Relevance and Scale
Challenges to the Institute for Leaning Technologies

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¶1:21 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.

¶2:21 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. 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.

- **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.

- **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.

- **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.

This mission is stable. How we pursue it is not. During the period 2001-2002, The Institute is going through a re-examination of our operational objectives, seeking greater relevance in order to work more effectively in a context in which the scale of initiative rapidly escalates.

¶3:21 During the 1990's the long-ranged transformation of education was in a nascent stage. Technologies were immature and the infrastructure available in schools was insufficient. How educators could use a good infrastructure to support educational reform and improvement was not clear. The situation called for limited, exploratory projects. Accordingly, ILT's operational objectives concentrated on funding and implementing multi-school exploratory research and demonstration projects linking classrooms through school LANs to the Internet via high-speed connections and working with teachers and students to develop effective ways to improve educational experience through the use of these resources. Through these projects, ILT has pioneered in finding ways to bring higher education, with its deep cultural resources, into fuller interaction with students in our schools.

¶4:21 Our emergent project-based experience began in 1990-91 when the Dalton Technology Project began — a four-year, multimillion-dollar effort to integrate networked multimedia resources throughout the educational work 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, via Bell Atlantic) 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 5-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 some 70 New York City schools and community-based organizations (CBOs).

¶5:21 These projects have provided ILT with a useful core of experience with attempts to use new media as transformative forces in education. With respect to technology configuration, we have learned that it is possible to get a lot of equipment operational in schools and community organizations, but it is a challenge to reach the point where it becomes integral to the educational work taking place, not merely an appliqué on the surface of existing educational arrangements. With respect to curriculum innovation, we found a vast range of possibilities hindered by some fundamental

tensions that arise within the classroom where the standards movement and high-stakes testing push teachers and students to concentrate on a much narrowed agenda while networked, interactive technologies open the potential discourse to greater diversity in depth. With respect to professional development, we are ever more mindful of the constraints on time binding teachers and the importance of reaching a point where the technology ceases to be an added object of professional development, a further demand on time, and becomes instead a means of efficient action and professional development, one that loosens the constraints under which teachers work. With respect to policy formation, we are increasingly aware that the educational potentialities of information technologies cannot be achieved by working within the school building and school day alone, for the technology is most beneficial when it operates as a linking empowerment permitting home, community, and school to interact in support of each person's cultural and civic aspirations.

¶6:21   Relative to what can and should be, ILT's exploratory projects, along with all others that we have seen, are very, very far from having demonstrated the actual fulfillment of the educational possibilities that people expect educational technologies to enable. Despite this lack of fulfillment, the current juncture is such that we must rethink our course substantially. In essence, the situation in the world of practice is changing very rapidly and the role that demonstration projects in one or a few schools may perform is fast disappearing. It is not that school-based action and innovation is becoming unimportant; it is all the more so, but not as privileged demonstrations, but as part and parcel of the responsibility, incumbent on every school, to provide the best possible educational experiences for its students. Ready or not, full-scale implementation of information and communications technologies is coming to all levels of education, to every school, to each home, throughout the whole community. With that full-scale implementation, everyone needs to exercise great effort and imagination to make it work well. In this context, however, with educational technology becoming pervasive, the scale of the action and innovation in which groups such as ILT operate greatly grows, and the character of our work needs to change in response.

¶7:21   Contemplate the indicators of change in the technological context embedded in our recent experience working in New York City schools. In the spring of 1996, ILT wrote the proposal for the Eiffel Project as a break-the-mold challenge grant, setting for the project what turned out to our surprise to be rather modest infrastructure goals. Between 1996 and 2001, the project proposed to install T1 lines into some 70 participating schools and CBOs, with that connectivity to be distributed to classrooms via school-wide LANs, with workstations for the teacher and for students in small groups of five or so in participating classes. Our primary purposes concerned the educational uses of this infrastructure, especially the curriculum changes it made possible and the professional development challenges that came with the feasibility of different curricular and pedagogical arrangements. Although achieving the substantive deepening of curricula and supporting teachers effectively has proven to be difficult under urban school conditions, movement towards the transformation of technological infrastructures has accelerated far beyond our expectations in 1996. In our field of experience, the actual situation in each school varies considerably according to the complex realities of people and their spaces, but our project

approximated its infrastructure model faster than expected. About mid-way in the project, a variant of the model became the official objective of the New York City school system itself and incorporation of the technology into the system has taken on a life of its own quite independent of demonstration projects such as Eiffel.

