Developing an Educational Culture of Skill and Understanding in a Networked Multimedia Environment

Volume 1
Second Annual Report—1992-1993

The Dalton Technology Plan

The New Laboratory for Teaching and Learning
The Dalton School
1993

Contents

To the Dalton Community:

In reviewing this past year, there are three things that stand out:

First, the Dalton Technology Plan has taken root in the school. The Faculty has taken up the opportunities to use the new technologies to meet their educational objectives in creative and compelling ways. Whether one focuses on the Science Department with astronomy, geology, and chemistry or the English Department with the study of the Bible, Russian literature, American literature, film and Shakespeare, it is clear that the School is a beehive of purposeful activity. And the key is that it is purposeful; the technology is always intended to serve the educational goals around which there is and has been a clear consensus. We seek methods and means that allow us to empower individual children to think for themselves and find in their studies a meaningful engagement with questions of personal significance.

Second, we have had success in initiating the dissemination of our discoveries and creations. Whether the medium is through the published word or collaborative projects such as those with Chula Vista, Boys Harbor or Columbia University, we have begun to see how our projects play in diverse environments. All the early indications are that they have a high degree of flexibility and can be productive of positive results in varied settings. We look forward to continuing and expanding this effort.

Third, we have achieved a national reputation as the School that has most successfully and productively incorporated the new technologies into the mainstream of a school curriculum. Acknowledged as pursuing a philosophy of responsible progressivism, we receive requests from literally hundreds of people for information or to make a visit to the school. Apple's selection of Dalton and the New Laboratory as best representing the educational landscape of the future and their decision to feature Dalton in their broadcast production, *Technology and the Evolving Classroom*, has consolidated our position as a national leader in the field.

The goal for the 1993-94 academic year is to consolidate our gains, to fine-tune and further enhance the initiatives begun over the previous two years. New enterprises will be kept to a minimum and emphasis will be placed on existing opportunities for extending the use of Dalton-produced software and bringing to fruition unrealized capacities in the cyberspace of our networked environment. There are six areas within which we will pursue our goal:

The Technical Environment - We have created one of the most complex technical environments in existence in the school world. For example, we will very shortly have in excess of 1,000 E-mail users on a system with only 150 workstations. This is unprecedented; the common understanding of electronic mail is that each person who has an account also has a computer. In addition, the software available to students at every workstation has grown in number and complexity. We have also recently reconfigured the network with a new server and new possibilities for phone-in use. Within such a rich environment, certain problems and

difficulties inevitably emerge. This year we intend to work on improving the stability and utility of the existing infrastructure so that it serves the educational needs of our community even better than it does now.

Classroom Culture - We have focused intensely, for two years, on the development of software and on opening up a range of opportunities to both faculty and students for using that software. We have also begun to reflect on the impact of these new technologies on classroom culture and the new demands that their evolution makes on both adults and children in the school. As part of our consolidation and fine-tuning we will continue to inquire into the nature of the emerging new habits, expectations and possibilities.

Follow-up of Evaluations - In the second year of the program we have done an extensive in-depth evaluation of many dimensions of the projects in the Dalton Technology Plan. The process itself was of value since it required that project directors and other faculty engage external evaluators in conversations that were substantive and generative of new ideas and new possibilities. Further, the final evaluation reports have within them recommendations pertaining to the future development of our projects and it is our intention to look closely at each of the evaluations and decide on which of the many recommendations we intend to pursue.

Exploitation of Existing Resources - The network supports many software tools which have been available now for almost two years. Many of us have not yet learned to use these tools nor have we conceived of ways in which these tools can be deployed in our course work. For instance, the School owns multiple licenses to Microsoft Excel, a spreadsheet program, which could be purposively used in many different classroom environments. Another example is our E-mail system; it makes possible on-line conferences which could leaven and to some extent redirect the nature of conversations in the classrooms. Now is the time to reflect creatively on how to realize the potential implicit in the resources offered by the rich technological environment we have created.

Horizontal Dissemination - We have experienced significant success with a number of innovative projects that have been done by individual faculty members. At this juncture, we would do well to challenge ourselves to consider whether or not these projects, so successful in the hands of certain individuals, might be internally disseminated so that they become more centrally part of the curriculum for every student.

Financial - The Dalton Technology Plan's funding has remained constant for the third year. That means that, over time, our actual resources have decreased—since the cost for personnel has increased if only as a function of the raises given each year within the School. In addition, we have expanded a number of projects that we are doing, requiring more support, technical and personal.

In a nutshell, we have an expanding environment and stable resources. As a result, it will be necessary this year to make some significant decreases in expenditures, supplies, and technical additions. Neither will it be possible to support the faculty with stipends to the extent that we have in the past. However, the intention is to share whatever resources we have

with faculty actually engaged in developmental endeavors involving significant additional time beyond what is demanded by classroom work.

As we look to a future in which the exceptional will become the commonplace, we realize that we are still at the early moments of a bold new time in human history. In the age of the printing press a new order emerged and it is without question that in the next decades our world will continue to evolve in its use of the new technologies and make and discover things yet unknown. If anything is essentially human, it is to change and we should consider ourselves fortunate to be alive at such a fecund time.

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

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An Overview of the Dalton Technology Plan

When the Dalton Technology Plan was initiated in the Fall of 1991, it consisted of twelve discrete projects. Perhaps the most telling indication of the success of the past two years is the fact that the impact of the new technology has refused to remain confined to the initial project categories. Last Spring, the New Laboratory received over thirty faculty proposals for new initiatives as the success of early efforts has spilled over into new and unanticipated areas; more surprising still are the many other initiatives that have emerged spontaneously during the opening weeks of the semester as faculty and students become increasingly aware of the potential of the new technologies at their disposal.

An anecdote serves to illustrate the point. Shakespeare's oft-quoted "what's in a name" took on new meaning when the New Lab's multimedia Macbeth software had its name changed from "Playbill" to "Navigator". As the Tenth-Grade Introduction to Drama class began to demonstrate the effectiveness of a hypermedia approach to literature, the underlying software engine began to find applications throughout the High School English curriculum, and the course-specific moniker no longer reflected the use of the program. This year, the Navigator appears with teacher-designed content-bases in Russian Fiction, Film Studies, American Literature and Introduction to Literature, not to mention in Eighth-Grade English, High School Latin and Advanced Placement Spanish classes. What had been developed as software for a specific course is rapidly becoming a core technology for literary studies, and more generally, for student and teacher navigation and creation of networked hypermedia at the Dalton School.

One of the major enhancements to the Dalton Technology Plan this year is the introduction of schoolwide electronic mail. Again, we are discovering that curricular (not to mention administrative) applications for this new communications capability are emerging at an exponential rate. But our ability to sustain these applications technically has been enhanced by their participation in a common hardware/software platform which supports a variety of uses while centralizing development and maintenance.

In our third year of the Dalton Technology Plan, we intend to sustain the trend toward expansion and diversity even as we consolidate our limited resources. Our focus will be on deployment, on maximizing our capacity to accommodate the whole range of educational needs comprehensively and flexibly. In so doing, we move towards a new, and perhaps more challenging, phase of the project—namely, gathering the data from three years of experimentation and building the permanent underpinnings for the Dalton of the twenty-first century.

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

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1) Educational Goals

The *Dalton Technology Plan*, like *The New Laboratory for Teaching and Learning*, is committed to certain educational values and aims that have remained essentially unchanged since the founding of *The Dalton School.* We restate them at the beginning of both volumes of this Annual Report because of the quantity and complexity of the materials to be reviewed. The yardstick is placed next to the product. Volume I provides an internal perspective on the Plan while Volume II assesses our progress from without, but the documents in both volumes can only be judged in terms of the goals to which the Plan, like the Laboratory and the School, is dedicated. These goals have been variously articulated over the years; let this statement of them stand as a conceptual synthesis suited to this occasion. The culture of understanding and skills in our networked multimedia environment is dedicated to an educational process which is:

- *Constructivist* in an environment saturated with *authentic information.* An educational process is constructivist when students, driven by a compelling question of their own, are actively doing something—solving a puzzle, making something, looking for something—and skills and knowledge are enhanced as an aspect of that engagement. Information is authentic when what students do incorporates and generates primary data and concepts rather than predigested texts and definitions.
- *Collaborative* along at least three dimensions: 1) it encourages peer-to-peer cooperation rather than competition; 2) it reconfigures the relationship between teacher and student, so that the instructor becomes a guide, a leader in an open-ended activity of learning, and the profession of teaching is liberated from routines of repetition; and 3) it sustains a movement of inquiry beyond the confines of the discipline, the classroom, and the school itself, making the world's resources and expertise a part of everyday educational activity and so narrowing the gap between advanced research and the life of the school.
- *Cumulative* because information stored and processed digitally is naturally accumulated in two essential senses: 1) Each generation of students is engaged in inquiries which are continuous with those of preceding and succeeding generations. Students make use of information and commentary they have inherited, just as they pass on information and commentary they are creating—a true culture of education. 2) Each individual student will build upon what they have achieved over the course of a whole educational career. The concept of the portfolio will be fully realized in an evolving, self-reflective and self-modifying trajectory of intellectual and moral activity which will someday constitute what we mean by a person's education.

The documents in this report have been organized and edited so as to make it as easy as possible to judge our activities and results against these goals. But all the important documents are reproduced and contextualized completely. The whole story is given.

Volume I provides an internal perspective on the Plan, while Volume II assesses our progress from without, but the documents in both volumes can only be judged in terms of the goals to which the Plan, like the Laboratory and the School, is dedicated.

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2) Apple Comes to Dalton

Roy Cox Productions
July 30, 1993

The New Laboratory for Teaching and Learning
The Dalton School

Attn: Tom de Zengotita, Rachel Packman

When Apple wanted to produce a one-hour television show on how computers are helping to shape the school of the future, we began a nationwide search for a school who's philosophy and use of technology matched Apple's vision. Our search included primary, middle and high schools and was driven by the belief that these formative years are most important in the development of learning skills. As Director of the television show, my goal was to find a school that was successfully integrating technology into its curriculum and pushing the technology itself to its limits. I discovered this was no easy task.

Many schools were using computers in isolated classrooms or labs. Some were using multimedia. Some had installed or were experimenting with networking. Some had developed custom software. We found many teachers who were dedicated to using technology in their classrooms, but they had encountered financial limitations or resistance from state and district regulations. None of the schools we contacted could say its use of technology was fundamentally expanding its capabilities. None was completely comfortable in letting go of conventional structures. Then we discovered The New Laboratory for Teaching and Learning at The Dalton School.

What set Dalton apart from other schools was its commitment to integrating technology into all grade levels and all areas of its curriculum. Even more important was the staff's belief that education has been needing to change and that technology is finally providing the tools that will make this change possible. Dalton's commitment to technology is evidenced in its innovative use of custom-made programs like *Archaeotype* and its willingness to experiment with different ways of structuring assignments and class periods. Many students are creating their own assignments within a set of parameters defined by teachers. This is creating new rules for evaluation and is redefining the roles of teachers and students.

Dalton's local network allows students to work on their projects from anywhere in the building, and their access to outside networks is allowing them to pull in information from virtually anywhere. At Dalton, the traditional walls of the classroom are breaking down and as a result, learning is taking place anytime and anywhere.

I believe Dalton's willingness to experiment with different ways of integrating technology into the educational process and their commitment to sharing their discoveries will make it easier for all educators and students to move gracefully into the future.

Sincerely,

Roy Cox, Director

From Apple's 'Imagine':

Change has become the norm. We know that change is going to continually happen, which means lifelong learning. Teaching young people to memorize the facts is not really doing all the job.—**John Sculley, Chairman and CEO, Apple Computer, Inc.**

The new technologies are exciting because they allow us to achieve goals educators have long sought. We talk about the new Dalton Technology Plan because, through networked multimedia, we are fulfilling the highest expectations of the founders of this school in a way they could not have imagined.—**Gardner Dunnan, Headmaster, The Dalton School.**

We always have to remember that children come into schools curious. I don't care what their socioeconomic background is. They come in curious. They want to know about things. Why is it that four years later that curiosity doesn't seem to be there? I would say that the variable is not in the nature of the child, the variable is in the nature of the institution. We see the new technology as building on that curiosity and liberating it for exploration.—**Frank Moretti, Associate Headmaster and Executive Director of the New Laboratory for Teaching and Learning at the Dalton School.**

Hello, I'm Kenyon Scott and welcome to "Imagine." You just heard some pretty powerful comments on how the world has changed and the implications that this has for education. Technology is causing many of these changes and it's also helping us adapt to them. To help prepare our students for the demands of the 21st century and today, educators are realizing that technology must be an integral part of their world. But that big a change does not come easily. You need vision and commitment. The Dalton School, in New York City, is an excellent example of what it takes.—Kenyon Scott, speaking for Apple's *Imagine* Series.

3) The View from Within; Faculty Reports and Proposals

Introduction

In the Annual Report of 1991-92, we were able to publish all the Faculty Reports and Proposals that even approached the guidelines established by The New Laboratory. This year we had to be more selective—and not only because of sheer quantity. From an administrative standpoint, the category "project" comes into question when faculty and students spontaneously undertake activities using resources already in place and develop educationally credible structures. Similarly, with the category "proposals," this year we received between thirty and fifty, and uncertainty about the number once again reflects an expansion of complexity, as well as increased interest. Such developments confirm that an educational culture of the kind we envision is in fact in formation, but that happy outcome does not lend itself to simple or brief description.

Reports and proposals were chosen for inclusion in the Annual Report based on the following criteria: 1) educational and intellectual interest 2) curricular and age group coverage, and 3) the representative nature of a particular report or proposal.

Selective judgments notwithstanding, our intent is to represent the current "state of play," and a whole volume of this Annual Report is therefore given over to internal evaluations ("Final Reports") and proposals by the faculty and by the New Lab staff most concerned with faculty support. These reports and proposals are presented according to Division and introduced by contextualizing remarks from the Divisional Directors or Technology Coordinators. The three reports in the concluding section deal with schoolwide points of technological convergence and intersection, a locus of special interest for members of the New Lab trying to ensure that the needs of the future inform our solutions to the problems of the moment. Extraordinary growth of the kind we have experienced this past year has inevitably created pressures on the system as a whole—as the faculty documents make evident. Those pressures can be ameliorated, and the energies they represent liberated, by thoughtful responses at the level of global design—at the level of the Multimedia Library, the Network and the Navigator.

The documents speak for themselves first of all, and appended editorial commentary will highlight themes common to, or distinctive of, certain types of reports and proposals. But virtually all of them, across the curriculum and through all grade levels, emphasize three intertwined concerns—a rising demand for resources (hardware, software, technical support) coupled with increased pressure on physical spaces and scheduled times. When students dubbed Room 307, where astronomy was taught (experienced? explored?), the "Astrocave," they were unintentionally memorializing a general lesson of our experience. The original concepts of the Lab and the Assignment are being reborn *de facto* in these projects. A dedicated space, a flexible schedule, individually tailored task streams, and the constant presence of a teacher who gives guidance rather than instruction is the emerging formula for success.

In a situation of rising demand and limited resources, a great deal of our creative attention is therefore given to issues of *deployment.* The New Lab response to the reports and proposals gathered in this volume has focused not only on technology, but also on choosing tables to accommodate more students per computer or on coordinating time slots so as to dedicate one room to more than one project.

But the first and last criterion governing the allocation of our resources, technological or otherwise, continues to be pedagogical quality. The three documents which follow are memoranda that went out to participants in the *Dalton Technology Plan*, giving guidelines for the reports and proposals here assembled. They are given verbatim and included to illustrate a point the New Laboratory has stressed above all others. Extra resources must go where extra educational value is most likely to occur.

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Guidelines for Final Reports

To: Project Managers, Dalton Technology Plan
From: Luyen Chou and Thomas de Zengotita
Re: Final Reports on Projects

As the summer approaches, we want to thank all of you for your hard work on the Dalton Technology Plan this year. The success we have enjoyed is due to the tremendous dedication and effort each of you has committed to the project.

