Risk and Renewal

First Annual Report -- 1991-1992
Summaries and Excerpts

The Phyllis and Robert Tishman Family Project in
Technology and Education

New Laboratory for Teaching and Learning
The Dalton School
1992

To the Dalton Community:

A year ago the Phyllis and Robert Tishman Family Fund gave the Dalton School $2 million to integrate information technology into its educational programs. In the pages that follow, we give a full report on the activities initiated as a result of Mr. Tishman's vision and generosity.

To participate in the Project teachers, staff, and students need to take risks, for it requires us to set familiar practices aside in order to create new ones. It promises renewal in return. That is the theme of our report and of our project -- *risk* and *renewal*. Robert Tishman exemplifies for us all that capacity to accept risk and to achieve renewal.

This report, *Summaries and Excerpts*, is from the full report of our first year of experience with the Phyllis and Robert Tishman Family Project in Technology and Education, which is almost 400 pages in length. If you wish to see the full report, please contact Frank Moretti at the Dalton School, 212 722 5160. The purpose of this summary is to give you an overview and some substance from the very comprehensive effort of this past year. This summary includes the following sections:

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Two lines of effort led to the Tishman Project, one theoretical and one developmental. These provide the foundation for the intense and extensive activity of the past year.

Theoretically, over the past few years several of us have been asking how information technology may alter educational practice. We approach this question from a grounding in history and philosophy. We think that new communications resources, especially high-speed digital networks and interactive multimedia, will profoundly change the curriculum and the way students and teachers can work with it.

With the full use of information technologies, the educational resources of a school will be ubiquitously available and they will be far more extensive and powerful than those currently available to students and teachers. Two features, we think, will be of transformative importance.

- First, all the materials pertaining to the curriculum will be accessible to any student or teacher at any time. The curriculum will cease to be a sequence of compartmentalized units.
- Second, the scope of the materials included in the curriculum, while not boundless, will be much greater than the print-based resources it can currently comprise. The curriculum will provide multiple paths to the highest levels of achievement in all domains of the contributing culture.

These two features -- a transformation of scope and a transcending of sequence -- will profoundly alter the constraints of the current system, radically changing its limits and methods.

Practically, work had begun at Dalton through the New Laboratory for Teaching and Learning on innovative programs in technology and education. Starting in 1988, the New Lab initiated design and development work on two programs that are now coming to significant fruition -- *Playbill*, an interactive multimedia system for studying dramatic literature, and *Archaeotype*, a cooperative, archaeological simulation for the study of history. In addition, Malcolm Thompson had begun to explore the possibilities of using computer-based sky simulations as a means of reorganizing his High School Astronomy elective and a group of seniors started working through a history elective sponsored through the New Lab on the *Civil War CD-ROM*. All these projects have burst into flower with the added support of the Tishman Project and external evaluations of them form the centerpiece of this *Report*.

In addition to these four projects, numerous other activities have been initiated during the past year. In the First Program, we are endeavoring to introduce a coordinated use of computers in every classroom. In addition, we are setting up a model technology center in the 91st street building in which classes can work more intensively with tools of inquiry and communication. In the Middle School, we seek to integrate computer resources into the study of writing and mathematics and are working closely with the Director and Faculty in a major reorganization of the program and schedule in the sixth, seventh, and eighth grades. In addition, extensive further development of *Archaeotype* is taking place, extending its historical scope to new sites. Similar in spirit, *Ecotype* is a new simulation under development in the earth and life

sciences. In the High School, while *Playbill* in English, *Project Galileo* in Astronomy, and the *Civil War Project* in History are moving forward, other areas of initiative are gaining significance -- Foreign Language, possibly Chemistry, and certainly Art and Architecture.

During our first year, initiation of the Dalton Network and Multimedia Library absorbed much effort. The library will comprise a comprehensive, selective representation, in digital form and multiple formats, of key phenomena of the world and of humanity. It will include a full repertoire of the cultural tools that people use to interpret these phenomena, in examples that range from the most simplified to the highly sophisticated. With the network, we seek to make these resources available throughout the school.

In all, during 1991-92, the project spent $1,010,000, with a similar amount budgeted for 1992-93. For the past year, $475,000 went for faculty and staff salaries and wages, about half for Tishman Project staff and half for members of Dalton's faculty and administration. $435,000 were spent on Equipment, the bulk of it for computers and accessories and a bit over $100,000 for network installation and components. An additional $79,000 went for Materials -- space renovations, software, and the like. We give fuller details on expenditures in Section 6 below.

For 1992-93, we expect a year of sustained, intense activity. 1991-92 was a start-up year with many energies absorbed in the initial implementation of systems and programs. During the coming year, we will have more time and energy for reflective practice. It will be an opportunity to understand the educational dynamics of our projects. These seem to share some important characteristics. An editor of *Electronic Learning* recently spent a morning looking at different projects and the work students did through them. Toward the end she observed that she had seen elsewhere innumerable fruits of computer-based activities that students had conducted but those at Dalton stood out remarkably for their substantive depth, for their intellectual consequence.

This observation points to an important quality of the educational innovations that we are implementing through the Tishman Project. Our programs do not teach; rather they engage students in the work of scholarship and inquiry. Consequently, our programs result, not primarily in predictable learning, but more importantly in activities of intelligent inquiry. In the coming year, we should extend the reach of these programs further through the school and attend to their dynamics more reflectively. And we should ask incessantly, 'What makes these programs work educationally?'

To accomplish this, we should devote sustained attention to some difficult questions. Can we develop a better understanding of how students learn and develop with intensive use of information technology? Can we document the ways in which this learning and development differs from that in traditional settings? Can we explain to ourselves and others the principles which make it happen? In the pages that follow, there are many hints of answers to such questions. The Tishman Project, the New Lab, and the Dalton School are sites of immense educational vitality because daily experience puts such questions to us all.

Co-Directors of the Tishman Project:

Frank A. Moretti, Executive Director, the New Laboratory for Teaching and Learning, and Associate Headmaster, The Dalton School

Robert McClintock, Director, The Institute for Learning Technologies. Teachers College, Columbia University

Luyen Chou, Associate Director of the New Laboratory for Teaching and Learning

Tom de Zengotita, Teacher, The Dalton School and Professor, New York University

A Glance Back at a Look Ahead

In the 1984 Dalton School *Annual Report*, Gardner Dunnan, headmaster of the Dalton School, reflected on an education appropriate for the next century and set forth five "next steps."

"We believe that in shaping a curriculum for the future the direction should be:

- more to asking questions rather than providing set answers,
- more to developing skills of cooperation rather than competition,
- more to nurturing a global perspective rather than a narrow national view,
- more to functioning in a 'post-chip' rather than a 'pre-chip' world, and
- more to preparing students to live in a world of scarcity rather than a world of plenty."

These steps characterize the Tishman Project well. Here are some excerpts from the evaluations and proposals included in our full annual report. They indicated how these steps have become deeply embedded in the work of the Project.

Apropos *Archaeotype*

. . . The real work done in these classes, therefore, is synthetic thinking, a demand more often made only on students in upper-level university courses. It would be difficult to overstate my admiration for the results of the program and those who have brought it to life in the classroom. The sixth and seventh-grade students at Dalton have, first of all, learned an astonishing amount of information about the ancient world. Students know who fought in the Persian and Peloponnesian Wars, and why, and when; they know Themistocles and Pericles; they understand what ostraka are, and why they were used. I had a long discussion with one group about Archon-lists (!) They had found in their quadrant a fragment of stone engraved with the names of Archons and were in the process of creating short biographies of the characters. Most of us who instruct first-year university students scarcely flinch when bright undergraduates from good schools don't know that Greece "came before" Rome, that the Homeric poems are in Greek and the *Aeneid* in Latin, or that Athens in the fifth century was special. I was frankly stunned to hear sixth grade *Archaeotype* students at Dalton correcting each other in class on the dates and places of Greek history, and making detailed contrasts between the artifacts used in the fifth century and those used in Homeric times.

Students have acquired a well-developed sense of the intellectual, as well as the material, culture of the Greeks. They are thoroughly acquainted with the myths and legends of the Heroic Age; they understand which gods the Greeks worshipped, and what their chief attributes were. I was further impressed that students knew how these mythologies and theologies were practiced and applied: one group explained to me that myths of the Amazons were used in Athenian literature and art to reflect the Greeks' pride in their victory over Persia; other students made some interesting guesses about an engraving of Heracles and Apollo fighting over a tripod at Delphi. These are giant steps, in my opinion, for students so young to have taken: *Archaeotype* students have a solid elementary grasp of the sweep of Greek history and culture, and an impressively precise knowledge of the major events and historical milestones. Best of all, they have more than the handbook views and stock opinions so often imparted by traditional courses. Students are learning how to deal with cultural studies in three dimensions, and they have begun to understand what lies behind the two dimensional accounts of the past found in text-books.

