything else. In every town and township, in every neighborhood and barrio across the United States, we have built schools and hired teachers and forced every child between the ages of six and sixteen to attend--six months or more per year by day count, six hours or more per day. Ten years of training, enforced by law, for every single one of us. And to what effect?

A vast cultural apparatus has been erected to achieve the aim of universal literacy, and it has in large part failed. Our success, to put it mildly, is disappointing in virtue of the effort expended. To be sure, if by "literacy" we mean something like testably reading at what is designated as the "sixth-grade level," then our efforts succeed reasonably well. Not as well as we might wish, no doubt, but well enough. If, though, by "literacy" we mean something more like the universal attainment of a state in which the process of decoding print media is utterly unconscious and no impediment to understanding--in which print media become "transparent" in the sense which speech is "transparent"--then we of course do far worse.

There is every reason to believe that literacy at this level is rare--perhaps three to four percent of the population, perhaps less. It is not universal even among professional academics. Evidence, I suspect, is to be found in the number of people who read regularly and extensively for pleasure--and reading becomes a pleasure, I would argue, almost precisely to the degree that the process of reading is transparent.

Simply put--reading is hard and unnatural. Few of us ever learn to read easily in any language. Listening, by contrast, is easy and natural. Watching is easy and natural. And here lies our great social hope. For computers, too, are easy to the degree that operating with them depends upon listening and watching instead of reading, and as that degree increases, using computers will become easier still.

In the age of print, I would argue, what we are evolved to do, and what our culture, our surroundings, reward our being able to do, have fallen seriously out of phase. We are all hard-wired to speak and to listen--that has long been, if not an evolutionary requirement, then a powerful enough Darwinian advantage to have been selected for so hard as to make its attainment very nearly a species-wide universal. Up until very recently, though, there has been no such selection pressure acting in favor of the varied capacities which go to make up a proficient reader or writer. Hence proficient readers and writers remain rare.

One result, it might be argued, has been to increase social inequalities, disproportionately rewarding a very unevenly distributed set of attributes. The capabilities which allow some of us to read with real ease, were apparently of little evolutionary importance until very recent times and hence are very unevenly distributed. In our present environment, however-- or more to the

point, perhaps, in the environment of our immediate past--what had heretofore been peripheral factors of no very great or very obvious differential survival value have suddenly and unanticipatedly became of great, if not central, importance in encouraging the welfare, social and Darwinian alike, of those who can read easily and well. And that, manifestly, has not been and is not everybody--not even everybody who stands in a socioeconomic position in which literacy is encouraged and expected. The educational world is full of socially privileged students with what we have come to term "learning disabilities" of one sort or another, and a very large proportion of these fall under the rubric of what used to be termed "dyslexia."

The advent of computers goes a far way toward changing this situation, which encourages social stratification, simply because what has heretofore been the most efficient means of information storage and conveyance is a means which is only marginally accessible to us and only marginally in tune with our innate cognitive capacities. Because we think of print as very much a low-tech medium, we do not think of ourselves, as participants in a print culture, as enslaved to the dictates of technological convenience. But we are enslaved to those dictates, and to a degree far surpassing that to which we are ensnared by--or are likely to be ensnared by--digital technology precisely because digital technology, by virtue of its very complexity, can be made to work so very much more easily in accord with our long-evolved cognitive systems. Print is, or has been, the cheapest and most efficient information storage medium available. It is not the easiest to use. It takes, let us consider one final time, on average ten to twelve years of training to learn to use it, and even so most use it badly at something far below peak efficiency. We are wired by nature to process (among other things) visual images, body language, facial expression, music, rhythm, and speech. The great advantage of digital technology is that it can present information to us, making use of electronic storage capacities, in ways that we are equipped by nature to process--an "ergonomics of the mind," if you will. As Nicholas Negroponte puts it in his influential Being Digital, computers offer at least in potential an "interface" drawing upon "many different and concurrent channels of communication," and "from a number of different sensory devices," so that "one channel of communication" can provide information unavailable to us in the others.

Such potentialities in view, it is possible to imagine scenarios in which, a generation or so hence, no more of us will have to know how to read easily than now know how easily to read Latin. Icons and voice-overs could do the rest. Were it so, it would, I think be a blessing. For all kinds of reasons.

Women: Lost in Cyberspace?

Laurie Finke
Professor of Women's and Gender Studies
Kenyon College, Gambier, Ohio

The Culture of Virtual Communities

In one passage from A Room of One's Own, Virginia Woolf's fictional narrator finds herself walking across the grounds of an Oxbridge college deep in thought, contemplating an essay by Charles Lamb on Milton's "Lycidas." She remembers that the manuscript of that famous poem that Lamb cites in his essay is housed in the library of the very college whose grounds she walks. She imagines herself literally retracing Lamb's footsteps "across the quadrangle to that famous library where the treasure is kept." Finding herself at the door of the library,

> "I must have opened it, for instantly there issued, like a guardian angel, barring the way with a flutter of black gown instead of white wings, a deprecating, silvery, kindly gentleman, who regretted in a low voice as he waved me back that *ladies are only admitted to the library if accompanied by a Fellow of the College or furnished with a letter of introduction*." (Woolf 7-8; emphasis in original)

The narrator's response shows how quickly alienation follows from exclusion, how quickly intellectual curiosity can become indifference: "Venerable and calm, with all its treasures safe and locked within its breast, it [the library] sleeps complacently and will, so far as I am concerned, so sleep forever" (Woolf 8).

