Educating America for the 21st Century

A Strategic Plan for Educational Leadership

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Institute for Learning Technologies
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Overview

Entering the 21st century, Americans embark on an era of historic change in which they are using new information technologies to renovate education and society for the betterment of humankind. The Institute for Learning Technologies seeks to help advance these changes by exerting educational leadership through innovative projects, seminal research, and enlightened counsel. It aims to nurture, in a sustained manner, the humane application of information technologies, expanding educational opportunity and achievement for all.

At the turn of the century, a new strategic context for educational policy and practice emerges. Government, corporations, and philanthropies are investing substantial resources, opening access to information and research for broad use in schools, colleges and universities, and through libraries and other cultural and public service institutions. These large initiatives, together with secondary public and private funding, will invest many billions of dollars in information technology and its cultural uses over the coming decade. To achieve the educational and cultural potentials of such investment, educators need to step to the forefront of the effort, asserting leadership and taking responsibility for initiative.

Educating America for the 21st Century presents a strategic plan through which Teachers College and Columbia University can exercise educational leadership. By tradition, they must seize the opportunities presented by the flux of history to help shape a robust and humane information-based society. In the 21st century, information and knowledge will arbitrate the fate of both individuals and institutions, and, more than ever, an enlightened citizenry will need to be intellectually empowered to provide for the common good. The Institute for Learning Technologies exists to help shape the effort by Teachers College and Columbia University to grasp these historic opportunities, and the Institute's program of practice follows from this purpose.

To educate America for the 21st century, educators need a firm, astute agenda -- a strategic vision that can inform the kaleidoscope of practice with purpose and direction. Established educational arrangements constitute a complex system of immense scale. A bright innovation here, and another there within the system, will not change it. A diversity of large, sustained efforts, working in many different domains, all bound together through shared vision and energy, all combined over time, will result in transformative improvements.

Here then is the essence of the Institute's strategic plan: use technologies to enable educators to address the intractable pedagogical problems, seeking their clear correction; implement sustainable projects, each with the potential for evident success at the local level; use institutional alliances to pursue systemic results that transform practice at all its levels; and throughout all, chart, not correctives, but the fundamental betterment through education effective for all.

This document presents the Institute's strategic plan in three parts. *A Program of Practice* addresses issues of technology configuration, curriculum innovation, professional development, and policy formation -- the four basic objectives that the Institute works to advance -- and it explains why ILT holds these to be of compelling importance. *Effecting a Strategic Vision* addresses the problem of means, the challenge of generating significant historical force so that the Institute can work towards its objectives. How can a small group achieve resonant effects, advancing difficult objectives? This plan develops an answer to this basic question by addressing four key components to a strategic vision: a proof of concept, a driving force, a moving social vision, and tangible institutional leverage. *Imperatives of*

Implementation concludes the plan by setting out proximate goals against which observers can assess the effectiveness of ILT's effort over coming years.

Through this plan, the Institute invites all who share its vision to participate in the effort to help all people use information technology to fulfill their aspirations and potentials.

A Program of Practice

Let us frame basic objectives with a sense of historical perspective. In the 21st century and after, education will significantly differ from education in the 20th century and before. The Institute's objectives aim to abet this transition.

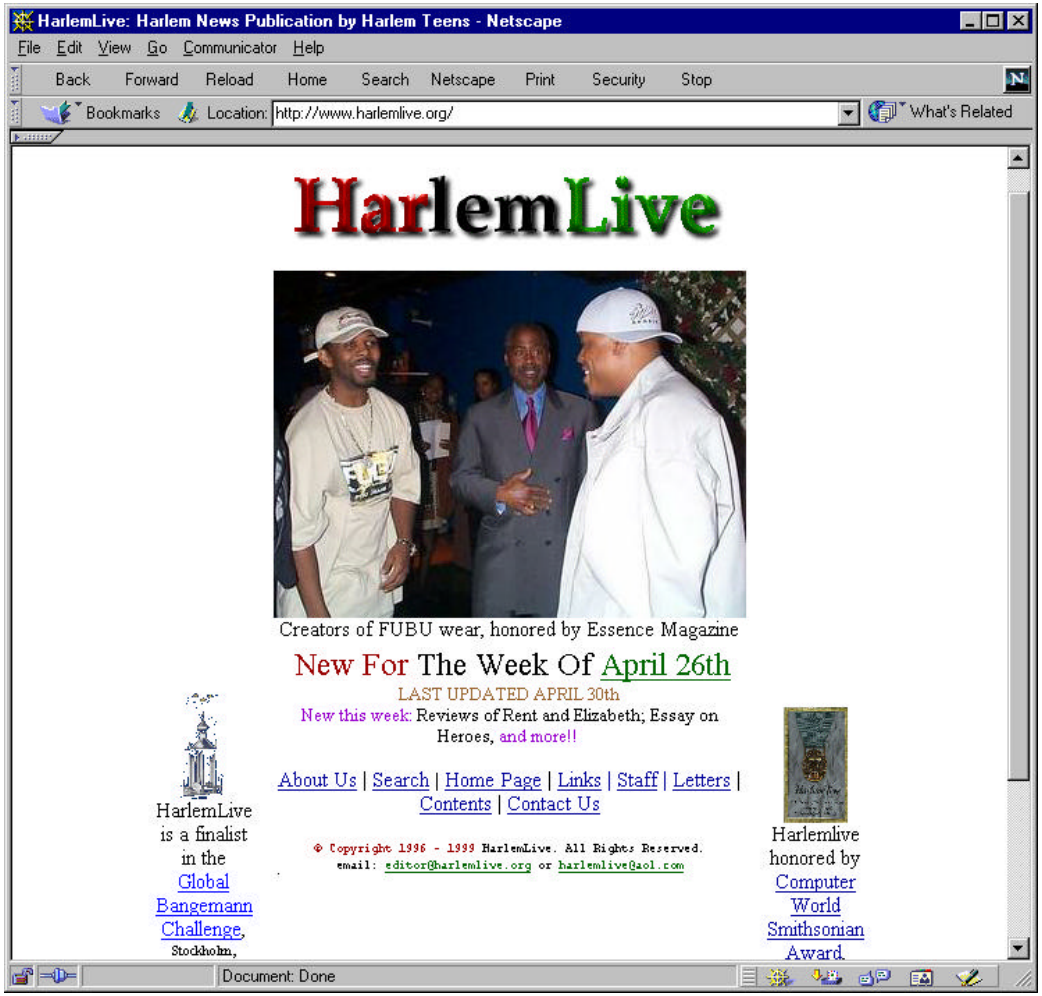
Historically, changes in technologies change what people can do in life. New technologies do not determine the particulars of human fates; they alter the spectrum of potentialities within which people act. People acting determine their actualities; technologies, along with other conditions of action, determine their possibilities. The new communications technologies significantly alter the possibilities open to people thinking. They change the five conditions limiting the value and power of ideas in human activity. New communications technologies facilitate the production and reproduction of ideas; they expand the storage of ideas and make their retrieval faster and more adaptable to the constraints of situation, time, and place; they improve the transmission of ideas, expand selection among them, and strengthen the human capacity to use ideas to process information intelligently. As communications technologies change how people can reproduce, store and retrieve, transmit, select, and process ideas, they transform the range of options within which people determine their lives.

Technologies facilitate many modes of collaborative interaction in working with ideas and information. As collaboration with ideas increasingly pervades daily life, both work and leisure in the 21st century will increasingly resemble idealized models of academic scholarship -- they will be collaborative; focused on inquiry, innovation, and design; engaged in producing new knowledge, ideas, and experiences. *Mente*facture displaces *manu*facture. If 20th century life was the era of industrial democracy, that of the 21st will become the era of intellectual democracy. The values inherent in the house of intellect will be central to the emerging commonweal.

Creating an era of intellectual democracy is a worthy mission for educators, but to fulfill it, they too must master the possibilities of the new technologies. Formal education must adopt a new pedagogy, oriented not to text-bound subject matters, but to dynamic operational skills and collaborative modes of inter-disciplinary thinking. Students will require new languages to interact with information systems -- they will require a multi-modal literacy combining video, audio, graphics, animation, and simulation, along with text. Students will require a more refined ability to handle the language of inquiry, knowing where and how to formulate and frame their questions, to obtain useful information, and to create empowering ideas. They will require the capacity to produce new knowledge by discovering, selecting, and combining previously unrelated data in novel ways. Education will increasingly be judged, not only by what the well-instructed prove to know, but more fully by what people are empowered to do in fulfilling their lives and contributing to the greater social good. Knowledge is power, and in an intellectual democracy it must be power *for all*.

Schools -- K12, colleges and universities – should increasingly use methods that engage students in inquiry and action. Teachers

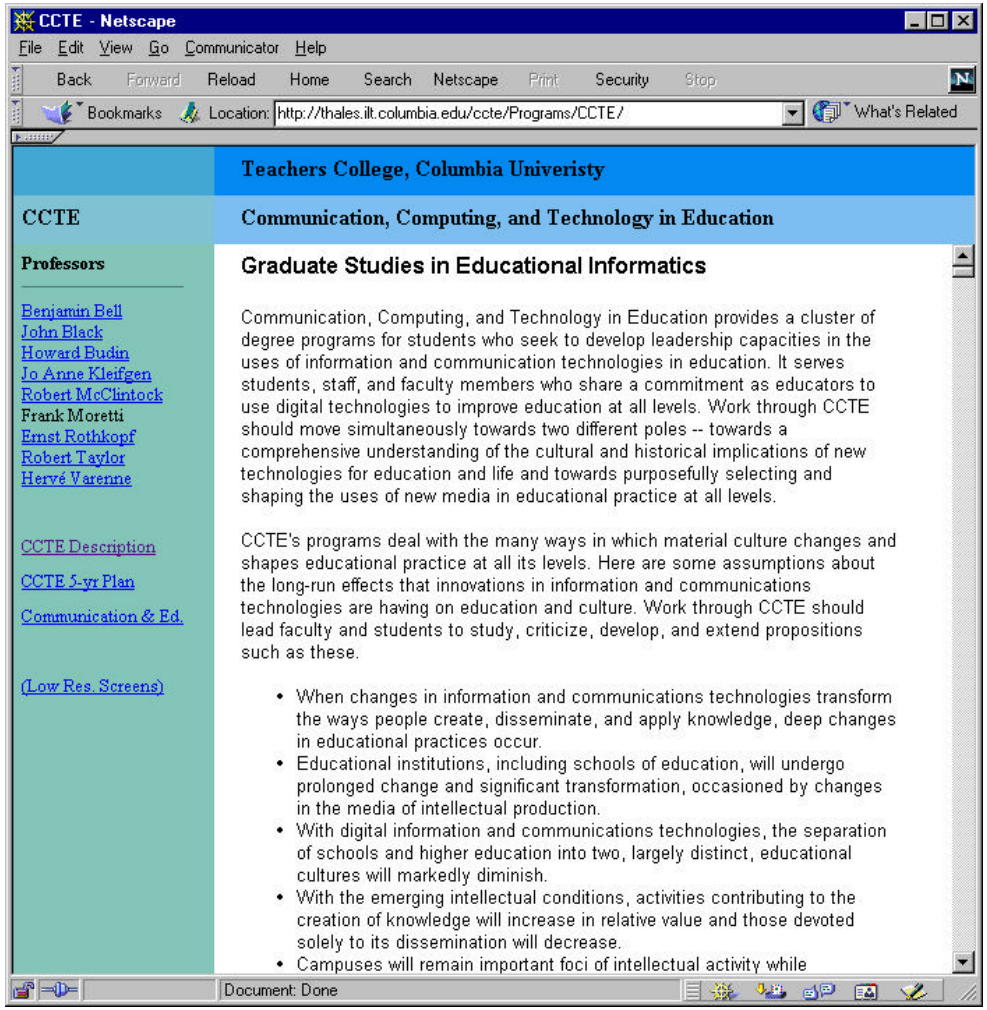
should become intellectual coaches, helping students to interact with diverse databases of networked multimedia resources and to participate actively in cultural work. Traditional teaching through extrinsic manipulation or reinforcement -- in practice more random than planned -- should give way to involving students meaningfully in task-oriented learning projects connected to their life-experience. Assessment should be through portfolios and performances rather than standardized tests and impersonal grade-point averages. Such assessment should encourage performance mastery, more than test taking or laboring at set assignments.