¶8:21 Now, full-scale technology deployment is near at hand. In the context of the startling rise of the Internet, the public and its leaders have made some important inferences from the numerous demonstration projects in the schools during the 1990s. They infer that the massive deployment of information and communications technologies is quite feasible. They also infer that the educational benefits of digital technologies are not fully realizable without its full-scale, pervasive deployment. In addition, in places such as New York City, where few expect public education to flourish under a regimen of business as usual, there is a readiness to try aggressive interventions. Hence, as the Eiffel Project is ending, the New York City Board of Education is setting its sights on a startling extension of basic technology goals in the expectation that it may thus turn a faltering system into one that again becomes capable of exemplary achievement.

¶9:21 Towards this end, at the start of 2001 the Board publicized an ambitious request, which sought partners for a pervasive, citywide effort to

- Architect, build, implement, and maintain an Internet portal for the entire Board of Education community;

- Develop and execute a plan for deploying internet or computing appliances and Internet connections (for use both at school and home) to students, teachers, and other members of the BOE community, including training;

- Implement a revenue-generating business model to help finance the development of this portal as well as the procurement and deployment of Internet appliances and connections. (New York City Board of Education, 2001)

¶10:21 With this request, New York City is seeking thoroughgoing educational improvement, system-wide, through the full-scale deployment of educational technology in home, school, and community. The project aims to equip and engage each student and teacher in the system with any-time, any-place connectivity to the Internet and to provide via the Board portal for all the cultural and pedagogical resources to support all educational needs of the entire city-wide public school community — over 1.1 million students, over 80,000 teachers and staff, some 2.2 million parents, guardians and care givers. This project aims to use information and communications technologies as essential resources in the full education of each child, reforming the process of student learning by accomplishing important goals. Towards this end, the project will

- Provide access to the Internet to drastically increase student exploration of the educational resources of the Internet, thereby empowering students to enhance their learning abilities and better prepare themselves for school-based instruction. Students' learning abilities will be greatly accelerated by the vast educational resources and numerous opportunities presented on the Internet, such as search

engines, electronic libraries, multi-media presentations, live performances or lectures, and current advances in scientific research.

- Place Internet technology firmly in the hands of all students, teachers and administrators in order to allow the Board to better facilitate collaborative work and research by both students and teachers.

- Connect both students and teachers to the Internet inside and outside classroom settings, improving teachers' ability to facilitate instruction to meet the needs of the varying learning styles and paces of their students. Therefore allowing immediate implementation of teaching standards in a technological environment.

- Encourage increased interactivity and communication within the Board of Education's learning communities through the use of e-mail, web pages, and electronic bulletin boards. The portal will also enable stronger ties between parents, teachers, students, administrators, and corporate partners.

- Allow for the rapid dissemination of current and future BOE information and relevant content quickly and easily. (New York City Board of Education, 2001)

In May 2001 the Board received a dozen or so responses from coalitions of powerful potential partners and these are under evaluation now with the intention that work on the project will start before the year is over and unfold through this decade into a basic transformation of how public education works.

¶11:21 New York City's project includes a radical method of financing, which may or may not succeed, and if it does not, the move to full-scale deployment of educational technology throughout the city will be delayed. Yet it is a fair probability that during the first decade of the 21st century, system-wide initiatives like the one New York has proposed will start to be implemented the world around, drastically changing the scale of work with technology and education. This prospect poses a significant challenge for innovative groups such as the Institute for Learning Technologies. Groups such ILT, which could take on "large" projects such as Eiffel, more or less sufficient for the task, are completely incommensurate with the scale of innovation that is beginning to unfold. The Board Portal will encompass a comprehensive digital library and set of knowledge tools, providing a school community of 1.1+ million children, ages 5 through 18, and over 80,000 teachers and staff, along with the whole constituency of both groups, with all the educational resources it might need. Costs will be in the several hundred millions. This scale of innovation is simply incommensurate with the scale of action in which groups such as ILT can engage. What, then, if anything, should be the prospective role of ILT in the ensuing efforts to integrate digital technologies into educational practice?