As promised in the request for midyear reports we wrote to you this past winter, we are writing now to provide guidelines for year-end reports. The goal of your report should be to provide your colleagues—both at Dalton, and in the larger educational community—with insight, based on your firsthand experiences, on the benefits and challenges of integrating new technologies in the classroom.

We realize that this is a busy part of the year for everyone and we appreciate your taking the time to provide this documentation. Though we are frequently unable to respond to each one individually, your many proposals, reports, electronic correspondences and memos have been invaluable to those of us who are trying to manage the Dalton Technology Plan. It is only through your feedback that we can begin to adjust and effect the systemic changes necessary to make the project as a whole better.

So that the entire community may learn more about your work, we intend to publish final reports in the project's Annual Report and to make them publicly accessible on the Dalton network. If for some reason you must keep your report confidential, however, please indicate and explain that upon submission.

In order to prepare the comprehensive Annual Report, we need your contribution by June 30th; as in the case of the midyear reports, we would appreciate receiving them in electronic form.

Overall Theme

Address the Dalton faculty; they are your audience. Convey to them what you are doing and why.

Part I: Retrospective

For this section, ask yourself this: What has happened so far? What decisions did I make, under what circumstances have I worked, what happened in my classroom, what have my students learned? Go back to the beginning of your work, thinking about how it evolved. For the sake of structure, we recommend using a "three best/three worst" approach.

It would be most helpful if you could divide your response to Part I into the following categories:

The Physical Environment—We all know how crucial issues of time and space and equipment have been. Talk about your experience with the deployment of these kinds of resources. What three things in this area were most obstructive and why? What three things were most helpful and why? How have things changed in these areas over the life of your project?

The Soft Environment—Describe the digitized world within which you and your students work. What materials are available and how are they accessed? What tools do students use when they work with those materials? Which get used and work best and why? Which are ignored or underutilized and why? What was the process of acquisition and usage?

The Pedagogy — What are the structuring questions, the motivational hooks that activate the inquiry in the new educational environment? And how is that environment related to educational resources beyond it—to libraries or museums or subject area experts? And, again, what structuring questions and what outside resources have functioned most and least efficiently?

Part II: Prospective

In this section, describe your plans for the future, as far as they extend but focus on your plans for next year. Move through the same categories you discussed in your retrospective, highlighting your reasons for moving in the directions you have chosen. Describe your expectations, given this or that development.

Conclusion

Again, recalling your audience—your peers—talk about what effect the whole experience has had on your sense of yourself as an educator. What is it to be a teacher in the emerging environment?

cc: Divisional Directors
Divisional Technology Coordinators

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Proposal Guidelines

Dalton Technology Plan
Thomas de Zengotita

What follows is a description of how to launch a full-scale curricular project using the facilities and/or personnel of the New Laboratory for Teaching and Learning. The description as a whole applies to proposals which project a complete reformation of a course of study. Proposals which involve the enhancement of traditional curricula, of a full-scale project already under way, or of a general service (e.g., library, preceptorial) fall under more limited guidelines, published separately. The Divisional Directors and the Divisional Technology Coordinators are prepared to assist faculty and staff in the process.

"Experience has shown that proposals for the educational use of the new technology vary greatly according to grade level, subject matter, faculty interest, scope of project, etc. But a standard proposal format is essential if we are to process the increasing volume of requests in a timely, orderly, and equitable manner."

I. Proposal Format

Experience has shown that proposals for the educational use of the new technology vary greatly according to grade level, subject matter, faculty interest, scope of project, etc. But a standard proposal format is essential if we are to process the increasing volume of requests in a timely, orderly, and equitable manner.

A proposal originating from the ground-up may involve more explanation than this document calls for, but all such proposals should at least address the issues described below.

A project, and therefore a proposal, falls naturally into two parts:

Project Development

1) Proposals should relate projects to the philosophy of the Dalton Technology Plan. That is, to a revival of cumulative, collaborative, and constructivist learning through the original concepts of the Assignment and the Laboratory, reconceived in the new technological environment.

2) Proposals should provide a brief narrative account of the origin of the project. How did you get the idea? How did it unfold within your specific working environment? How does it fit into the larger context of educational development as you see it?

3) Proposals should refer to related research and pedagogy and to existing software and databases, both within Dalton and beyond, describing how they might bear on the project being proposed. Proposers who envision an extensive development of tools or data-bases must be sure that they are not already available.

4) Proposals should present a **development plan**. The plan should specify materials which need to be gathered, made, scanned, etc., or computer tools which need to be acquired or developed *before* the project can be brought to the classroom. Technological requirements should be described *in terms of functionality.* That is, they should explain what you would like to be able to do with the new technology in a way which relates specifically to **educational objectives.** "Educational objectives" are discussed in Item #1 in the Project Implementation section.

For example: *Playbill* wants to be able to immediately call up different video performances of parts of a drama by linking segments of the videos to the text. An educational objective of the *Playbill* course is to enhance student understanding of the concept "interpretation." The proposal should explicitly connect the technical functionality with the educational objective. Or, *Galileo* wants to be able to digitize Palomar plates and link them directly to certain graphing capabilities. An educational objective of *Galileo* is to improve student ability to interpret geometrical representation of physical relationships. The proposal should explicitly connect the technical functionality with the educational objective.

Requests for specific hardware and software only make sense if they are lodged in the context of educational objectives. It will be the New Lab's responsibility to work through the feasibility and timeframe of the development plan with the proposer(s).

Project Implementation

1) Proposals should include a clear statement of **educational objectives** which specifies particular outcomes. Where a course of study is involved, such outcomes will deal with student mastery of content and skills. Such outcomes should be related to a proposed pedagogy, for example, to sample assignments. Where the educational objectives involve more generalized services—e.g., in the case of a preceptor or library proposal—expected outcomes would deal with patterns of usage and their enhancement. Educational objectives should be timelined; that is, given implementation of the project, when will students be expected to have achieved those objectives?

2) Proposals should indicate how student performance will be assessed. Projects depend largely on student-generated projects and student collaboration. Traditional methods of assessment will necessarily be subject to revision.

3) Proposals should outline a plan for an internal evaluation of the project over and above the assessment of students. Participants will be expected to report on what has been working, what hasn't, and why. Reports will be expected at midyear and at year's end.

II. Responsibilities of Project Managers

Once a project has been launched, the faculty and staff responsible assume the responsibilities of a Project Manager:

1) Project Managers should establish a minimum level of computer competence before a proposal can be accepted. The Divisional Technology Coordinators will establish criteria appropriate to a given project and certify that they have been met.

2) Given that level of competence, Project Managers are responsible for basic upkeep and monitoring of resources used in their projects. So, for example, they must know how to:
   - Check cables (power, keyboard & mouse, etc.) if the machine isn't running.
   - Force quit a program or reboot the machine when it freezes.
   - Reinstall the system when the machine doesn't come up because the system is corrupt (question mark on start-up, or unhappy mac face).
   - Access the network and recognize associated rights.
   - Use their particular software—where it is, what steps are needed to prepare it to be used by students, where certain pieces are (like videos in Macbeth).

3) Project Managers should understand that resources deployed in the service of a particular project remain under the control of the School and the New Lab. Decisions to redeploy may have to be made on occasion.

4) Project Managers should understand that, as part of our commitment to our funder and to our school, we undertake to evaluate the success of various projects in the classroom. Regular evaluations by qualified outsiders are essential to a credible developmental process, but they will not supplant internal evaluation mechanisms developed and implemented by Project Managers.

III. Proposal Procedure

Before a proposal goes to the Co-Directors of the Dalton Technology Plan, it should be submitted to the appropriate Divisional Technology Coordinator and Divisional Director. A Divisional Director may meet with project proposers and the Technology Coordinator in order to refine a proposal. Their comments and recommendations may be appended to the proposal when it comes to the Co-Directors. The Divisional Director is responsible for formally submitting the final proposal.

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Guidelines for Enhancement Proposals

Dalton Technology Plan
Thomas de Zengotita

The *Dalton Technology Plan* envisions a future in which technology is so integrated into the life of the school as to be, in effect, transparent - as taken for granted as paper and pencil. Integration of that kind occurs not only in the context of groundbreaking projects like *Archaeotype* and *Galileo.* It is, in a more incremental but pervasive way, also a result of a myriad of limited imperatives all tending for circumstantial reasons in the same direction. Educational issues that might otherwise remain hidden become the object of intense scrutiny. Printing capacity is a source of frustration for everyone, but there may be developmental reasons why very young children need more printers. Older children seem to collaborate better if they are allowed to develop partnerships spontaneously; what are the implications for deployment of computers in dedicated spaces in the high school?

Proposals which do not envision a curricular reform from the groundup of the kind undertaken by *Galileo* or *Ecotype* are "enhancement pro-posals." Such proposals involve items of hardware or software and/or deployments of such technology which will enrich ongoing projects or traditional curricula, but will not require extensive use of Lab resources for data gathering, curricular design, programming, etc. Proposals of this kind should follow structurally similar but simpler guidelines than those governing a curricular reform project.

Phase I—Development prior to classroom use

List:

1. Hard-and software needs (including books, slides, clerical help, limited reprogramming). Describe in terms of functionality and, where appropriate, include purchase information.
2. Timetable for acquisition and deployment (including scanning) of the items described in #1.
3. Anticipated needs for space, scheduling, etc., duringPhase II.

Phase II—Implementation in the classroom

1. Explain why you want to do what you want to do with the resources described in Phase I. How did you get the idea? How is what you envision consistent with New Lab educational philosophy?
2. Describe, in terms of specific skill and content objectives, the educational uses to which you will put what you develop, and outline your plans for assessment.
3. Provide a schedule for the achievement of those objectives over the course of the school year.

Responsibilities of faculty to the New Lab

1. Faculty must meet a minimum level of computer competence before a proposal can be accepted. The Divisional Technology Coordinators will establish appropriate criteria

and certify that they have been met.

2. Given the competence indicated above, faculty are responsible for basic upkeep and monitoring of resources used in their projects. For example, they must know how to:
   - Check cables (power, keyboard & mouse, etc.) if the machine isn't running.
   - Force quit a program or reboot the machine when it freezes.
   - Reinstall the system when the machine doesn't come up because the system is corrupt (question mark on start-up, or unhappy Mac face).
   - Access the network and recognize associated rights.
   - Use their particular software—where it is, what steps are needed to prepare it to be used by students.
3. Resources deployed in the service of a particular project remain under the control of the School and the New Lab. Decisions to redeploy may have to be made on occasion.
4. As part of our commitment to our funder and to our school, we must evaluate the success of projects in the classroom. Faculty should expect evaluations by qualified outsiders to supplement internal evaluation mechanisms they have developed.

Proposal procedure

Before a proposal goes to the Co-Directors of the Dalton Technology Plan, it should be submitted to the appropriate Divisional Technology Coordinator and Divisional Director. A Divisional Director may meet with project proposers and the Technology Coordinator in order to refine a proposal. Their comments and recommendations may be appended to the proposal when it comes to the Co-Directors. The Divisional Director is responsible for formally submitting the final proposal.

There is no formal New Lab deadline for proposals, although resources are limited and summer planning is beginning now. Directors and Technology Coordinators may have internal reasons for setting such deadlines within a Division.

Technology at the First Program

Retrospective and Prospective: Karen Bass

Part I: Retrospective

At the beginning of the 1992-93 school year, The Dalton Technology Plan began to introduce technology-based programs into the First Program. After initial hands-on classes, a blank schedule was posted so that teachers could sign up for "lab time" in the newly configured computer room on the first floor. This type of schedule allowed for more flexible use of the resources. A class working on a particular project could sign up for as much time as was needed. Meanwhile, the New Lab staff became familiar with individual class curricula in order to help better integrate computers into students' daily activities. Many First Program teachers worked closely with the New Lab staff to plan, prepare, and orchestrate a vast number of projects.

Most of the time, half classes came to the lab. This allowed each student to have his/her own computer. However, each classroom had a compatible computer set-up so that students had the opportunity to complete assignments, explore individually, and reinforce skills acquired. As students gained independence using the technology, they felt comfortable using any available computer in the school. Thus, the newly acquired room truly functioned as a Dalton "Lab", and many activities, projects, and independent assignments took place simultaneously. Throughout the year, we observed students in the Lab from grades K-3 communicating with and/or helping each other.

The First Program was not equipped for doing multimedia projects involving video because we did not have the proper hardware or software. We relied on Don Nix, an educational consultant, to help fill this void. Don completed two major projects. He worked with a first grade social studies unit creating a family role-playing multimedia presentation. He also built upon a third grade New Amsterdam unit with a multimedia project that included filming at Philipsburg Manor.

We lobbied for a demonstration monitor which did not arrive until the end of May, but then made many of our classes much more successful, and class presentations more enjoyable. Not having a computer set aside for development purposes was one of the most obstructive elements of this year. This, combined with a lack of space for teacher/Lab Associate development and exploration, was a hindrance. Our computer memory capacity is limited. Our current system is made up of stand-alone computers, and the lack of a network means that we often do not have enough memory to store and run many of our programs. In addition, we have to rely on floppy disks, which are unreliable. Lastly, we do not have enough printers to serve our population. Primary age children need a hard copy of their work in order to feel a sense of completion.

> It is interesting to notice how much of what has been done, or is projected, at the First Program prepares students to use resources only now being developed in later grades. The cumulative tendencies of this environment, infused with this pedagogy, are inherent.

Valuable time was spent previewing software and ordering the programs that teachers found to be useful. Everyone benefited from the introductory hands-on classes. Thus, teachers became knowledgeable enough to meet the technical criteria for managing projects and equipment. Both teachers and students were able to build on this initial positive experience. As a result, many different kinds of technological projects were completed (listed below).

The computer environment provided the opportunity for students to learn about technology. Throughout the year this learning process has continued as our projects have become more sophisticated. At the primary age technology projects have involved a combination of the following:

- Expression
- Exploration
- Presentation
- Reflection

Goals

1) Increasing learning skills through exploration.
2) Stimulating inquiry-driven environments.
3) Maintaining a constructivist atmosphere (learning through exploration and inquiry, while at the same time accomplishing and/or completing a project and gaining overall knowledge to that end).
4) Encouraging children to pursue a project for their own sake and grasp knowledge as they go along.
5) Increasing self-confidence, motivation, and independence.
6) Providing general knowledge of the use of current technology.
7) Allowing students to freely express their ideas in ways with which they are comfortable.
8) Enhancing learning by making available media to suit different learning styles.

The use of technology at The First Program helped us achieve our goals by:

1) Alleviating the frustration of underdeveloped small motor skills. At this age small motor obstacles can impede free inquiry and creativity. Providing graphics, writing, and editing tools that are easy to manipulate can help the writing process.
2) Using the keyboard, which allowed the students to concentrate on writing (forming words) rather than forming the letters.
3) Enhancing expression through the merging of graphics, writing, and sound. Children have the opportunity to express themselves in different modalities.
4) Having a means of recording their works in progress (notes, audio, video).
5) "Unpacking" the writing process; allowing children to think first, organize second, edit freely, and then obtain a hard, neat copy of their work.

6) Providing a vehicle that allowed for easy integration of primary school curriculum. Children research, write, and draw in the same setting, approaching the same problem.
7) Encouraging free exploration through the available tools and materials in the Computer Lab and in the classroom.
8) Fostering collaborative learning through peer-to-peer communication.
9) Increasing self-confidence through each accomplishment.
10) Using existing software whenever possible in order to find programs that fit the needs of the curriculum. This software has been continually previewed and evaluated.
11) Developing programs to fulfill our requirements when no suitable software exists.

Some results and observations of the use of technology at The First Program

Collaborative learning has taken place. For example, this year two first grade classes worked together on a social studies unit. Both teachers and students were combined for various activities including technology-based projects. Although these students did not see each other on a daily basis, during these activities they were comfortable sharing ideas, helping one another, and exploring various aspects of the program.

Cooperative learning among students and teachers when working together at a computer.

Classroom teachers and specialists have worked together to plan and organize interdisciplinary assignments. Organizing and implementing these projects led to a sharing of ideas and more open communication.

Students have become adept at using tools that will be an important part of their Middle and High School experience.