During the 20th century, educators created the large, comprehensive school as the norm of service. During the 21st, they are replacing that with a smaller, more personal place of education, the essential school -- schools that students, parents, and teachers can find to be engaging, committed, meaningful, and moving. Efforts to effect educational reform are nurturing small, effective schools, committed to equity and engagement. These work well, and should become the norm of good practice.

Critics worry about an either-or, however: small, essential schools will either prove very expensive or they will be unable to provide effectively for a diversity of individual needs, something the comprehensive schools were designed to do efficiently. This worry will disappear as educators develop advanced technologies to create a networking infrastructure for education designed to enable students and teachers in essential schools to employ, at low cost and large effect, the full range of powerful educational tools, cultural resources, and social services available electronically. These technologies can enable small essential schools to provide comprehensive yet compelling opportunities for their students far more effectively than large, impersonal schools have done by working, all-too-well, as alienating instructional factories.

Educational change is not, and should not be, technologically driven -- but it is, and always has been, technologically enabled. Over the past five centuries, printing enabled the transformation of education from a system of apprenticeship into one of universal schooling. It did so because its provision of mass-produced texts altered the limiting conditions under which people engaged in the advancement of learning. As with printing, new communications technologies will enable the complete redesign of educational practice because they likewise thoroughly alter the constraints conditioning the creation and use of knowledge.



Digital technologies are enabling a new wave of educational innovations, not by bringing historically novel pedagogical principles in their train, but by changing the ecology of feasibility with respect to known principles. Technologically enabled innovation occurs as new commonsense practice emerges from obscure, peripheral procedures that savvy practitioners traditionally held to be too difficult for general practice, however attractive in principle these might have been. This is the way of historical change.

Communication innovations alter the ecology of historical effectiveness. Dominant practices become marginal; possibilities that were difficult under traditional constraints become more feasible. The once marginal becomes dominant.

New communications technologies create challenging opportunities. But opportunity is not tantamount to actuality. Educators must grasp the opportunities. Their educational innovations will determine the cultural and social characteristics of the resulting arrangements. The Institute seeks to implement such innovations according to progressive educational principles, holding that these will enable a greater proportion of people to attain an education that is both personally meaningful and culturally significant. The Institute's program of practice seeks ways for schools, universities, libraries, museums and other cultural institutions to capitalize on opportunities emerging through current innovations, to extend their educative resources deeply into the community, and to make them available to the broadest possible audience through effective use of information technology.

New communications technologies are facilitating once hard to practice pedagogies -- learning by doing, inquiry-based education, project methods, autonomous study, in short, educators' great humanistic hopes and unfulfilled progressive aspirations. These have been the aspirations of the enlightenment tradition and the Institute believes that in the 21st century Teachers College and Columbia University should and will be at the vanguard of their historical fulfillment. Towards this end, the Institute seeks to advance four basic objectives:

- **Technology configuration** -- ILT seeks to configure advanced technologies in everyday educational settings, especially inner-city schools, to support constructivist curricula and pedagogies. The objective here is to empower the work of students and teachers with digital tools in ways that make an intellectually rigorous progressive education feasible for all.
- **Curriculum innovation** -- ILT acts to promote the reconfiguration of knowledge into an integrated, comprehensive resource, open to all, for bringing ideas and understanding to bear in the conduct of life. The objective here is three-fold: to make all the elements of knowledge accessible to any person at any time and at any place; to render the questions and concerns animating the creation of culture open and active for all; and to enable each person, as is his or her birthright, to participate meaningfully in the advancement of learning.
- **Professional development** -- ILT works to help teachers adapt to a setting in which students will exert substantial control over their educational work and have direct electronic access to all the resources of their culture and in which teachers will exercise influence primarily by posing powerful questions and by guiding student inquiry towards the frontiers of knowledge, understanding, and reflective practice. The objective here is to extend and deepen the professional challenges engaging educators in the 21st century, making the work of students and teachers central determinants of the common weal.
- **Policy formation** -- ILT aims to sustain public policy initiatives that rally broad coalitions of interested parties from academe, government and industry committed to transforming education through the astute use of information and communications technologies. The objective here is to mobilize the civic commitments requisite for the public to translate new possibilities into historical achievements.

These are large objectives, as befits the premise of historical engagement.

Effecting a Strategic Vision

In practical work, historical thinking guides the Institute. ILT forms its basic objectives through a context of historical reflection. Reliance on historical reflection makes the Institute distinctive as an agency of change in education. The dominant model of educational reform is one of applied educational and psychological research. Instead, ILT grounds its work in historical reflection and cultural interpretation. Effective educational practices are those that prove suitable with respect to complex historical and cultural conditions. Effective innovation rests on insight and understanding, both informed and inspired. The conscious pursuit of change, the design and implementation of an historical pedagogy, arises through immersion in the field of practice, seeding it with educational arrangements that have the capacity to flourish within the emerging cultural ecology. Simply put, in grounding pedagogical change historically, one bases effort, not on proven theory, but on strategic vision.

Effecting a strategic vision in education requires the sustained application of diverse resources in a deliberate manner, according to a reasoned plan. It is to help lay the groundwork for such an effort that the Institute has designed its program of practice. The Institute believes that there are four distinct requirements to effecting systemic educational change. These are:

- a proof of concept, to show that a significant alternative to existing practice is possible;
- a driving force, to provide the historical energy to carry innovations through to full implementation;
- a moving social vision, to legitimate the costs incurred with change and to inspire the efforts needed to effect it; and
- tangible institutional leverage, to enable new practices to alter resistant organizational structures, transforming them from within.

The Institute is developing its program to meet these requirements and to provide a framework for the mobilization of disparate elements in a common endeavor.

A Proof of Concept

A significant alternative to current practice will necessarily not be entirely novel. It will nevertheless be massive, pervasive, and thorough-going in its effects. Technological innovation exerts historical influence by empowering traditionally marginal practices to become dominant and formerly dominant ones marginal. Technological change enables such new possibilities by shifting the balance of constraint and facilitation, altering which possibilities predominate and which hover eccentrically at the margins of practice. The proof of concept that the Institute seeks will show that several factors converge through the new technologies to make the implementation of progressive educational principles more effective in the absolute and relatively more suitable as the predominant form of educational practice than they have hitherto been.

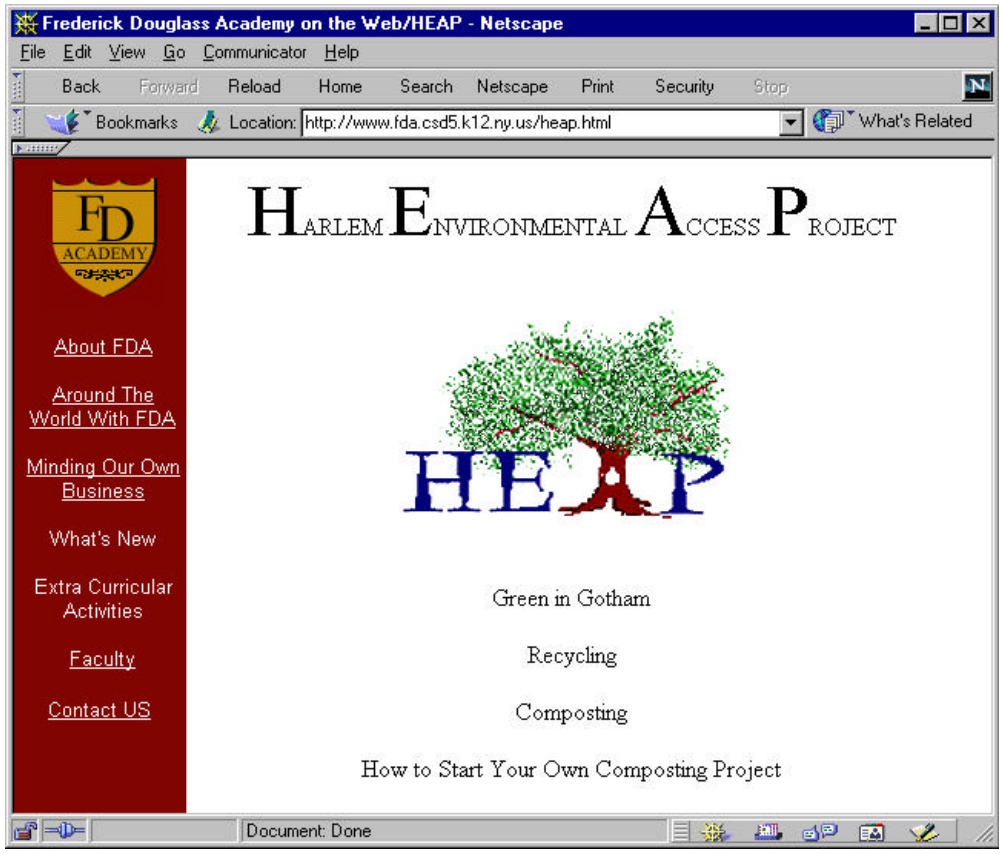
Traditional educational technology made implementation of progressive principles difficult. The individual teacher had a limited stock of knowledge. Were the teacher to give a class of active children free rein to inquire about a topic, starting from a given set of particulars, the children would quickly branch out beyond the limits of the teacher's competence. The school, which would have at best a limited library that is awkward to use in the give and take of questioning, could not respond effectively to the play of inquiry. Thus in practice the child-centered pedagogy encountered difficulties in implementation. Once so real, these difficulties now diminish. The new information technologies significantly increase the ability of the teacher and the school to sustain the open-ended inquiries that diverse students can generate, making progressive pedagogy more practicable.