> ...nurturing a global perspective rather than a narrow national view...

I would like to add a further observation. When a culture and its people are treated as idealized and monolithic -- "the glory that was Greece, the grandeur that was Rome" -- the game is over before it begins. Few students will ever love or understand or be changed by these larger-than-life creations that seem to exist only on the shelves of a Great Books series. *Archaeotype* students instead absorb history and culture piece by piece, one stone at a time. They know the general facts that any teacher wants students to have learned, but they have gone beyond the mystique

and venerability that obscures the true beauty and real greatness of antiquity. For these students, Homer, Pericles, and the Parthenon have ceased to be remote and inaccessible objects; they have human size and proportion, and have the potential to be sustaining presences in students' personal and intellectual development. . . .

From "Evaluation of *Archaeotype*," Professor Mark Petrini, Department of Classics, Columbia University.

Apropos *Project Galileo*

. . . A further indication of this enhancement of control lies in the following episode: in one laboratory session (exercise) which I observed the instructor provided the students with basic data on the four largest satellites of Jupiter, including the sizes of these objects. The students were asked to input this information to the computer, calculate other properties of the satellites from those given, and display the results in spreadsheet form. One subset of the data supplied was incorrect (too large by a factor of 2): diameters rather than radii had been supplied by the (wily) instructor. As a result the calculated densities of the satellites were uniformly low (by a factor of 8 !) indicating that all of these bodies were lighter than water, and indeed that all were lighter than Jupiter itself. As the results appeared on the screen, the students were quick to notice the anomaly, to sense that its implications were unreasonable, and to conclude that some component of the data provided was erroneous. The instructor (of course) was quick to pinpoint the "error", and (with a wink in my direction) inform the students how to compensate for it. The point was made, however: the students were tested and they passed with flying colors.

Thus, the students' general awareness of planetary relationships, their intellectual reflexes, and their recall of previously learned facts and previous calculations of their own, are all very strong. They were well aware that the smaller objects in the solar system are by and large more dense than the larger bodies, they remembered and understood the basic relationships between mass, radius, and density, they were able to recognize an unusual result immediately, and to speculate what its consequences would be were it "real." they have mastered both the concepts and the facts.

Many times during my own career as an instructor, I have deliberately thrown an outlandish "curve ball" at my students as a test of their reflexes, understanding and recall, and almost always I have been disappointed with the reaction -- or lack of reaction. I was surprised, delighted, and impressed to observe the reaction of the Dalton students to this test, and I can only conclude that the hands-on approach to the subject made possible by Galileo is responsible for their superior comprehension of the material. . . .

...asking questions rather than providing set answers...

From "Evaluation of *Project Galileo*," Professor Joseph S. Hogan, Dean, School of Engineering, State University of New York, Stony Brook.

Apropos *Archaeotype*

. . . I was impressed and surprised, finally, to see the way in which girls in the groups formed bonds, and how they learned to interact together and to work out problems. At one point during a discussion session a student felt that she was lagging behind her group-members, and worried that she was being excluded. The teacher took all four students into the hall, and together they worked out a solution in a few minutes; later in the discussion the same student spoke up and offered her own ideas, and seemed to have been brought back into the fold. This incident strikes me as a fundamentally significant pedagogical event. Such problems, with different theme and variation, are a constant fact of all classroom life, and the hope of every teacher is that they be brought out into the open and resolved. In a conventional class, unfortunately, the student would have grown increasingly diffident and frustrated, and slipped further and further out of reach: I would also guess that a female student might be less likely to ask for the attention she needed. The fact that the student did ask for help speaks well for the ambiance that *Archaeotype* creates; it may further suggest that a small. single-gender group gave her the freedom and the confidence to speak up.

...developing skills of cooperation rather than competition...

At the very least it is clear that this project can be used in such a way that it does not exacerbate the familiar problems of gender-bias, and it can even be used (as I saw in action) to begin to serve as a remedy.

From "Evaluation of *Archaeotype*," Professor Mark Petrini, Department of Classics, Columbia University.

Apropos *Playbill*

. . . A curious consequence of the "experimental" aspect of the unit -- the presence of evaluators -- was that students became self-conscious about the way they were learning. They enjoyed talking pedagogy, playing guinea pig, comparing the *Macbeth* unit to traditional ones, and seemed to pride themselves on their mastery of the play and the computer. As with the finished products, however, the process itself was by no means uniform. Some groups revealed a high level of interactive energy, playing off one another's ideas, struggling to wrest control of the keyboard. In other cases there was resentment within the group that some had shouldered the burden for others, and that the chain was going to be judged by its weakest link. . . .

From "Evaluation of *Playbill*," Professor Joseph Voelker, Department of English, Franklin and Marshall College

Apropos the *Civil War Project*

But probably the biggest surprise for me was to see how powerfully the students had been affected by the experience of historiography. Through close examination of the values and bias of a renowned television documentary on the Civil War and of written history, they acquired the habit of seeing the historian behind the history. Five separate students brought up historiography as a personal turning point. "I was never that interested in history," said one. "But this year we saw the real problems historians face with bias, with what is a fact." What was the turning point for you, I asked a second student? "Deconstructing Ken Burns. Watching someone critically examining something I might have taken for granted." A third student, whose project consisted of deconstructing images, explained that "Mr. Napoli got me started on this. At first I was all caught up in Burns. But he showed me how manipulative he was." To a fourth student, the historiography and her own multimedia project were the high points, and in her mind they went together: the historiography showed her that much of what is taught in school "is really society talking," and the project gave her a chance to talk for herself, without either a teacher or the requirements of a linear paper imposing artificial limits on her work. All these students felt the power of the historiography and the connection between it and the multimedia project. The decisions which the project forced them to make -- which links, which documents, what commentary to include -- brought home to them the complex historiographical issues of bias. As a fifth student said, "the first revelation was in class, [which was] then supported by the project."

> ...asking questions rather than providing set answers...

From "Evaluation of the *Civil War Project*," Professor Steve Golin, Department of History, Bloomfield College.

Apropos the First Program

. . . Karen Bass' third grade began the school year studying about water. Studies included: Where does water come from? How is water important to human life? How can we preserve our water supply? Can we substitute anything for water? What if our water stopped? The class visited the Central Park Reservoir and found the answers to many of these questions.

> ...preparing students to live in a world of scarcity rather than a world of plenty...

The 6 week archaeology unit had The New York Harbor as its site. A guest speaker from the Museum of Archaeology brought old maps of New York City and actual artifacts that were found in lower Manhattan. The class began to piece together what life was like many years ago. The students began their excavation and examined the artifacts found on each level. They drew pictures of the artifacts they found. Students discussed each level and then constructed murals to represent what they believed took place during that time period. Each group presented their mural with a detailed explanation.

In the next phase of the project the use of computers was incorporated in many different ways. The class made a list of possible research topics. Each student was able to choose his/her topic. The students were given the opportunity to gather information from many resources. During this time they were taught word processing and various tool programs. Most of the students learned *Microsoft Word* or *Bank Street Writer*. They learned how to create a file, save and retrieve a file, edit, and print a file. They used *Kid Pix*, *Mac Paint* or *Print Shop* to create their graphics. A booklet was assembled that included their research and pictures. Each child was given a copy of the book and created an individual cover. As a

> ...functioning in a 'post-chip' rather than a 'pre-chip' world...

culminating activity students planned their own diorama time capsules. The poetry unit was enhanced by having the students choose an object from their time capsule and write a Haiku using their newly attained computer skills. Oral presentations then took place.

At the end of 6 weeks the class began to study the harbor with a concentration on the New York City Harbor. They discussed the history of the harbor. How the harbor was used for trade. Why the harbor was moved to Port Newark. The role the harbor plays in a community. A comparison of a United States harbor to a foreign harbor was made. The teachers worked diligently with the school's environmental consultant and with the Museum of Natural History consultant. The class took trips to the South Street Seaport, Ellis Island, a lighthouse and a Circle Line boat ride. Members of the U.S. Coast Guard came to the classroom as guest speakers. Current events relating to our topics of study were discussed. The use of technology in research projects continued to be integrated into these areas of study. . . .

