

**EXPERIENCE AND INNOVATION: REFLECTIONS  
ON EMERGING PRACTICE WITH NEW  
MEDIA IN EDUCATION\***

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**ABSTRACT**

In 1986, the Trustees of Teachers College established the Institute for Learning Technologies (ILT) with the mission of using digital technologies as means to effect humane reform in education. During ILT's first years, we developed initial ideas about the potential for networked multimedia as transformative forces in educational practice. At the time, these ideas struck most funders as too visionary and impracticable. We struggled to find implementation opportunities, prototyping some possibilities on a small scale internally and on a larger scale at the Dalton School. By 1990 we were ready to test the power of networked multimedia as an agent of change in education in the arena of institutional practice. Over the past ten years, these explorations have been ILT's primary activity.

Through the decade just ended, the Institute for Learning Technologies (ILT) has directed several large projects integrating new media into the practice of elementary and secondary education. These projects are permitting ILT to create a body of emergent experience with the educational potential of digital technologies. We are learning some lessons that are simultaneously sobering and hopeful.

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In 1986, the Trustees of Teachers College established the Institute for Learning Technologies with the mission of using digital technologies as means to effect humane reform in education. During ILT's first years, we developed initial ideas about the potential for networked multimedia as transformative forces in educational practice. At the time, these ideas struck most funders as too visionary and impracticable. We struggled to find implementation opportunities, prototyping some possibilities on a small scale internally and on a larger scale at the Dalton School. By 1990 we were ready to test the power of networked multimedia as an agent of change in education in the arena of institutional practice. Over the past ten years, these explorations have been ILT's primary activity.

Our emergent experience began in 1990-91 when the Dalton Technology Project began—a four-year multimillion-dollar effort to integrate networked multimedia resources throughout the curriculum of a leading independent school in New York City. Subsequently, this project, which centered in an elite private school, led to a series of efforts in inner-city public schools. In 1994, ILT won funding for the Harlem Environmental Access Project, a two-year collaboration with the Environmental Defense Fund and five inner-city schools, supported by the Telecommunications and Information Infrastructure Assistance Program. Shortly thereafter, ILT developed the Living Schoolbook Project, a three-year collaboration with the Syracuse School of Education, involving the five schools, plus two more in New York City and more in Syracuse and its environs, subsidized by NYNEX (now Verizon) and the New York State Science and Technology Foundation. In 1996-97, ILT conducted the Reinventing Libraries Project, a pilot program to redefine the role that school libraries can play in sustaining the curriculum with advanced media resources, sponsored by the IBM Corporation. In 1996, ILT designed the Eiffel Project and has managed it in partnership with the Center for Collaborative Education on behalf of the New York City Board of Education, funded through a five-year \$7.8 million U.S. Department of Education Challenge Grant for Technology in Education. This project uses advanced media to support small schools reform in over 80 New York City schools and community organizations. These projects constitute a useful core of experience with attempts to use new media as transformative forces in education.

In all these projects, ILT's basic aim has been to use digital technologies in schools and classrooms to change the operative intellectual constraints that have traditionally limited what students and teachers could accomplish. Material conditions of cultural communication shape what students can study and how teachers can teach as much, if not more, than do differences of aptitude and instructional theory. ILT has grounded its projects, not on psychological research but on an historical analysis of existing communication practices in educational institutions and potential alternatives to them. We began with the recognition that traditional schools have a very well developed communications infrastructure based on printed textbooks as information resources, a curriculum constructed of subjects and lessons, and a pedagogy driven by competitive recitation and testing.

New technologies, specifically networked information systems, are interesting as means to introduce alternative pedagogies and to leverage changes in educational structures. In framing ILT's school projects, we have hypothesized that digital technologies will make two significant long-term changes in educational practice feasible and we seek through our practical projects to take concrete steps toward these changes. One such change involves pedagogy; the other the structure of educational institutions.