This resuscitation of progressivism is the concept. The proof of it will be in the practice, however. The real know-how essential will come from the field. The Institute is working with numerous teachers in diverse schools, across all grades and subjects. ILT will increasingly shape its professional development work to identify and communicate classroom-based know-how to an ever-widening circle of teachers. ILT needs first to help innovating teachers discover how to use digital tools to support progressive pedagogy, and then, observing and celebrating their discoveries, it needs to develop ways to spread successful practices to more and more electronic classrooms, disseminating the emerging norms of new practice. In this way, the Institute will test whether a renewal of progressivism can shift the balance of pedagogical practice.

A digital information infrastructure, enabling students and teachers to use powerful educational tools in the study of cultural resources, unprecedented in depth, breadth, and flexibility, will enable educators to raise the span of pedagogical possibility for all. These developments should have greatest value for those presently

least-well served by our educational institutions. Many activities associated with the Institute seek to demonstrate that educational use of networked multimedia can greatly shorten the intellectual distance separating the frontiers of research, professional practice, and creative artistry from the introductory processes by which people, especially the young, construct their understanding of their culture. The Institute seeks to demonstrate the educational significance of such developments through diverse projects, among them –

- The Harlem Environmental Access Project, or HEAP, which was an NTIA-funded pilot program to extend the National Information Infrastructure to connect the information resources and expertise of Columbia University and the Environmental Defense Fund (EDF) with students and teachers in the Upper Manhattan Economic Empowerment Zone (1995-97);
- The Living Schoolbook Project, which was a New York State funded collaboration among Columbia University, Syracuse University and Bell Atlantic (then NYNEX) to provide high-speed connectivity and networked curricular support to NYS schools (1995-98); and
- The Eiffel Project, which is a collaboration among the Center for Collaborative Education, the Institute for Learning Technologies, the New York City Board of Education, and a consortium of partner organization and schools, funded by a U.S. Department of Education Challenge Grant, to empower the small-schools reform movement through technology (1997-2001).



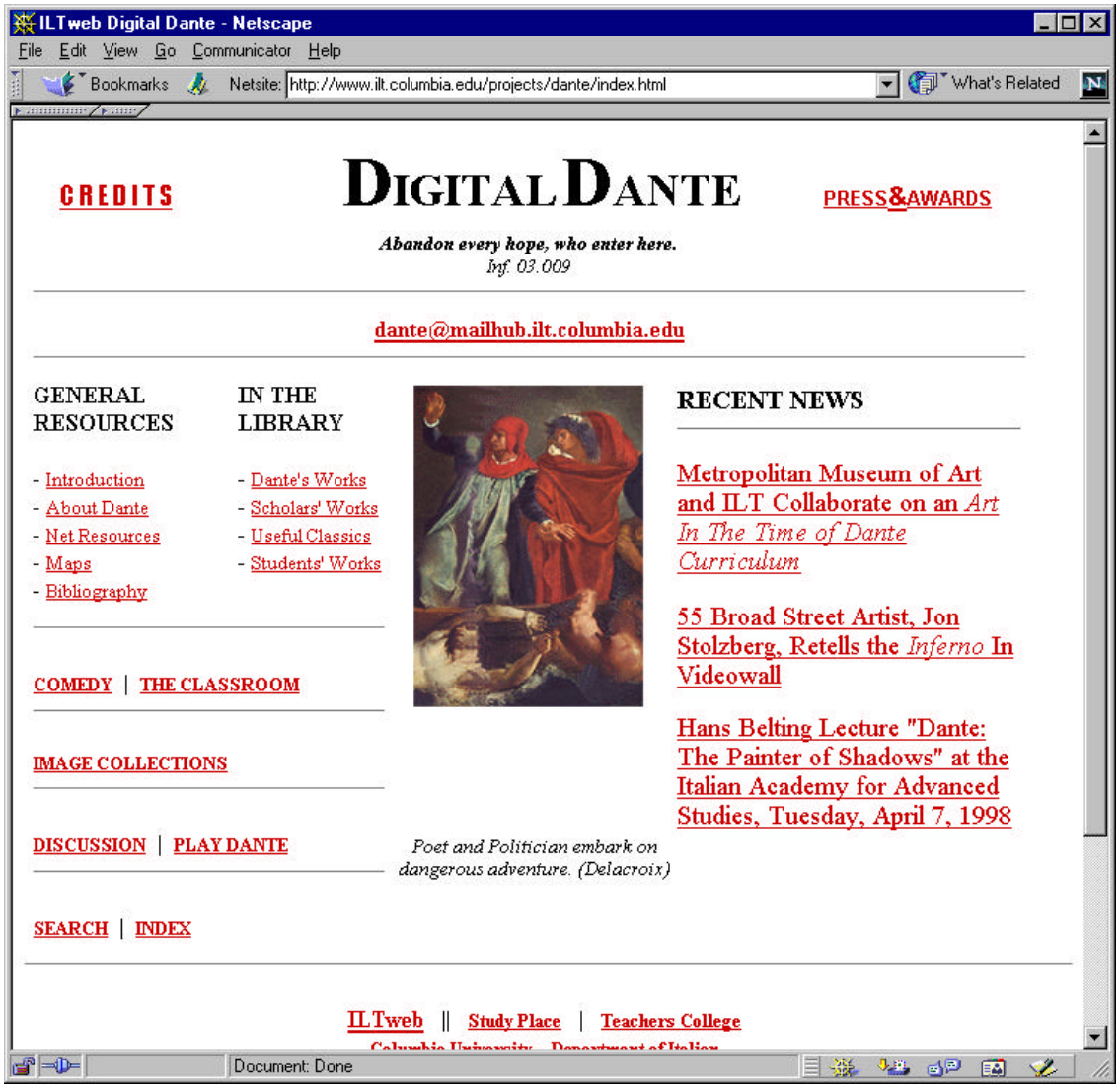
ILT will seek to sustain such projects for extended periods for the current distance separating the culture of the schools from the culture of the universities arose from an extended process of historical development, which we cannot transform quickly.

In typical schools, the reigning instructional strategy is based on the textbook as an abridgment of subject matter that students should master in unison, subject by subject and grade by grade, even school by school. The Institute believes that *construction* will displace *instruction* and curricula will become a study support system, helping students construct their understanding of a field by working in small groups, with advanced tools and resources, surrounded by engaging databases of

networked multimedia resources, motivated by powerful pedagogical questions, ones inherent in living finite lives in an infinite universe. The Institute is seeking to develop a proof of concept for this alternative model of study and believes that there are significant opportunities for joint development projects between educational practitioners and a research university such as Columbia. Over the coming years, the Institute will continue to expand such efforts, currently represented by projects such as these –

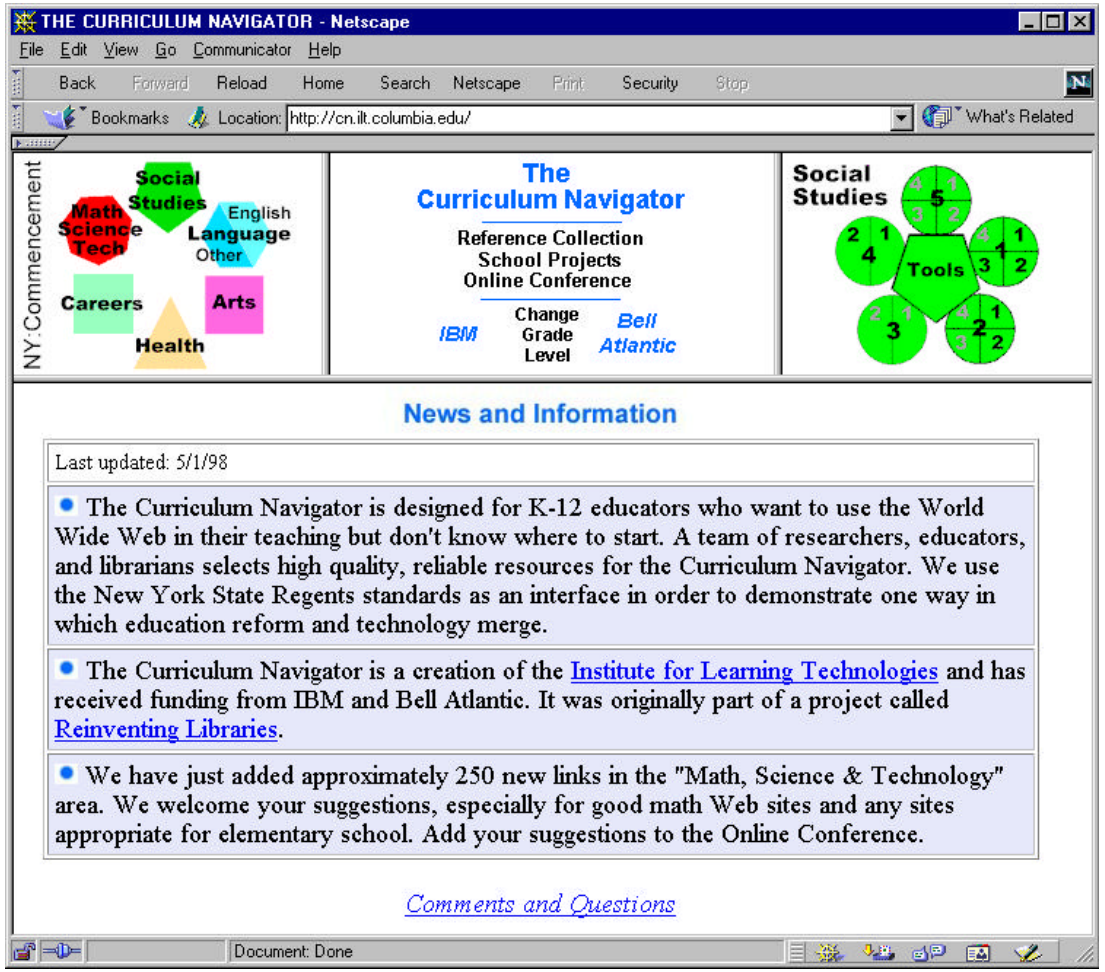
- *Digital Dante*, a long-term effort to prototype and develop an online, multimedia Dante-related academic resource combining traditional elements of scholarly research with new communication and presentation possibilities enabled by networked digital technology.
- *Where Are We?*, a computer-aided learning tool, which simultaneously displays a visual-representation of an interesting, real, environment, and a map view of that same terrain, in order expand the bounds of what can be learned in a classroom setting.
- *New Deal Network*, designed as an educational web site sponsored by the Franklin and Eleanor Roosevelt Institute and ILT to stimulate students and historians throughout the United States to discover and document the human and material legacy of the New Deal.
- *Columbia Curriculum Navigator*, a prototype designed for K12 educators using the New York State Regents standards as an interface in order to demonstrate how education reform and technology can merge in a resource useful across the full span of the school curriculum.