Form "The First Program: Retrospect and Prospect," Karen Bass, First Program Technology Coordinator, and Eileen Gumport, Design Associate.

Apropos Fourth Grade Writing

. . . I am always laughed at when I say that I need 19 or 20 computers during class session. Yes, I know we have no facilities like that, but that is because you (or those who decide on hardware purchases) do not place value on writing and computers. I think the other New Lab projects are great. I just don't see why the school can't also consider less sexy projects like a writing lab or writing project. I have proposed to Peter and will now propose to you that since there is no space available for 20 computers, then buy 20 laptops (they don t have to be the most powerful on the market, don't worry about datedness, after all I am using ancient Apples in my classroom right now) and have a location where a teacher can sign them out for a class session. If control is a problem I would be happy to help. I'll set up a schedule, see that they are powered up, whatever is needed. With laptops the space problem would be eliminated. Also, if these computers were meant primarily for writing the other labs would be freed up for other projects. The laptops could also solve another problem -- equity. It concerns me that while many of our students have computers, some don't and don't have the resources to get them. They need to be aided in access to computers for writing so they can have the same advantages that writing on a computer provides. . . .

> ...functioning in a 'post-chip' rather than a 'pre-chip' world...

From "A Plea for Support," Monica Edinger, Teacher, Fourth-Grade English.

Apropos *Archaeotype*

The physical remains of the Neo-Assyrian Empire are among the most spectacular produced by the ancient world, on a par with those of Egypt, China and Greece. Large scale stone sculpture and bas reliefs mirror some of the earliest examples of political propaganda extant. We see the king in battle, on the hunt and at prayer. Moreover, we hear that king in his own voice tell the story of these, his sacred acts. For Assyria has preserved more of the ancient world than awe-inspiring demons of basalt. Among the marvels of antiquity saved for us by the desert are the great libraries of Nippur, Nineveh and Ebla. What vocabulary, both verbal and pictographic, do these men use to present themselves and their doings? To whom did their annals speak? Who was the audience for their reliefs?

> ...nurturing a global perspective rather than a narrow national view...

Since the iconography of the Assyrian palace reliefs is generally inconsistent with the ecology of the region as we know it today and as we believe it to have been at the time of the Empire some important factor must have encouraged the Assyrian kings to carve and paint flora and fauna that they rarely if ever saw. What was that factor? Both the texts and the reliefs give us detailed descriptions of the flora and fauna of the time. Thus Assyria gives us as an excellent opportunity to study subsistence bases and their relationship to religious practice, and political, military and economic institutions. . . .

From "*Archaeotype* Review and Proposal," Mary Kate Brown, Ph.D., Teacher, Sixth-Grade Social-Studies.

Apropos *Archaeotype*

First, the archaeological simulation appeared to be a powerful means of motivating extended, self-directed student inquiry. Students routinely came to class early to begin excavating, and many spent lunch hours in the classroom as well. The unit as a whole was repeatedly extended, from six to eight weeks, to ultimately more than sixteen, as the momentum of student investigations, and the desire to present findings thoroughly, did not abate. From the outset, students' sense of ownership over knowledge was reflected in their frequent talk of "our artifacts," "our findings," and "my theory." It seemed clear that both the experiential and the visual aspects of the program contributed greatly to its success in motivating students.

...asking questions rather than providing set answers...

Second, *Archaeotype* helped students and teachers work in a variety of shifting configurations and roles. Over the course of the inquiry, students functioned as team-members, dividing up the tasks of excavation, research, and interpretation; as independent researchers, consulting resources and teachers throughout the school; as colleagues, sharing findings and arguing over interpretations with members of other teams; and as authors, writing summary monographs on an aspect of Greek culture. Teachers, no longer responsible for motivating and organizing student activities on a day to day basis, were able to function as intellectual coaches, guides to resources, content experts and, where necessary, as co-investigators.

...developing skills of cooperation rather than competition...

Third, *Archaeotype* helped mobilize students' use of a wide range of resources throughout the school, and beyond. Students consulted on-line libraries of images and texts, videodiscs on classical art, library books on Greek history and myth, teachers in archaeology, philosophy, and ancient languages, the computer programmer, and the collections of the Metropolitan Museum. To build their interpretations of individual artifacts and the site as a whole, they collected print-outs of their finds in group portfolios, plotted their data on site maps, and annotated both of these. Over time, students made increasing use of visual resources like maps and timelines, as they struggled to make sense of increasingly complex data. Finally, for several groups, the inquiry culminated in the writing of HyperCard documents that grouped and linked their own and other's findings in multiple ways, representing their conclusions visually and experientially, as well as textually.

...functioning in a 'post-chip' rather than a 'pre-chip' world...

From "Digging History: *Archaeotype* and the Development of Historical Reasoning," Bill Tally & Margaret Honey, Bank Street College of Education.

Apropos *Ecotype*

. . . What is it that will motivate students to plunge into *Dinosaur Canyon* and engage in inquiry? In the attached assignment, students are asked to first examine a paleoenvironment, then a geological succession, and then to create their own geological succession. The compelling questions arise naturally from the tasks, and can be summarized as follows:

(a) Paleoenvironments: What was this area like at this time? Build a picture of the environment -- describe, draw, make models of it. Imagine that you stay there for a day.
(b) Geological successions What was the story of this area? Imagine the area changing over millions of years before your eyes -- like a speeded up movie. What happened? Why?
(c) Build your own succession: Can you use your imagination and what you have learned to build a geological history of your own?

The function of the teacher is to help the students to ask useful questions, and to provide structure and guidance. Once the inquiry is under way, it will have its own momentum. . . .

From "*Ecotype* -- Dinosaur Canyon: A scientific expedition from the classroom," Malcolm Fenton, Ph.D., Science Teacher, Middle School and High School, Rachel Bellamy, Ph.D., NLTL Software Engineer.

Apropos *Project Galileo*

. . . The notion of "LEARNING" as primary -- though often nebulous, mostly test-driven -- course activity became an incidental side effect of "DOING". When alumni of academic courses are asked about the courses they usually say "*We learned* this and *we learned* that". When asked about Astronomy they say, "*I did* this and *I did* that". Yet when asked a specific astronomy content question they will either speak knowledgeably on the subject or ask to what experience the particular concept connects. There is no sense of what they are "supposed to know". There is only an honest sense of what they do know and what they don't

know. But what they don't know is not viewed as being beyond their ken. It is simply seen as something not yet encountered and mastered. This attitude makes these students largely indistinguishable from science-oriented students. That outcome is a completely new one for this teacher. . . .

From "Project Manager's Assessment -- Galileo," Malcolm H. Thompson, Teacher, High School Science.

Apropos *Playbill*

. . . For example, if we are going to ask our students to work in collaboration with each other, to make use of interdisciplinary critical resources, and to do innovative in-class presentations, it is clear that teachers will need to take a more active role in working with students to teach them how to do these tasks, to provide some useful models for student work. More collaborative exercises should be built into English courses using *Playbill* prior to that unit. . . .

...developing skills of cooperation rather than competition...

From "The *Playbill* Project -- Directions for the 1992-1993 School Year," Steven L. Bender, Chair, High-School English Department.

Apropos the *Civil War Project*

. . . History is almost entirely historiography. It is all about reading documents with a critical eye, and learning how to extract what is useful, even from the most blatantly biased accounts. For everything and everyone has some sort of a bias, including textbooks of course. This is not necessarily bad, but it cannot be ignored. That is why it is extremely important to teach history students to critically examine everything. When textbooks are presented as fact, no matter how even handed and objective those textbooks try to be, the student is denied an important skill. What students learn is one view of history, instead of learning how to explore and discover history themselves. It is as if a math class taught students the right answers to many math problems, but not how to get them. But it is even worse in history where, unlike math, there's no single "right answer".

...asking questions rather than providing set answers...

To say that there's no one "right answer" in history is not to say that there are no wrong answers. There are an infinite number of right answers, but many things fall outside that infinity, just as there are an infinite number of points on a number line between 1 and 2, and yet the number three is not included. Historical "fact" is like a physical object such as a tree in that, like a tree, it does exist in a certain way, and yet there are infinite ways of viewing it -- from above, below, the right, the left, and any conceivable angle in between. It is not possible to conceive of what the tree really "is" without filtering it through our five senses, and thus what we get is only our *view* of the tree. But although an infinite number of views are valid, it would be wrong to say that the tree has pink and purple polka dotted leaves when in fact it is the middle of winter and the tree has no leaves. This analogy holds true for the "facts" of history. . . .