We approach pedagogy as ecologists, not psychologists. A pedagogical ecology determines dominant practice under set historical conditions. The way teachers teach and students study results, not from the prescriptions of tested theory but from the interplay of empowering aspiration and limiting constraint as these operate through teachers and students. As historians, we observe that under the constraints pertaining in traditional schools, pedagogical strategies of instruction have proven far more feasible than alternative strategies of construction, even though constructivist aspirations, the current way of describing progressive educational practices, have long been highly attractive ideas to both students and teachers. An infrastructure of one-way communication, in which teachers ultimately must work to transmit pre-set agenda, printed in authoritative curricular resources, uniformly to their students, biases practice toward techniques of instruction. As educational reformers, we act on a key hypothesis: as networked digital information and communication systems become pervasive in educational environments, students and teachers will find that the limiting constraints have changed in ways that increase the feasibility of strategies of construction and diminish the practicability of instruction. New media provide students with powerful tools of interaction, self-direction, and open-ended exploration, and as students use these tools, teachers can exert influence by posing productive questions rather than providing pre-set answers. Traditionally, learning by inquiry was difficult to practice because the curiosity of children exceeded the capacity of teachers to respond intelligently, isolated in closed classrooms with few intellectual resources. Now communications networks facilitate effective inquiry. New technologies link classrooms to the world and provide students with unprecedented powers of communication and far more intelligent tools of inquiry. Teachers can deploy much more comprehensive resources of response and stimulation. As a consequence, we anticipate progressive pedagogy, generally impracticable during the 20th century, will become the dominant practice in the 21st.

A second long-term change involves the structure of educational institutions, and it reinforces the increasing feasibility of progressive pedagogy. Despite differences of national tincture, traditional education constitutes a highly developed global system of institutions. As the educational structures of modernity developed over the past five centuries, everywhere a significant divide has come to separate elementary and secondary schools from universities and professional schools. We act on a second key hypothesis: this divide has resulted neither from the structure of knowledge nor from the nature of human cognition,

rather it too resulted from material constraints in the organization of educational and intellectual work, constraints that are ceasing to bind. Higher education requires research libraries and laboratories—expensive, delicate, and often dangerous material objects. Limits on their availability have implacably constrained the reach of higher education. Even very wealthy societies have found it difficult to provide productive tools of inquiry in sufficient measure to sustain at an optimum pace their advancement of learning through universities and research labs. It has been out of the question to use such resources as the intellectual locus for universal education. Now new media are loosening these limits. Digital libraries and scientific collaboratories provide novel opportunities of access for scholar and lay person alike, making the intellectual apparatus of research and scholarship accessible to any one at any place at any time. This emerging condition provides opportunities for significant pedagogical innovation. If educators can discover how to use this emergent accessibility of hitherto elite intellectual resources, inventing ways to join the curiosity of the young with the most powerful resources of inquiry possessed by the culture, they may make an intellectually rigorous progressive education accessible to everyone. We anticipate that the telos of educational reform in the 21st century will be precisely this—to afford everyone with the life-long opportunity to pursue an intellectually rigorous progressive education.

These two hypotheses have informed the design of ILT's projects. In the design and implementation of our projects, we translate these hypotheses into several axioms of practice, as we might call them. Axioms of practice are operative goals or imperatives that should prove increasingly attainable in practice should our key hypotheses prove sound.

- High-speed WAN to LAN connectivity is essential, reaching into all classrooms—ubiquitous computing.
- The transformation of the school requires the integration of new media into all aspects of the curriculum, for students of all ages.
- Diffusion of the use of new media in a school should result, not from mandate but from responsive support of voluntary efforts—constructivism in school management.
- Schools should design their technology implementations as investments in the power of students to acquire their education.
- New media enable people to take positive control of their education, and to realize the full benefit of this control it must extend to children and their families in their homes and communities, in addition to the school.
- Educators should abandon the premise that they can predict what a good student should have learned as a result of an educational experience.
- Classrooms should become places from which students and teachers communicate interactively, among themselves and with specialists and peers throughout the locality, culture, and globe.