Throughout the 20th century, a significant divide separated higher education from elementary, secondary, and adult education. Essentially the apparatus developed to support higher education was too expensive per capita to deploy in elementary and



secondary schools. This was especially true of the apparatus developed to support work in elite colleges and research universities, with the result that a gulf separated the cultural character of work in these institutions and that in typical schools. This situation is changing.

Creating a digitally-based apparatus for scholarship, research, and professional practice is still a difficult and expensive enterprise. But insofar as this digital apparatus has been created, the per capita marginal costs of extending access to it will be minimal. As a result, educators can dismantle the divide, and research universities, long set apart from the rest of education, can become the font of preferred educational practice, not by turning away from what they do best, but by pushing forward with it, adapting it fully to the possibilities of digital communication.

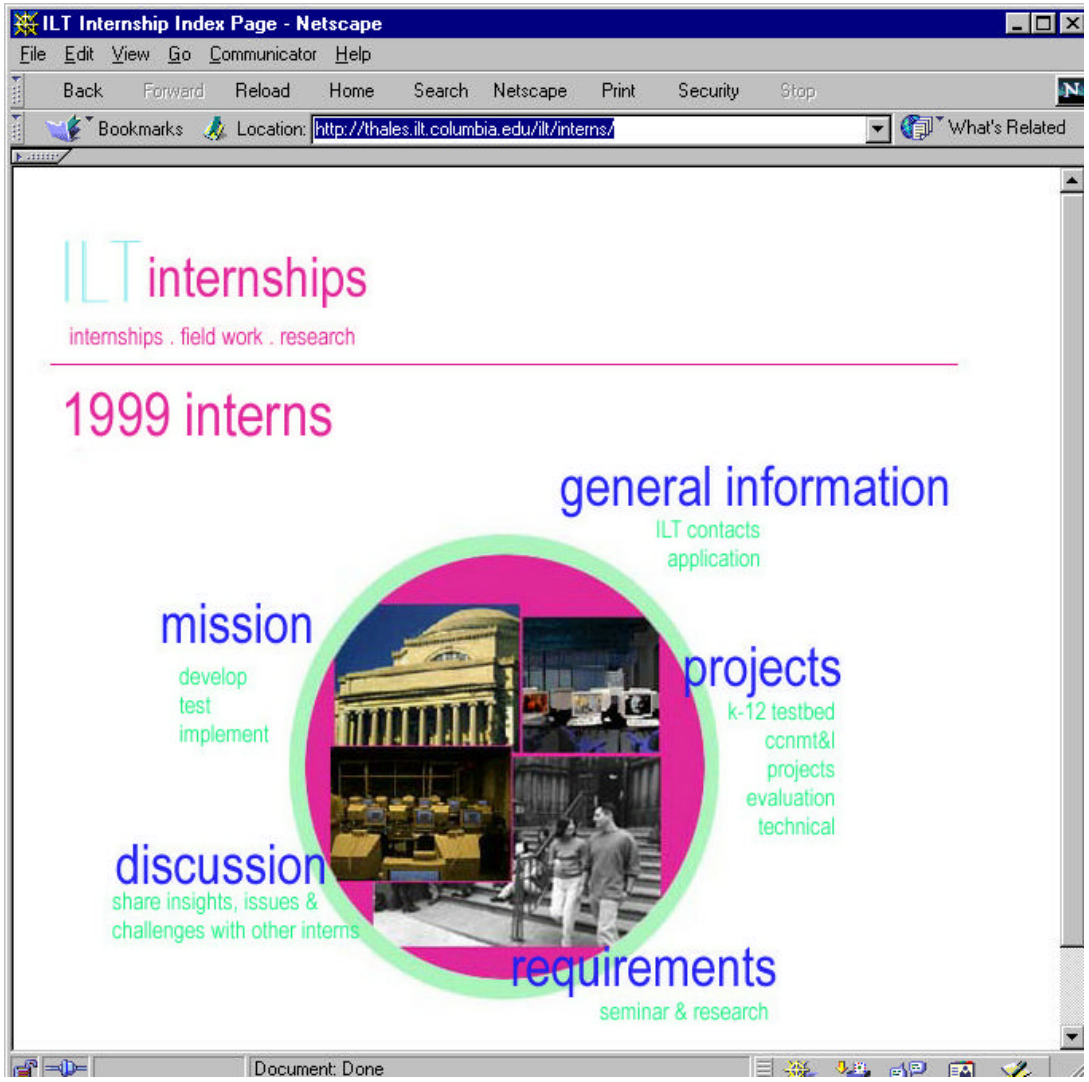


In this process, the Institute for Learning Technologies functions as a facilitator, helping Columbia and other universities redirect their on-line intellectual resources, creating pedagogical strategies enabling novices to use advanced materials productively, and developing the potentialities of a unified intellectual environment for educational practice writ large. To fulfill this role, the Institute seeks to push initial projects to a much higher level of development in two overlapping areas: curriculum development and teacher education.

With *curriculum development*, ILT wants to mobilize substantial resources to convert its prototype, the *Columbia Curriculum Navigator*, into a premier Web portal for K12 education, bringing the intellectual resources of higher education fully into operation within elementary, secondary, and adult education. Columbia can advance this purpose with effective attention to three things. First, subject-matter specialists need to expand the correlation between national and state learning standards and the ever-changing contents of the web. Second, ILT and its collaborators should generate a growing, deepening body of on-line pedagogical insight, know-how, and reflection, providing would-be users – teachers,

parents, and children – with immediate support. Third, the pedagogical implications of electronic curricula need much further development with careful attention to the way sustained assignments, addressed to small groups of collaborating students, may supplant collections of traditional lesson plans, which address the work and needs of teachers, not those of students. Students, not teachers, are the primary users of information and communications technologies in homes and schools. In the emerging educational environment, the locus of causal initiative in the process of education will shift from the teacher to the student. The successful design of a powerful pedagogical portal will follow from the degree to which it enables both the student and the teacher to act effectively in educational settings where this shift in initiative and control has taken place.

With *teacher education*, the near monopoly on the interaction between K12 classrooms and higher education, which schools of education have traditionally held, is fast disappearing as the World Wide Web opens the on-line reference, research, and course resources developed in colleges and universities to study by curious children around the globe. With digital communications technologies spreading throughout the world of education, the separation of schools and higher education into two, largely distinct, educational cultures will markedly diminish. Specialists in education will need to work closely with scholars, scientists, and professionals to embed powerful learning experiences for diverse students into the digital means for advancing knowledge. Students in schools will routinely have access to a wide range of sophisticated sources and intellectual tools, enabling them to raise questions to which teachers will frequently have no ready answers. In schools that use technology well, the teaching staff will need much greater sophistication than it has traditionally needed in managing open-ended inquiry by students, using advanced intellectual sources and tools. In short, those engaged in advancing the frontiers of knowledge will need greater sophistication in the pedagogies of its apprehension by the



less sophisticated, and those engaged in helping the young learn to participate in the use of knowledge will need greater sophistication about advanced research and inquiry. Such changes suggest that recruitment to the teaching profession and the locus of teacher preparation in the university will undergo significant long-term secular changes. ILT will work across Columbia University and Teachers College to organize a consortium to use the University's telecommunications linkages with New York City schools to create a 21st Century Teacher Preparation network serving the schools in the Upper Manhattan Empowerment Zone, and elsewhere throughout New York City.

To provide a full proof of concept for a new paradigm of education, educators need to develop comprehensive initiatives in all these areas. Educational institutions have entered into the initial stages of a profound historical reconfiguration. The Institute for Learning Technologies, Teachers College, and Columbia University have the responsibility and the opportunity to exert leadership in this reconfiguration, showing how networked multimedia on a national and global scale can support diverse, engaging efforts to transmit and extend the culture.

By developing its planned initiatives in these areas, the Institute must show that significant transformations of education are in fact feasible, providing the first component, *the proof of concept*, requisite to its strategic vision. Consider now the second component, *a driving force*, something that might provide the historical energy needed to convert intimations of the possible into instantiations of the actual.

A Driving Force

Technological innovation is an essential enabling factor in the educational developments that the Institute seeks to promote. It is hard, however, to draw sustained strength from technological change alone. Too often educators adopt a new technology as if it were a stable foundation for their novel efforts; what starts as an energizing empowerment all-too-quickly becomes an impediment of installed obsolescence.

Over the past decade the Institute has kept current with the curve of innovation. During the early 1990's, ILT helped develop the Dalton Technology Plan, which represented the application of commercial grade local-area networking to the educational needs of the school. That project demonstrated the educational value of well-networked small-group workstations in the classroom, at a ratio of about one workstation to five students, linked to an advanced set of servers in the school, providing email and user accounts for all teachers and students, tethered to the Internet by a broadband connection. McKinsey & Company used that model as the basis for its influential report on the prospective costs of integrating technology into the schools nationally and ILT has continued to use the model as the basis of its testbed construction through HEAP, the Living Schoolbook Project, and the Eiffel Project. Beware obsolescence.

To draw power from new technologies over time, educators need to do so by engaging in the process of technological innovation, not simply by acquiring its products. A significant element of the Institute's program consists of efforts to integrate its activities into the very processes of technological innovation so that, over time, the processes themselves will become imbued with a substantial dynamism towards educational reform. In a knowledge socity, educational requirements will drive the design and implementation of communications technologies.

As a driving force in educational change, the well-networked presence in every classroom of multiple small-group workstations seems increasingly insufficient. Full access to the possibilities enabled by digital technologies requires a more complex technological environment. Until now, industry has designed few digital products specifically for use in schools. Educators generally must select hardware designed for home or office and turn it to classroom use. They should shift from perceiving

potential educational value in products developed for non-educational activities to defining specifications for products optimized for educational purposes and finding manufacturers willing to provide those products at affordable costs.

For instance, high-end laptops designed for corporate executives are beginning to prove very useful in the classroom. They are nevertheless not necessarily optimized for those uses. Cheaper, more flexible devices might work even better. The Institute plans to develop and publicize a clear request for educational products, such as a student's hand-held digital companion. Such an appliance would have a distinctive list of features, and manufacturers should find it feasible to package these together effectively. If they did it well, the device could have a potentially very high-volume (although very low-margin) market. By far the largest job category in the world is that of "student," with some one to two billion persons in it. The era of adapting designs developed for other purposes to the needs of schools should end. It is time for educational leaders to define the hardware requirements for the devices they need and to challenge industry to deliver them at top quality and rock bottom prices.