From "Teaching History Through Multimedia Technology," Sarah Shapiro, Student, Twelfth-Grade History.

Teaching *is* the teacher's function. But learning, in passive response to the teacher, is not the job of students. Study is their business; and the motive force of education is not teaching and learning, but teaching and study. In designing a curriculum, educators should not pose the impossible question of what ought to be learned; rather they should put to themselves the more productive, restrained question of what opportunities for study should they offer to the young. What opportunities for study should they offer? What agencies should they use? What helps should they give? These are among the important question that educators would pose if they saw the motive force of education to be a process of teaching and study.

Robert McClintock
"Toward a Place for Study in a World of Instruction," 1971

"The Finest School in America"

June 20, 1992
Dr. Gardner P. Dunnan
The Dalton School
108 East 89th Street
New York, NY 10128
Dear Dr. Dunnan,

Thank you for your very kind and flattering letter, which I truly appreciated. I felt honored when elected Master of Ceremonies of our graduation, and relished the once in a lifetime opportunity to bring together the students, parents and faculty in a final affirmation of self-achievement through the generosity, intelligence and love for education of the group. Indeed, after speaking with many friends and parents, I think the ceremony successfully engendered reflection on the past, and became a real spiritual, emotional catalyst for optimistic dreams of the future.

Speaking from my own experience at Dalton, I certainly cannot thank you enough for heading an institution that has shaped so much of my mental and spiritual life. How can a child thank its parents for creating it? The human infrastructure of Dalton's system of education coupled with the irreplaceable gifts of the teachers themselves have mothered and fathered me in the vast and sometimes confusing world of information. Dalton has laid a solid yet pliable foundation for my character, which at this point interweaves all of my personal experiences with the set standards of knowledge. As a result of my five years there, my strong motivation to create the new standards has been given the means to specify and realize what were once barely comprehensible impulses, which I feel will be further galvanized by the accumulation of time and thought. If invisible knapsacks do exist, then Dalton packs them well and leaves plenty of room for personal belongings.

However, before I disappear into the jungle, I feel the necessity to leave some affective words of gratitude for the idealism and humanity of the teachers at Dalton, whose qualities and presence in the school environment reach far beyond the plainness of a text, and so subtly yet powerfully introduce us into that exciting realm of abstraction, otherwise known as the mind. They are truly amazing.

But as society changes so must its education, and I hope you will continue to support and expand the necessary innovations implemented by teachers and departments such as the New Laboratory for Teaching and Learning. Because as a student, the removal of deeply ingrained confines in the classroom is like a Renaissance of the learning process, especially when the teacher discovers new concepts as well. Although I am very content with my education so far, it was built on a tangent to the Dalton Plan, the ideals of which I hope will increasingly become realized into the structure of what I consider the finest school in America,

Sincerely,
Michael Goldstrom
Class of 1992

"If it ain't broke, don't fix it!" Why risk change at Dalton? Its leadership is strong; its teachers are dedicated and humane; its students excel. The cliché of complacency would seem to apply here, if anywhere. Yet two reasons demand that we nevertheless risk renewal.

First, however good Dalton's education may be, American education as a whole is broke. In a floundering system, elite schools cannot stand on their laurels. If the best cannot point the way to renewal, there is little hope that mediocre and lagging institutions can fix the system.

Second -- a point deftly grasped in this letter from a recent graduate -- Dalton's links to its own unique traditions, if not broken, are tenuous. The Children's University School, built to nurture education through experience according to the Laboratory Plan, has become a pre-eminent college-preparatory school. External pressures -- SAT's, predictable coverage of the standard subjects -- increasingly shape our practice. Dalton can innovate and lead by renewing its own traditions -- that is the essential purpose of the *New Laboratory for Teaching and Learning.*

Project Evaluations

It is unusual, in the first year of development projects, to have external evaluations of results. Yet if we are to risk innovation in a going, successful school, it is essential to do so. As we implement programs in the classroom, we need to initiate their evaluation, to ensure from the outset that they are worthy components of a Dalton education, meeting the school's established standards and contributing appropriate increments to each child's development.

In our first year, four specific projects have reached the classroom -- *Project Galileo*, an eleventh and twelfth grade astronomy elective; *Archaeotype*, a substantial component of sixth grade social studies work; *Playbill*, a unit in the tenth grade literature course; and the *Civil War Project*, an eleventh and twelfth grade history elective. We present here the formal evaluations of these. Each major project evaluation consists of a report by an outside evaluator with established credentials in the field of study. We preface these with some general observations.

Of the four projects, only *Playbill* suffered at all (and only occasionally) in comparison to more traditional pedagogy. Criticism of the *Civil War* course came from all sides, and was sometimes fairly intense, but the underlying assumption was that "this is the most exciting history course ever." It was criticism from the converted. As for *Galileo* and *Archaeotype*, the only substantial negatives came from the project developers themselves; that is, from artists ever unsatisfied with their own work. For an observer familiar with the developmental history of all four projects, the first general lesson is unsurprising, but important: the success of the projects was proportional to the amount of quality time and energy that New Lab staff, faculty and students were able to give to them in the classroom setting -- that is, in the laboratory as the Dalton Plan originally conceived it.

Thus, while software essential to *Playbill* was under development by the New Laboratory before the Tishman grant, actual classroom implementation began only in the spring of 1992 and was sandwiched into a six week period in what was otherwise a conventional Drama course. Both *Galileo* and *Civil War* experienced "shakeout" periods during which students and faculty adjusted to the demands of the new technology and to the teaching and learning expectations that went with it. *Playbill* was in shakeout mode for the duration. No wonder *Archaeotype* escaped that limitation this year. It has been used in the classroom for two years, and also because sixth graders, unlike their already regimented counterparts in High School, are still flexible enough to jump right into whatever activity presents itself. From the developmental point of view, the conclusion is obvious: the possibilities of *Playbill* -- and of the "notebook," a key new project which it foreshadows -- remain to be fully explored in the only setting that really counts, the classroom as laboratory. With that said, it is all the more striking to notice that, in spite of the difficulties, all three of the (technologically naive) teachers involved are committed to further development.

The *Civil War* project may seem to violate the overall investment/success ratio rule, since it elicited a massive effort from all participants but took more criticism than *Archaeotype* or *Galileo*. But that impression evaporates when the aspirations of the Civil War course are understood. Of all the projects undertaken so far, it is most informed by the New Laboratory's long range vision of education in the 21st century. It is the least modular, the most open-ended, of all the projects. It was that visionary dimension which kept *Civil War* students coming to Dalton to work on their projects until the end of July.

Personal Note

Of the four members of the Executive Committee for the Tishman Project, I have long held the most skeptical view of our enterprise. My orientation towards scholarship and teaching is deeply traditional. I believe colleagues and students must struggle with the great texts through extended conversation, face to face, day after day. I don't trust the new communications technology -- in fact, I am a bit suspicious of technology, period. But any careful reader of this evaluation package will realize why I have been forced to suspend my skepticism. Critical of particular applications I remain, but never before in my career have I seen such a variety of students brought to so intense a level of engagement in so many different subjects.

Tom de Zengotita

A second general lesson can be drawn out for emphasis. The success of these projects establishes a claim which progressive educators since Rousseau have always made -- namely, that learning is doing and not memorizing. The hoary old issue in debates with proponents of traditional pedagogy simply goes by the board in the context of the new technology. No judge of these projects can reasonably say: "Yes, I can see the kids really love all this, but are they *learning* anything?" Dr. Joseph Hogan, evaluator of the highly factual and densely conceptual astronomy project, was unequivocal on this crucial point: ". . . the Galileo format is such that by seeing and doing the students are far more likely to recall nontrivial facts, and to appreciate and understand the concepts, than they would were the course given in the conventional format. There is no question about this."

A third general lesson goes to the heart of the matter, and can be stated as an overall conclusion. Compared to the traditional text-based classroom, the educational environment provided by the new technology is more intellectually stimulating more of the time to more people -- faculty and students. On one level, this comes as no surprise; multimedia grip human attention through all channels. But, on that level, the new technology appears to many to be more a danger than an opportunity. But any impartial reader of the documents to follow will quickly realize that the Tishman projects are not about audio-video buzz. This is *interactive* multimedia, and not only in the usual computer sense of the term, but in extended senses as well: interactive in the personal dynamic which is set in motion among students and teachers; interactive also with respect to other resources like museums, libraries, university professors, pictures, buildings -- and, yes, books too. The outside evaluators especially were impressed, even awed, to see the wealth of materials involved in these projects, quite apart from the technology. But these materials were not, so to speak, brought up to school in a giant truck and dumped onto the courses. The other resources were recruited by the intellectual and even moral imperatives that were built in to the projects themselves. What the technology allows and propels is a situation in which more people are driven to interact as learners with an enriched environment because they have ownership of those imperatives. The first premise of the New Dalton Plan is: education begins with and is sustained by compelling questions that arise spontaneously in settings which allow people to pursue them successfully. The overall conclusion, the fruit of a year's labor by many dedicated students, teachers, staff, and administrators is quite simple: in the environment we are creating that kind of education is more likely to happen.