Programs based on current curriculum have been developed which are used by students as a means of organizing their observations and as a source of reference for future work.

Using the technology has enabled students to observe and reflect on the evolution of their thinking.

The following is a sampling of K-3 projects that have been implemented this year:

- Science curriculum (Rain Forest)
- Art (Big Books, Slide Shows)
- Interdisciplinary activities (Rain Forest, Zoo Unit)
- Multimedia (Family Unit, Rain Forest, Philipsburg Manor)
- Library (Zoo Unit, Archeology, Oceanography)
- Archeology (Inwood Park)
- Writing Process (Sara Adler, Marie King, Mary Mellow)
- Math (100 Days)
- Reading (Big Books)

- Social Studies (Senior Citizens, NY Tour, Zoo Unit, Timelines)
- Language Arts (Creative Writing, Newsletters)

Part II: Prospective

Plans for next year include preparation for the First Program network. This will hopefully alleviate memory and lack of equipment obstructions. With the advent of this network The New Lab staff will need to increase their technical knowledge. Staff members plan to attend LAN system manager classes to become acquainted with the basics of network design, how a network operating system intersects with the workstations, and other basic necessary troubleshooting and management techniques. As part of the network introduction, First Program teachers will be introduced to the E-mail system.

The New Lab staff will continue to support approved proposals and enhancements of this year's major projects. This will give us more information and better tools for evaluation. Some ideas for new projects include designing a curriculum using simulations such as *SimCity and SimAnt*, creating a writing process technology center (using the old math lab space), and continuing the integration of appropriate software. Lastly, we look forward to integrating technologies other than the computer, i.e., cameras, video, sound, CD-ROM. This will increase our use of multimedia.

Hardware Needs and Software Needs

Space and curriculum warrant the need for more CD-ROM drives and computers.

- Local drives for the library
- More classroom printers
- Video software
- Video editing equipment
- Copies of highly used software so that more than one class can use current software upon demand

We are proud and pleased with the First Program accomplishments. We are proud of the knowledge that the students and teachers have gained, and the ease and independence they have shown in using our newly acquired technology. Many teachers worked very hard to incorporate these resources into their ongoing programs. Not only have they enhanced their current programs, but also broadened their students' learning experiences. First Program teachers are gratified by their accomplishments and feel that the professional development they have acquired is a necessity for work in this new educational environment. It is important for all teachers to realize that the challenging task of making a wide range of technological experiences available to students is an important goal.

* * *

Reports and Proposals From the First Program

In the absence of a network at the 91st Street building, and given a fixed need for close supervision, technology-based initiatives at the First Program often take shape as a single project—complex and interdisciplinary, but essentially dependent on a central "Lab" and its staff. But the documents to follow demonstrate that the effects of new technologies, when governed by a progressive pedagogy, are centripetal from the outset. Projects animated by real questions drive students out into the world, no matter how much they rely on the computer for synthesis and presentation.

Final Report: Don Nix

This document updates my involvement at First Program in terms of (I) Activities during the past year, 1992-1993; (II) plans for school year, 1993-1994; (III) recommendation for video editing facilities at First Program. Descriptions are intended only to provide an indication of degree and character of involvement.

All of the activities that have been completed and that are planned or recommended are connected by the concept *expressive learning*. Expressive learning refers to a focus on learning through self-expression in topics of intrinsic interest and relevance to the child, rather than learning by being taught wherein the learning outcome is compared to a preset body of information prescribed by the teacher/system. This approach views children as humans—not as "students." Expressive learning can be an end in itself, or a component of a larger nexus of learning goals.

(I) Activities, 1992-1993 school year

A. Multimedia projects.

For the following projects, I brainstormed with, taught, and consulted with teachers; worked with children in conceptual overviews, script writing, rehearsing; directed the skits, did the taping and retakes, and the video editing and postproduction, provided funding and arrangements for creation of video discs; and finally designed, programmed, and debugged the end application. These projects are: (1) House 41 (Head Teacher, Judy Visoky) Open House—focus: welcome to parents and presentation of the doll-making project. Kids created dolls and then discussed in small groups their activities—the groups appear freeze frame on the computer monitor, and when the user clicks a picture, the kids on screen describe their ideas and activities. (2) House 33 (Head Teacher, Barbara Cramer) Open House—focus: welcome to parents, and a child identification guessing game. Each child appears freeze frame in cameo on screen, user locates an essay posted on the wall that he or she thinks was written by his or her child, and makes note of the number of the essay. Parent then selects child on screen, types in the number; if correct, child is shown enlarged giving personal congratulatory and welcome-to-my-class message. If incorrect, whole class is shown enlarged saying "not." (3) House 41 *Family Multimedia Magazine*—focus: certain concepts

for organizing the study of family life (rules, jobs, conflicts, and traditions in the family). Children wrote scripts, designed props and costumes, and acted out skits. The computer application implemented the notion of a magazine with chapters for each issue. The end user clicked on a chapter heading and then viewed the skits interactively. This was presented in the gym twice, to several other classes and parents of House. (4) House 33, *New Amsterdam Project* (currently *in media res*—to be completed mid-May)—focus: life in New Amsterdam, mid-17th century. Children play roles of 20th century newscasters who go back in time and broadcast events of the day in 1640s. The events are acted out, covering a range of topics (e g., celebration of holidays, meals, role of children, pets).

B. Dalton and P.S. 92 Collaboration

(1) At the *Kids at the Wheel* project at P.S. 92 we hosted House 34 (Head Teacher, Ethel Goldhagen) in our classroom. We discussed and demonstrated some of our multimedia creations covering civil rights topics, and then helped the visitors try out some of our computer games. Dalton teachers and children brought refreshments and P.S. 92 children provided drinks. (2) House 34 invited P.S. 9 kids to go to Central Park with them. This is scheduled for May 27. (3) Isabel Washington Powell (first wife of Adam Clayton Powell, Jr.), who works with children at P.S. 92, was invited (and has accepted, health permitting) to visit Dalton House 31 with several *Kids at the Wheel* kids to talk about life in Harlem during the years of the Harlem Renaissance. These activities, (1) through (3), have provided a basis for an ambitious, year-long collaboration planned during the 1993-1994 school year (described in Section II, following).

C. Other Activities

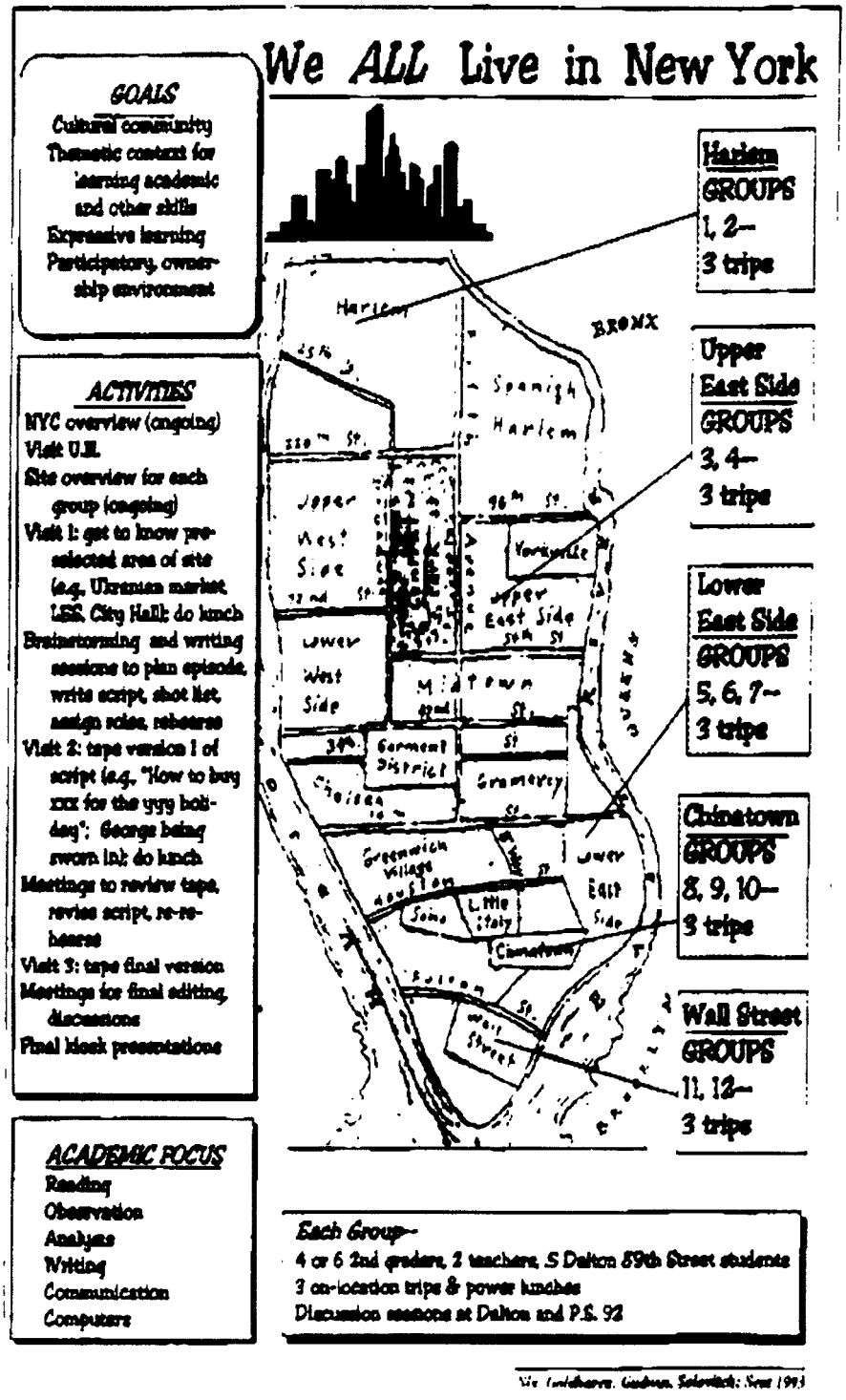
I installed several commercially available programs and trained teachers and children in their use. In particular, two CD-ROM based applications, *Mammals* and *Stories and More,* were placed in Houses 41 and 55. In addition, an experimental application which I am developing, *Making a Scene,* was installed in House 33 and I taught children how to use it and provided guidance in application ideas, using a video disc with civil rights news clips. Several applications were developed by the children.

(II) Plan for School Year, 1993-1994

We ALL Live in New York

Dalton and P.S. 92 Joint Project

The goal of this project is to deal with facilitating racial community by combating stereotypes that function to separate people, and doing this via direct motivated interactions between kids from two schools, and between the children and members of selected city neighborhoods. Groups of second grade children with diverse backgrounds, including House 34 at The Dalton First Program and Room 2-227 at The Mary McLeod Bethune Elementary School (P.S. 92) in Central Harlem, will work together in small groups on a regular basis during the school year, visiting ethnically and culturally interesting neighborhoods in New York City (e.g., Chinatown, Harlem, Lower East Side, Upper East Side, and the United


We ALL Live in New York
GOALS
Cultural community
Thematic content for learning academic and other skills
Expressive learning
Participatory, ownership environment
ACTIVITIES
NYC overview (ongoing)
Visit U.N.
Site overview for each group (ongoing)
Visit 1: get to know pre-selected area of site (e.g. Ukranian market, LES, City Hall; do lunch
Brainstorming and writing sessions to plan episode, write script, shot list, assign roles, rehearse
Visit 2: tape version 1 of script (e.g. "How to buy xxx for the yyy holiday"; George being sworn in); do lunch
Meetings to review tape, revise script, re-rehearse
Visit 3: tape final version
Meetings for final editing, discussions
Final block presentations
ACADEMIC FOCUS
Reading
Observation
Analysis
Writing
Communication
Computers
Harlem GROUPS 1, 2– 3 trips
Upper East Side GROUPS 3, 4– 3 trips
Lower East Side GROUPS 5, 6, 7– 3 trips
Chinatown GROUPS 8, 9, 10– 3 trips
Wall Street GROUPS 11, 12– 3 trips
Harlem
BRONX
Spanish Harlem
Upper West Side
Upper East Side
Lower West Side
Midtown
Garment District
Chelsea
Gramercy
Greenwich Village
Soho
Little Italy
Lower East Side
Chinatown
Wall Street
Each Group–
4 or 6 2nd graders, 2 teachers, 5 Dalton 5th Street students
3 on-location trips & power lunches
Discussion sessions at Dalton and P.S. 92

Nations), and expressing their impressions in terms of a multimedia computer-based kiosk application they themselves will create. The application will include a video of the site, and videos of the children themselves in roles they choose for interacting with the site (e.g., newscaster, restaurant critic). Kiosks will subsequently be on display at both schools.

Each project group will consist of four or six children, half from each school. There will be about 10 such groups, and each will visit their site three to four times, for exploration, videotaping, and re-taping. In addition, each group will meet several times a month, at Dalton and at P.S. 92, for script writing, brainstorming, rehearsing, planning, and various other activities. Each area of New York City that is a project site will be hosted by a resident of the area, who can represent the particular area as an insider. Two teachers from each school, and a researcher, will conduct the project.

One of the Chinatown groups might work as follows. The four (or six) child group would visit the area, talking to people there, learning about its history, and then determining in both electronic (fax, e-mail, telephone) and face-to-face meetings how to create an interactive skit about the area. They might do a travelogue documentary, a restaurant guide, or how Chinese children learn to use chopsticks. They would write a script, assign each other roles, and rehearse. Revisiting Chinatown, they would videotape their script on location and then discuss and present in-progress versions to the other Chinatown groups for feedback. These presentations would alternate between Dalton and P.S. 92. In addition, a child in the Chinatown group might fax interim thoughts or a photo he or she found to the members of the group at the other school, or use e-mail, or a phone call. The children would rework their ideas, go back on location, re-tape, revise, polish and complete. The final version of their production, along with the work of the other groups, will consist of, as indicated, a multimedia kiosk an interactive, computer-based, child-centered and child-created collage of sights, sounds, and idiosyncrasies of New York City, focusing on locations exhibiting various ethnic and cultural milieus.

Student activities will be distinctive (kids will brainstorm together, plan together, take trips together, eat together; use faxes, e-mail; create interactive videos; and own their work in a direct, experiential way). In this context, we are interested in documenting the relevance of stereotypes as the groups evolve, both in terms of children's interactions with each other, and in terms of their perceptions of New York City. A powerful factor contributing to divisions among children of different backgrounds is a lack of direct, shared contact. Due to the large number of hours children spend in school at formative ages, dealing with this type of problem in a school and interschool context has the potential for far-reaching impact. We expect that this project, upon evaluation and revision, will function as a model for similar work at other school partnerships.

(III) Needed—Video Editing Facilities for First Program

Computer-based applications, created by children and including video created by children, either shot or acted, have potential for learning experiences with depth, in part because they directly involve the learners in expressive activities that can be relevant to the

learners as persons rather than simply as students, and also in part because the finished products are sources of real pride. Many examples of this occurred in the projects outlined above (both children's pride in seeing themselves acting live on stage on screen and parents seeing their children thus). The projects above would have been considerably more tractable if we had access to, on First Program premises, lights, video editing equipment (two tape decks and editing controller), two cameras and a large-screen projection device for the finished product. Instead, it was necessary for me to supply the equipment (camera and lights) or borrow it from the 89th Street building (projection monitor) or travel back and forth from one location to another (editing). Below is an itemized list of devices needed. It should be noted that the on-premises availability of such equipment would make it feasible for other Houses to explore some of the approaches we used, much as the current First Program computer lab does for more established computer applications.

- 2nd VHS camcorder $1000
- Projection monitor (already scheduled)
- 2 editing tape decks $2000
- Editing controller $300
- Lights $1000
- VHS tapes $200
- Video disc imprinting $1000

(Prices above are estimates)

The above video equipment would be used with the hardware I have already installed at First Program, and would also be available for use by upgraded hardware provided by the LTC. In addition, I would be able, with such equipment, to conduct small workshops for interested teachers, in order to enable them to include, where feasible, active video projects in their curriculum.