Another problem with educational tools arises because schools often proceed on a one-size-fits-all basis. In reality, schools need tools for a number of different types of users in several different typical settings. In the school the network should be ubiquitous, offering wireless hook-up so that students and teachers need not be tethered to a room or to a desk. The needs of children vary, let us postulate on the basis of K through 2nd grade, 3rd through 5th, 6th through 8th, and 9th through 12th. Teachers need an in-class installation that supports their work with the whole class; they need a professional support center in the school; and they need a reasonably full-featured home or portable computer for use outside the school. Higher level administrators should move about the school and need flexible, easy-to-use, digital communications devices wherever they happen to be, while support staff should have well-networked desktop information management resources that allow them to interact effectively and efficiently with students, teachers, administrators, and parents. Parents should have access to information appliances that allow them to be apprised substantively about their child's educational experience and to act in support of the teacher and the school. In actuality, schools rarely plan with their full spectrum of needs in view. They respond first to one need and then to another. As a result, a hodgepodge of resources are usually available from one school to another.

Given an infrastructure, adequate programming is a further fundamental. The software available for education is incomplete, poorly integrated, bloated with unnecessary features, and difficult to use. Powerful corporations have designed the dominant operating systems and applications programs to market to affluent businesses

> . . . CSD6 should publicize a clear request for a product, a student's hand-held digital companion. Such an appliance would have a distinctive list of features, and manufacturers should find it feasible to package these together effectively. Among the features of a basic educational appliance, one might include the following –
>
> - ruggedized (3 year guarantee)
> - secure ($0 street value)
> - i/o ports including USB
> - 12 hour battery life (rechargeable)
> - 2 lbs. +/-
> - wireless networking (fast enough for multiple video streams to different machines in the same room)
> - microphone/speaker
> - color screen, back lit, 16K color, 800 by 600 pixel resolution
> - possibly touch screen with handwriting recognition
> - good modem
> - operating system and core programs in ROM
> - a complement of software optimized for classroom uses
> - 5 meg flash memory or RAM for assignments
> - under $1,000 cost. . . .
>
> Robert McClintock to Irving Hamer, Jr
> February 17, 1999

and individuals under quasi monopoly conditions. This presents a problem to schools. One does not equip school-bus fleets with luxury tour buses. Developers have not yet optimized software for educational uses. Schools require a comprehensive, well-integrated user environment, serving a wide range of purposes, often in unique ways. Commercial software development conditions put the creators of educational software in difficult situations. Schools cannot afford all the different programs that they need, assuming they could find them all on the market. The Internet has, of course, greatly facilitated this option, providing a flood of quality content at very low costs with immense interoperability over diverse systems on the market. Yet content alone does not an education make; schools must integrate in many other programs as well – applications, simulation tools, experimental probes, multimedia editing and presentation programs, email and conferencing, information management resources, and on. With conditions of systems-bloat inflating costs for all these components and delaying their development, even affluent schools end up with an incomplete collection of programs that work poorly together and a staff desperate for sufficient training.

A chicken and egg problem impedes the educational use of the information infrastructure. Educators can solve it only by binding systems design and applications design in a tight, iterative reciprocity. The Institute will offer a full range of technology consulting services to schools, helping them design comprehensive, sustainable installations. ILT will also work with technology providers to help them understand the requirements of the emergent system of education. With respect to hardware, ILT will work with large schools systems, particularly that of New York City, to develop specifications for technology appliances and systems optimized for pedagogical usefulness, and will serve as an expert agent ensuring that major producers supply the types of products schools require. A major project of the Institute over the next five years will assemble a coalition of software developers to create a stable, easy-to-use, comprehensive body of software for schools through open source development. Educators will develop a driving force from new communications technologies as they move from the current level of per pupil software expenditure and force that cost down to $0 through a concerted effort to provide educational leadership to the open source software movement.

Throughout the post-War period, innovating entrepreneurs have made enormous personal fortunes creating digital information and communications technologies, but the benefit to people at large, throughout the nation and the world, has only recently started to arise as those technologies have finally penetrated deeply enough into established systems of production and exchange to yield gains in tangible productivity of significance to the whole economy. In like manner, ILT holds that technological innovation as a driving force in efforts to improve education must penetrate throughout the world system, improving substantially the spectrum of opportunity for each and every person. An unseen hand will not necessarily spread innovations throughout the world system of education. This purpose requires intentional policies, pursued by both technologists and by educators. ILT seeks to join both groups in a share, pervasive effort at innovation. From this shared purpose, a commitment to a social vision must follow.

A Moving Social Vision

Technology is a powerful, yet indeterminate, tool of change. Educators must make their actions with technology serve determinate values; they incur historical responsibilities to be activists with respect to the problems of their times. Technological change is neither a malevolent corrupter nor a beneficent machine that guides itself, able to cure social ills without people choosing to make an effort to do so. In the course of its work in education and technology, the Institute intends to address social and civic problems that merit effort as digital technologies become pervasive in education and culture.

At the turn of the 21st century, the rich enjoy ever-more dynamic wealth while the poor face civic stasis. It is a time of public parsimony. To understand what to do with technology, educators need a diagnosis of this prevailing paucity of purpose. Western societies seem to have backed away from further pursuit of their underlying ideals and aspirations. Post-modernist intellectuals legitimate this abdication with chatter about the irrelevance of grand narratives, as if their endless description of symptoms might somehow serve as a redeeming remedy. It is but another opiate. Educators must ask whether the ideals of equality, autonomous participation, and rational self-governance are intrinsically meaningless and worth no serious common effort? Or have people now withdrawn from pursuing the historical fulfillment of such ideals further for some other reason?

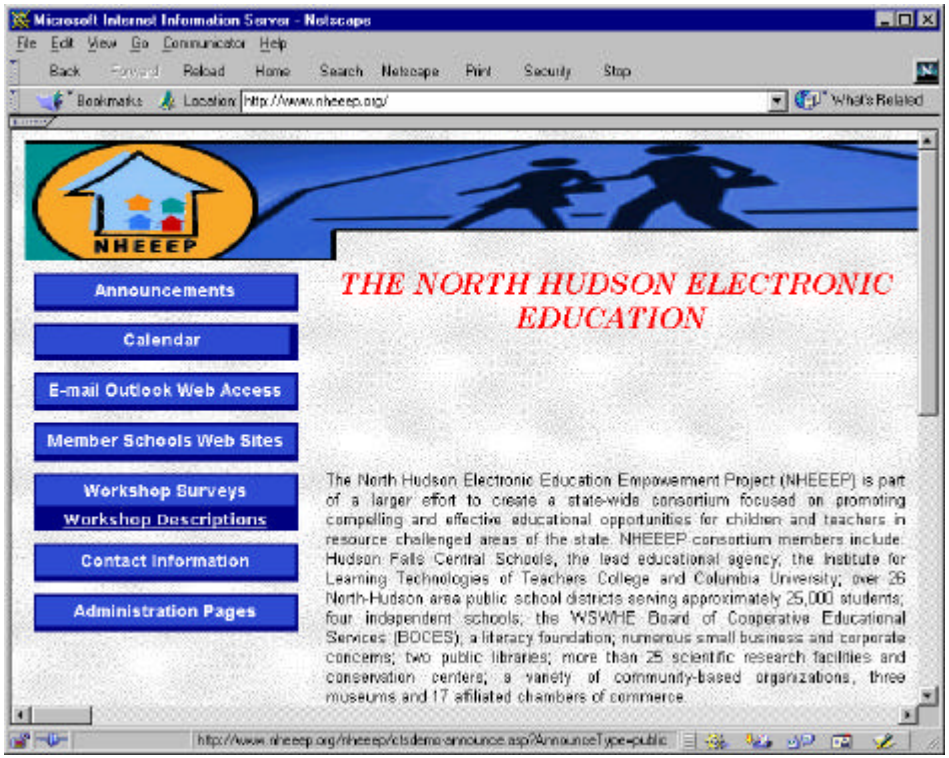
Educators need to diagnosis why a generous civic spirit turns mean and stingy. Public parsimony makes sense, often even to those who still believe and feel deeply committed to the ideals of our liberal traditions, if people believe that they have at their avail no effective means for achieving those ideals. The problem may result from the context, not from the text. The test – the stirring aspiration to achieve enlightenment for all -- may not be wrong and defunct, or unworthy of human hope and effort. Rather people may perceive that the means now available for pursuing these ideals, namely, the techniques of programmatic administration in the context of the democratic nation-state, have reached the limits of their historical effectiveness. The whole complex context of bureaucratic social

service and rational public control – schools, hospitals, police, sanitation, public transportation, social services, benefits for this and that, the protection of rights, and on – have all done great good in providing conditions under which life, liberty, and the pursuit of happiness are meaningful expectations to the majority of people in some societies and to significant minorities in others. But where they have been most effective, the further extension of their effects slows; their costs accelerate; and they approach the limits of their effectiveness – limits that leave the driving ideals far short of fulfillment. As effort approaches its limits, people question the value of additional effort, for its cost will prove high and its results low.

To break through the prevailing public parsimony, educators need to rekindle belief that people have effective means for advancing basic ideals towards historical achievement. With familiar means approaching their limits, this breakthrough requires a transformation in which new principles of action incorporate and transcend the old, working well where the old have ceased to have effect. Educators should adopt new communications technologies, not because these are, in themselves, some sort of good, but because they may offer new means, renewing pursuit of long established, but far-from-finished goals. As people address the limits of action evident in existing programs, a moving social vision will emerge. Public parsimony will give way when people begin to see significant achievements in areas where they have ceased to expect them. The Institute wants to address two such domains.

From social reproduction to educational self-determination. Ideas of educational self-determination motivated the original creation of modern school systems. Each person should have substantial opportunity to cultivate his or her potentials to the full, and as Jefferson perceived, those societies that best delivered such opportunities to their members would thrive, able to draw on the fully developed spectrum of human abilities dispersed through the populace. During the 20th century, the leading nation-states have expended vast resources to implement this rationale. The results, profoundly characteristic of modern life, fall far short of the ideal. The system legitimates a second-class status for those who fail at school. It offers some a measure of educational self-determination, which works to co-opt renewing talent into established elites while in the aggregate it reproduces socio-economic divisions and biases.