I found myself returning to this scene again and again when I was asked to think about the consequences of emerging information technologies for the teaching that I do in a Women's and Gender Studies program, particularly in relation to the kind of student-centered pedagogy that we, for the purposes of this project, are calling "proximity learning," and opposing to the "distance learning" so often extolled as information technology's future (Twigg, Alley). Surely such scenes of exclusion as Woolf describes in 1928 could not be repeated in an American university at the end of the twentieth century? No student of ours--female or male-- would be turned away at the doors of our colleges' libraries by kindly silver-haired librarians guarding the doors and rebuffing the unwelcome. Yet the refrain heard constantly among cyber-touts these days is that the locus of the library is rapidly changing. Soon the "treasures" about which Woolf writes so eloquently will reside not in atoms--in weighty volumes stored on scores of shelves in monumental stone buildings--but in ethereal bits, floating around in a non-place we've come to call "cyberspace," capable of being disassembled and reassembled at our merest whim in any format we desire (Negroponte). Knowledge--or at least information-- will no longer be "locked away" and apportioned out by the gatekeepers of culture, but will be available anywhere, anytime at the press of a button or the click of a mouse.

This enthusiastic assessment of the democratizing potential of information technologies, however, merits closer scrutiny. What will the effects of this dematerialization--this transformation of information from atoms to bits--be? In particular, we ought to pay close attention to the rhetoric of the sales pitch through which the benefits of cyberspace are being

promoted. While the term is often used rather loosely to refer to everything f0rom computer games to the World Wide Web, "as though each computer screen were a portal to a shadow universe of infinite, electronically accessible space" (Markley 2), it is worth noting how the experts talk about the concept. Michael Benedikt defines cyberspace as "a globally networked, computer-sustained, computer-accessed, and computer-generated, multidimensional, artificial, or virtual' reality" (Benedikt 122). Marcos Novak characterizes it as "a completely spatialized visualization of all information in global information processing systems, along pathways provided by present and future communication networks, enabling full copresence and interaction of multiple users, allowing input and output from and to the full human sensorium, permitting simulations of real and virtual realities, remote data collection and control through telepresence, and total integration and intercommunication with a full range of intelligent products and environments in real space" (Novak 225,226). What both definitions have in common is their thorough erasure of human agency in the transition from a material to a virtual reality [1]. In both definitions machines are remarkably lively and intelligent. They "network," "sustain," and "generate." They provide access; they "enable"interaction, "allow" input and output to circulate, and "permit" simulations. Humans, on the other hand, have almost entirely disappeared or are completely passive. Indeed we no longer have people attached to computers at all, but "human sensorium." People have become little more than inert receptacles for "input" and "output." As Donna Haraway writes, "Our machines are disturbingly lively and we ourselves frighteningly inert" (Haraway 152). This way of talking about computer technology is not limited only to VR visionaries. Most educators writing about the benefits of information technology use the very same rhetoric:

> IT will change teaching and learning profoundly, no matter what the response of traditional higher education institutions. (Massy and Zemsky 2)
>
> IT enables students to work at their own pace with continuous assessment, in contrast to the traditional post-secondary education method which can be described as batch-processing with episodic assessment. (Massy and Zemsky 4).
>
> For not only will information technology accelerate the move toward a process focus and collaborative learning, it may change the fundamental relationships and understandings we've developed during the era when most information was stored on paper. (Batson and Bass 44)

In the first sentence, information technology is characterized as having the power to transform higher education in spite of whatever paltry resistance its institutions might mount (notice it isn't educators, but only institutions that resist). Human agency can amount to little more than a pallid and ineffective imitation of computer efficacy ("batch-processing with episodic assessment"). In fact, in the technological determinism that marks most writing of this kind, human actors appear only as obstacles to the electronic transformation of higher education. Faculty and administrators who resist the inevitable digitalization of the university are seen as the problem to be solved: "faculty will have little interest in IT's capacities to boost academic productivity to the extent that they lack an appropriate vision of learning productivity" (Massy and Zemsky 6). Sentiments like this are so common nowadays that they fly by unnoticed. But their consequences for how we think about information technologies and for the problems we gloss over are profound.

The effect of this discursive logic that endows machines with agency while erasing human actors

is to write out of existence a whole host of material and cultural institutions and practices that create and sustain information technology, but which also determine who is allowed access to this information. Gone from the analysis are the programmers, designers, factory workers, sales workers, service technicians, patent and copyright lawyers, policymakers, executives, college faculty and administrators, as well as the hardware, software, electricity, and raw materials necessary to keep the production line moving. A whole host of technoscientific, economic, social, and cultural practices that regulate both knowledge of and access to information technology simply become invisible. Those who extol the democratizing potential of new information technologies rarely talk, for instance, about the complexities of copyright law, the economic costs of access to this information, or the inevitable pattern of breakdown, repair, and obsolescence involved in maintaining electronic equipment, all material practices that involve human actors who serve as gatekeepers, determining who will have access and who will be denied.