- Under emerging conditions, precepts of pedagogical common sense may need substantial revision, particularly with respect to what is and is not “age appropriate,” who can make sound pedagogical choices, and how feedback controlling the educational process should work.
- As different students learn different things at different times, a common culture will emerge from the overlap of their interests, with each providing a distinctive contribution to the whole.

Looking back on our experience frankly, the results of ILT’s projects so far have been disappointing with respect to our axioms of practice. Progress has been good only on our first axiom: it has proven feasible to link schools via high-speed wide area networks to the Internet and to provide widespread access to that connectivity through local area networks reaching multiple workstations in each classroom. Such connectivity is expensive, but the resources available for it are increasing while the expense declines, perhaps soon greatly. The goal of classroom connectivity no longer needs to be the outcome of projects; increasingly classroom connectivity is a given, starting condition, and the goal can be to achieve the effective use of it. ILT’s other axioms of practice pertain to such use, basically as criteria of effective use, and they are proving difficult to achieve. We have learned a well-worn truth—significant historical change in complex institutions takes place on a time-scale of extended duration.

Consider the axiom that schools should integrate new media into all aspects of the curriculum, for students of all ages. Working in a wide variety of schools, kindergarten through college, we have not encountered an area of the curriculum where we think digital communications are irrelevant, useless tools. But in any particular school, even those that are nearing a condition of being thoroughly equipped, the use of the digital infrastructure in the learning process is far from pervasive and routine. In large part, this is a factor of time. Technological infrastructures develop more quickly than the cultural ethos resulting from their habitual use. That ethos is only beginning to merge. Many teachers, who actively seek to make use of new media with their students, find it very hard to do so pervasively, day in, day out, for it requires a thorough rethinking of all aspects of their pedagogical agenda with many structural requirements standing in the way, such as tests and habitual expectations—their own, those of their students, of administrators, of parents, of the community and the general public.

Viscosities of procedure and habit are not the whole reason for the slowness of curricular change, however. In significant part, the difficulty of integrating new media into the curriculum arises because schools do not follow the third axiom, to rely not on mandate, but on giving responsive support to voluntary efforts, that is, to practice the constructivist agenda in their management. For instance, the New York City school system, serving 1.1 million students, K-12, mandated the equipping of classrooms according to a centrally promulgated, city-wide plan, and

through its Project Smart and Project Connect pumped four computers into each classroom in all its middle schools, networking them, and connecting them to the Internet. These projects combined ideas about best practice with a serious intent to mobilize the requisite monies, despite their scarcity. Admirable as all this may be, the policy disregards who is ready for what. Equipment and connectivity, which might be discretionary resources that principals might use to focus efforts by their teachers, become instead a general managerial difficulty. By providing equipment uniformly, the system creates a tremendous professional development problem—how to prepare teachers to use these tools even though they may be neither ready nor eager to do so. The result feeds the canard that all-too-often expensive computers sit unused in many classrooms while other pressing needs go unmet.

Schools in New York City, including those in which our projects work, encounter great difficulty with our fourth axiom of practice as well, the idea that technology implementations are investments in the power of students to acquire their education. Public educational institutions are part of the paternalistic structure of social services that modern societies have created to help their members. As with the poor and the sick, so with the young: people have trouble believing that individuals and groups have much capacity to act on their own behalf. In schools in which we work we hear incessantly about the need to prepare teachers to work with the new technologies; and worse, we at ILT also add our voices to the call. Professional development is immensely important, especially efforts to prepare teachers to work creatively with *children* who are using technology. Expectations about education are far too teacher centered. The rare teacher gives control of the technology to her students and then observes what they do, abetting, encouraging, and helping the most interesting uses. When technology serves to empower the student, good teachers, who may be klutzes with technology themselves, can work with great effect as students use well-designed new media. We need much more student-driven exploration of possibilities, in classrooms and in homes and community centers as well. The real challenge to professional development is to enable teachers to facilitate these student-driven explorations, a good example of which is HarlemLive ([www.harlemlive.org](http://www.harlemlive.org)).