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Proposals, Reports, and Initiatives

Education should not be a dumb matter of trial and error. It moves instead through cycles of trial and reflection. Both teachers and students flourish when they become reflective practitioners, people caught up in practical actions yet moved continuously to reflect about the what and the why of those efforts.

Reflectivity should continuously inform work supported through the Tishman Project. Too often technology gets put into classrooms, unreflectively, without thought about its purpose or about the processes for using it well.

In managing the Tishman Project, we are trying to engender reflection among its participants. We want specific projects to be rooted in the goals and concerns of specific teachers and groups of students. But teachers and students must possess those projects, not as entitlements, but as reflective achievements. For that reason, we expect participants to keep developing proposals, plans, and reports, and we will not support proposals that seem perfunctory and thoughtless.

Dalton is uniquely positioned as an innovator in technology and education. It is a resourceful school -- kindergarten through twelfth-grade -- with strong ties to important cultural and academic institutions. Almost all public schools, and many private schools, serve only one or another age segment in the school population. Yet the benefits of technology in education will not neatly unfold according to those established divisions. At Dalton we can work in a coordinated way with students from the beginning of schooling through entrance to college. Apart from anything else, this gives the Tishman Project a great strategic importance.

We present a variety of working documents in the pages that follow, starting with our internal call for proposals. The purpose of the Tishman Project is not simply to install as much technology in Dalton as we can. It is to use technology in the systematic improvement of educational work at Dalton. Our request for proposals, circulated in the Fall of 1991, invites the Dalton community to think through what they might do with new information management tools. We then offer a sample of internal proposals, plans, and reports in a way that accentuates our commitment and ability to work across the age spectrum. Some of our developments are school-wide in conception. We present documents relating to these first. Then we work up the age ladder -- First Program, Middle School, and High School. We conclude this section with a working summation by Tom de Zengotita, beginning to extract from our first-year experience key educational and technological principles.

Another key advantage to our project, in addition to our working across the whole chronology of a child's development, is our ability to work across the whole range of technical opportunity. We define this by the short-hand terms "Builds," "Buys," and "Infrastructure."

"Builds" are programs that we design and create, using the active classroom as the development site. *Archaeotype*, the *Civil War Project*, *Playbill*, and *Dinosaur Canyon* are examples of "builds" taking place through the Tishman Project. It is difficult to use the classroom as a development site, but very fruitful. Developers who look at educational settings and then retire to distant development labs loose a major creative opportunity. In their labs, what they saw in the classroom tyrannizes their creative imagination -- they basically design for a static image of classroom practice. By working in the classroom, we can design much more freely, working iteratively with teachers and students to discover new ways to use school space and time. Rapid prototyping resources and techniques make such on site design and development possible.

"Buys" are another way to make software development responsive to the realities of education. Many software vendors and publishers try to develop turnkey systems for schools -- "integrated learning systems" in their jargon. These are not at all what we mean by "buys," and they have no place in the Tishman Project. The opportunity for "buys" in our sense arises because the marketplace is generating an incredible diversity of software that educators can select and deploy to facilitate the work of teachers and students. *Project Galileo* in astronomy is our pre-eminent example. Both professional and amateur astronomers are developing all sorts of digital resources to serve their purposes. We are acquiring these and combining them with programs designed for the general marketplace -- spreadsheets and the like -- to make a novel environment for the study of astronomy.

"Infrastructure" is in part the sum of our "builds" and "buys," but it is also a distinct effort in itself. We think that information technology will deeply transform the intellectual experience of education. For centuries the curriculum has been stepped, with specific treatments of specific subjects allocated to specific grades. This is the sequential, graded

curriculum, in which particular materials are available only to particular children at particular times and places. We think the *graded curriculum* is giving way to the *cumulative curriculum*, in which all materials will be available to all students at any time and place. Our effort with "infrastructure" -- the Dalton Network and Multimedia Library -- aims to make the cumulative curriculum possible.

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How misleading it is to speak of 'Technology-based education.' How could education be otherwise? From epic and dialectic to pen and printing press, from the elenchus to the thesis essay, from the market forum to the little red school house, teaching and learning have always been based upon -- some would argue defined by -- the available technologies. The inextricable bond between technology and human activity is in evidence all around us. A business executive ports his office, in the guise of a cellular phone and a notebook computer with fax modem, to a meeting three hundred miles away in Boston; a surgeon in California uses a videophone to assist in a heart transplant in Paris; ecologists assess the extent of environmental damage from an Alaskan oil spill by analyzing satellite images; even in my home, sinuous strands of ones and zeroes traveling through space and along miles of cable connect me from my armchair to besieged Sarajevo, the hurricane-stricken outskirts of Miami, the fifty-yard line at Giants' Stadium. It is as if my little apartment was built with corridors that extended in all directions through space and time. But in schools students study the Ancient Greeks without seeing Athens, the Renaissance without hearing a Monteverdi madrigal, or the Vietnam War without witnessing the My Lai Massacre. The textbook and the classroom teacher, wonderful technologies for teaching and learning in an information-poor world, provide a narrow conduit for the building blocks of knowledge in today's information-rich world. Like my apartment, education will undergo significant technological renovation in very few years to come. The crucial questions remain:

- What will the new information corridors look like?
- What directions will they extend?
- What use will be made of them?
- Most importantly, who will get to answer these questions?

The time is now for teachers and students to pick up their drafting pens and become the architects of the post-modern school.

Luyen Chou

Collaborations

Institute for Learning Technologies Teachers College, Columbia University

Robert McClintock, Director of the Institute for Learning Technologies, and Frank Moretti, Director of the New Lab, have collaborated on technology projects since the mid 1980s. In 1990, they together developed "The Cumulative Curriculum Project," a large-scale proposal for using multimedia in transforming the school curriculum. The conceptual foundations for the Tishman Project derive from this proposal. Even earlier, an ILT programmer, Steve Taylor, worked with McClintock and Moretti through NLTL on the early versions of *Playbill* and *Archaeotype*.

Several current staff members of the Project come to it through ILT and the Department of Communication, Computing, and Technology in Education at Teachers College, in particular Bob Matsuoka, the Dalton School Network Manager, and Toby Sanders, Middle School Technology Coordinator. ILT runs a Multimedia Design and Development Lab in which advanced implementations of networked multimedia are being developed for testing at Dalton. This work will help the New Lab make use of high-speed wide-area-networks and develop a multimedia library of diverse digital resources to support the intellectual life of the school. During the 1992-93 school year, we will establish high-speed links between the network server in the ILT lab and the main server at Dalton.

Center for Telecommunications Research Columbia University

The Institute for Learning Technologies and the New Lab are together a prospective test site for Project ACORN, a very high-speed networking project at the Center for Telecommunications Research. ACORN has extensive support from the National Science Foundation and from a coalition of major corporate sponsors. Schools with technology enriched curricula such as that we are developing at Dalton will be important users of very fast networks capable of sustaining numerous interactive multimedia exchanges simultaneously. ACORN will transmit information encoded in laser beams sent through fiber optic networks. The preliminary installations for our participating in these tests will be installed in the ILT development lab in 1993.

WNET/Channel 13

Good networked multimedia for educational uses thrives on collaborations between groups that previously seemed to be working in separate domains. This fact is at the basis of an on-going collaboration with a multimedia development group at WNET under the direction of Hugh Osborn. Currently, we are jointly discussing with several software companies ways to manage very large multimedia databases. In addition we are exploring ways in which our pedagogical expertise can combine with their video production capacities to create effective educational programs more economically.