Even the most superficial examination of the material practices that sustain the illusion of "cyberspace" reveal that far from being a cultureless and egalitarian meeting place in which "status, power, and prestige are communicated neither contextually. . .nor dynamically," in which "charismatic and high-status people may have less influence and group members may participate more equally" (Taylor et al. 18), emergent information technologies, because they are situated in networks of material and cultural practices, institutions, and economies, replicate all of the inequities and hierarchies that currently plague academia and the larger world of which it is a part. As colleges and universities celebrate the promise of brave new technologies that will fundamentally change the ways in which faculty and students interact, it is important to keep in mind the very real danger that some of our students, because of where they are situated in these networks, may, like Virginia Woolf, find themselves locked out of the technological campuses of the future.

I believe that both faculty and students can use computer mediated communication (CMC) and IT to teach and learn in new ways that are more collaborative, interactive, and ultimately more effective, but I am also wary of the very real possibility that gender, race, and class hierarchies will (and have) all to easily become part of the "circuitry" of the new information technology on our campuses. I worry that these technologies could have unforseen and undesirable consequences for the politics of gender, race, and class in academia. The question I want to pose is, as teachers, how do we responsibly integrate new information technologies into our classrooms without excluding or alienating the very students we want to empower? My answer is that we can do so only when we pay attention to the material and cultural practices that accompany the adoption of new technologies.

The cultural practices that have sprung up around computer mediated communication (CMC) and information technology (IT), far from being gender-neutral, are, if anything, more male than the culture they mirrors. By almost any measure we might choose, men dominate the computer world through sheer numbers. 87% of all doctorates in computer science go to men (and two-thirds of all bachelors degrees); 92% of all computer science faculties are male (and 97% of all tenured faculty) [Shade, Simmons]. These numbers suggest that those who are designing hardware, software, and networks, supporting and servicing them, and teaching about them are most likely to be men. This is not to suggest, however, that women have nothing to do with computers. Women figure heavily in the global production lines of the computer industry

(Taylor et al., 15), in data entry, and in secretarial positions. In other words, they cluster disproportionately in those areas of computer technology that are low-paying, repetitive, and routinized, those areas that are least likely to influence decisions about how CMC and IT will be used and who will have access.

On the Internet, the heart of the revolution in information technology, depending on how you count, men outnumber women in proportions that range from 2 to 1 to 9 to 1. If you measure access men outnumber women only by two to one. If you measure actual use the disparity can be as high as 10 to 1. A survey conducted in 1994 by the Graphics, Visualization, and Usability Center (http://www.cc.gatech.edu/gvu/user_surveys/survey-09-1994/graphs/Gender.html) at Georgia Tech showed that male internet users outnumbered female by a ratio of 9 to 1. A year later, the same survey showed that , at least in the U.S, the disparity had begun to shrink; women accounted for 29.3% of users in the 4th Annual GVU Survey (http://www.cc.gatech.edu/gvu/user_surveys/survey-10-1995/graphs/general/gender.html). However, to be counted in a survey of this kind a user would have to find the GVU web site and complete the questionnaire. To avoid the potential biases that might result from self-reporting, Matrix Information and Directory Services (MIDS) and Texas Internet Consulting sent electronic surveys to the domains representing organizations on the internet. These surveys counted the numbers of men and women who could send e-mail outside the domain. In 1994, this survey showed only a two to one discrepancy between men and women who had active email accounts (64% to 36%, MIDS Survey). John Quarterman and Smoot Carl-Mitchell suggest that the proliferation of email on college campuses explains the smaller gap between male and female users in this survey. Students have become the largest proportion of internet users and the average university student population is pretty evenly divided between men and women. But the MIDS survey still leaves a 2 to 1 "gender gap" even for relatively simple electronic technology like email. Collectively what these studies suggest is that while men and women are becoming more equal in opportunities for accessing the internet, there are still wide disparities in how men and women use electronic media.

The reasons for this disparity, I believe, are not all that well understood. Much of the research on women and computing, even the feminist research, begins with the assumption that women are disadvantaged and even deficient users of computer technology. Such analyses locate the problem in the resistance of users rather than in the technology they are being asked to use, or better in the network of material and cultural practices that sustain the technology. Women, in this view, are intimidated by the technology and the communicative style of the internet because they communicate differently from men: men are comfortable with the kind of adversarial exchange characteristic of the internet, while women prefer a more supportive communicative style (Herring). Indeed, women's and men's communicative strategies are so different that they inhabit different cultures (Mulvaney). Such views, however, are based as much on stereotype as on any empirical evidence. Michele Evard's research on fourth and fifth grade children using a netnews-like forum in a classroom setting suggests that, before they encounter the culture of the net, boys and girls act in CMC in almost identical ways: girls speak as often as boys, they give instruction in equal numbers, and they flame just as often as boys (Evard). This study suggests that what ever discrepancies exist between men's and women's use of CMC and IT result less from profound psychological differences between men and women than from the practices, values, and institutions that constitute and are constituted by the virtual communities that have sprung up on the Internet.