New Lab (Enhancement) Proposal—The Need for Development Space: Karen Bass, Wendy Weisner

Proposal

In the past year, the New Lab staff at the First Program has developed several major projects: the Kindergarten Rain Forest Project, Monster Math and Archeology. These projects required programming as well as equipment. The work was done despite difficult conditions, brought on by space and resource limitations. Until April, we did not have our own machine, nor did we receive a copy of *SuperCard* until the end of May. Lastly, the work was done amidst the Lab with students coming in and out, asking questions, needing attention and help.

As the program at the First Program grows, there will be an ever increasing need to create and develop more and larger projects. That means that separate space and resources will be needed.

Rationale

Software development requires a quiet environment with relatively few interruptions in order for efficient, quality work to take place. A very important part of our job is to be available to help the students in the lab. Children of this age need immediate attention and feedback, so if we are in the room we must be available to help them. If we had a development space, we could arrange with each other so that one person is in the lab while another is in the development space. Thus, we would not be neglecting the children.

Needs

1 computer (possibly a Quadra)

1 scanner

1 color printer

1 table to hold equipment

Space (can be a very small room, possibly one of the walk-in closets)

Project Proposal—The Writing Process and the Computer: Sara Adler

This is a proposal designed to extend the use of the computer to enhance the writing process curriculum this coming fall. I propose to turn the old math lab space on the third floor (west) into a mini computer lab. The plan is to offer the facility to the first, second and third grades as soon as scheduling constraints can be worked out

Many of the teachers at the First Program (myself included) have been making extensive use of the computer Lab on the first floor in innumerable writing-related projects. Converting this space, which can comfortably fit three computers plus a printer, would ease the pressure now placed on the first floor Lab to accommodate excited, but demanding, children and staff.

Hardware Requirements

- 3 Macintosh computers (complete) with capabilities such as those of the Mac IIsi.
- 2 Desk-writer printers 550C (including one for my classroom).

Software Requirements

- *The Writing Center*
- *Bank Street Writer*
- a paint-type application so that students can illustrate their work
- *Kid Pix Companion*

Operational Start Date

This installation will be fully functional by the start of classes in September 1993.

Space & Equipment Requirements

The 3 Macs and printer can be placed in the old Math lab with the use of computer tables.

Although I have a good amount of knowledge for handling challenges that occur when one is working with computers, I would like to enhance my expertise by working this summer with Karen Bass. By exploring the software I can ensure that I will be utilizing all the possibilities as they relate to the children's writing. Also, with this training, I will then be able to share my knowledge with colleagues and students utilizing the space. Mary Mellow, who shares this section of the building with me and who would also make extensive use of the mini-lab, is already quite proficient in the use of the above-mentioned programs. She could, therefore, also be a resource to other teachers and students.

The computer's editing features, cut and paste, allow young writers to change wording or spelling easily. Students do not feel as much pressure while writing, and expression is less inhibited.

Rationale

Computers can facilitate the writing process by offering students the ability to let their ideas flow freely. The technology provides writers with the power to add to their documents and edit their work. Students can be encouraged to get their ideas down first, and later rearrange words, sentences, or paragraphs and expand on their original ideas. The computer's editing features, cut and paste, allow young writers to change wording or spelling easily. Students do not feel as much pressure while writing, and expression is less inhibited. Additional software features, such as a spell-checker, thesaurus and graphics capabilities, further help eliminate pressure and enhance expression. They allow students to make corrections by themselves that otherwise would have to be done by a teacher. This empowers students and bolsters self-confidence. The ability to incorporate graphics is particularly important in early childhood writing. Computers can also be useful for students whose small motor skills are not yet well-developed. They often find it much easier to press the keys on the keyboard than to write with a pencil or pen. For these students, a computer can eliminate a frustrating barrier to the writing process.

Lastly, the computer can help establish an easy flow of communication between students and teachers. A student can submit writing to a teacher electronically, and the teacher can edit it and make comments in another color. The writing can be sent back and forth in this manner until a final product is achieved that is satisfactory to both student and teacher.

The oft-repeated observation that this technology frees young children from limits imposed by peripheral motor skills is emblematic of the possibilities apparent in the First Program.

Hardware Proposal—The Need for a Printer: Judith Visoky

I am submitting this proposal for a Desk Writer C printer in my first grade classroom. This year, the computer has become an integral part of my curriculum. I feel that it is extremely important that children of this age level receive an immediate, tangible and legible hard copy of their work. The printer that I presently have is more frustrating than helpful. It will also give me the opportunity to take random samples of the children's work for assessment purposes. Therefore, I would appreciate it if I could have a Desk Writer C printer installed in my classroom.

Below is a list of some of the activities I have done this year using the computer. I plan to continue some of these activities next year, as well as explore new activities.

* The writing process on the computer incorporating our social science unit on the family. Since the children were using the computer to do their writing, they spent less time worrying about correct letter formation and were able to concentrate on the actual story.
* Use of the writing process, organizing research, and beginning mapping skills during our unit on the zoo.
* Multimedia performance on the family using the IBM computer. The children wrote and role-played various family situations as they explored family values and jobs.
* Use of the IBM computer for (1) research during our zoo project using the *Mammals* program and (2) developing reading and writing skills by using the *Stories and More* program.

My Plans for Next Year

* I would be more than willing to share my ideas and activities with my colleagues so that they can use some of these computer activities in their classrooms next year.
* The first grade faculty is planning to meet over the summer to develop social science curriculums and I have a few ideas that I plan to share with the group (whether we will use them or not, I cannot say). I would like to have my class study the Dalton School Community. An example of some of the activities the children would be doing are teacher interviews which they would put on the computer as well as floor plans of the school that they would transfer onto the computer using the appropriate software. I also plan to meet with Don Nix over the summer to incorporate the IBM computer into this curriculum and to develop more ideas with the help of his expertise.

Proposal for Technology Enhancement for the Art Room at the First Program.

The Art Room at the First Program would like to incorporate the use of technology for direct use of the students and for improved administrative organization. We are requesting an up-to-date Macintosh computer that is compatible with the rest of the school network. It should have as advanced as possible drawing capabilities and we also need a black-and-white printer. At the present time we can use the software currently in the school system. This computer should be purchased during the summer so that faculty can begin to use it prior to school beginning. We will then be able to begin incorporating its use into the Art Room as

soon as school begins. We do not anticipate needing any additional space (a computer table was donated) or changes in scheduling because of it.

New computer technology has greatly affected the world of visual art. Dalton students should learn to integrate their new technological skills with the creative arts as well as with academic areas. The graphics that students now create with computers should be related to their work in the Art Room just as painting a picture in the classroom is. In order to do this the art faculty must be educated and familiar with the language and creative potential of computers. They will then be able to participate in and enhance any graphics or pictorial computer project that students are doing just as they are available to support and guide scenery design or other special art projects in or out of the classroom. In addition, it is important to expand students' understanding and experience of how computers can be used as a tool in the creative process. We believe that it is crucial to make sure that art continues to be linked to all other aspects of a Dalton education and not be left behind in the "dark ages". Because computers are relatively new to all of us, we can only envision the beginnings of how it can be used in the Art Room. However, there are a number of specific ways we plan to utilize it in our current curriculum. Students will be able to draw plans for constructing their woodwork, furniture and wood constructions. Expanding their vision to be able to make 3-D drawings would enable them to better understand their plans, as well as be able to experiment and change their ideas before they begin to execute it. Students will be able to easily explore and create imagery to use for printmaking, tile making and sewing. The computer will enable them to quickly flesh out many ideas without feeling overly attached or committed to their first attempts. We pride ourselves on offering a wide variety of materials for expression. Students who are easily frustrated at not being able to work in a particular medium may more easily find success by using a drawing program to express their ideas. Using computers in the Art Room can help to teach the children new ways to approach problem solving.

The art faculty will be able to assess the success of using a computer in the Art Room in a few different ways. Firstly, by how often the computer is used for projects that have already been part of the curriculum. Secondly, by the types and success of new projects that will grow out of the use of the computer. We can also evaluate whether or not the computer is a valuable planning tool for assisting students in woodworking, printmaking, sewing, etc., by looking at where and how their process, understanding and completed products are affected by using the computer. We will be able to assess how well we are making use of the computer in the middle and again at the end of next year.

The Art Room currently sees all of the classes in the First Program, with many of those students also coming every other week in addition. In a program that is continually serving more children and that is as highly individualized as ours, it is a cumbersome task to keep track of what each student is currently working on and what they have already done. Having our own computer would enable us to devise more efficient ways of keeping track of the activities in each class as well as each student. In addition, with our budgets always getting tighter and tighter for art materials, we could better keep track of what we have and what we

need by using a computer.

In conclusion, after having patiently waited for three years, we strongly request a new computer for the Art Room. Its uses will be multifaceted and will benefit both the art education in the school and the functioning of the Art Room.

> What goes for motor skills and writing, in the traditional sense, goes for graphic representation of all kinds—and the principle applies at all levels and not only in "art" class. Free expression in the creation of representations is an essential skill in a constructivist educational culture.

New Lab Proposal—Integrative Use of Technology in a First Grade Classroom:
Rene Goldberg

I have used the computer this year as part of our writing program. The children created stories in the form of slide shows. They were able to "create" their own stories, and by putting them on the computer they were integrating many skills, such as the use of the keyboard, manipulation of the mouse, and the ability to use the computer to *graphically* represent ideas. They created stories and could then easily change them because of the ability to instantly "redo" something on the computer.

We have found that not having a printer has thwarted our efforts in fully extending the writing process. For example, when editing or rewriting pieces it would be valuable for the children to have a printed copy of their efforts with which to work. While they are reviewing and revising their writing, the computer is free for other children to use. It is also common knowledge that children of this age need the instant gratification of seeing the results of their efforts. It is important that we do not lose sight of the hands-on experiences of first grade.

Math Program

Our math program is integrated into many areas of the curriculum, including social studies and reading. We encourage children to constantly express their thinking patterns, strategies and logic.

Goals

To use the computer as a tool to allow for the expression described above. If children are posed with a word problem to solve they can use the computer in many ways to represent their thinking.

The "stamps" and ability to "draw" and make a visual representation that *KidPix* provides help children to work in the semi-concrete. They can also use colors effectively to make a point. They can move or redo something they've done easily and quickly, eliminating the frustration of having to "start all over again." They can also type a written response.

Plans

I intend to create many word problems that could be representational of the math concepts covered in first grade. These problems would also relate to the children personally (i.e., using their names), their immediate environment (Dalton), their social studies curriculum (post office, zoo) as well as literature we read. A math response journal can also be created on the computer.

Aside from the word problems that we create on the computer, the children can create their own problems and have their classmates solve them. This could be done on the computer or printed out and completed on paper.

While I feel comfortable trying to use existing software (*KidPix*) to do this, I would benefit from some technical support from the New Lab. If we felt a measure of success in this area, it might be worth having the time of a programmer to create a program specific to our Dalton community and the first grade curriculum.

I also wish to explore other existing programs, such as *Superpaint*, as there has not been enough time during the year to do so. I wish to use these other programs in as many ways as possible next year. I intend to create a library of big books written by the children themselves.

Needs

If I have the opportunity to carry out some of these ideas, it will be essential to have an additional computer in the classroom. Also, at least one printer would be needed. I would also require some time this summer from New Lab staff for technical support, the introduction of existing software, and possibly programming.

New Lab Proposal—Increased Integration of Technology Into the Science Program: Victoria Mayer, Wendy Weisner

We would like to use technology to further enhance the science curriculum at the First Program.

Science Objectives for First Program Students:

1) Developing an interest in scientific exploration
2) Identifying and solving problems
   *Seeing themselves as creative problem solvers
   *Forming hypotheses
   *Designing experiments to test hypotheses
3) Searching for patterns to find meaning, looking for:
   *Spatial patterns—connecting structure and function

*Temporal patterns
*Patterns in data (number series) analysis

4) Developing concepts of number and mathematical relationships
*Counting
*Measuring
*Comparing quantities
*Graphically representing mathematical relationships

5) Communicating information effectively
*Participating in small group and class discussions effectively
*Organizing thoughts, observations, and data in written form
*Gathering information through reading and discussion

6) Working cooperatively, developing:
*Self respect
*Respect for others
*Good communication skills
*Responsibility

Projects

Kindergarten Animal Protection Project

This year, a *HyperCard* stack was developed for use by the kindergarten classes in their study of animal behavior. The children visited the rain forest section of the Wildlife Conservation Center in Central Park to study how animals protect themselves from predators. Each child chose an animal to observe, and drew a picture of it. Since children of this age are limited by what they are able to write, we recorded their verbal observations and hypotheses on cassette tape. When they were back at school, they re-drew their pictures on the computer using *Kid Pix*. They also went to the library with their class to collect additional information about their animals. After the research, they returned to the computer lab to incorporate the new information as written text. The *HyperCard* stack brought together their pictures, tape-recorded observations, and writing, as well as color pictures of the animals that had been scanned in from books. The completed program was then installed in each classroom to be used by the students.

This program was an integral part of the larger animal study. The children worked cooperatively to create habitats for the animals using the information gained from their direct observations and library research. We then invited in guest speakers and some classes traveled to the American Museum of Natural History to study the effect of human

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populations on these habitat areas. As a result of their studies, each class chose a conservation project to undertake to help preserve areas of tropical rain forest. The children shared these projects, the rain forest dioramas, and the animal protection *HyperCard* programs with their parents.

Although the program was successful overall and truly reflected the analytical and creative efforts of the children, we would like to make some modifications in response to feedback solicited from the House teachers. We would like to shorten the length of time it takes to complete the program after the children have visited the zoo and to improve the quality of the sound or investigate the possibility of using video instead of sound. To help beginning readers, we have decided to have the written text duplicate the auditory information which is presented simultaneously with the drawn image and the text. These changes would allow us to make the finished program a more effective communication tool. Children could still incorporate additional information in written text to accompany the rain forest dioramas.

Electronic Lab Book

Since a computer was obtained for the science room in the spring, the older children have used it to record experimental observations and conclusions. We would like to develop an "electronic lab book" for use by third grade classes. In the second grade, these children have recorded their observations on paper, keeping their records in a science folder. In addition to helping them record their discoveries as they did this year, this program would allow them to edit and to add to earlier work. We would like to create a program that would allow them to incorporate graphics, charts and graphs. This lab book program would also add a new dimension to using the computer for communication by allowing the children to access, reference, and link other students' work .

Third graders with experience of the electronic lab book will be prepared to make full use of various "notebook" capacities in projects later in the educational cycle. From *Archaeotype* and *Ecotype* in the sixth grade to the various *Playbill* applications in the eighth, ninth, and tenth, to the full-blown multimedia construction capacities of *HistoryMaker* - the educated person of the 21st century will "write" in a manifold of dimensions simultaneously.

This project will necessitate introducing the science teachers and all third grade students and House teachers to *HyperCard.* If there is a network, students will be able to access their notebooks from their classrooms or the computer lab in order to reference or to add to their work.

Human Biology Reference

Another proposed use of the computer involves the study of human biology, which will be included in the curriculum at each grade level in the First Program. Visual information is a very effective means of communicating information at this developmental level. We would like to purchase a CD-ROM reader and software (if it exists) that will allow students

to examine images of human organ systems. The program would, for example, allow the user to study a diagram of the body, click on the lungs, and then see photographs, scanning electron micrographs, video and/or simulated images of working lungs. If no such program exists, perhaps a stack could be developed. The children would use this program in conjunction with scientific experimentation and model building.

CD-ROM Reference Collection

Finally, children in the science room frequently use reference materials to help them in their scientific explorations. In addition, many students come to the science room throughout the day for reference materials and information on a variety of subjects. A CD-ROM reference collection would be invaluable for individual students and science classes. If moved into the new building, this facility could be situated in the front classroom, to be used by a class or individual while another class is working in the experimental area in the rear of the building. This collection could be coordinated with the library or accessed via the network so as not to create unnecessary duplications.

Needs

In order for all of these programs to be successful, an additional computer would be necessary. The two computers could be in the hall that connects the two rooms in the new science area and/or the front room. This would allow for both group and individual use of the computer. It would be extremely helpful if these two computers were networked.