To realize all the educational and social benefits of new media, children and their families need access to them outside of school. This proposition is our fifth axiom of practice. Schools, as they exist, offer the children of the poor and disadvantaged real but limited opportunities to acquire an effective education. Schools are receiving a bum rap and are often far more effective than they get credit for being. Hence many children, with effective support at home and in their community, are using existing inner-city schools and related agencies to learn, to mature, and to improve their life chances. Yet the schools are not good enough and the resources to support children available through home and community are often

weaker still. One reason why new media are interesting agents of change is the fact that they can have effects in schools, in homes, and in communities too. New media can improve the educative power of schools and strengthen out-of-school educational support even more. ILT has tried through its projects to expand access in inner-city homes and community organizations to educative resources, and we see the power of such efforts in groups such as HarlemLive and Playing2Win and projects such as Harlem Renaissance 2001 (HR2KI). Yet it is very difficult to link in-school with out-of-school initiatives. Given the absolute numbers in school and city populations, relative to the size of real projects, it is accidental when the same children are participants in both school initiatives and those based in homes and community organizations. Schools in Community School District 6, with which we work, are beginning to pursue the best path, introducing highly portable technology that children can take with them back and forth between home and school. The logical consequence of seeing the technology as an investment in the power of students to accomplish their work is to situate the infrastructure, not in the school but throughout the life-world of the child.

We also find it difficult to implement directly our sixth axiom—educators should abandon the premise that they can predict what a good student should have learned as a result of an educational experience. Politicians, journalists, and the public at large increasingly reduce educational issues to comparative performances on standardized tests and equate reform with the implementation of standards-based instruction. At its best, this movement takes as controlling standards high-order cultural and intellectual capacities. In practice, however, these capacities convert into well-enumerated specifics, mastery of which is to be enforced by batteries of tests, creating great pressure on schools and teachers “to teach to the tests.” This movement works counter to the natural genius of digital technologies as investments in the autonomous power of students to manage their own educations, learning by inquiry and by doing. All-too-often on sitting down with a principal in our projects, we hear a predictable question: “How can the Internet and computer technology help our students perform well on the new Regents examinations?” We would like to respond that they should forget the tests. Our faith: if students can run free to educate themselves really well in a challenging, responsive environment, they will do fine on the tests. It is not fair, however, to call on school administrators and teachers to ignore heroically their imperatives of survival, wagering on the truth of our faith. Hence we look for ways in which the new technologies can in the short run help students and teachers prepare for the tests. In the long run, we think that digital technologies will prove more powerful educational forces than will pervasive standardized tests. We can spread use of new media in our schools by showing how they may relate to standards-based curricula. In due course, however, routine presence of the new media will lead to the dissolution of standards-based curricula as mindlessly narrow and uniform. Meeting the standards will have great value if educators and

the public can perceive that achievement, not as the mark of high educational attainment, but as a *means* making the real work of education more feasible.

Our seventh axiom of practice concerns characteristic communication patterns in educational settings, suggesting specifically that classrooms should become places from which students and teachers communicate interactively, among themselves, and with specialists and peers throughout the locality, culture, and globe. Here we see three types of programs having evident effect—Web quests, on-line mentoring, and computer-mediated collaborative projects, locally and at a distance. We have also seen ample evidence that school-wide use of e-mail by students, teachers, and parents can greatly increase the communicative liveliness and effectiveness of the school. At the same time, we have generally found it difficult to convince school administrators that the introduction of e-mail for all is worth the resources and administrative headaches it can entail.