To understand the discrepancies between male and female computer use and their implications for classroom use of CMC and IT, we must investigate the material practices that discourage women from participating. These include:

Economic barriers. Access to information technology requires hardware, software, and, increasingly, internet access, all of which require a significant financial output. Since women on average make less than men, they may be more disadvantaged as buyers of computer services (Shade, Simmons). Cost may have less impact on college students as the cost of some (though certainly not all) of these services are borne by colleges and universities. Nevertheless, as educators we must constantly remember that the increasing dependence of higher education on electronic technology will always work to the benefit of more advantaged students who can afford the cost of cutting edge technologies.

Lack of familiarity with computer technology. As children, girls are often have less access to computers than boys. When they do, their use of the computer is almost exactly the same as boys (Evard). The computer game industry, however, is notoriously male-oriented, producing few titles that would appeal to girls.

Learning styles. While the literature on infotech frequently promotes the potential of technology to appeal to a variety of learning styles (Negroponte, Batson and Bass, Alley), it is not always clear that training in the use of infotech accommodates a variety of learning styles, especially when the learner in question is resistant to technology or anxious about it. For some users (and here I would include myself), the rapid obsolescence of technologies once learned can be quite daunting and a disincentive to investing the time required to learn still newer technologies every six months.

Harassment and pornography. Information resources like the internet are not always friendly places for women. The kind of harassment that often plagues women in face to face communication has, not surprisingly, become perhaps too frequently a fact of life in CMC (Anderson, Brail, Kendall). The libertarian, anything goes culture of the Web has made it an attractive place to sell and disseminate pornography. Without advocating censorship or indeed any reigning in of the Web's decentralized (non) organization, I would point out that the climate for women on the web can be chilling; one need not actively look for pornography to find it. Recently I logged onto a popular search engine, looking for information on "women and the internet" for this piece. My query yielded some fifty entries, half of which advertised "the hottest women on the internet," "lingerie lounge," "Asian playmates," and "SEX PORN XXX FUCK ADULT GAY WOMEN VIDEO.XXX.COM" repeated over and over in capital letters (the electronic version of shouting). My students have reported similar experiences. Women on the Internet are both subjects and sexual objects.

Discursive inequalities. Although CMC was supposed to eliminate status markers like race, age, physical appearance and physical abilities, empowering those in low status positions,(Lee Sproull and Sara Kiesler, Taylor et al. 54, Stone), gender seems to be a status marker that persists even in electronically mediated situations [2]. Recent studies of usenet groups show that, even when the subject matter focused on women's issues, in mixed sex groups men contributed significantly more posts and that when women's participation rose above 30%, they were perceived as dominating the discussion (Taylor et al. 17, 55, We).

In a study of the relative participation of men and women in usenet groups devoted to women's issues (where we might expect women's interest, and hence their participation to be higher than elsewhere), Gladys We reported the following discrepancies between men's and women's contributions:

Newsgroup	#responses	%female	%male	%unknown
Alt.feminism	303	11%	83%	6%
Soc.women	292	13%	78%	9%
Soc.feminism	47	53%	40%	7%

These findings validate the experiences many women have had in Internet discussion groups and raise questions about the consequences of their use in a classroom setting.

The Pedagogies of Virtual Communities

As colleges and universities invest more heavily in information technology and as IT becomes more integral to our teaching, educators need to think about those we may be leaving behind. And yet such discussions seem to me to be precisely what is missing from the literature on information technology's pedagogical potential. Although much of this literature discusses forms of faculty resistance to classroom uses of IT (Twigg, Massey and Zemsky, Gilbert), rarely does it acknowledge that student resistance will also be a barrier to the successful integration of electronic media into our teaching. In fact, students will show the same diffusion curve in adopting IT that experts predict of faculty; there will be a small group of early users, the majority will only follow once a critical mass is reached, and the resistors are in real danger of being left behind altogether (Green 29). It would be useful to have some information on, for instance, how gender, race, and socioeconomic class affect these categories. Are men really more likely to be among the early adopters of IT? Are economically privileged students with access to the resources required to access cutting edge technology more likely to be represented among early adopters? Are women more likely to resist the change to electronically mediated classrooms? Are there students or even entire institutions who lack the economic resources to participate in the IT revolution? It would be preferable to rely on some empirical data to answer these questions rather than on stereotype. Once patterns of student use have been established, educators have the more difficult task of determining the causes of resistance. As I have tried to suggest above, resistance to IT among women students (and faculty) may result less from deficiencies in the individuals than from their resistance to the culture they are being asked to enter. Overcoming this resistance will require paying attention to the developing cultures of virtual communities.

We must also pay attention to the pedagogies we adopt within these virtual communities, and the assumptions that underlie those pedagogies. Enthusiasts of IT will often point to the shift electronically mediated learning requires from a teacher-centered classroom to a student-centered

one (Twigg, Alley). As Carol A. Twigg quotes Alan H. Leader, dean of the School of Business at Southern Connecticut State University:

> "The purpose and outcome of our educational enterprise is learning, not teaching. Teaching is what we do. Colleges do not exist in order for us to teach but so that students can learn. . . .The focus must be on the student, not the instructor" (Twigg 13).