Existing schools fail to serve many people well, and very few members of the public believe that additional monies or improved



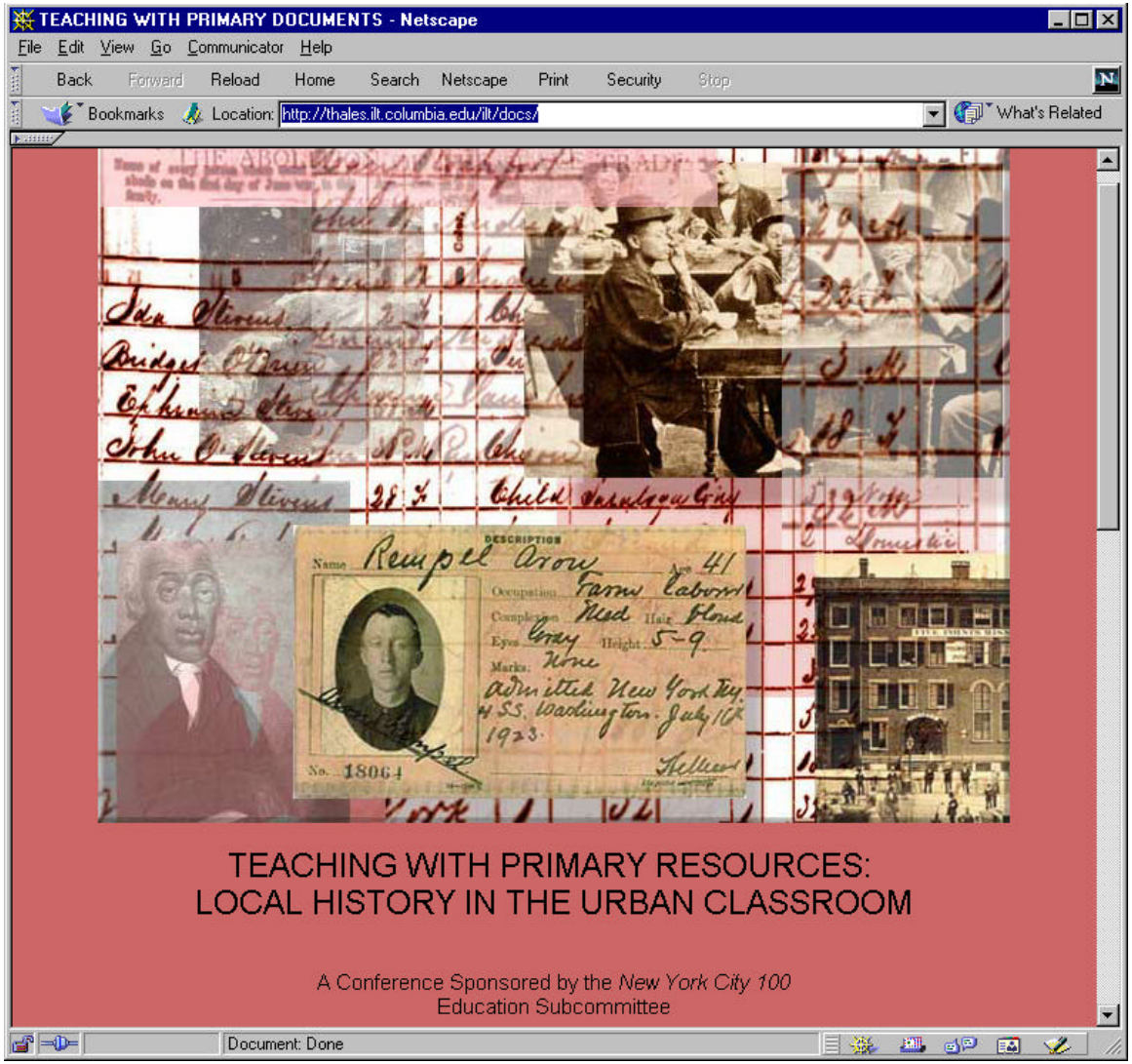
leadership will suddenly enable existing schools to meet effectively the needs of those it now so poorly serves. The Institute believes it is of compelling civic importance to redress poor performance by the schools. Educators using technologies in ways that will transform the system must show that a new system of education can meet the needs of the rural and inner-city poor.

The Eiffel Project and the North Hudson Electronic Education Empowerment Project (NHEEEP) have this goal.

Advanced media in education are promising as a positive solution to existing inequalities because they introduce new causal forces in education. New technologies are not merely a good to be distributed, but a force to be shaped and activated. In concept, networked multimedia can make the richest, most powerful resources of our culture available to anyone, anywhere, at any time, and in principle this change should have greatest relative value to those who presently have least access to the fullness of our culture. All children will benefit, but the least advantaged children can benefit the most. The Institute holds that digital learning technologies bear within them potentials for renewing the historical pursuit of progressive social consequences. The Institute will work to activate that promise.

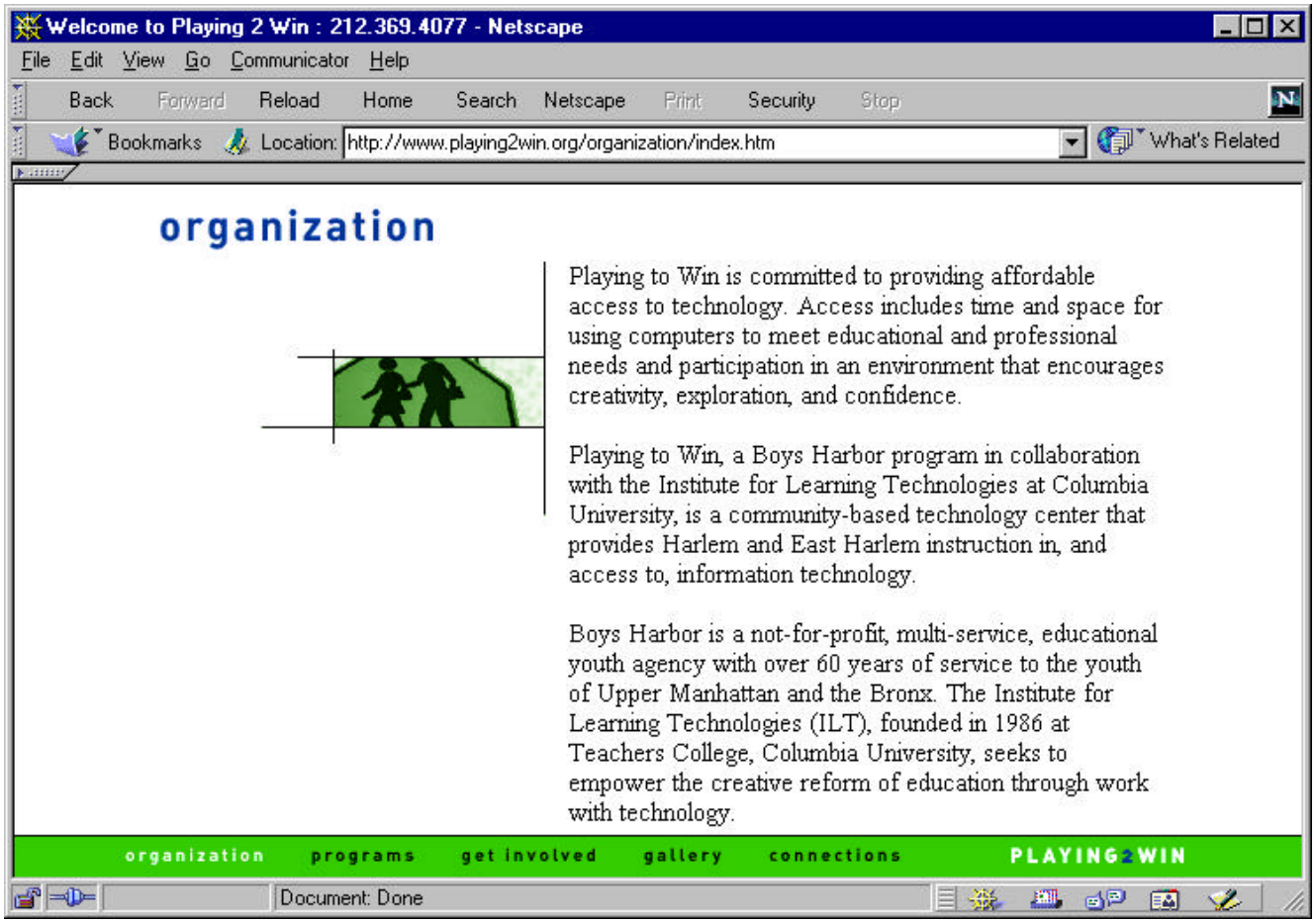
Democracy in a world of global, inter-generational choice. With the rise of industrialism and the spread of advanced techniques in economics, medicine, law, and government, much of life has been stabilized and rendered relatively predictable. That has not, however, banished risk and uncertainty, but rendered them more abstract, more global, and more long-ranged. With these transformations, problems of public choice change significantly. Accountability, which could once be handled well through elections every few years within localities, regions, and nation-states, now becomes, in addition, a global, inter-generational problem, turning often on obtusely abstract relationships, visible -- if visible at all -- only through very sophisticated statistical analyses and projections.

Global development brings challenges of astounding complexity and frightening finality. As people find themselves caught in a present, facing an indeterminate future, having to make



uncertain choices, needing to live thereafter with the consequences, measures of educational quality for the person and for the public prove to be prospective, not retrospective. Whether the education acquired turns out to have been excellent or egregious depends on unfolding experience and their ability to cope well with it. Old norms mean little if they prove irrelevant to future hazards. Henry Adams described it well -- "Not a man there knew what his task was to be, or was fitted for it; every one without exception, Northern or Southern, was to learn his business at the cost of the public. . . . Their education was to cost a million lives and ten thousand million dollars, more or less, North and South, before the country could recover its balance and movement." Historical remediation can come at a terrible cost.

In the 21st century, the destabilizing challenges will arise from the complexities of global interrelationships. For the first time in history, humans are becoming aware of how everything affects everything else in health, industry, agriculture, planning, transportation, trade, government, and the nurture of nature, as these cut across all walks and conditions and cultures of the world. The ability to experience these global interrelations arises largely through the capacity of digital communications to manage stupendous complexities of information and ideas.



Learning to cope with this complexity is the long-ranged pedagogical challenge that current systems cannot manage.

To craft an education that allows our progeny to prepare prospectively to cope with these complexities without a forced re-education imposed by cataclysmic events, Americans need to extend their collective capacity for comprehension far beyond norms of past sufficiency. Declining standards are not the educational problem; the inability to raise standards -- markedly, rapidly, across the whole spectrum of achievement -- is the truly

portentous problem. The Institute has begun to address such issues through the Harlem Environmental Access Project and work with Columbia's Earth Institute, Biosphere II, and the Black Rock Forest Consortium. But these efforts are at most a mere beginning. The Institute seeks to join with other innovative groups, nearby and round the world, to address this pedagogical challenge created by the human need to exercise public choice on a global, inter-generational scale.

Institutions seeking to influence change incur historical responsibility for the consequences of their actions. The Institute intends for its efforts and those of Teachers College and Columbia University to stand the test of time as a national model for an effective information-based society, one that people will experience as both empowering and equitable, renewing the Enlightenment agenda, displacing the current public parsimony with a renewed liberality in the pursuit of the public good.