Requirements

- 1 Macintosh computer, networked to the one already used by Science
- 1 CD-ROM drive
- 2 tape recorders with hand-held microphones OR the use of 2 portable computers for two weeks
- CD-ROM software for the human biology program
- Other relevant CD-ROM software for reference purposes
- Science and/or New Lab staff time for finding and previewing relevant software
- New Lab staff time for:
  *Enhancing the animal protection program & creating each class's stack
  *Creating the "electronic lab book"
  *Teaching *HyperCard*
  *Possibly developing a human biology stack
  *Technical support

Summer Computer Project Proposal—New York City: Julie Brush

I have used new technology this year in ways I never imagined possible. It has been especially helpful having Karen Bass as a resource. Her expertise has been invaluable. While I initially found the open-endedness of using the Lab rather intimidating, I have grown more comfortable with the possibilities this set-up has to offer. I have worked on a project this year that has been an integral part of my social studies unit on New York City. It has only begun to tap what I envision as a central tool of this same unit next year.

Each student in my class researched a different topic within New York City. The students sent away to their respective places of study and received information. Using photographs they received, or from books, students scanned the topics into the computer. The children then used graphics in *Kid Pix* to create a scene around their photos. Experimentation left each student with not one, but a series of variations on his or her topic. Through this, the project evolved into twenty-two individual slide shows, each telling a story about each topic. It is an impressive presentation. More impressive however, is consideration of the skills that this project has fostered: familiarity with the computer as a tool; development of fine motor and eye-hand coordination; logical reasoning; reinforcement of knowledge gained while researching topics; practice extracting significant details or highlights from an enormous wealth of information; knowledge of microphone use; and, lastly, keyboarding practice.

During the summer, I would like to pursue the following goals:

- Develop a resource bank of topics from which the children could choose.
- Learn how to scan in pictures.
- Integrate geography into the presentation, whereby each child would locate his or her topic and/or design a map.
- Develop several different types of models for demonstration purposes.
- Visit site locations in order to collect information and photographs.
- Finally, review other software available for classroom use.

New Lab Enhancement Proposal—Third Grade Archeology: Neil Goldberg, Ellen Levenson

Proposal

In Spring 1993, a prototype HyperCard stack was created to enhance the presentation of the third grade archeology data. Students entered the data on specific artifacts, including weight, size, coloring, etc. Then their writing was brought into the stack and connected to the card with their data, which also included scanned photos the students had taken of their artifacts. Site summaries written by the students and a site-level directory were incorporated as well. The final stack encouraged the students to review the dig, giving them a more definite feel for the entire site. There was much discussion and collaboration as the students prepared

for their final presentation. One class presented the stack to their relatives on relatives day with great success.

Next year we would like to include a stack for each third grade class involved with a dig. We would also like to:

1. Create a library of scanned images. Artifacts are reused from year to year.
2. Develop graphing functions. Students could graph artifacts by level/material, function and country of origin.
3. Create an on-line bibliography. Students could see what books are available in both the First Program and Middle School libraries.
4. Link stacks. Classes could use previously developed stacks as resources for their research.

Needs

Ellen programmed the prototype with minimal HyperCard knowledge. She would like to take a HyperCard course this summer, so that the enhancements can be made. The New School offers a six week *HyperCard for Multimedia* course that begins July 8th. The cost is $270. Ellen will also be looking into courses close to her summer location.

Resources also need to be allocated for the time to research and create the scanned images. Templates have been developed for the students to enter their data, but additional templates will be needed for the new level information. Lastly, because of the size of the stacks and the number of images, storage and development space will probably be needed.

Enhancement Proposal—First Program Library : Cynthia Millman

Phase I

1. The James R. Hurst Children's Library at the First Program is requesting:
   - A MAC II setup compatible with the new equipment that will be installed elsewhere in the First Program
   - A Desk Writer 550 printer.
2. We would like the system to be installed ASAP, but no later than August 31, 1993.
3. This system would replace the Apple IIE and ImageWriter II that are currently being used.

Phase II

1. This resource would be used by the Head Librarian, Associate Librarian, and parent volunteers for all word processing and database needs in the library including:

   memos, newsletters, weekly and end-of-year overdue lists, donation thank-you letters, summer reading lists, subject bibliographies, ordering, proposals, reports, evaluations, and other miscellaneous procedures.

The current system is heavily used. It is essential to the daily functioning of the library.

Since all computers in the FP are now MAC-based, the librarians feel out of touch with the new technology. Both librarians have taken advantage of the instructional opportunities offered by the New Lab staff. Last fall, the librarians tried to take projects down to the Computer Lab in order to begin transferring library operations over to the MAC system and to increase our skills. Because of our busy teaching/reference schedule and the Computer Lab's heavy schedule, this was not a successful strategy.

We feel that it is important for both librarians to be knowledgeable about the same computer system as the rest of the school. In light of plans to install CD-ROM technology in the FP Library, it is even more important for the librarians to become computer-literate with Macintosh computers.

We believe it is necessary to learn the Macintosh environment so that we will feel comfortable using the computers once the First Program is networked. Networking will give children access to the collections in the Middle and High School Libraries. We already have an active interlibrary loan system, particularly with the Middle School. Networking would enhance this exchange.

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3. We will begin transferring our operations to this system during the 1993-94 school year. we expect that the new technology will be completely integrated into library operations by June 1994.

Responsibilities of Faculty to the New Lab

Both librarians meet the requirements for a minimum level of computer competence. However, we both hope to increase our level of expertise through formal training and application.

Problem Solving Using Kid Pix: Rene Goldberg

Most of the math programs presently available for young children are "response" programs and allow for little or no logical thought and creativity on the child's behalf.

Problem solving is an integral part of my math program. It gives the child the opportunity to think logically, to think inductively and deductively, to estimate, predict and justify their reasoning. Almost all the first grade mathematical concepts can be explored through problem solving. These could be real problems, in other words, everyday situations which

arise and can be solved, as well as "contrived" problems, created in order to purposely ensure that certain concepts are being explored.

If the problems relate to either the child's immediate world or to a specific area ofstudy, it is more likely to capture his/her interest. For this reason I have created problems which relate either to children, their Dalton environment or to the topic being studied in our social studies curriculum (The Post Office, The Zoo).

The ideas behind creating this "starter file" of problems are as follows:

1) The computer becomes a tool of expression for the child to express mathematical thought, just as we use word processing for written language.
2) The child not only becomes familiar with using the graphic tools and keyboard but those who are easily frustrated by drawing and writing are better served (stamps may be substituted for drawing).
3) It allows for individuality and creativity.
4) It lends itself to easy editing and avoids the frustration of starting all over again.
5) It models the creation of word problems for the child.
6) The child is encouraged to "create" his/her own word problems. These would be solved by others in the class and could be saved on the master disks.

Assessment

It is easy for the teacher to pull up a chair and observe as the child works or to involve herself with a "math chat" with the child, in other words to better understand the child's thinking.

Following are some factors to make note of while evaluating a child solving problems.

- Are children progressing in developing concepts?
- Do they work systematically or randomly (i.e., do they have a problem-solving strategy)?
- Are they aware that they have a strategy?
- Are their thoughts logical?
- Can they represent their thinking visually and in written form?
- Are they noticing patterns (visually or numerically)?
- Are they able to transfer their thinking into a math sentence, e.g., 7+2-3=6?

Concrete evidence of the child's progress comes from printed out copies that could become part of his/her portfolio.

To keep in mind:

The teacher needs to caution against using the computer to the same end as a "workbook". The problems created should provide opportunities to illustrate different responses to a problem or allow for creative representation of solving the problem, i.e., drawing. It should not be a "filling in the blanks" response. Since many of the first graders are beginner readers, the written instructions have been kept minimal. It would be ideal to find ways of allowing for a voice to read the script. Perhaps this could be explored in the future.

How I intend to organize and use it in my classroom

All the problems are currently saved as files on disks using *Kid Pix*. The files read Problem 1, 2, etc. These problems would be put on the hard drive as needed.

I have created an Index of the "problems" along with the mathematical concepts covered. Although the problems have been saved in numerical order **They Do Not** appear in sequence of graded difficulty or concepts covered. The teacher is free to then choose the problem applicable to what is being studied in the classroom or to the level of difficulty needed. Also, as new problems are created, either by the teacher or the children, they could be easily added.

The printed-out pages act as a quick reference for the teacher. They can also be copied and, during an evaluation/observation of a child, comments can be recorded directly on the page which makes the explanation of the problem easier as the problem is there to refer to.

During the week each child has his/her own scheduled time on the computer. The teacher decides on the Problem for the week. The file name will then be posted on tag board above the computer, e.g., "Problem 1". The child then knows to retrieve that file from the hard drive.

They work on solving the problem. They then save it on their own disk (in this way the original is not altered and can be used by others). Once they have completed their work they print out a copy of their final product. If the teacher was not present at the time for observation, then time should be found to "chat" with the child about their work. Their problems then become part of their portfolio of work. At the end of each week the class gathers to discuss all the children's work, particularly to notice the different strategies they all used.

A very important piece is also to encourage the children to create their own problems for others to do. Children are very motivated to solve the problems of their peers. In this way, the children are also able to work at their own level. For example, the more advanced children are free to create problems which are challenging to them. Having the children create their own problems is also, in turn, a good tool for evaluating their abilities and progress.

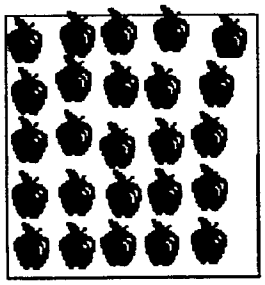
The P.S. often found at the bottom of a problem is usually a "stretcher" for those who are ready to take it a step further. Hopefully, it will encourage the children to realize that one "problem" could easily generate another.

Sample Problems

Mary put apples in box A. Estimate how many apples. Count them by putting a mark on them.

Estimate how many will fit in box B. Fill box B and count the apples.

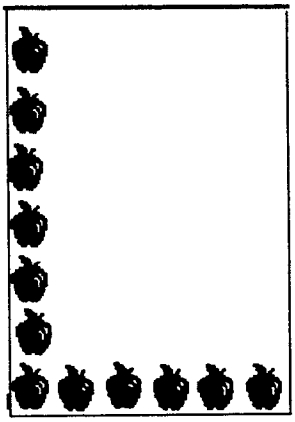
A



Estimate

_____ ?

A _____ apples



B

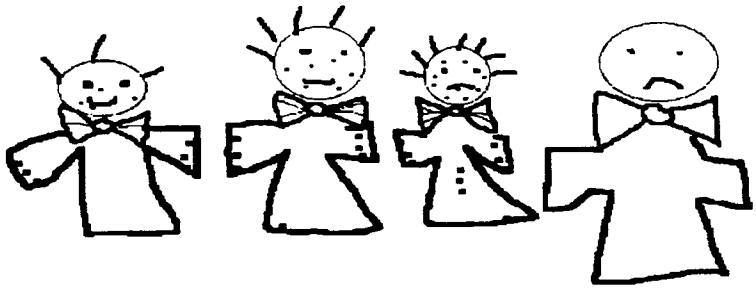
Estimate

_____ ?

B _____ apples

Print out and write about how you did your estimate.

What comes next? What have you observed?



Technology in the Middle School

Realizing Progressive Ideals: Peter Sommer

These exciting reports of a revolutionary educational pedagogy develop a common theme: the most profound changes wrought by computers in the Middle School are social and pedagogical, not technological. Digital technology enfranchises this revolutionary pedagogy but does not mandate it. The technology, all these practicing Middle School teachers agree, must be used in a certain way; and they have—working in different classrooms and independently from one another —pretty much agreed on what this way is. These teacher/researchers have come to see that they are passing through a profound state change in education, but their feet remain commendably on the ground. No prophetic mode here; these teachers aim to be of immediate use. Let me try first to summarize their collective argument.

As for the machines themselves, keep them simple. The Macintosh computers and Texas Instrument word processors have done just fine. In addition, the machines must be networked so that every student and every teacher can talk one with another. As for the classrooms, throw out the fixed seats facing a teacher's desk and substitute clusters of student workstations.

> We should aim for the use of computers in every classroom on a daily basis. We might then enter the next stage of technology development.

As for the pedagogy, first understand that the teacher's privileged position has been metamorphosed by electronic text. The students write, compute, and research for one another, not for the *Person Up Front.* The success of these classes is measured by how well the students constitute *their own* social and scholarly community. The old Skinner-box conception of computer-assisted instruction argued that the teacher would be replaced by an artificially intelligent, tireless electronic robot. The new conception of computer-mediated instruction advanced in these reports offers a more promising replacement—the students themselves. They work collaboratively, as they will do later in the workplace. The teacher becomes a learned coordinator.

We also report that electronic texts, by filtering out the customary clues of social and sexual hierarchy, allow a more balanced contribution to class discourse by those who usually remain silent. And a further redress of balance is encouraged as well — a balance of authorial motive. Several of the reports mention that, when the class rather than the instructor becomes the audience, the competitive and performative motives for writing, doing mathematics, or doing history give way to the motive native to digital devices and electronic text — pure play, governed, in this context, by an inherent educational aim.

Such pedagogical enhancements ought not to surprise us. For the principal building blocks for educational computer development at the Middle School have been based on shared educational principles, convictions reified at the Dalton School since 1929.

For almost sixty-five years, our aim at Dalton has been to foster creativity, initiative, and adaptive intelligence among all of our students. We wish for our children to learn to think

inductively through experiential learning. Inquiry-oriented learning is a habit we aspire to. Learners need to develop the ability to reflect on their own thinking processes. The idea that students pose problems, "mess around with ideas," and inquire, suggests active, involved learners who come to understand how mathematicians, scientists, historians, literary critics, and artists wrestle with problems. Knowledge of subjects is constructed and owned as a consequence of robustly interacting with computers, teachers, and classmates. The teacher is guide, coach, and gentle pusher, not the sole source of disciplinary (in both senses of the word) authority. In current jargon, such views might be called "situated cognition"; in the older tradition of John Dewey, Helen Parkhurst and, later, Jerome Bruner, they refer to the intersections between knowing and doing.

With this tradition in mind, the Middle School has undertaken, above and beyond the specific projects described in the following documents, a more systematic response to the *Dalton Technology Plan's* call for a return to our roots. The sixth, seventh and eighth grades in the Middle School have been scheduled in two "core groups" at each grade level. A team of teachers is responsible for half the grade level in House, English, Mathematics and Social Studies. Teachers can meet together often and share a common conception of the needs of their students. Each core group also shares three rooms in the Middle School. One of these three rooms in each core is networked. Networked rooms have four to six workstations and a printer, as well as certain "extras" (plotters, scanners, video control boards and the like) needed to run our innovative programs in sixth grade Social Studies, seventh grade Mathematics, and eighth grade English. Core teachers control their own schedule, so the use of these "tech rooms" is entirely in the hands of the core teaching group. The technology is equally available for all teachers and students in the core. Furthermore, these rooms are used throughout the day during Labs (as well as after school) to facilitate work on Assignments linked to our technology projects. Overall, this arrangement leads to smaller, more self-contained communities of learning of the kind envisioned by both the original Dalton Plan, and by its technological descendant.

As for the actual actvity of teaching and learning, you will see little emphasis in these reports on learning *about* computers and learning programming as ends in themselves. The students do learn about computers and, perhaps, learn to program, but as a means to different ends, which we conceptualize as entering a new learning culture—that is, developing new ways of learning and thinking. This vision focuses upon learning and thinking *with* computers — technology is seen as a medium for expression.

In my nine years at Dalton, the Middle School has gone through a series of developmental stages in its use of technology.

The P stage: We taught **P**rogramming and treated the computer as an object of instruction. At this stage, the computer was a **P**eculiar item in the school, usually a **P**ersonal item perceived as "belonging" to one or two teachers or rooms in the school.

The D stage: We used computers for **D**rill and practice in the regular curricular **D**isciplines, especially in mathematics.