The pedagogical writing about IT and distance learning extols the advantage of student-centered learning, but what is its vision of student-centered learning? Critiques like Twigg's of the traditional teacher-centered classroom, in which the scholarly expert, having distilled the truth from the best minds in the field, transmits it to students, identify real problems in traditional teaching methods. But what do they offer in place of what Paolo Freire has described as the "banking method" of teaching in which teachers make deposits of knowledge in their students' minds (Freire 1968)?

Even the most sophisticated writing on distance learning and the pedagogical applications of IT, as, for instance, Twigg's call for a national learning infrastructure, views the primary goal of education as the delivery of information transplanted from the teacher's brain into the student's (Freire's "banking method" of teaching under a slightly different guise--the scholarly expert has been replaced by a computer). Such transfers, educational analysts like Massey and Zemsky or Twigg claim, may be more efficiently accomplished with greater convenience to students (who may even be able to learn in the comfort of their own homes) by computers in an individualized, asynchronous learning environment, which is an elaborate way of describing a student sitting in front of a computer terminal. (Brint: "Being Digitally Educated: Dewey, Technology, and Distance Learning") And if this is all education is about, they are undoubtedly correct. Computers can more efficiently convey information than human instructors. They can store, search, sort, transfer, transport, organize, replicate, and compute information much faster than any human can.

But do these enthusiastic claims about information technology confuse knowledge and information, transmitting with educating? Does student-centered learning refer only to students' passive assimilation of data or does it require more active participation from them, more interaction both with their teachers and with their peers? Perhaps we cannot substitute a computer for the social interactions we claim occur in proximity learning anymore than we can create a computer program to parent or an electronic therapist. Like parenting or therapy, teaching (and learning) does not involve a simple exchange of information. Information gathering is not the central activity. Like parenting or therapy, education integrates students into particular social networks--in the case of education we call these social networks disciplines. These social networks have customs, rules, procedures, and specialized languages. Some of these are explicit, but many are unstated, taken for granted by those who have already been integrated into the social network. These rules, procedures, customs, and languages dictate what questions can be asked, what counts as an answer, what counts as evidence or explanation, who may speak at any given time, whose answers count, and how information is gathered. Students learn the customs, rules, and procedures of their chosen social networks or disciplines by acting as participant-observers, by learning the "culture" of their discipline, and not simply by acquiring the discipline's content. A students become a member of the social network as she learns to create new knowledge, not as she learns to regurgitate information (Brown and Duguid). The

goal of higher education then only partly the transmission of knowledge; it also requires the creation of new knowledge.

Missing, then, from discussions of the technological classroom is a sophisticated analysis of pedagogy that unpacks the social networks students must learn to navigate during their college years. Those pedagogical discussions are, however, available in many other places. Feminist scholars, for instance, have explored these issues and their impact on women for nearly two decades. For two decades they have mounted a challenge to teacher- and information-centered models of education which has been remarkably successful at many institutions. That challenge has gone unnoticed in the literature on classroom uses of IT, this despite a virtual explosion of information on the subject (see Bibliography: Feminist Pedagogy, below). In the 1970s, feminist teachers, convinced that a female-friendly education required not only a transformation of the content of higher education but of its method of delivery as well, began to explore new teaching approaches. They found useful strategies in many different sources: the consciousness-raising practices of the early women's movement, the progressive tradition in American education created by John Dewey (see Brint: "Being Digitally Educated: Dewey, Technology, and Distance Learning"), and the liberatory teaching promoted by Paulo Freire and others. What makes feminist pedagogy unique, however, has been its attention to the particular needs of women and its grounding in feminist theory as the basis for its multidimensional view of how classroom knowledge is constructed through the formation and maintenance of social networks (Tetreault and Maher). This information is voluminous and readily accessible [3].

Yet, despite this wealth of information, discussions of both feminist pedagogy and information technology's impact on the women who constitute upwards of 50% of our students are notably missing in most mainstream discussions of the IT revolution, which tend to treat students as largely featureless and interchangeable cogs.

Obviously I believe that IT and CMC can and utlimately must have a place in a feminist classroom. I have use these tools--e-mail, electronic discussion groups, the Internet, multimedia programs-- on a daily basis in my own classes. And my experience has taught me that these tools, along with the networks of social, cultural, and material practices in which they are imbricated, will change how we teach. But finally it is up to us as teachers (and as members of our own social networks) --and not the technology--to determine the nature and extent of these changes. It is my hope that by understanding the particularities of our students, the nature of the social networks to which they seek access, and the nexus of material and cultural practices that IT both embodies and sustains, that we will not, to paraphrase Anne Fausto-Sterling, create an electronic academy in which cyberspace seems an illegitimate place for women and gender issues seem an inappropriate enterprise for the gatekeepers of infotech.

Other Resources

For a bibliography of research on feminist pedagogy see Bibliography: Feminist Pedagogy (below).

Notes

[1] I am indebted to Richard Grusin for this point (see Grusin 1996, 40-41).

[2] Though "computer crossdressing" in CMC is by no means unheard of and given the lack of bodily cues, relatively easy to achieve, it is not at all clear whether such behavior has challenged or simply reinforced traditional gender stereotypes, see Stone, 82-85, Kendrick 155- 159, and Kendall.