Harvard University/Perseus Project

The New Laboratory for Teaching and Learning has been a beta test site for Harvard University's Perseus Project for the past three years. Perseus, a multimedia database on Hellenic civilization which was recently released commercially by Yale University Press, includes a wealth of textual, pictorial and video resources. The CD-ROM based resource designed for use by scholars and university students allows users to view LANDSAT pictures and zoom in on portions of the classical Hellenic world, examine city plans, see reconstructions of ancient sites, and follow guided tours of selected ruins contained on an accompanying videodisc. Perseus also provides access to a wealth of primary texts (in original and translation), museum artifacts, and other scholarly materials. Since 1990, students and teachers working with *Archaeotype* in sixth grade social studies have used Perseus as a research database and provided the Perseus Project team with written reports on program bugs, design flaws, and content errors.

Cornell/Interactive Multimedia Group (IMG)

In consultation with Professor James Maas of Cornell University's Department of Psychology, the New Lab and the IMG have begun to discuss the formation of an on-line multimedia design colloquium that would link major educational technologies developers around the country via electronic mail. The colloquium would allow developers to share design ideas and implementation schemes, as well as to exchange prototypes of new software. The IMG, headed by Dr. Geri Gay, has developed several videodisc based educational resources used by students at Cornell. Of particular interest to the technical staff

of the New Lab is the IMG's research into networked multimedia and the transmission of moving images over wide-area networks.

Apple Computer

Following several visits by Javier Villalobos, manager of ESL, Bilingual, and Literacy Solutions for Apple's K-12 Marketing division, the New Lab was contacted by several groups at Apple about collaboration in beta test programs. The New Lab is currently a test site for Apple's new system software and its "world script" extension which provides the Macintosh with foreign language capabilities. Other beta collaborations planned or currently underway involve QuickTime digital video software, HyperCard, and AppleScript. Apple also plans to feature the work of the New Lab at the Dalton School in its initiative to help schools plan for technology integration. Most notably, the New Lab and the Dalton School will be featured this fall in two Apple "Success Stories" on educational computing and on educational uses of digital video (QuickTime). A request has been sent to Apple for $1.6 million in equipment to make Dalton into an "Apple Academy", which would serve as a demonstration site for regional schools interested in exploring curricular uses of new technologies. The New Lab has been instrumental in revitalizing Apple's interest in private school initiatives in technology and education.

DiVA

Last fall, the New Lab became a beta test site for The DiVA Corporation's VideoShop software, a revolutionary desktop video editing tool based on Apple's new QuickTime technology. With the help of DiVA's staff, Dalton became one of the first schools in the country to use VideoShop to make digital movies in its courses, and the only site to engage in networked storage and playback of QuickTime video. The Civil War class used VideoShop to store selected clips of Professor James Shenton's walking tour of New York City, interviews with teachers and students, and to construct video documentaries on Civil War history. VideoShop is also being used to update the Playbill software and eliminate its dependence on videodiscs. Next year, students in the Playbill class will be able to store performances of their own interpretations of scenes from *Macbeth* on the network. This fall, DiVA's staff will be conducting workshops in digital video at The Dalton School. DiVA, increasingly interested as a result of these early experiments in educational applications, is seeking ways to disseminate the New Lab's successful use of digital video in the classroom. Student work is already being featured at DiVA's conference exhibits and in their promotional materials, a plans have been made to develop future educational products in collaboration with the New Lab.

The New York Historical Society

In the fall of 1990, member's of Dalton's Civil War Project course became the first high school students to be granted access to the New York Historical Society's archives. As part of an on-going collaboration between the New Lab and NYHS, the society's staff has conducted tours of the collection, demonstrated preservation techniques, and consulted with the Civil War Project's participants on their research. The New Lab is continuing to seek ways to expand its role as a channel through which the Historical Society's collection can be made available in digital form to the educational community on CD ROM and via high-speed wide-area networking.

Columbia University

This past academic year, Professor James Shenton of Columbia University's Department of History joined the New Lab as a consultant to the Civil War Project. In addition to conducting a tour of New York City which was filmed and digitized by Dalton students, Professor Shenton made himself available to students as an advisor, and conducted several classes and seminars for the Dalton community on New York City and American history. This year Professor Shenton's undergraduate course entitled "The Historian's Craft" will be conducted in partnership with the Civil War Project at the Dalton School. Columbia students will collaborate with Dalton students on the expansion of the multimedia library on American History and the construction of multimedia history projects.

Professor John Russell of Columbia's Department of Art History and Archaeology has joined the *Archaeotype* team as a technical consultant to the construction of the Assyrian site that will be unveiled in October, 1992. The *Archaeotype* development team has made extensive use of Avery Library and has been provided with office space at Columbia where it is compiling material for the multimedia database on Assyrian history. As in the case of the Civil War Project, the Assyrian *Archaeotype* will be used at the university by undergraduate and graduate-students in Professor Russell's course on Assyria.

The Institute for Learning Sciences Northwestern University

Roger Schank, the former and well known Director of the Artificial Intelligence of Yale University, has put together $150 million initial funding for the Institute with the intention of serving both industry and education. Dr. Schank's goal is to revolutionize education through the use of new technologies. Dr. Schank visited New York and the New Laboratory for Teaching and Learning at which time he met with Frank Moretti, Robert McClintock and Luyen Chou where a number of the New Laboratory's Tishman Projects were demonstrated. Dr. Moretti returned the visit by going to the Institute for Learning Sciences and spending an entire day reviewing the software creations of Dr. Schank's associates. At the end of that session it was agreed that the Institute for Learning Sciences would enter into a collaboration with the New Laboratory for Teaching and Learning by providing whichever software packages most interested the New Laboratory so that they may be both tested and critiqued.

University of Pennsylvania Interactive Language Instruction Program

Dr. Jack Abercrombie visited The Dalton School at the invitation of Drs. Steinlight and Moretti who had visited Dr. Abercrombie at his University of Pennsylvania Laboratory. Dr. Abercrombie has done cutting edge work in the use of interactive programs in language instruction that rely on the use of film as the data platform. We are presently field testing two of Dr. Abercrombie's projects and intend to be integrating them into both appropriate French and Spanish classes.

The Chula Vista School District

Chula Vista is a California School District four miles north of Mexico which has a uniquely American multi-cultural population of Mexicans, Asians, Blacks and Caucasians. We have entered into an agreement with the Chula Vista School District to allow them to field test *Archaeotype* at the Juarez Lincoln School. This collaboration is useful to the New Laboratory since it automatically creates a direct linkage with San Diego State School of Education which has a very positive link to PacBell, the local phone company. Our most immediate plans are to have two tele-conferences between the Juarez Lincoln students and teachers and the Dalton students and teachers who are doing *Archaeotype*. Our long term goal is to use this as a demonstration to generate support for our efforts to create broadband tele-conferencing capacities between Chula Vista and Dalton as well as between Dalton and a number of other cultural and educational institutions including both schools and museums and libraries.

Massachusetts Institute of Technology MUSE Project

Through the efforts of Dr. Steinlight and Dr. Janet Murrary, Director of MIT's Athena Language-Learning Project and key foreign language person, Dalton will become a beta test site for the MUSE Interactive Video Project in both French and Spanish. MIT has agreed for a nominal price to provide faculty training in the use of these tools. The faculty training has begun this August with the visit of Dr. Giberte Furstenburg who worked with Dr. Steinlight on the pedagogy she has deployed with the use of *Philippe*. MIT is eager to see what use Dalton and the New Laboratory makes at the school level of their projects developed for the university level. We are eager to proceed with our testing. Also in conjunction with MIT's MUSE Project we have explored the possibility of collaborating on the design of an ecologically oriented program in conjunction with Professor James Noblitt, the Director of that project.

Paramount Inc.

Dr. Kathy Wilson, who has been a constant collaborator with Dalton's New Laboratory as the creator of *Palenque*, has become a key member of the strategic planning group of the Paramount Corporation. The intention of this group is to plot the future in regard to multimedia and electronic publishing. In an August meeting with Dr. Wilson, Dr. Moretti has begun planning a project that Dr. Wilson indicates Paramount would have great interest in. That is, the creation of a simulation that brings together both the features of *Archaeotype* and *Palenque*. These discussions are in their preliminary stages but are anticipated to be very positive with productive outcome.

The Educational Development Corporation

Dr. Median Kurland, the creator of the *Bankstreet Writer*, has met on three different occasions with Luyen Chou and Frank Moretti to discuss the deployment of his newest and most fascinating piece of software, "The Text Browser". We have agreed to proceed over the course of the next term with a proposal that would embed the Text Browser as an assessment tool in some of the Dalton projects. It is hoped that the Text Browser will begin to address some of the assessment problems one encounters when one creates a constructivist learning environment and emphasizes collaborative endeavors. Dr. Wilson of

Paramount Inc. is also eager to include the Text Browser as a dimension of the *Archaeotype/Palenque Project* discussed up above.