At a more fundamental level, we think researchers should pay very close attention to the effects new media have on the communications dynamics in educational settings. As we spend more and more money on technology in education, the pressure to show how it makes a difference will increase. We believe that outcomes analysis will in fact serve this purpose poorly—it is in truth difficult to specify outcomes for comparison that are comparable, relevant, and significant between schooling status quo ante and education subsequent to its having gone digital. We need instead to develop ways to document how processes of education based on different technologies may differ from one another, if possible, independently of the pedagogy consciously in use and without reference to outcomes, short-term or long. People speak easily of the digital technologies as interactive technologies. We need to attend far more closely to what interactivity actually means with respect to the processes of education. Looking ahead to the agenda of work that ILT will pursue in the decade now starting, we plan to devote an increasing portion of our energies to systematic study of the patterns of communication that different media facilitate and hinder and how these may shape and alter the processes of education. How do feedback experiences and the dynamics of communication and control differ from traditional ones when students have command of new information and communications technologies?

Through changes in such experiences and dynamics, through changes in the processes of education itself, developments will emerge with respect to our eighth axiom, concerning the common sense of education. Under emerging conditions, precepts of pedagogical common sense may need substantial revision, particularly with respect to what is and is not “age appropriate,” to who can make sound pedagogical choices, and to how feedback controlling the educational process should work. We suspect that the fundamental communications dynamic, which has been inherent with the materiality and fixity of print, has been to present a



pre-determined, standard communication in a directive way to many individuals. Pedagogical common sense, as we know it, is a set of implications inherent in such a structure of communication. Here the medium has indeed been the message. For instance, “age appropriateness” is not an attribute of the intellectual content of a communication, but of the content when it is communicated in ways characteristic of traditional educational settings, namely through unidirectional communication that presents pre-determined, standardized content in a directive way to many individuals. Given the intent to communicate the same material simultaneously to many individuals, it is necessary to mobilize similarities in the potential audience; it is hence commonsensical to organize students by age and ability. With a type of communication in which content is neither pre-determined nor standardized, and its reception is not to be uniform across a large cohort, age grouping and concomitant age appropriateness may cease to be a relevant category. With communication directed by the individual, not directed at him or her, an entirely different common sense of education may arise, perhaps one stressing the need for immediate, continuous feedbacks helping the student judge for herself whether her inquiry is progressing soundly towards a solution. We see intimations of such developments, but they are far from maturely developed.

We find our last, the ninth axiom of practice—that a common culture emerges from the overlap as different people learn different things at different times—to be consistent with realities but inconsistent with prevalent prescriptions. At its best, American culture has always been trans-national, drawing great strength from diverse currents of culture. Contemporary New York City churns with protean diversity. New media, we find, can recognize, celebrate, and harness such diversities through open-ended inquiry, through communication with diverse people about topics that drive distinctive interests and through creation of portfolios and projects capturing the special genius of each child. Traditional schools and expectations put greater emphasis on disseminating the least common denominators of our culture, suspicious that diversity is divisive, subverting the common culture. We encounter a tacit fear of the new media, a reluctance to work freely in accordance with their natural power to diversify and individualize. Too often, people want instead to harness the digital technologies to furthering well-established, homogenizing purposes, driven by standards, tests, comparative scores, social sorting, and ranks. It will take time, an extended time, to build the confidence that meaningful unity will emerge through educational efforts that systematically treasure and nurture the unique, special interests of each person and group.

Looking back on a decade of design and implementation in practical educational settings, I experience a sense of sobered hope. Digital technologies are very powerful forces that are deeply shaping our culture, education included. That is said from the perspective of an historical observer. From the perspective of people acting, trying to shape practice through the intentional use of digital technologies,

we must recognize that educational change happens very slowly, that schools constitute a vast, far-flung system of practice. At best, reform must be wrought slowly. But like iron, once wrought, it will hold its shape for ages.

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