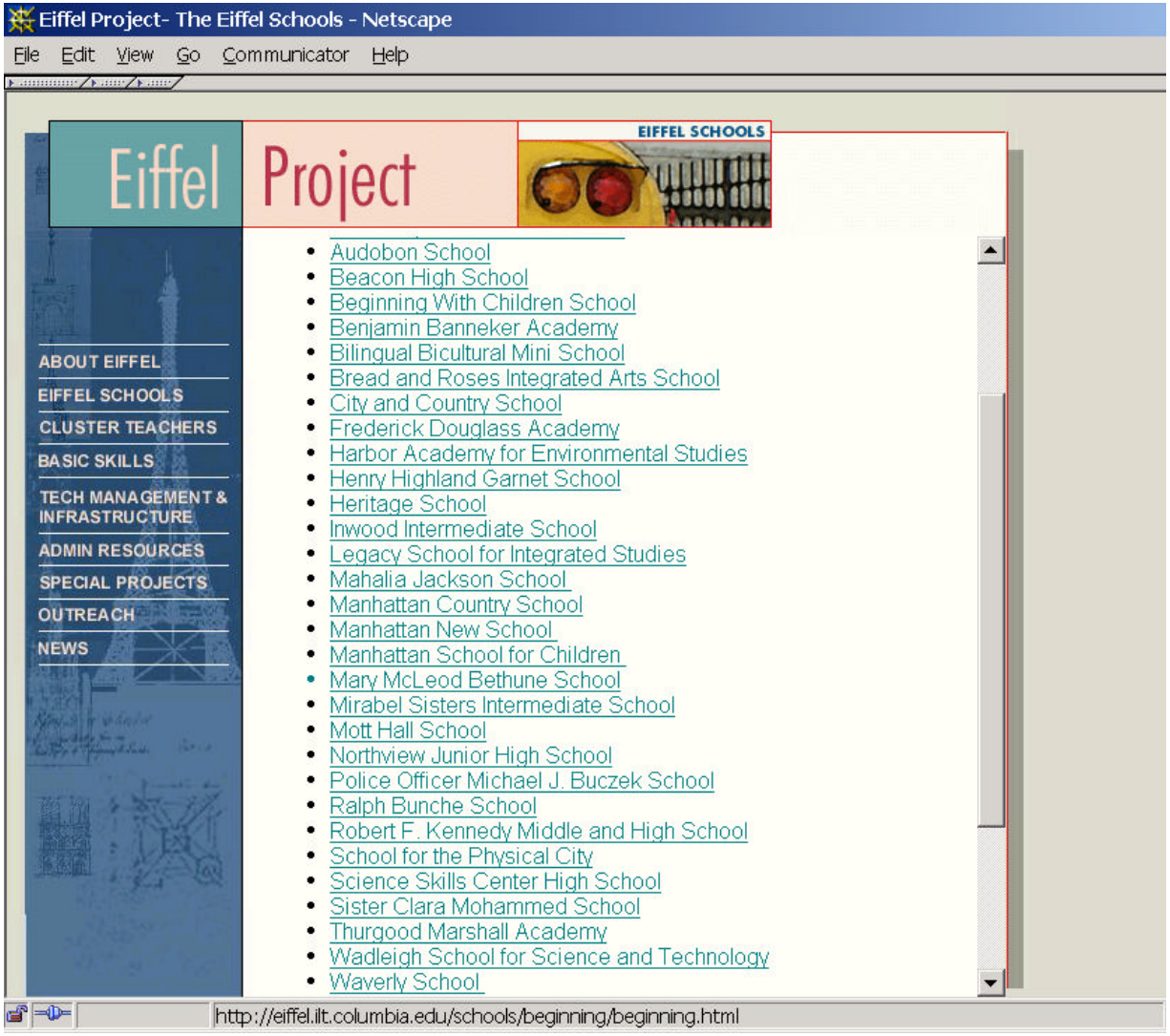
Tangible Institutional Leverage

Institutional leverage helps advance innovation in education. To move new possibilities from potentiality to actuality, educators need powerful leverage on working institutions. Schools and colleges are remarkably resistant to change. One can demonstrate the power of new practices; one can link them with material forces restructuring the practical use of information and ideas; one can imbue them with a compelling sense of public purpose; but without gaining institutional leverage on the educational system, the effort will remain peripheral.

Institutional leverage must be substantive; it must comprise significant changes in specific, active institutions and experiential realities in the life and work of individual students and teachers, parents and administrators, professors and researchers. In addition, institutional leverage arises when innovations become contagious, spreading infectiously from school to school, from college to college, from level to level, from locality to locality. When that happens for a sustained period, systemic change will result.

How? One requisite is an alert attention, an open mind, a willingness to observe, hypothesize, and test. Another is to look for the deep diagnoses, insights into pervasive etiologies that go almost unquestioned because they seem to be a necessary part of the order of things. The Institute is working with two such deep diagnoses, one pertaining to assumptions about the relationship between the size and the quality of schools and the other to assumptions about the relationship between the transmission of knowledge and its generation. Both sets of assumptions involve defining a dilemma, a key trade-off that seemingly must be made and that, in being made, appears to set the leading characteristics of most educational efforts. By developing the educational uses of digital resources through networked multimedia, educators can restructure these trade-offs in hitherto impossible ways, generating leverage for change.

Consider first the relationship between school size and school quality. The twentieth century has been the era of school consolidation and common sense long held that the good school was a large school, one able to accommodate students of different needs with the services of specialists with different skills. The mid-century vision pointed to the comprehensive school as the school of choice, able to serve at once the academically gifted, the remedially needful, and the vocationally minded. This vision, which seemed so reasonable with respect to the aggregate, has not necessarily served well with respect to the person. Individual children, their parents and friends, teachers, coaches, and counselors, all need a place of bonding, one in which each can engage with others in the creation of shared meaning. Increasingly, late-century research shows students in small schools doing better than in large, learning more and coping more effectively with the stresses of coming to age. As an alternative to the comprehensive school, reformers increasingly turn to the



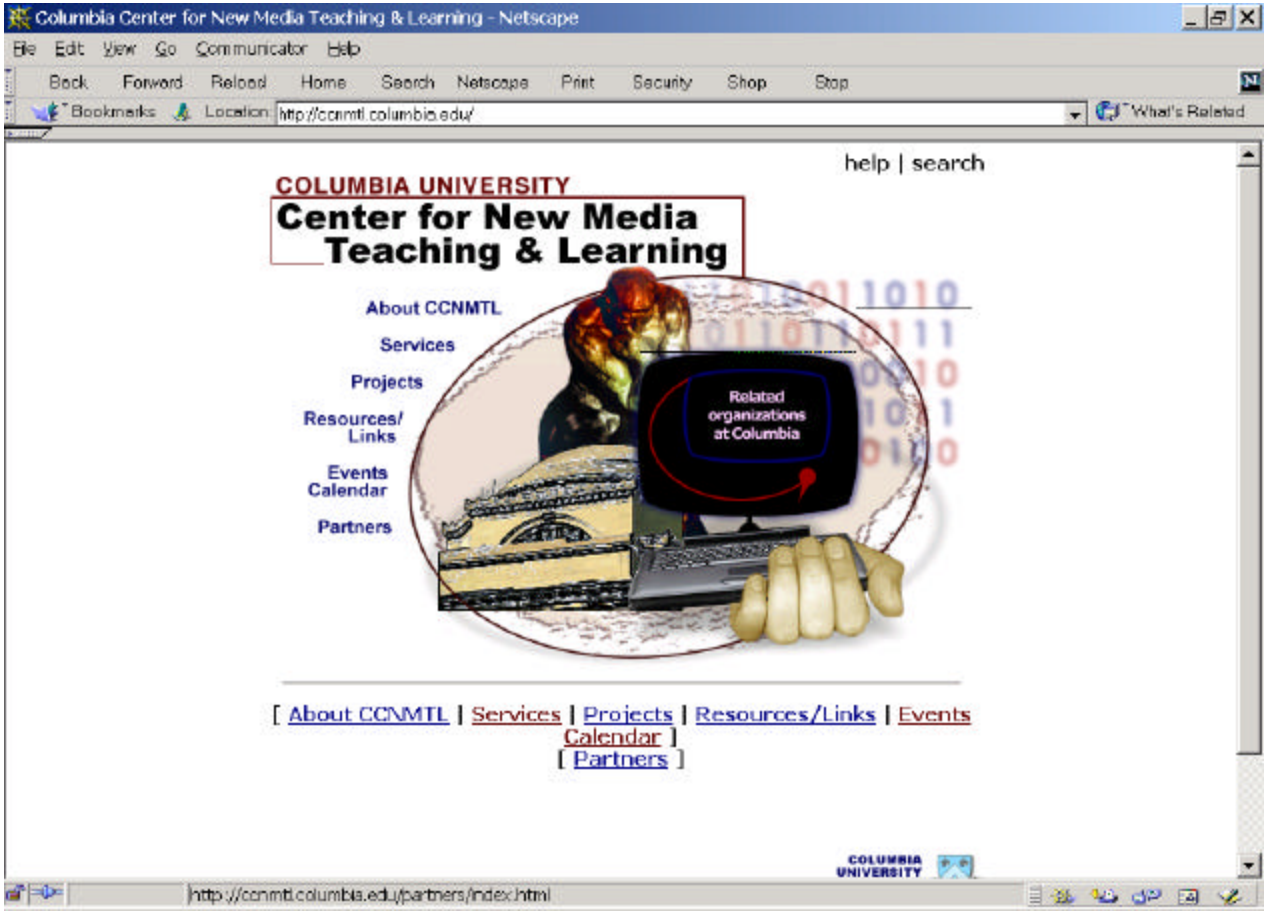
essential school, the school that respects the essentials of interpersonal relationships, of the human dignity and thoughtful values common across all the cultural diversities of our heterogeneous society.

Yet the dilemma remains -- people differ in their needs, interests, and abilities. The small school caters to these differences only at great expense; the large school nurtures a sense of meaningful place only through heroic exceptionality. Here is where digital technologies can alter the traditional trade-off. Small schools supported by powerful, wide-area networks can provide students with effective access to a great diversity of experiences, resources, and specialists, yet they can do so on an engaging, personal scale in their immediate surroundings. Essential, intensely inter-personal schools, supported by comprehensive digital networks will transform the twentieth-century either-or into a twenty-first century both-and. The Institute believes that this combination can develop into a thorough-going structural reconfiguration of educational institutions of immense cultural and social import.