Dr. Donald Nix, IBM Research

Dalton has entered into a collaborative agreement with Dr. Don Nix, Manager of Educational Research at IBM Research. Dr. Nix has set up two advanced multimedia work stations in Dalton's First Program and will be spending two mornings a week at the Dalton School working with teachers on the use of these systems. Dr. Nix's specific interest is in expressive learning and he has created cutting edge prototype tools that give students, from the age of 7 on, the opportunity to create multimedia documents with facility. Dr. Nix has been a long-time associate of the New Laboratory for Teaching and Learning. In the late 1980s, he helped to pioneer the New Laboratory's efforts in technology by doing a demonstration project in the use of his own authoring language, *Handy*, with two groups, one of Dalton's seniors and one of middle school students.

NYNEX Science and Technology

The New Laboratory for Teaching and Learning has presented its work, in conjunction with NYNEX's Science and Technology Division, to Vermont educators and state officials as examples of the educational potential of networked multimedia. We will soon present a proposal to NYNEX Science and Technology, seeking high-speed data links between the New Lab and Columbia, WNET, one or two public schools, and several cultural institutions like the New York Historical Society.

IBM Research Interactive Media Program

IMP Builder is an experimental authoring resource for creating digital video programs quickly and simply. During the 1992-93 school year we will be testing its usefulness in allowing students to create an interactive video magazine covering the life and times of Dalton.

Rensselaer Polytechnic Institute

Dr. Jack Wilson, the Director for The Lois J. and Harlan E. Anderson Center for Innovation in Undergraduate Education has entered into a collaborative agreement with The Dalton School so that Dalton can become a field site for testing his CUPLE Program. CUPLE is a tool that can be used either by teachers for demonstration purposes or by students for research purposes. It allows the deployment of a number of existing computer tools in interaction with a variety of video disk resources. Dr. Wilson's most telling examples is the use of the disk on the Tacoma Narrows Bridge in the deployment of superimposed plotting devices as well as spread sheets both of which the user can manipulate. Dr. Wilson will be visiting The Dalton School in the 1992-93 academic year, as he did in 1991-92, to work with students and teachers on the use of CUPLE.

Metropolitan Museum of Art

Over the past two years Dr. Kent Lydecker, the Director of Education for the Metropolitan Museum of Art has met with members of the New Laboratory of Teaching and Learning to explore possible collaborations in the area of multimedia curriculum and multimedia presentation. In Dalton's effort to create a working relationship with NYNEX it is anticipated that the Metropolitan Museum of Art will be a key participant. We are presently exploring further linkages that might be effected through the establishment of a common employee who would provide linkage between the Metropolitan Museum and Dalton.

Bank Street School of Education The Center for Children and Technology

Over the past two years under the direction of Kathy Wilson and Jan Hawkins the Dalton School has enjoyed a useful collaboration with Bank Street. As part of a large federally funded study, they have dedicated significant resources to the end of evaluating *Archaeotype* and, more broadly, the development process the New Laboratory has used in various technology-based curriculum areas. The future of Dalton's collaboration with Bank Street is bright. Presently, Dr. Moretti and Dr. McClintock are talking with Center's leadership to shape a proposal directed at the question of assessment in new innovative programs which are technology based. At the same time, the evaluations that are sponsored by the Federal Government which Bank Street has done in the past are continuing a pace.

Mount Wilson Observatory, Pasadena, California

The New Laboratory for Teaching and Learning has established a strong relationship with the Mt. Wilson Observatory to create links from their 60-inch astronomical telescope and solar telescope directly to Dalton. The effort is part of a pilot program to eventually build an automated telescope on the mountain for national school use. The Galileo Project manager sits on the Mount Wilson Educational Advisory Board

and is a principal in a Mt. Wilson $200,000 proposal to NYNEX and to the DOE.

Harvard-Smithsonian Astrophysical Center

The New Laboratory for Teaching and Learning has a close working relationship with staff astronomers at HSAC. Through the Center, a small NASA grant ($4K) has been obtained for the development of materials. HSAC is a rich source of advice, guidance and information for the project.

National Oceanographic and Atmospheric Administration

We are currently linked to NOAA by the Internet to acquire daily solar images from them. They maintain a collection of images from six western observatories on a computer to which we have access.

Camp Sloane, Lakeville, Connecticut

We are currently investigating the Camp Sloane campus as a possible site for archaeological, ecological and astronomical field programs during the school year and in extended school year programs. The camp has shown a strong interest in collaborating with NLTL in the development of such programs.

The Cumulative Curriculum . . . is not a new notion. We seek to replace the superficial traveler through the sequential school, who collects knowledge trinkets to memorialize each stop on the cultural itinerary, with the philosophical explorer, whose very search for knowledge is a search for self and community. The word cumulative points to the growing personhood of the child. As the Latin indicates, it is a "heaping up" within. Able to instantly access the totality of his work through time, the child has control of his intellectual history as a series of understandings rather than the usual cryptic external judgments symbolized by [grades]. Accordingly, a child need not see each year as a separate beginning but rather as a continuation of an already substantially accumulated educational reality, which is his currency entering a new year. The challenge for the child is to understand his rich past and to plan a series of strategies for moving to the next stage. He chooses his educational future in the context of the world within him that he has already shaped and formed. In this context, adults have to give up the security that comes from pretending to know precisely what it is that children ought learn by year, by subject. . . . The child begins with his own rich world, which is the starting point of all inquiries. . . . He understands the art he will master is that of the tentative hypothesis, the value of which is determined by the degree to which it has to the power to explain. What the student of the cumulative curriculum will perceive as "learned" are formulations whose parenthood is not in doubt. Clear about his ownership and authorship, he will perceive all that he knows as the immediate horizon of his all-too-human vision and will seek to extend it, to glimpse a new world and form new understandings that embrace the old.

Frank A. Moretti

Contributions, or extending our resources

Estimated Value Of Gifts -- Cash, Staff, Hardware, and Software

Donor	Cash	Staff	Hardware	Software	Totals
IBM University Relations (ILT Lab equipment donor valuation)			$160,000		$160,000
IBM Research (Ecotype assistance)		$20,000			$20,000
IBM Research (First Program assistance)		$20,000	$18,000	$10,000	$48,000
IBM Research (IMP Builder -- development software)				$20,000	$20,000
Microsoft Corporation (beta test)				$3,000	$3,000
Apple Computer (Civil War CD-ROM's)				$5,000	$5,000
Apple Computer (QuickTime, etc., beta test)				$8,000	$8,000
DiVA Corporation (site license & beta test; donor valuation)				$150,000	$150,000
Radius Corporation (beta test boards)			$5,000		$5,000
Rensselaer (CUPLE -- development software)				$20,000	$20,000
Michigan State (Chemistry development software)				$20,000	$20,000
Institute for Learning Sciences (Program development software)				$20,000	$20,000
MIT Muse (French development software)				$20,000	$20,000
University of North Carolina (French development software)				$20,000	$20,000
Harvard Perseus Project (beta test)				$2,000	$2,000
Reginald Powe -- training tapes (donor valuation)				$70,000	$70,000
E.E. Ford Foundation	$10,000				$10,000
NATO Grant for Collaborative Study	$10,000				$10,000
Institute for Learning Technologies (McClintock, Grimaldi, etc.)		$60,000	$10,000	$10,000	$80,000
Bank Street Evaluations		$50,000			$50,000
Totals	$20,000	$150,000	$193,000	$358,000	$741,000

Estimation notes:

Where donors have made explicit valuations, we have used these.

With software and some hardware contributions, we receive two different types of products -- beta test versions of soon to be marketed programs and copies of development programs that are very useful but will not be marketed. With beta test items, we have valued them according to their prospective market value -- what would they cost us to purchase? With development software, we have valued it in each instance at $20,000. This amount is far less, in each instance, than the actual development cost of the software. It reflects, very approximately, how the availability of such software amplifies our effort.

Staff valuations represent a rough estimate of the cost of time contributed to the effort.

Expenditures and Inventories

Compared to many projects devoted to technology in education, our expenditures for salaries are relatively high. People, neither hardware nor software, are the essential elements in both technology and education.

For an effort such as the Tishman Project to succeed, people need to take risks. In particular, teachers need to rethink in disconcerting ways how they will go about their work. To do that, teachers need some reward and much support. To a modest degree the reward has been monetary, raising slightly through percentage overages and stipends what participating teachers earn. More significantly, we suspect, the reward arises from intangibles -- a sense of renewal, engagement, adventure, and accomplishment. Teaching with technology changes the profession in ways that may make it more bracing and satisfying.