[3] A gopher site maintained by the Women's Studies librarian at the University of Wisconsin contains a searchable bibliography on women and information technology with seven hundred entries. (gopher://silo.adp.wisc.edu:70/00/.uwlibs/.womenstudies/.infotech/.infofull)

Bibliography

Albright, Julie M. "Of Mind, Body and Machine: Cyborg Cultural Politics in the Age of Hypertext." (http://www-scf.usc.edu/~albright/cyborg1.txt)

Alley, Lee R. 1996. An Instructional Epiphany. Change. Mar: 48-54.

Anderson, Judy. 1996. "Not for the Faint of Heart: Contemplation on Usenet." In Lynn Cherny and Elizabeth Reba Weise, eds. Wired_ Women: Gender and New Realities in Cyberspace. Seattle, WA: Seal Press.

Brail, Stephanie. 1996. "The Price of Admission: Harassment and Free Speech in the Wild, Wild West." In Lynn Cherny and Elizabeth Reba Weise, eds. Wired_Women: Gender and the New Realities in Cyberspace. Seattle WA: Seal Press.

Brown, John Seely and Paul Dugid. 1996. "Universities in the Digital Age." Change. July/August: 11-19.

Cherny, Lynn and Elizabeth Reba Weise. 1996. Wired Women:Gender and New Realities in Cyberspace. Seattle: Seal Press.

Evard, Michele. 1996."'So Please Stop, Thank You': Girls Online." In Lynn Cherny and Elizabeth Reba Weise, eds. Wired_Women: Gender and New Realities in Cyberspace. Seattle WA: Seal Press

Finke, Laurie A. 1993. "Knowledge as Bait: Voice and the Pedagogical Unconscious." College English 55 :5-25.

Finke, Laurie A. 1994. "Pedagogy of the Depressed: Feminism, Poststructuralism, and Pedagogic Practice." Teaching Literary Theory, eds. Dianne Sadoff and William Cain. MLA: 154-168.

Freire, Paulo. Pedagogy of the Oppressed. Trans. Myra Bergman Ramos. New York: Herder and Herder, 1 968

Gilbert, Steven W. 1996. "Making the Most of a Slow Revolution," Change. March/April: 10-47.

Green, Kenneth C. 1996. "The Coming Ubiquity of Information Technology." Change. March/April: 24-29.

Grusin, Richard. "What is an Electronic Author? Theory and the Technological Fallacy." In Robert Markley. Virtual Realities and Their Discontents. Baltimore: The Johns Hopkins University Press, 1996: 39-54.

Haraway, Donna J. 1991 "A Cyborg Manifesto: Science, Technology, and Socialist Feminism in the Late Twentieth Century." In Simians, Cyborgs, and Women: The Reinvention of Nature. New York: Routledge.

Herring, Susan. "Gender Differences In Computer-Mediated Communication: Bringing Familiar Baggage To The New Frontier." (http://www.cpsr.org/cpsr/gender/herring.txt)

Kendall, Lori. 1996. "MUDder? I Hardly Know 'Er!: Adventures of a Feminist MUDder." In Lynn Cherny and Elizabeth Reba Weise, eds. Wired_Women: Gender and New Realities in Cyberspace. Seattle WA: Seal Press.

Kendrick, Michelle. "Cyberspace and the Technological Real." In Robert Markley. Virtual Realities and Their Discontents. Baltimore: The Johns Hopkins University Press, 1996:143-160.

Maher, Frances A. and Mary Kay Teatreault. 1994. The Feminist Classroom: An Inside Look at How Professors are Transforming Higher Education for a More Diverse Society. New York. Basic Books.

Markley, Robert. Virtual Realities and Their Discontents. Baltimore: The Johns Hopkins University Press, 1996.

_____. "History, Theory, and Virtual Reality." In Robert Markley. Virtual Realities and Their Discontents. Baltimore: The Johns Hopkins University Press, 1996: 1-10.

Massy, William F.and Robert Zemsky. "Using Information Technology to Enhance Academic Productivity." (http://www.educause.edu/ir/library/abstracts/nli0004.html)

Milroy, L. 1980. Language and Social Networks. Oxford: Basil Blackwell.

Mulvaney, Becky Michele . "Gender Differences in Communication: An Intercultural Experience."(http://www.cpsr.org/cpsr/gender/mulvaney.txt)

Negroponte, Nicholas. 1995. Being Digital. New York: Vintage Books.

Quarterman, John S. and Smoot Carl-Mitchell. "Is the Internet All Male?" (http://www1.mids.org/ids2/gender.505)

Shade, Leslie Regan. "Gender Issues in Computer Networking." (ftp://cpsr.org/cpsr/gender/leslie_regan_shade.txt)

Simmons, Susan. "Democracy, Women, and the Internet." (http://www.techbabes.com/zines/24hours.Susan.html)

Stone, Allucquere Rosanne.1991. "Will the Real Body Please Stand Up? Boundary Stories about Virtual Cultures." In Benedikt, Michael, ed. Cyberspace: First Steps. Cambridge, MA: M.I.T. Press.