The T stage: We used computers as productivity Tools, Tailored to the needs of students, Teachers and the curriculum. We moved away from direct instruction with computers and toward the use of general tools such as word processing, databases, spreadsheets, and telecommunications.

In 1992-93, we expanded our use of computers and entered a new stage:

The T^2 Stage: We used the "new class of tools" (such as multimedia), large on-line CD-ROM databases, laptop word processors, and so forth, throughout our curriculum and operations.

As we entered this last stage, however, we consolidated our efforts and focused on familiar, traditional subjects first—on topics that are related not to the computer but to the curriculum. Every student in grades six, seven and eight studied one core academic area which was mediated by the computer: social studies in sixth grade, mathematics in seventh grade, English in eighth. We wished to find out an answer to a very simple question: What would happen if every student in the upper Middle School (grades six through eight) had access to computers in at least one academic course?

Much like a small town, the Middle School as a technologically equipped information landscape did not come to life until it became populated by users who felt at home in it. As the community settled and grew in that environment, more users became guides and blazed new trails that added meaning to the landscape, which made the landscape more attractive to newcomers. The human factor is what made the difference here; we tend to trust people more than machines.

> I'm not interested in technology per se. I'm not somebody who gets excited because you have a new thing on the computer, just because it does it. I'm interested in what it can do for me. If I was put into an environment that had no technology, I would keep the groups, I would keep the collaboration, I would keep the investigative method, and I would deal with the hassles of it...if I had to, but I...would never voluntarily give up the technology. They'd have to steal it from me.—Molly Pollak, 8th Grade Literature, Apple's *Imagine* series.

The use of computers by so many students in so many classrooms presented a variety of opportunities and entailments. We wished to provide time for each faculty member and student to make use of these resources in his/her classroom. This meant a reconfigured student schedule and will necessitate further changes in the future.

Socrates could not have educated Plato as he did if he had 59 other students, for four 40-minute periods a day. We discovered many years ago that under these conditions it is virtually impossible to make "wrestling with ideas" and "aiming for wisdom" educational goals for all students. Now come computer tools which can help us scale the pyramid of wisdom. Before we can expect these powerful technologies to take hold, we need to raise our expectations. How do we raise educational expectations? We must demonstrate how technology can help change our school and how technology empowers learners and teachers. Technology can be the spark that lights some new fires and restores loftier educational goals to our school.

The workshop-style environment, for example, necessitates a change in the format of a class. Little time is devoted to lectures. Instead, the course assumes the format of a workshop, with students engaging in the writing, mathematics, or history process during class when they can get help from each other and from the teacher. The process becomes intrinsic to the students, who plan, draft, revise, proofread, hypothesize, draw, compute, and research in the same way professional writers, mathematicians, and historians do. The class learns to write, compute, and research by writing, computing, and researching, with the teacher-editor providing a scaffold on which students can climb to gain skills in planning and revising the way a good editor nurtures writers.

Under this format, many Dalton laboratory conferences occur during classes. No longer are there long lines snaking around a hallway outside a teacher's room at a few designated times during which students slouch against walls waiting to discuss their plans or drafts. Instead, teachers and students engage in numerous Labs throughout the day during class periods. Nor do teachers have to wait until students turn in a paper to discover they are going in a wrong direction. By scanning students' texts on their monitors, teachers can "head them off at the pass."

Our overall goal is to create not a computer community, but a learning community. To create this learning community we must (1) make the technology widely available and (2) develop a sense of community that extends beyond the classroom.

Most important is the community of teachers and students. Our networked computers have facilitated a new kind of conversation: easy sharing of Assignments, resources, student papers, even a place for dialogue between and among teachers and students. Teachers have begun to work with each other, sharing classroom experiences and research formally and informally across our network in various user groups.

A second community is the administrators. The administrative community needs to respond to the real needs of the other community. Administrators need to be reminded that teachers and students—those who utilize the space—must have the leading voice in designing that space and selecting the appropriate technology for their ends.

Parents form a third community. In May of 1993, several parents began to communicate with me through the Dalton network's E-mail system, utilizing their Middle School children's accounts. The technology offers rich possibilities for direct parent-Director and parent-parent dialogue. Many new formats and services could contribute to the revitalization of parent participation in the Middle School. This could help us in our attempt to reshape our school so that we reduce the isolation of students, teachers and parents.

Perhaps the central administrative problem with our growing use of computers is our lack of technologically enhanced classrooms. As we create computer classrooms, we have to be committed to getting maximum use out of these rooms. With an ever-increasing need for more computer classrooms, administrators have to be creative in seeking out and utilizing space. In 1993-94, computer -enhanced rooms on Middle School floors will be used all day. This will leave Middle School teachers without space in which to work or meet with students

when they are not scheduled for class.

> ...the most profound changes wrought by computers in the Middle School are social and pedagogical, not technological. Digital technology enfranchises this revolutionary pedagogy but does not mandate it.

We must place computers *in every classroom* for use by teachers and students when they are being used as part of regular instruction. Having two to eight computers located in each classroom is a more comfortable setting for both teacher and student and is a more natural way to integrate their use. Yes, it means that the computers may not be used each minute of every day, but we should stop looking at computers as scarce resources. More importantly, it means that teachers and students will use the computers when it is appropriate to use them. They will use them much more in the comfort of their own classroom than if they must trek to an overscheduled computer-enhanced room.

We should aim for the use of computers in every classroom on a daily basis. We might then enter the next stage of technology development:

The U stage: Computers are **U**biquitous in the school. **U**sed for everything. They are as commonplace as a pencil or a book. Computing is **U**nobtrusive and **U**neventful, part of the **U**sual and customary school day.

* * *

Public Information Office

National Council of Teachers of English

1111 Kenyon Road,

Urbana, Illinois 61801

URBANA, ILLINOIS—Monica Edinger, The Dalton School, New York, New York, has been appointed to an important post with the National Council of Teachers of English. She will serve as a member of the NCTE Committee on Instructional Technology.This committee is charged to study emerging technologies (word processors, computers, videodiscs, etc.) and ways to integrate them into English and language arts curricula and teacher education programs. It examines the effects of these technologies on teachers and on students, especially minorities, the disadvantaged, and the handicapped. It also explores ways to disseminate information about new technologies to educators and acts as liaison between NCTE and other groups interested in computer-based education in English and language arts.The National Council of Teachers of English is a professional organization for teachers and supervisors of English at all levels of education. Its aim is to improve the teaching of English and the language arts in the nation's schools and colleges. NCTE conducts national meetings and smaller conferences, publishes journals and professional books on problems and issues in the teaching of English, and provides other teaching aids. Its task groups carry out a wide range of projects to enhance the teaching of English.

New Lab Final Report—Fourth Grade Writing Project: Monica Edinger

Retrospective

The project incorporating computers into the fourth grade writing program has been very successful. Forty Tandy portable word processors were shared by the four fourth grade houses for writing. Doug Brin, Tom Doran, Ilene Lewis, Pamela Ness, Julia Stokien, and myself were all teacher participants in the project. Those of us who ran writing workshops in the classroom found the Tandys to be particularly successful. Many wonderful publications came out of our classes: Brin House's Gorey stories, Doran House's Biographies,

Edinger House's Memoirs, Ness House's Whale Book.

Our greatest difficulties were dealing with batteries (by the end of the year even the back-up batteries were becoming worn-out resulting in lost files) and printing. We depended on hard copy as a form of saving since the Tandys cannot save to a disk and saving to the Mac and then to a disk was laborious. More printers would make things go a lot more smoothly.

Another problem was sharing Tandys. Since we all taught at the same time, children could not use them as freely as we would have liked. For example, Tom Doran and I shared a set. Tom runs an open classroom where many different things are happening at the same time. Thus, his students couldn't write during their morning work period because it was the same as my class's writing workshop period. While Tom and I were able to negotiate times, we could have done much more if we each had our own set of Tandys.

As a result of the Tandy project, I began to focus more closely on writing and technology research, especially for elementary school children. I presented the Tandy project at a conference on writing and computers at New York Institute of Technology in April and was invited to become a member of the National Council of Teachers of English's Instructional Technology Committee. In February, I began participation in a pilot project of Scholastic - Scholastic On Line, an educational telecommunications network. I will continue to help Scholastic develop this network for a fall launch date. Through all of these contacts, I have learned more about the possibilities of writing and computers.

> ...I recommend that we consider these children's future as writers at the Dalton School....They may be frustrated next year if they don't have the same kind of access to word processing as they have had this year. Access and equity continue to be troublesome questions as we do more and more teaching with technology.

Students' Voices

As a final evaluation of the 1992-93 school year project, I asked as many fourth grade students as possible to complete a questionnaire about the Tandys. They are the best indicators of the success of the project.

1. How do you write best? (print, script, or computer.) Please explain your answer.

In the three classes where the Tandys were extensively used, the vast majority of respondents preferred writing on the computer. For example, in Tom Doran's class, eighteen out of twenty preferred writing on the computer.

Student Responses:

"Sometimes print because I think it is faster. But sometimes computer because it is neater." (Ness House)

"I write best on the Tandy or computer because I don't like my handwriting and I am constantly going back and erasing. I also like how I have no loose papers to keep track of as I write long things." (Ness House)

"Computer because in print or script if you mess up you have to erase it makes smudges. On a computer you just press delete." (Ness House)

"I write best in print because the Tandys can get messed up. (Ness House)"

"Computer because if you make a mistake you can erase it without any marks." (Doran House)

"Print because when I use the Tandy I usually stop to look for where the letters are and I might skip a word. I just don't like to write in script." (Doran House)

"Tandy because when you make a mistake I don't have to rewrite the whole thing." (Doran House)

"Computer because it is faster." (Edinger House)

"Print, because it is fastest, but computer because it has spell check and is neatest." (Edinger House)

"I write best with computer because on a computer you can't break the tip of your pencil, you can't run out of eraser and you don't get a cramp in your hand." (Edinger House)

"Print because I'm used to writing that way." (Brin House)

"Computer because it has perfect handwriting and has spell check." (Brin House)

"Print because I can't type very fast so it slows me down. But when I print I can write pretty fast without making it messy." (Brin House)

2. What keyboarding practice have you had this year?

Edinger House had three weeks of keyboarding practice on the Tandys using keyboarding books and two sessions with Mavis Beacon. *Brin House had approximately six sessions using* Mavis Beacon *supervised by Julia Stokien. Doran House had an introduction to* Mavis Beacon. *Ness' House had no formal keyboarding.*

My students used the keyboarding books for three weeks daily in April. Afterwards I noticed that several children who had not been electing to use the Tandys switched to them for composing. Some began using correct fingering while others (often those most facile on the Tandys) continued their previous hunt-and-peck technique.

3. Do you feel the keyboarding practice made a difference in your writing? Why or why not? (For example: did it make it easier or harder for you to use the Tandys?)

Since my class was the only one to have formal keyboarding with immediate follow-up by composing on the Tandys, only their responses are useful.

Student Responses:

"Yes, it made me write a lot faster." (*student who switched to Tandy after keyboarding practice*)

"Keyboarding practice made it a lot easier to use the Tandys and my computer at home."

"It made it worse because my fingers did not feel good when I was trying to touch-type." (*This student was freed up as a writer by the Tandys. He had a very successful hunt-and-peck method, touch-typing frustrated him.)*

4. Would you like more keyboarding practice in school next year?

Again, my class answered this differently from the others since they had a formal keyboarding unit.

Student Responses:

"A little because we need a little more practice." (Edinger House)

"No, because I learned how to already." (Edinger House)

"Yes, the book our class used was great. I didn't master typing but I got better. I also didn't finish the book." (Edinger House)

"It wouldn't hurt because you can't get enough of everything." (Edinger House)

"No because I already know how to use the keyboard." (Doran House)

"I would because I could get so good at typing I could do everything." (Doran House)

"Yes. I feel I need more practice in school next year for keyboard. Because I am not very fast with the computer and I'd like to be." (Ness House)

"Yes, because I only know ADSFGHJKL by heart." (Brin House)

"Yes, because I think it is faster than writing and I think it's also a little easier than writing." (Brin House)

"Yes, because it was fun and it helped me type fast and accurately on the computer." (Brin House)

"I would not because I thought it was very boring and I'm bad at it." (Brin House)

5. When you used the Tandy, what did you use it for?

Student Responses:

"I used it to type part of our Gorey stories and also at the beginning of the year we had to write a couple of different assignments on the Tandy." (Brin House)

"Writing workshop." (Ness House)

"Stories (fiction), book reports, travel, biographies, math, Roald Dahl, reports." (Doran House)

"Pueblo Pottery Report, book review, memoirs, keyboarding, and the Maya." (Edinger House)

6. If you used the Tandy, what features did you use?

Most used cut/paste and the spell checker. One or two knew how to use find. Most could print.

7. Did you change as a writer during this year in any way because of the Tandy? If so, how?

"Yes I did. It is a lot easier to get ideas now and to make the ideas come together." (Edinger House)

"I did because with one part of your brain you use to think and the other type. With writing (print or script) you concentrate on the writing with all your brain." (Edinger House)

"Yes, because you write a lot more and it's neater and easier to write." (Doran House)

"I'm finally using the computer at home." (Ness House)

"No because if I get a thought in my head by the time I get the first three words down I forget what it was because it takes so long to type." (Brin House)

8. What did you like about the Tandys?

"It didn't make my hand ache like pencils do." (Brin House)

"It is fun and I don't have to do a second draft." (Ness House)

"I liked the way you didn't have to look things up in the dictionary." (Ness House)

"The whole idea of being able to edit so easily." (Doran House)

"It was fun to use and also small so it was easy to move around." (Doran House)

"I liked how it is so easy to make changes and move different articles around." (Edinger House)

"I think it really comes in handy. And we didn't have to print everything out." (Edinger House)

9. What did you dislike about the Tandy?

"I hated when the batteries went dead and that it's not smart." (Edinger House)

"I disliked when you drop your Tandy it usually loses your files." (Edinger House)

"Things got erased. Tandys are in a different room when we need them." (Doran House)

"The printer." (Doran House)

"That files got erased." (Ness House)

"I hated it when I would write something and the Tandy would get screwed up and erase everything." (Brin House)

"The screen was small." (Brin House)

10. Do you have anything else to add about your writing and the Tandys?

"I think it is great that we get to use these computers." (Edinger House)

"I'd like to have my own Tandy next year." (Doran House)

Prospective

I proposed several extensions of the project for the 1993-94 school year based on my outreach work, the other teachers' requests, and observations of students. The suggestions involve providing more portables so that each child in the three classes that used them successfully can have his/her own. The teachers involved in this project have demonstrated how the Tandys have caused us to create new and innovative assignments. I am certain that we could do even more if the Tandys were not shared. Particularly attractive is the potential for more writing across the curriculum, especially in science and math. Bringing telecommunications into our classroom will provide another way to use writing. Our students could then be communicating to students, authors, and scholars all over the world in written form.