Where teachers take the risk to restructure what they do and how they work, they need also much support. Essentially, our expenditures for staff, equipment, and materials serves this function. Our means are substantial but limited. The limiting factors on support, however, are not primarily monetary. Scheduling inertias make it difficult to keep equipment that has been installed at its maximum potential use. In our first year, many staff members had to concentrate on installing and stabilizing new systems, with less time than needed for providing support to users. The mix of staff time in our second year should shift perceptibly to giving teachers and students more support in their work than was the case in our first.

Information technologies are rapidly evolving. Consequently, at this juncture, the human resources of the school are far more stable than the technical. As soon as we install equipment, it is obsolete. Teachers, in contrast, like their students, develop and grow in depth and ability. The most important infrastructure that we have to build is one of developing know-how and commitment. The best expenditure for equipment and materials is one that enables teachers and students to accomplish as much as they can, while whetting their appetites to move on to more challenging

Expenditures for 1991-1992

Summary Date 19-Aug-92

	Budgeted	Committed	Remaining	%
Total Expenditures	**$1,009,750**	**$1,010,737**	**($987)**	**-0.1%**
Total People	**$512,550**	**$475,659**	**$36,891**	**7.2%**
Total Equipment	**$360,000**	**$435,571**	**($75,571)**	**-21.0%**
Workstations & Accessories:		$285,518		
Network Installation & Parts:		$104,004		
Classroom Displays, etc.:		$14,553		
Peripherals (Printers, Scanners, etc.):		$31,496		
Total Materials	**$118,000**	**$79,403**	**$38,597**	**32.7%**
Space Rennovations:		$34,431		
Software:		$32,494		
Video Supplies, etc.:		$2,763		
Other & Miscellaneous:		$9,715		
Total Other	**$19,200**	**$20,104**	**($904)**	**-4.7%**

possibilities.

Our budget planning for 1992-93 increases the amount spent on people, reflecting increases both in faculty commitment and in support staff. In most areas, Equipment and Materials will be roughly the same as during the first year, except that expenditures for workstations and accessories, network installation and parts, and for space renovations should decline somewhat. Our main change with respect to our equipment environment is a matter of policy, not expenditure. Our original intent was to create a "dual-platform" computing environment, relying equally on *Macintosh* and *MS-DOS/Windows* systems. For the near future we have given up on this aspiration as it leads, over the short-term, to both development and support difficulties.

As a result, we plan for 1992-93 to purchase primarily *Macintosh* hardware, peripherals, and software. Instead of a dual-platform environment, we will be a *Macintosh* environment, with *MS-DOS* systems for computer science and mathematics and for occasional niche-programs across the curriculum. Should concrete interest in *MS-DOS/Windows* resources spread, then it may prove feasible in one or two years to return to the dual-platform strategy. Currently our staff is not sufficiently ambidextrous technically to support creative development simultaneously in both environments and most participating faculty members have a decided preference for Macs. While Macs are distinctly more expensive on a price/performance basis, the project will progress further over the next year or two by concentrating on the Macintosh.

Here is our budget for the coming year:

Estimated Expenditures for 1992-1993

Summary Date 19-Aug-92

		Budgeted	Remaining	%
Estimated Total		**$1,007,094**		
Projected people		**$557,599**		
Total equipment	**$0**	**$361,495**		
Workstations & Accessories:		$251,495		
Network Installation & Parts:		$65,000		
Classroom Displays, etc.:		$15,000		
Peripherals (Printers, Scanners, etc.):		$30,000		
Total materials	**$0**	**$68,000**		
Space Rennovations:		$25,000		
Software:		$30,000		
Video Supplies, etc.:		$3,000		
Other & Miscellaneous:		$10,000		
Total other	**$0**	**$20,000**		

Looking beyond the coming year for planning purposes, we have made two prospective budgets. Our current support from the Phyllis and Robert Tishman Family Fund runs through 1992-1993 year. Our first, minimal budget addresses the contingency that such funding will stop. What will it cost to keep the project functioning? Our second, optimal budget reflects the fact that integrating technology into a school such as Dalton is a long-term effort. At the end of the coming year, we will have made a significant beginning, but much will remain to be done. What level of expenditures would optimally extend the initiatives we have commenced?

Estimated Expenditures for 1993-1994				
Summary Date		19-Aug-92		
		1992-93 Budgeted	1993-94 Minimum	1993-94 Optimum
Estimated Total		**$1,007,094**	**$278,713**	**$1,288,015**
Projected people		**$557,599**	**$140,000**	**$613,359**
Total equipment		**$361,495**	**$119,560**	**$555,578**
Workstations & Accessories:		$251,495	$80,552	$366,070
Network Installation & Parts:		$65,000	$25,351	$129,355
Classroom Displays, etc.:		$15,000	$4,433	$19,433
Peripherals (Printers, Scanners, etc.):		$30,000	$9,224	$40,720
Total materials		**$68,000**	**$19,153**	**$99,078**
Space Rennovations:		$25,000	$8,915	$43,346
Software:		$30,000	$9,374	$41,868
Video Supplies, etc.:		$3,000	$865	$3,865
Other & Miscellaneous:		$10,000	$0	$10,000
Total other	**$0**	**$20,000**	**$0**	**$20,000**

Our minimum budget is essentially a maintenance budget. We assume that creative work on existing projects will stop, but use of existing resources will continue. As a result we anticipate a radical reduction in staffing, keeping only three positions -- the Associate Director of the New Lab, the Manager of the Dalton Network, and the Equipment Maintenance Technician. The amounts estimated for Equipment and Materials represent 15% of the amounts spent in these lines for 1991-92 and 1992-93. Such a percentage is a reasonable allocation, providing for good maintenance but only very slow replacement.

Our optimum budget would extend creative work on the project at a slightly higher level compared to our initial two years. We have projected a 10% increase relative to our 1992-93 budged for faculty and staff. This would provide for a modest expansion of faculty involvement and the addition of one more programmer/designer at an entry level salary. We expect several new project areas to be opening up -- in music, chemistry, and student assessment. Additionally we expect the scale of work in our First Program and Middle School initiatives to increase. We have estimated the Equipment and Materials costs by adding our allocations for maintenance in the Minimal 1993-94 budget to the largest amount spent in each area for 1991-92 or 1992-93. This would seem to provide for solidification of past initiatives and further extension of the technical infrastructure at a pace slightly above the current one.

Tishman Project Faculty and Staff: 1991 - 1992

Victor Aluise	Computer Lab Consultant
Karen Bass	First Program Teacher
Rachel Bellamy	Software Usability Engineer
Steven Bender	High School English Teacher; *Playbill* Designer
Mary Kate Brown	Middle School Social Studies Teacher; *Archaeotype* Designer
Luyen Chou	Co-Director of the Tishman Project; Associate Director of the New Laboratory for Teaching and Learning
Grant Courtney	Middle School Teacher
Jacqueline d'Aiutolo	High School English Teacher, *Playbill*
Tom de Zengotita	Co-Director of the Tishman Project; High School Philosophy Teacher
Monica Edinger	Middle School English Teacher
Malcolm Fenton	Middle School and High School Science Teacher
Neil Goldberg	First Program Social Studies Teacher, *Archaeotype* Designer
Teresa Gonzalez	Executive Secretary for the New Laboratory for Teaching and Learning
Eileen Gumport	Design Associate, First Program
Dan Kramarsky	Middle School Teacher
Bruce Long	Senior Design Associate
Robert Matsuoka	Manager of the Dalton Network
Robert McClintock	Co-Director of the Tishman Project; Director, Institute for Learning Technologies, Teachers College, Columbia University
Robert Meredith	High School Art and Architecture Teacher
Cybele Merrick	Administrative Coordinator
Frank A. Moretti	Co-Director of the Tishman Project; Executive Director of the New Laboratory for Teaching and Learning; Associate Headmaster of the Dalton School
George Mosler	Technical Support Coordinator
Philip Napoli	High School History Teacher, *Civil War Project*
Mollyann Pollak	Middle School Teacher
Joshua Reibel	High School English Teacher, *Playbill*
Toby Sanders	Computer Lab Consultant
Susan Schwarz	Tishman Project Secretary
Adam Seidman	Software Developer
E. Jay Simms	High School Art Teacher
Karen Steinlight	High School French Teacher
Malcolm Thompson	High School Science Teacher, *Project Galileo* Designer
William Waldman	Software Developer