Consider second the relationship between advancing and transmitting knowledge. Since the Renaissance, scholarship and science have become increasingly esoteric. To advance knowledge in virtually any field, scholars and scientists required access to costly, sensitive instruments and painstaking, exhaustive collections. These have been assembled with great patience and diligence and they have been difficult to use, requiring subtle skill and careful interpretation. Materials have been hard to acquire, experiments hard to conduct, results have been transient and difficult to record.

Great strides have been made through printing and related techniques, through photography and the like, in making the results

of systematic inquiry accessible to the general public and to discerning specialists. But access to the conduct of inquiry itself has been severely limited. How many have worked directly from a papyrus fragment of Homer or prepared a metallurgical sample for scanning by an electron microscope? In field after field, the working laboratory and academic archive are special places reserved for initiates, who gain access only after arduous preparation. They are not places for educating raw youth and bumbling novices.



Throughout the era of print, education has rarely been *empirical*, understanding empirical education as a process by which students master fields of inquiry and practice by using the data and tools of the different disciplines and professions to solve substantive problems and to answer challenging questions. Instead, education has been dogmatic and derivative, based on digests, authoritative at best. Even school laboratories are stylized simplifications having little resemblance to the working laboratories of the subjects they represent. Too often, the laboratory becomes a place where students go through the motions that an authoritative menu prescribes.

Traditional limitations are changing. Nearly all the data acquired in working laboratories is fast becoming digitized and it moves rapidly across networks from lab to lab and researcher to researcher. More and more, scholars capture, observe, analyze, and interpret all this material with computer-based tools, many of which are not difficult to use. The emerging information infrastructure can transport all these observations, measurements, collections, and models to virtually anyone anywhere, along with control over powerful tools of rendering, calculation, comparison, selection, organization, and expression. Collaboratories spring up, providing electronic linkages for sharing findings and discussing implications. These are the developments restructuring the relationship between the production and dissemination of

knowledge. These developments make empirical education a general possibility and change the relation ordinary people can have to the work of producing knowledge.

To make empirical education work well, educators need two key elements: fast, flexible, easy access to advanced digital libraries of data and tools, and powerful challenges and questions that will activate curious minds. When educators put such challenges to students, the students in turn will engage themselves, individually and as groups, in the work of empirical inquiry and reflection. A significant part of the funding for the national information infrastructure can support such work. It is in this sense that the idea of empirical education is commensurate with the emerging information infrastructure. As more and more resources and activities pour into the information infrastructure, empirical education becomes more and more feasible, more and more powerful.

Through a University-wide initiative to promote empirical education, the Institute will help shape and deploy these developments, in which efforts to advance research and to improve education converge. The more research and education converge in practice, the more leverage there will be for the use of advanced technologies in education.

Action through technical innovation is too contingent to have the foreknowledge that chosen strategies will lead decisively to desired destinies. History is always rich in ironies. Despite such imponderables, however, educators should seek to shape the processes of change to reflect their deep-felt purposes. With that intent, the Institute affirms a strategic vision. Guided by this vision, the Institute seeks to achieve historical effects of humane significance through a sustained effort to develop proposals, and through them projects, that provide:

- a proof of concept, showing that information technology can enable the progressive educational tradition to flourish as never before;
- a driving force, enabling the stream of innovation in information technology to work as a sustaining means to effect educational reform;
- a moving social vision, rekindling the expectation that educational reform can advance ideals of equality and engage public action on global complexities; and
- a tangible institutional leverage, changing every-day practice, making schools more intimate and compelling, and bringing the work of educators and researchers into a close, synergistic relation.

The Institute is working towards this strategic vision in a sustained way. To facilitate this work, the Institute has identified a few imperatives of implementation, practical goals to pursue while engaged in the diversity of its activities.

Imperatives of Implementation

This strategic plan sets an ambitious agenda for the Institute. Although ambitious, it is a plan proportioned to the scale of action requisite to make technology deepen and extend the potentialities of education for all. Moreover, it is a plan commensurate with the stature of Teachers College and of Columbia University.

Any group that seeks to help transform education with digital technologies must find the wherewithal sufficient to exert meaningful effects on comprehensive, pervasive institutions, such as education and the information infrastructure. These are universal concerns that touch an incredible diversity of people. To

change them, one must act through local institutions and specific programs in ways that have distinctive consequences far beyond the localities and specificities of ones actions.

To work towards the renewal of education with digital tools, the Institute, Teachers College, and Columbia University should concentrate on the four basic objectives of this plan -- technology configuration, curriculum innovation, professional development, and policy formation – and by effecting its strategic vision -- developing a proof of concept, harnessing the driving force of technical innovation, generating a moving social vision, and exerting tangible institutional leverage. To accomplish these general aims, the Institute must achieve proximate goals in concrete ways. Over the next few years, the Institute will work systematically to fulfill seven implementation imperatives by 2004. These are challenges that relate to the particulars of the immediate situation, the Institute's means towards its objectives and its strategic vision.

1. *Institutional leadership*: Act to bring the full resources of Teachers College and Columbia University to bear in using technologies to improve education.
    - Continue building the linkages between ILT and the program in Communication, Computing, and Technology in Education at Teachers College. Fund a broad range of paying internships for students in CCTE to provide concrete experience integrating technology into schools and academic institutions.
    - Build the capacity of Teachers College to provide graduate students in GSAS, SEAS, and other Columbia schools general know-how about teaching and the requisite mentoring to acquire teacher certification, should they desire it.
    - Work with other innovating groups at Teachers College and throughout Columbia University to deploy advanced technologies in was that enhance the essential, animating missions of education in its fullest forms.
    - Work with the Columbia Center for New Media Teaching and Learning to identify technology-based resources that may have significant educational value for use in K12 schools.
2. *Core financing and institutional development*: Mobilize the resources, financial and human, needed to implement the Institute's strategic plan.
    - By 2005, increase ILT's endowment from approximately $1,000,000 to $10,000,000 (in current dollars) in order to enable ILT to maintain an adequate core staff and well-equipped quarters while ceasing to need support from the University's Strategic Initiative Fund and the operating budget of the College.
    - Strengthen the staffing structure of ILT by appointing people to an expanded array of roles, such as a chief operating officer, a development officer, and heads of technology innovation, curriculum design, professional development, and policy consultation.
    - Design at least one new media resource, probably the *Columbia Curriculum Navigator*, which can start to produce significant royalties by 2002.
3. *Technological innovation*: Develop sustained initiatives shaping the hardware and software available for use in schools.
    - Publicize specifications for school networks and educational appliances and get major suppliers to produce them.
    - Initiate creation of an open-source software environment for schools and see that the complete repertoire is available by 2004.

- Lead consortia making effective educational use of Bell Atlantic's Diffusion Fund and the Federal E-Rate.

4. *Programmatic collaboration*: Create the connections and procedures that will enable ILT to work in concert with existing organizations to achieve its objectives.

   - Put together a management structure for the diverse schools participating in ILT projects and work with the leadership of the New York City schools to put them in the forefront of educational practice.

   - Establish formal consulting arrangements, paid through a Board of Education contract, with key high schools and community school districts in Upper Manhattan, especially CSD6.

   - Participate in leadership efforts through the Mayor's Council on New Media, the Board of Education CyberLearning Taskforce, and in collaboration with MOUSE, HEAVEN, diverse corporations, to address the needs of schools and to diminish the Digital Divide.

   - Submit successful proposals extending the Eiffel Project beyond 2001 and obtain funding to keep the ILT school testbed at the leading edge of technical and pedagogical practice.

5. *Curriculum design*: Promote the educational use of digital research resources and develop a comprehensive repertoire of activating pedagogical questions, scenarios, and simulations.

   - Secure funding, and a broader base of participation, to continue development of efforts such as *Digital Dante* and the *New Deal Network*.

   - Find ways to enable K12 schools to participate in Columbia's digital library projects and work with researchers to make their on-line resources and tools accessible in schools to non-specialists.

   - Work with teachers to design and implement ways to enable students to use advanced technologies to support inquiry, problem-solving, and the creation of portfolios.

6. *Professional development*: Implement just-in-time arrangements for technology-based pre-service and in-service professional development.

   - Establish school media centers in 50 or more schools connected to the Columbia testbed and deliver on-demand technology-based professional development through them.

   - Put collaboratories for teachers and administrators in New York City schools into operation and build a broad base of participation in them.

   - Develop a broad range of internships for graduate students who seek to develop improved curricula and classrooms practices for the use of advanced technologies in education.

7. *Policy formation*: Exert leadership in forming public policies through which educative technologies will gain historic significance in fulfilling equitable, humane aspirations.

   - Respond as fully as possible to opportunities to speak out on policy questions and to form public opinion about the uses of digital technologies in education.

   - Defend the integrity and autonomy of public and non-profit educational institutions and use technological innovations to improve their effectiveness.

   - Define new issues and concerns as new technologies transform patterns of feasible practice, rendering familiar conflicts meaningless and making new ones significant.

8. *Web construction*: Activate the Web as a medium for developing and disseminating educational ideas and practices.

   - Complete the thorough revision of ILTweb during the 1999-2000 academic year.

- Construct ILT web resources as tools of program implementation and require all staff to participate in the development of ILTweb.
- Engage a wide circle of teachers and students in the use and construction of ILTweb as an educational resource.
- Develop the theory and practice of using the Internet and the Web as agencies of communicative action in the service of educational initiative.

With sustained attention to these implementation imperatives, the Institute can help shape the way educators use information technology to construct a worthy educational future. Through such effects, Columbia University and Teachers College will advance their leadership in education. Significant opportunities exist through government and industry to win funding for projects of sufficient scale to make a difference in developing the educational uses of technology and the national information infrastructure. Educators can mobilize the means for a great effort. To grasp this opportunity for leadership and excellence, educators need two essentials: commitment and collaboration.

Commitment requires decisive action -- an active decision, a resolve to make the effort required to achieve results. The challenge entailed in the ambition to reform our educational activities is massive; the opportunity to do so is an exceptional historic opportunity – exceptional in two senses, as an extremely unusual opportunity, which occurs rarely in the fullness of time; and as an extraordinary opportunity, which will lead to great historic achievements should we grasp it during the present juncture. This exceptional opportunity merits the commitment of an unstinting effort, one in which we mobilize all the talent and resources required to shift the spectrum of educational possibilities upwards for all.

Collaboration follows from attention to the large, important goal -- the betterment of education and the quality of life. Narrow, cramped visions beget spiteful competitions, each against all. So long as the end-in-view requires a large vision, the many possible projects, groupings, and participants can naturally fit together in a shared effort. The Institute believes that to accomplish the large goal, it must create strong alliances throughout Teachers College, throughout Columbia University, and throughout New York City, and throughout the world of education in all its forms. The Institute invites participation on all levels from the greater Teachers College and Columbia University community, as well as from the community at large. Together let us act to achieve a vision in which all people can use information technology to enable themselves to fulfill their greatest potentials and highest aspirations.