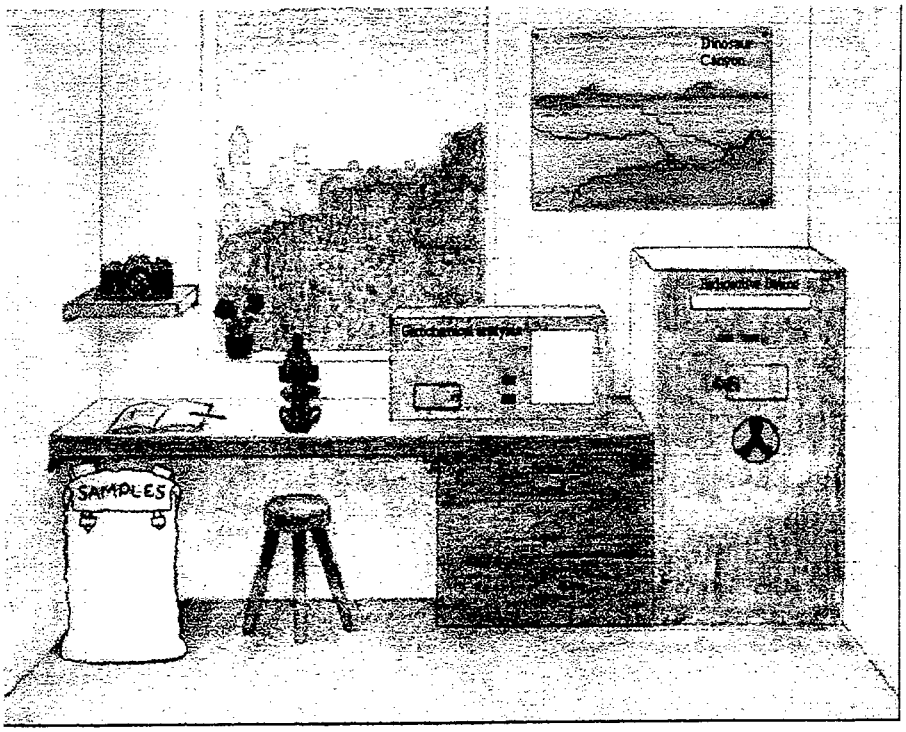
Conclusion

I feel this has been a highly successful project. With minimal investment, these children have been greatly empowered as writers via technology. Children and teachers were not frustrated as the voices of the teachers (in the mid-year report) and students (in this report) indicate. The teachers involved have been very enthusiastic about the potential computers hold as writing environments. Tom Doran and I have already been brainstorming the possibilities if we can give each child his/her own machine next year. I have long known the excitement possible when teaching with technology; it is great to watch others see the potential as well.

Again, I recommend that we consider these children's future as writers at the Dalton School. Clearly, many of them have become writers on the Tandys. They may be frustrated next year if they don't have the same kind of access to word processing as they have had this year. Access and equity continue to be troublesome questions as we do more and more teaching with technology.

* * *

Ecotype End-of-the-Year Report 1992-93: Malcolm Fenton



Laboratory Facility Interface for *Ecotype*

Introduction

Ecotype consists of a computer simulation of a geological section through a canyon. Development began in June of 1992, when Rachel Bellamy and I began to collaborate on this project. The first prototype for classroom use was completed on schedule in March 1993. I then used this prototype for 12 weeks in my two Sixth grade classrooms until the end of the academic year.

The two primary objectives of this first year of development have therefore been met — a functioning and robust classroom prototype was designed and produced, and the prototype was used extensively and successfully in the classroom. These first classroom trials have shown that *Ecotype* is a valuable educational tool, with considerable potential. The report that follows is divided into five parts: objectives, structure, classroom testing, design, and future development.

Objectives

Ecotype is designed to help students become confident learners capable of independently addressing scientific questions. It aims to achieve this by moving away from teacher-centered learning, and towards a format that resembles scientific research. Such research usually generates its own questions, and the resultant learning is often of a particularly vivid

and lasting sort. Ecotype is process-oriented, and in an information-laden world, the ability to identify important questions and to obtain and to process vital data is a fundamental skill. The goals of *Ecotype* include helping students to develop the following skills:

- identifying important questions and working out how to answer them
- careful and objective observation, including measurement whenever possible
- thorough and organized recording of evidence
- use of graphs and math to analyze information
- research, especially the use of texts
- formulation and testing of hypotheses in an objective manner
- synthesis of information
- working cooperatively and productively in groups
- drafting, editing and writing reports

No doubt *Archaeotype* was an influence on *Ecotype*, but, as Dr. Fenton makes clear, the web of collaboration is much richer than a simple analogy of digging suggests. As students access collections in distant museums, so faculty are finally able to use what they learned in situations having nothing to do with technology—in conversation with colleagues, in ICM workshops, in university research.

The secondary goal of this project is to provide students with a basic understanding of some aspects of earth science. Some of the topics that students address are the geological time scale, rock formation, stratigraphy, evolution, extinction, plate tectonics and palaeoclimates. It is difficult to predict the aspects that students will study and the exact information they will eventually assimilate since all the learning is exploratory and open-ended. The hope is that the students will better retain what they learn because the research is theirs, and that even if they do not retain the information they will have the understanding and the skills to rapidly recapture it.

There is a powerful reason to use computers to aid the study of earth science. Research-based learning in conventional geological studies can be difficult unless a school happens to be adjacent to some very suitable rock outcrops. Most schools are not, and field trips of the required duration and/or frequency are generally out of the question. Often rocks and fossils are studied with little or no contextual basis. One answer (perhaps the only one?) is to bring the geology into the classroom in the form of a computer simulation. This is what *Ecotype* does.

Structure

Ecotype consists of a computer simulation of a geological section through a canyon (called *Dinosaur Canyon*). The section consists of a linear series of squares, known as locations. Students work in small groups, and each group is assigned a portion of the section to research. Entering *Dinosaur Canyon*, they select the location that they wish to study. Major geological features may be observed at each location, and the students find fossils and take rock samples, recording their provenance on a printout of the location. The rocks and

fossils are then removed to a simulated lab for analysis. Once the evidence is obtained, the students commence independent and group research.

In this version of *Ecotype*, the sedimentary strata are horizontal. Each group first investigates a flat surface in the canyon (where the sediments are of about the same age), and reconstructs a palaeoenvironment. They then study a cliff surface within the canyon, and reconstruct the geological history of the rock sequence. Although the canyon is imaginary, every effort has been made to ensure the integrity of the geological information within the canyon.

It was not that the students used the computers most of the time—in fact, most of their time was spent researching and discussing evidence.

Throughout this process, the students work very much in the manner of a research geologist. They do field studies using maps, they take samples and analyze them, and they conduct research through studying texts, experimentation and discussions with colleagues. A number of relevant research texts and rock samples are available to them in the classroom, and they make extensive use of these. The students are required to write reports on their work, and to present these to their peers. This attempted replication of scientific research is deliberate—in fact, it is central to the whole endeavor. *It is important to note that their teacher only provides guidance and structure. The students' research is their own, and they have to conduct it themselves.*

Classroom Testing

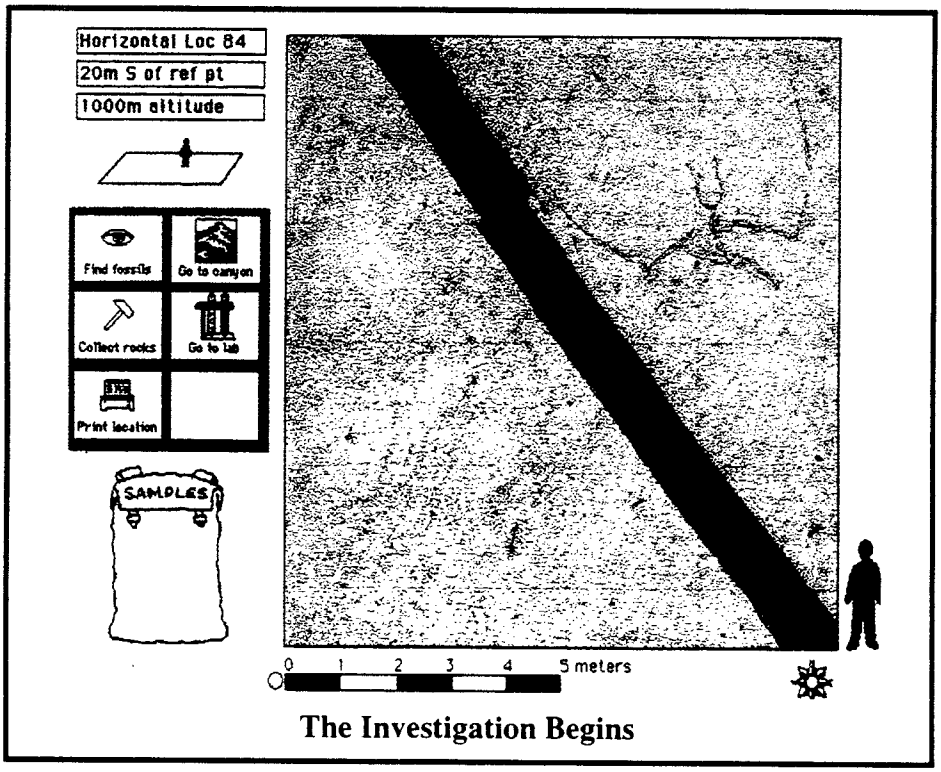
The classroom testing of *Ecotype* has been a tremendous educational experience for me as a teacher. I now understand much more about how a sixth grader's mind works. To my great satisfaction, *Ecotype* has allowed me to follow The Dalton Plan more closely than ever before, with individualized learning that is centered on the child, and that springs from the child and not the teacher. Many students became involved in research for its own sake, sometimes defining their own assignments and reports, and spontaneously taking on and doing additional work.

The computer and the software were, however, essential. The simulated geological section was the platform upon which everything else stood.

Some students became engaged far more deeply than before in science class. Three or four began initiating research and producing reports of their own accord. At the end of the assignment, two students who had already fulfilled all the requirements put in a huge amount of effort (working until 4 a.m. one night, I am told) to build a very impressive diorama of their site. I had frequent research discussions with these students. What distinguished these students was that they were almost completely self-motivated, and our conversations were very collegial in nature, with the students in near-total charge of their work. This does not mean that these students were always correct in their observations or ideas, but they had become self-motivated learners following the scientific method, and once someone has reached that point then progress is virtually guaranteed. Level of engagement does not necessarily equate with quality of work. The standard of achievement rose as the *Ecotype* assignment progressed, and most students adjusted to the increased

freedoms offered to them, and took ownership of their work. My subjective assessment, based on written reports and work in the classroom, is that in general the quality of students' thought and achievement was greater during the *Ecotype* assignment than during the previous science units this year. There were twenty-seven students in total in the two classes. Of these, I assess eleven students as having shown a significant improvement in the quality of their work, fourteen as having maintained their previous standard of achievement, and two as having performed at a significantly lower level than before.

The fact that, in *Ecotype*, students could focus on one research area for several periods in succession meant that the nature of the learning experience changed for them. They had sufficient time to come to grips with a problem, and to engage in meaningful learning in the process. All too often, it is assumed that because a student or the teacher has stated an idea and other students are able to reproduce what was said then that must mean that those students understand the idea and can use the idea in other contexts. Early in the assignment, one student solved one of the central problems of *Ecotype*, the anomalous radiometric dates for the sedimentary rocks. He explained this solution very clearly and concisely first to his group and then to the class. Everyone agreed the explanation was sound, and everyone went on to ignore his solution completely, even when there was a glaring need for its application. It was only towards the end of the assignment that some other students came to understand and use his idea, because the problems related to dating rocks had not gone away. *Ecotype* both highlighted the kids' initial lack of comprehension and subsequently forced them to come to grips with the problems. In other circumstances. we might have all agreed that we understood initially and moved on none the wiser.



The Investigation Begins

The use of computer technology and of a simulated environment that the students could investigate was central to the success of the project. It was not that the students used the computers most of the time—in fact most of their time was spent researching and discussing evidence. Only one member of a group of four might be using a computer at a given time. The computer and the software were, however, essential. The simulated geological section was the platform upon which everything else stood. It constituted the body of evidence upon which all the research was based. It is difficult for me to conceive of a more powerful medium for this purpose. Sometimes there is the impression that the adoption of computers means the neglect of more traditional skills. In practice, the students were intensively engaged in book research, note-taking and report writing for much of the assignment.

It is now possible to characterize the learning that went on in the *Ecotype* classroom. The learning closely parallels much of what was proposed in The Dalton Plan and The Dalton Technology Plan. The learning is certainly cumulative, collaborative and constructivist. It is based on the concept of the assignment. Each class is in itself a series of Dalton labs, as the teacher works with small groups and with individuals to further their research. Several salient features of *Ecotype*, observed in this initial trial, are listed below. (This paragraph and the following five points are excerpted from my *Ecotype* proposal for the 1993-94 academic year.)

A. Students are asking and attempting to address their own questions. These compelling questions are springing from the program, and the program and the class reference materials are supporting most of the subsequent research.
B. Students are learning about earth science in a contextual environment. Their knowledge builds as they do their own research and as they confer with their peers. Instead of spending one or two classes on a topic, they are spending many classes addressing a number of related topics, and discovering the connections. There is a heavy emphasis on cumulative learning. Many of the most interesting questions can only be answered through gathering and analyzing data over time, from research partners, and from other groups. An understanding of the subject is built by the individual student in an organic fashion, absorbing facts, ideas and insights as his/her research progresses and new needs arise.
C. Students are working intensively with one another. They have to communicate extensively and effectively to solve the challenges that confront them. They work in small groups for most of the time, they rely upon each other, and sometimes the entire community comes together for a conference.
D. Students are learning to use the scientific method—not through a series of lectures and prearranged "experiments", but in a learning environment where the scientific method is the only method that works. Students have to be objective, they have to observe and record carefully, and they have to construct and test hypotheses if they are to succeed in producing valid research. This is because there has been a concerted effort to construct a program that has factual integrity, and to reproduce an environment that is as close as possible to a research unit in the classroom.

E. Students are defining and carrying out their own research projects. The original Dalton Plan was focused on child-centered education, on learning that is centered on the individual. *Ecotype* fulfills this goal—students are following their own questions, learning at their own pace, and becoming familiar with the scientific method in the process.

It is not possible here to give a full account of the classroom testing of *Ecotype*. Instead, a broad summary of the trials with some initial findings is presented. For clarity, the total assignment is here presented as a series of stages.

Stage 1: Introduction to rock and fossil identification.

The students were introduced to *Ecotype* in late March 1993. The first six classes were dedicated to the basics of rock and fossil identification, with the emphasis on methodology and close, objective observation. We went on a field trip to examine, describe and identify building stones in the immediate vicinity of the school. The students also viewed a video on collection, reconstruction and research of dinosaur fossils, to help them place the computer program to follow in a concrete context.

These first two weeks proved a successful and engaging introduction. It was evident that most students had very little knowledge of the basics of geology, but this did not concern me, since the application of the scientific method, and not an in-depth study of earth science, was to be the primary focus of the program that followed. In addition, I preferred that the students approach *Ecotype* with as few preconceptions as possible.

> For a teacher, there is a severe temptation to intervene in these instances. It is far more powerful educationally to allow the students to work out the issues for themselves.

From the perspective that I now have at the end of the course, I would expand the introductory section, probably through the use of mini-lectures and short videos. I plan to focus particularly on the processes of rock formation, fossilization and canyon formation.

Stage 2: Introduction to the computer program

We began using *Ecotype* and therefore the computers in the third week, shifting classrooms to Room 1103. The students were largely enthusiastic about the program, and most appeared to like it immediately. They were quick to grasp the functioning of the program. The interface rapidly became invisible to the students, and most began treating the scientific content as if it were real. The students clearly liked the concrete nature of the tools —putting a fossil under a magnifying glass, or hammering out a rock sample at a location. These representations of activities and objects clearly helped them to see what it was that they were doing. This is largely a tribute to the strength and insight of Rachel Bellamy's interface design. Only two students thought that the design was unnecessarily complicated. The students also found almost all the images satisfying, although they occasionally asked for side views of some fossils so that they could see their shapes better.

I made it very plain at the beginning that I was a research coordinator and advisor, and

that I would not provide information, although I would help students find information in reference texts. I kept this promise, even when a student was heading in the wrong direction on an identification or a problem. The emphasis was always on process, rather than on "answers", and I kept reminding the students that it was the quality and depth of their research that counted, not whether they were "right" or not. This approach is essential to the success of the venture. Most students seemed to get this message, and they profited greatly from it. Following the scientific method is a surer path to success than randomly flicking through books to identify a fossil or solve a problem (although luck did occasionally play its part). Most kids who did go down blind alleys eventually extricated themselves through sound scientific practice. For a teacher, there is a severe temptation to intervene in these instances. It is far more powerful educationally to allow the students to work out the issues for themselves.

To a remarkable degree, their research followed the pattern of nineteenth century geologists' research and controversies, something that also struck Dr. Rampino, the project evaluator, when he came to visit.