¶12:21 ILT is in the midst of considering this question. With respect to our internal organization, different members of our group have interests in diverse possible answers. At this point it is premature to say that here is what we intend to do in answer to the question. Instead, what follows constitutes some reflections within our process of examining it. In examining this problem of scale, let us set aside for now the four specific components of ILT's stable mission — technology configuration, curriculum innovation, professional development, and policy formation. To know

what we can and should do in each of these areas, we may need to look behind them, so to speak, to find what will be at issue as whole school systems shift their entire operation to a primary base in information and communications technologies.

¶13:21 Fundamental changes bring more than new ways of achieving established purposes. In addition, fundamental changes act to transform the established purposes themselves. It is important for different groups to attempt to explain those transformations of purpose, and to elucidate the significance of those transformations for practical work in the field. Prospectively, it will not be evident which group has it right, but over time, some interpretations of the transformation will wax in influence, while others will wane. Through this interaction between alternative interpretations, over time, a new consensus about controlling purposes may emerge. From its outset, ILT has advanced basic views about the purposes of education and the significance of new media for them. An element of our work, as the scale of technology and education initiatives expands, may involve an effort to chart how changing technologies affect the controlling purposes of the system.

¶14:21 Consider an example. Through much of its work, ILT has tried to call attention to the fact that students are the primary recipients of investment in information and communications technologies in education. We think that equipping students with powerful tools may establish the material conditions for significant pedagogical changes, namely a wholesale change from a pedagogy of instruction to one of construction. Currently the dominant educational activity in schools consists in instruction. Modern school systems have been built as large-scale systems for the delivery of instruction. Throughout the twentieth century, educational research concentrated on improving the methods of instruction, and the lesson, in one or another variant, has served as the primary opportunity for teachers to impart instruction to the young. Instruction locates educative agency in the teacher and the formal curriculum, and characterizes education as a causally effective transmission from the instructor to the learner, a receptive student. This teacher-centered quality in instruction is captured well in the following definition of instructional method by an influential theorist — instructional methods consist in "the provision of cognitive processes or strategies that are necessary for learning but which students can not or will not provide for themselves." (Clark, 1994, 27; cf., Clark and Estes, 1999, 10) Most educational effort deployed in the twentieth century implements this idea that schools must use instruction to provide the input necessary for learning that students cannot or will not provide for themselves.

¶15:21 Now the deployment of digital technologies in education does not change greatly the amount or power of the instruction that schools and teachers can deliver to students. Lesson planning is a well-developed tradition and the school has long optimized its schedule to permit the delivery of many lessons to its pupils. On-line libraries of teacher-reviewed lesson plans may marginally improve the average quality of lessons delivered across the curriculum in the aggregate of the classrooms around the world. But the promise of educational technology lies neither in increasing the amount of instruction delivered nor in making it significantly more effective in transmitting knowledge, skill, and value it the receptive student. Students, not teachers, are the primary users of information and communications technologies in education. For

each agent in a classroom providing what students cannot or will not provide for themselves, there are twenty-five, plus or minus, agents providing what students can and will provide for themselves. Educational technology primarily alters the capacities of this latter, student-driven, educative agency. If instruction denotes input needed for learning that students cannot and will not provide, construction denotes activities that students can and will provide, and construction in this sense is not a constant, but a very significant variable. What students can and will provide themselves can greatly increase with improved guidance, resources, feedback, and stimulation.

¶16:21 Great educators have always worked by driving, challenging, and moving students to test and expand what they can and will provide for themselves. We remember and love, not those teachers who taught us the most, but those associated with our own awakenings to intellectual efficacy; those who conspired in our taking possession of our own educations; those who triggered sustained independent effort, who provoked our resistance, who demanded our taking responsibility for our learning, our capacities, and our convictions. As digital technologies empower students to become more effective in their educative role, so the role of teachers, as they work within the system, changes. Teachers, working as Socratic subversives, have always conspired with students, within the interstices of instruction, to see how far the students can carry their learning. And within a system, optimized for construction, the best way to expand what students can and will do for themselves will be to put powerful questions to them, to confront them with the Socratic awakening that they know they do not know, and to equip them with powerful resources for pursuing knowledge in response.