Taylor, H. Jeanie, Cheris Kramarae, and Maureen Ebben. 1993. Women, Information Technology, and Scholarship (Taylor et al.). Urbana, Illinois University Press.

Twigg, Carol. "The Need for a National Learning Infrastructure." (http://www.educause.edu/ir/library/abstracts/nli0001.html)

We, Gladys. "Cross-Gender Communication in Cyber-Space." (ftp://cpsr.org/cpsr/gender/we_cross_gender)

Woolf, Virginia. 1929. A Room of One's Own. New York: Harcourt, Brace, Jovanovich.

BIBLIOGRAPHY: FEMINIST PEDAGOGY

Laurie Finke
Professor of Women's and Gender Studies
Kenyon College, Gambier, Ohio

[excerpted from "Liberal Learning and the Women's Studies Major: A Report to the Profession", by the National Women's Studies Association, completed in conjunction with the Association of American Colleges.]

Alic, Margaret. "The History of Women in Science: A Women's Studies Course." Women's Studies International Forum 5, no. 1(1982): 75-81.

Belenky, Mary Field, Blythe McVicker Clinchy, Nancy Rule Goldberger, and Jill Mattuck Tarule. Women's Ways of Knowing: The Development of Self, Voice and Mind. New York: Basic Books, 1986.

Bernard, Jessie Shirley. Academic Women. University Park: Pennsylvania State University Press, 1964.

Brett, Leslie, Carolyn Gable, and Migdalia Reges, eds. "Teaching Cross-Cultural Courses on Violence Against Women." Women's Studies Quarterly 13, (Fall-Winter 1985): 27-34.

Bricker-Jenkins, Mary and Nancy Hooyman. "Feminist Pedagogy in Education for Social Change." Feminist Teacher 2 (1987): 36-42.

Bunch, Charlotte . "Feminism and Education: Not by Degrees." [excerpted from Not By Degrees: Essays on Feminist Education, ed. Charlotte Bunch, Daughters, Inc. 1979.] Quest. 5 (Summer 1979): 7-18.

Burack, Cynthia. "Bringing Women's Studies to Political Science: The Handmaid in the Classroom." NWSA Journal 1, (Winter 1983): 274-283.

Carnegie Commission on Higher Education. Opportunities for Women in Higher Education: Their Current Participation, Prospects for the Future, and Recommendations for Action. New York: McGraw Hill, 1973.

Culley, Margo and Catherine Portuges, eds. Gendered Subjects: The Dynamics of Feminist Teaching. London: Routledge & Kegan Paul, 1985 .

Davis, A. Y. "Radical Perspectives on the Empowerment of Afro-American Women: Lessons for the 1980s." Harvard Educational Review 58 (August 1988): 345-353.

Davis, Barbara Hillyer, ed. "Feminist Education," Special Topic Edition of The Journal of Thought, and Interdisciplinary Quarterly 20, no. 2 (Fall 1985).

DuBois, Ellen Carol, et al. Feminist Scholarship: Kindling in the Groves of Academe. Urbana and Chicago, Illinois: University of Illinois Press, 1985.

Finke, Laurie A. "Knowledge as Bait: Voice and the Pedagogical Unconscious." College English 55 (1993): 5-25.

Finke, Laurie A. "Pedagogy of the Depressed: Feminism, Poststructuralism, and Pedagogic Practice." Teaching Literary Theory, eds. Dianne Sadoff and William Cain. MLA, 1994: 154-168.

Gardener, S., et al. "Responding to Differences in the Classroom: The Politics of Knowledge, Class and Sexuality." bibl. Sociological Education 62 (January 1989): 64-74 .

Gilligan, Carol. In a Different Voice. Cambridge: Harvard University Press, 1982.

Golden, Carla "The Radicalization of a Teacher." Feminist Teacher 1, no. 4 (1985): 10-14+.

Gonzales, Sylvia. "Toward a Feminist Pedagogy for Chicana Self-Actualization." Chicanas en el ambiente nacional/ Chicanas In the National Landscape, a special issue of Frontiers 5, no. 2 (Summer 1980).

Greenberg, S. and P. B. Campbell. "Sexuality, Sexism and Education: The Views of Feminists, Past and Present." bibl. Peabody Journal of Education 64 (Summer 1987): 13-24

Griscom, Joan. "Trying to Teach the Experience of Women of Color to White Students." NWSA Perspectives 5, (Spring/Summer l987): 6-8.

Hall, Judith A., Karen G. Braunwald and Barbara J. Mroz. "Gender, Affect and Influence in A Teaching Situation . " Journal of Personality and Social Psychology 43 (August 1982): 270-280.

Hall, Roberta M. and Bernice Sandler. The Classroom Climate: A Chilly One for Women? Report for the Project on the Status and Education of Women, Association of American Colleges, Washington, D.C.

Halpern, Carol C. and Marlene Samuelson. "Our Progress and Struggles as Feminists Teaching Biology." Feminist Teacher no. 4 (1985): 10-14.

Haraway, Donna, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," Feminist Studies 14, no. 3 (Fall l988): 575-599.

Harding, Sandra. The Science Question in Feminism. Ithaca, NY: Cornell University Press, 1987.