¶17:21 Initiatives such as that underway in New York City are transformative because they depart fundamentally from the past premise of instructional primacy:

> To date, the Board has focused its efforts on ways to integrate new computer and information technology in the classroom by using a teacher-and-school directed model for technology integration. Using this approach, teachers and administrators have decided how and when students should have access to computer technology for educational use. Further, they have largely determined the pace of student learning about the educational resources available on the Internet and how such resources could be best used to promote high levels of academic achievement. With this initiative, the Board seeks a new paradigm for student use of information technology, whereby students can help integrate the use of technology into their learning through their self-guided exploration, study and review of the Internet's educational content. The end result of this initiative is to advance the Board's goal of creating a more technologically proficient community that will maximize the learning environment of teachers, students and citizens. (New York City Board of Education, 2001)

Thus, the change in scale is also a transformation of type. Study, what the student can and will do for herself, will be a concern at least as large as that of instruction, what the student cannot and will not do for himself. And the role of teachers will be not only that of instructor, planning and delivering lessons, but equally, perhaps

predominantly, that of educator, putting and pursuing questions in the company of others.

¶18:21   In this transformation, we are beginning to see a role that the Institute for Learning Technologies can develop, commensurate with our scale and our commitment to fundamental change in education. In the midst of transformative change, assumptions about evaluation and educational research, along with much else about education, must come into question. Educators have developed practices of summative and formative evaluation, along with much of the structure of educational research, to assess whether innovations, large and small, are sound and worthwhile. Predominantly, this research and assessment proceeds via one or another means of comparing the cost of a specific incremental change with the associated benefit that derives from it. At ILT, we are beginning to contemplate the problem of research and evaluation in which the link between before and after may not permit direct comparison. This work may lead us beyond summative and formative evaluation, introducing a third type — transformative evaluation.

¶19:21   Methods of research appropriate in times of incremental change may not work in the midst of transformative change. The shift from incremental to transformative change in historical situations is like a change of state in physics, most familiar when water boils. Methodologically, the assumptions on which educational research and evaluation has rested are akin to the observational expectations associated with heating liquid water — as one adds (or subtracts) increments of heat to the water one should observe a direct correlation with increases or decreases in its temperature. Of course, as the temperature of the water reaches the boiling point, this correlation breaks down and during a latency period added heat seems to do nothing, with the temperature staying steady and anecdotal evidence occurring to observers in the form of visual reports suggesting that the water is becoming more active, as if it is beginning to stir itself in randomly distributed places. Further input of heat continues to leave the temperature steady, while the water starts to boil, with steam vapor escaping subsequently at a rate commensurate with the input of heat.

¶20:21   People have considerable experience with a change of state in boiling water, in both the laboratory and mundane life. Hence, the characteristics of the changed state, that is steam, are generally familiar, easy to anticipate before a particular pot of water may begin to boil. An historical transformation, which we experience taking place in our collective present, differs significantly, for we do not know much about the changed state that will follow from the transformation. In a transformative situation, neither formative nor summative evaluation is particularly feasible. In a transformative situation, what people need instead is transformative evaluation that tries to identify and understand the essential characteristics of the condition that the transformation is ushering in. The claim above, suggesting that pervasive use of information technologies will create a change in the role of the teacher from the planner of lessons to the putter of questions, might be taken as an initial hypothesis in such an effort at transformative evaluation. Our current questioning, as the scale of work with technology and education mounts, aims at developing procedures for generating, testing, and disseminating in useful ways, a transformative evaluation of the full-scale implementation of information and communications technologies in education. In the

future, we would like to be an active center for the transformative evaluation of an emergent technology-based system of educational work.

¶21:21 In sum then, we anticipate continuing to develop projects at a scale commensurate with our size, within the context of full-scale, system-wide implementation of technology in education. In ILT's projects, we will continue to devote attention to the areas of technology configuration, curriculum innovation, professional development, and policy formation. Our aim in these will no longer be to demonstrate interesting possibilities, but rather to describe and analyze how the emerging educational practices differ from the characteristics of the status quo ante. It is meaningless to compare two different states to each other, seeking to declare one better, more effective, more efficient than the other. They are different. What we need to know are the defining characteristics of the new state. We need to discover what range of conditions are possible within it and what options we have for bringing the better conditions within that new state to fulfillment. Towards this end, ILT will continue to work in New York City schools and communities in pursuit of this knowledge.

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