Hoffman, Nancy. "Black Studies, Ethnic Studies and Women's Studies: Some Reflections on Collaborative Projects." Women's Studies Quarterly 14, (Spring/ Summer 1986): 49-53.

Jacobs, Sue-Ellen. Women in Perspective: A Guide for Cross- Cultural Studies. Urbana: University of Illinois Press, 1974.

Lather, Patti, "Feminist Perspectives on Empowering Research Methodologies," Women's Studies International Forum 11, no. 6 (1988) 569-581.

Levin, Tobe and Janet Miller-Goeder, eds . "Feminist Teaching In a Military Setting: Cooptation or Subversion?" Women's Studies Quarterly 12 (Summer 1984): 13-15.

Maher, Frances. "Classroom Pedagogy and the New Scholarship on Women" in Culley, Margo and Portuges, Catherine, Eds. Gendered Subjects: the Dynamics of Feminist Teaching. London: Routledge 81 Kegan Paul, 1985, 29-48.

Maher, Frances and Kathleen Dunn. "The Practice of Feminist Teaching: A Case Study of the Intersection Among Curriculum, Pedagogy, and Female Cognitive Development," Working Paper, Wellesley College Center for Research on Women, Wellesley, Massachusetts, 1984.

Maher, Frances A. and Mary Kay Teatreault. The Feminist Classroom: An Inside Look at How Professors are Transforming Higher Education for a More Diverse Society. New York. Basic Books, 1994.

Mahoney, Pat. "Oppressive Pedagogy: The Importance of Process in Women's Studies." Women's Studies International Forum 11, no. 2 (1988): 103-108.

Martin, Jane Roland . "Becoming Educated: A Journey of Alienation of Integration, " Journal of Education 167, no. 3 (1985): 871-884.

Mason, Mary, and Martha Chew. "Two Studies: A Feminist Approach to Teaching Non-Traditional Students." Working Paper No. 123, Wellesley College Center for Research on Women. 1983.

Omolade, B. "A Black Feminist Pedagogy." Women's Studies Quarterly 15 (Fall/ Winter 1987): 32-39.

Pearson, Carol S., Donna L. Shavlick and Judith G. Touchton, eds . Educating the Majority: Women Challenge Tradition in Higher Education. New York: American Council on Education and Macmillan Publishing Co., 1989.

Pederson, Lucilla M. "Pedagogical Methods of Teaching Women in Public Speaking. " Communication Education 30 (July 1981): 256-264.

Radner, Susan. "Changing Approaches to Teaching Women in Literature." Frontiers, NWSA -- Selected Conference Proceedings, Bloomington, Indiana, 1980. 6, nos. 1-2, Spring- Summer 1981.

Rich, Adrienne. "Claiming an Education," On Lies Secrets and Silences: Selected Prose 1966-1978. New York: Norton, 1979.

Rosser, Sue V. Teaching Science and Health from a Feminist Perspective: A Practical Guide. Pergamon Press, 1986.

Schneidewind, Nancy. "Cooperatively Structured Learning, Implications for Feminist Pedagogy," Journal of Thought 20, no. 3 (1985): 74-87 .

Schneidewind, Nancy, and Frances Maher, eds. "Feminist Pedagogy." Special issue of Women's Studies Quarterly, 1987.

Schuster, Marilyn and Susan R. van Dyne. Women's Place in the Academy: Transforming the Liberal Arts Curriculum. Totowa, NJ: Roan and Allenheld, 1985.

Shrewsbury, Carolyn M. "Feminist Pedagogy: A Bibliography," Women's Studies Quarterly, Vol. XV: 3 and 4, Fall/Winter, 1987.

Stacey, Judith. "Can There Be a Feminist Ethnography?" Women's Studies International Forum 11, no. 1 (1988): 21-27.

Swift, Carolyn Ruth. "Once More Into the Breach of Western Literature Courses." Women's Studies Quarterly 9 (Winter 1981): 10-12.

Tetreault, Mary Kay. "It's So Opinioney," Journal of Education 168, no. 2, 1986, 78-95.

Thorne, Barrie. "Rethinking the Ways We Teach." In Educating the Majority: Women Challenge Tradition in Higher Education, edited by Carol S. Pearson, Donna L. Shavlick and Judith G. Touchton. New York: American Council on Education and Macmillan Publishing Co., 1989.

Walsh, Mary Roth. "Teaching and Learning About the Psychology of Women: A Workshop for Undergraduate and Graduate Faculty." SIGNS 13 (Summer 1988): 886-891.

Weiler, Kathleen. Women Teaching for Change: Gender, Class and Power. Critical Studies in Education Series. South Hadley, MA: Bergin and Garvey Publishers, Inc., 1988.

Whatley, Marianne H. "Taking Feminist Science to the Classroom: Where Do We Go From Here." In Feminist Approaches to Science, edited by Ruth Bleier. Oxford, England: Pergamon Press, 1986.

Wright, Barbara. "What's In a Noun? A Feminist Perspective of Foreign Language Instruction." Women's Studies Quarterly 12 (Fall 1984): 2-6.

Zinn, Maxine Baca. "Transforming the Sociology of the Family: New Directions for Teaching and Texts." Working Paper for Research on Women, Memphis State University . 1987.