There was a strong will to believe that the program was "real". The students knew that I was responsible for the scientific design and all the images, yet after the first few classes most of them behaved as though I knew nothing about it at all. The students would call excitedly for me to view a new fossil find, and enter into an earnest discussion about its identity as though I were a co-worker who knew as little as they of its identity. This will to believe, and willingness to take ownership of the material, was a key element in *Ecotype*'s success. A few students retained the perspective that I knew the program intimately, but once they saw that I was not going to divulge any information then they also took ownership of and pride in their research.

The students rapidly engaged with the information contained in *Ecotype*, and a host of questions began to arise, about the nature of the fossils, the rocks and the original environment. It became plain how very strange this new project was to them. One group, for example, determined that they had the skeleton of a large marine animal at their locations, and then began speculating what type of land surface it lived on. The idea that the site itself might once have been entirely underwater did not occur to them. These and other such incidents made me realize how very new and extraordinary this was to them. It was as if I had landed them on another planet—and, in a sense, I had.

The students began to ask the questions that would unravel the mysteries before them. To a remarkable degree, their research followed the pattern of nineteenth century geologists' research and controversies, something that also struck Dr. Rampino, the project evaluator, when he came to visit. For example, it was almost a week before any students thought to investigate the age of their locations. Students only gradually began to consider that locations might have been underwater, or that climates might have been different in the past—and then, of course, came the questions of how these changes had taken place. Some students opted for gradualism as a means of explanation for changes. More were attracted by catastrophism, with some suggesting an ancient flooding of the canyon. The parallels with early geological studies were often quite remarkable.

Stage 3: Initial research of the locations

Once the students had familiarized themselves with the functioning of the program, I assigned them to research their first location thoroughly and asked each individual to write a report on that location. Report writing was the motivating factor that I used to give focus and impetus to the children's research. However compelling the questions, few sixth graders will get seriously down to research unless something concrete is expected of them (although later I was to discover that several students were so engaged that they were to initiate their own reports and projects).

Most of the students tackled the initial research with enthusiasm and confidence, but a significant minority felt hesitant and asked repeatedly what they should do. I kept asking them what they thought they should do. They then proposed questions that I validated with comments such as "That seems like an important question." and then these students got under way. Only a three or four students seemed completely stalled and unable to either ask or follow up on meaningful questions. These students are discussed later.

I quickly found that the students needed considerable help with the recording and organization of their data, and prepared special sheets for them to record and summarize evidence from each location. This helped considerably, and some groups organized their data well, usually because a competent individual adopted the task. Other groups handled their data less ably, and it is clear that I have to design further mechanisms for organization in subsequent trials.

The majority of the students (between 80% and 90%) were engaged in this first stage of the assignment. This was a pattern that was to persist throughout the assignment. The level of engagement was very satisfying to me. It is the level of engagement that one might expect to see during an interesting experiment in our regular Investigation-Colloquium Method science classes. What is different here is that the students are engaged in hands-on tasks for a greater percentage of the time, and their discussion groups are typically small, with each student more actively thinking and talking. My impression therefore is that each student is more continuously and actively engaged in "doing" science during *Ecotype* than during the regular ICM classroom. This is not to say that students did not gossip on occasion, or that some students did not take advantage of the freedom offered them to do little. I allowed a limited amount of chatting to take place provided that the work was being accomplished. I cracked down on the students who were doing nothing and made it clear that they had a job to do, and that they would be in trouble if they did not do it—both here and out in the "real" world. This message seemed to sink in with most of them, although four or five students out of the total of twenty-seven continued to try to do the minimum throughout the assignment.

There were some periods during which the level of engagement was sometimes much lower. These were the last period classes after the students had been to gym. At this point in the day, the kids were often tired and incapable of the focus and self-discipline that research requires. On these occasions—and some days were just worse than others—some useful work got done, but it was an uphill struggle. I would estimate that the percentage of students engaged in serious research dropped as low as 60% to 70% at times.

The first set of reports were uneven in quality. Some were very high quality, while others represented a cursory effort on the part of the student. This was, of course, largely a reflection of how much work the individual had done in class. This is one of the positive qualities of the program—if you do not do the research, and if you do not work cooperatively with your colleagues, then it is hard to write an acceptable report. I did what I always do with substandard reports—I asked for a thorough rewrite. I also asked those who had written acceptable reports to enlarge on some of their points, emphasizing that the reports were part of an ongoing project, and not an end in themselves. The students appeared to be very comfortable with this logic. By the end of the next week, their reports were generally of a much higher standard. In the future, however, I will ask students who have written adequate reports to write a short report on some aspect of their locations—date, environment, a problem feature or fossil—with a view to encouraging specialization and in-depth analysis. Another change that I would make in the future is to have a standard format for the reports. Some reports were deficient because the writers had little idea how to organize their thoughts. Additional structure will help these students.

We devoted two classes to discussing the initial finding of each group, provoking some furious debates. These discussions were timely, but after all the productive small discussions I had witnessed and participated in, it was noticeable how little genuine interchange went on in the larger group. Most students seemed determined to speak, but very few did much listening. In future, I will have discussions on specific topics, such as paleoenvironments or ages of locations.

Stage 4: Specialized research

The students now had a reasonably clear idea of the fossil assemblage, rocks and paleoenvironment at their locations. They also had some burning questions to investigate, and so at the beginning of the sixth week of the assignment, I cut them loose. They were permitted to investigate a question of their choice, provided one person in each group took responsibility for the overall recording and reporting of the locations. This was quickly settled in most groups.

The majority of students chose to study interesting fossils or groups of fossils for their research. Three students studied rocks and rock structures, while two chose other areas: evolution and dinosaur footprints. Here I became conscious that a few students were having fundamental difficulty with *Ecotype*. Three students were very reluctant to propose questions or topics for research. When I eventually persuaded them to frame research questions, then their next response would be "What do I do now?" or "I can't do it." or "What do you want me to do?" There was a tremendous resistance to taking up research. They really wanted to be told what to do rather than choose for themselves, and for me to set all the parameters for them. Two of these students eventually undertook research in a moderately independent manner, but one did not. Eventually I assigned her a conventional research assignment which she completed very well. All of these students had achieved well to very well in previous units. The degree of autonomy that *Ecotype* demanded was very new to them. Next year I plan to modify the course to help these students better adapt to the modified

learning style necessary for *Ecotype*.

The positive side is that far more students seemed to bloom rather than shrivel in the *Ecotype* assignment. Students who had been partially involved before became actively engaged, and many became experts on various topics, sought out and consulted by their peers. Large problems, such as the igneous intrusions at various locations, were solved by meetings between experts in various groups. A researcher of mammal-like reptiles was able to identify a mammal jaw at a glance for another group.

Most of the students proved imaginative and conscientious researchers, and the set of reports that resulted were of higher quality than the first. Eleven reports were very good to excellent in quality, five were good, eight were adequate and three were substandard. Graphing and mathematical analyses appeared in three reports, and I set the graphing expert to work giving lessons in Microsoft Excel to those who asked for them.

This period of specialized research was most successful and clearly satisfying to the students.

Stage 5: Synthesis and closure

The students were now close to completing their ongoing studies of their first set of locations. I asked each student to select one of the following options:

- to draw a picture of their environment as they believe it originally appeared
- to write a story about their locations as if they were transported back in time machine and spent an hour or a day at their locations
- to assemble and organize all their group's data and to write a final, definitive report
- to pursue any individual research question that they wished, including the continuation of their previous research.

The intention was to help the students obtain a clear idea of the original environment, fossil assemblage and date of their group's locations. Three of the pictures produced were of very fine quality, but the stories produced were rather leaden in character. These are not options that I would offer in future, although if a student suggested a story or picture I would let them do it. The overall and specialized reports that the other students wrote were of much better quality.

In future, I would combine the last two options above with the final written assignment—the overall report on the history of *Dinosaur Canyon*. I led up to this final task by asking the students to fill out a large time chart with all their dates obtained from rocks and fossils. This allowed everyone to view the accumulated evidence. To complete the course, we used the two last periods to discuss the evidence. I acted as discussion leader, since it had become clear that this level of synthesis was beyond their capacity, and it was important that they saw how all the parts fit into an integrated whole. During the first period we established the pattern of the evidence. The students took home their notes and wrote their version of the canyon's geological history (some of these reports were remarkably good, despite the impending end of the year). During the second period we succeeded in establishing the

probable history of the canyon. "Now I can see how it all makes sense!" cried one student. At points in the discussion it was almost possible to hear ideas clicking into place for students.

The assignment ended with this final discussion, the end of the school year being upon us. Next time around, I plan to continue the earth science theme with lectures, readings and discussions about the evolution of the earth, and to move onto global environmental issues from there.

Overall, the first trials of *Ecotype* were very successful, and the program demonstrated its power as an educational tool and its potential for the future. The most encouraging sign of all was that *Ecotype* generated a wealth of compelling questions, and strongly supported subsequent research of those questions.

The Classroom

Room 1103 is a wonderful room, and every effort was made to accommodate *Ecotype*'s need for powerful machines by the New Lab and to accommodate my classes by Rob Meredith and E.Jay Sims. There were some significant disadvantages to this space. The major disadvantage was that 1103 was necessarily shared with other students and teachers during class time. This proved to be a substantial distraction for some students, particularly during group discussions. An unshared classroom would allow for better student focus. The variety of uses to which the machines were put was also a disadvantage, since extensive resetting of machines was necessary at the beginning of each class. The printer in 1103 also frequently developed problems, these mainly related to an unreliable connection box. The printer also was used by others during class time, and this occasioned some delays. It is hoped that all these problems can be alleviated by use of a classroom that is self-contained and more specifically dedicated to *Ecotype* use.

Design

Software design

The *Ecotype* software was entirely written by Dr. Rachel Bellamy. The prototype has proved robust, effective and successful in classroom use. Combined with her interface design and other contributions to *Ecotype*, this represents a very fine achievement on Rachel's part.

Only on two occasions, when a set of locations crashed entirely, was a group's work significantly interrupted, and all the data that they had failed to record properly were lost. The cause of these crashes remains unknown. In each instance, the program was replaced by a copy from the master files on the network, and research was quickly resumed. A number of minor bugs manifested themselves when occasionally an image or a piece of data could not be called up. This caused no serious interruptions of work, and I usually gave the data from my own master files to the students so they could continue.

In general, the network functioned reliably. However, the printing over the network was slow, and caused a small but cumulatively significant loss in research time over each period. Networking problems and printer malfunctions caused considerable delay and inconven-

ience on several occasions. The support staff made every effort to help alleviate these difficulties.

Scientific design

The scientific design, for which I was responsible, functioned very well, generating and supporting inquiry over a ten-week period. The program is very rich in information, and the students only addressed a fraction of the questions that might have been investigated.

In the immediate future, there is one major change to the existing scientific design that I would make, and that is to alter Location #80 so that it does not contain a large fossil turtle, which tended to be an uninspiring beginning for the two groups that investigated it. I plan to replace this with a more intriguing and problematic fossil. Other potential changes to *Ecotype* are detailed in the *Ecotype* proposal for 1993-94.

It is important to note that, while *Ecotype* contains more than enough material to be used in the classroom, the scientific design is not yet complete. The program has all of its twenty horizontal locations completed, and five of its vertical locations. Ultimately, fifteen more vertical locations are planned to connect all the horizontal locations. Completion of these locations will require a substantial amount of time—beyond that available to me if I teach a full load. I can write with authority here—the preparation of the scientific design has been a huge task. Planning sequences, selecting fossils and rocks, drawing fossils and thin sections, scanning, altering images on *Adobe Photoshop*, planning and selection of numerical and other data and the final assembly of all the images and data into a whole that has scientific integrity and educational potential takes weeks of focus and effort. This process cannot be aided by an assistant, since everything is interconnected, everything is refined as it is developed, and it is vital that the work is done meticulously, since a single error can cause a very large amount of extra work. At some juncture, I would like to discuss with you how my time might be freed up to allow me to complete the scientific design of *Ecotype*. (This paragraph was excerpted from my *Ecotype* proposal for the 1993-94 academic year.)

The images in the program proved to be satisfactory. At first, the students commented on how much they liked them, and then they just accepted the images without comment. The main exceptions were when students occasionally asked for side views so that they would have a better idea of the fossil's shape—a very reasonable request that I shall try to accommodate in future. A few images were missing such important features as scales, and I will correct these for the next version.

Future Development

It has not proved possible for *Ecotype* to run in a room that has sufficiently powerful machines for it to function adequately next year. This means that the program must be completely recoded so that it can run on less powerful machines and, possibly, over the network. It should be noted that the recoding is a necessary part of the project's evolution, and would have had to have been done at some juncture. Rachel did an excellent job in designing and coding the first prototype. Now recoding has become imperative.

The structure and basic design of the first prototype have worked very well in the classroom trials. Luyen and I have agreed that the program should retain all of its original functioning, and that the program should remain identical in appearance to the user. The recoding will be to allow the program to run quickly and reliably on the less powerful machines and, if necessary, over the network.

The exact structuring of the program's running has not yet been decided. My personal preference would be to download the entire program to the local RAM and run it from there, with automatic copying back up to the file server once the program is closed. There is the issue of whether the local machines' RAM will be large enough to allow this. If not, then temporary storage of some data on the local drive is a second option, and running much of the program over the network is a third. *Archaeotype*, I gather, runs off a kernel on the local drive, with other information being accessed over the network, and this constitutes another option. Clearly, this is an important design decision.

Rachel Bellamy's time is taken up with her new job at Apple Computers, and she does not think that she will have the spare time to accomplish this recoding. Accordingly, Luyen has decided to hire a new coder to effect the recoding of *Ecotype*. Rachel and Luyen independently estimated that this would take about one month of full-time work. Much of the strength of *Ecotype's* development thus far has resided in the productive collaboration that Rachel and I have established. The project now enters a phase of uncertainty as a new coder is required, but not yet hired. *Ecotype* will run in all six sixth grade classrooms next year, with my three classes beginning to use the program in December 1993. It is therefore necessary that the search for a coder begin soon so that the task can be completed in time.

The new coder needs to be reliable and capable of completing the task within this time-frame. I strongly suggest that s/he consults with Rachel at the outset, since Rachel is the only person familiar with the existing code, structure and programming issues. For example, she can quickly identify those segments of the code that she thinks require extensive alteration, and those that do not. Bill Waldman should also prove an invaluable source of information, as he has been to Rachel and myself in the past.

The recoder will also probably have to reinsert images and data into the new prototype. Rachel has found that this takes approximately one day per set of locations, making a total of five days for the existing five sets of locations. The recoder must also undertake thorough on-site testing of the prototype, to ensure both the functioning of program and the data sets are reliable, sufficiently rapid and according to specifications. The recoding and initial testing should be complete in late October, so that there is sufficient time for me to test the prototype myself, and for any necessary alterations to be made.

Notice how *Ecotype* was anticipated by the Kindergarten animal and habitat studies. Today, that is only a convergence, but on the digital platform, any convergence is virtual collaboration. Once realized in a fully saturated educational environment, a collaboration of this particular kind will also be truly cumulative.

In summary, I feel that the initial development phase and classroom trials of *Eco-*

type have been very successful. I look forward to using it again next year, and to the expansion of its use into Harry Lester's classroom. The key to next year is the successful recoding of *Ecotype* as outlined above. Once this is achieved, then the further progress of the development of *Ecotype* is largely assured.

Acknowledgments

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We also owe much gratitude to those in the wider Dalton community. We thank Peter Sommer for his advice and help. Judy Geller was, as ever, a tremendous source of good sense and support during a very demanding year—the consummate Department Chair. Malcolm Thompson, who paved much of the way for projects such as this one, provided many useful ideas and perspectives. Harry Lester has given me constant and valuable help over the past four years in using the Investigation-Colloquium Method, an experience which proved so vital in the pedagogical design of *Ecotype*.

We would also like to extend our thanks to Mr. Tishman, whose vision and generosity have made this project, and many others, possible.

* * *

Using Geometer's Sketchpad as a Means of Dissolving Notions of Intellectual Separation of Algebra and Geometry: Robert E. Mason IV

Introduction

As far as I can tell, algebra (which includes number) and geometry (the study of space) developed rather independently. The terms algebra and arithmetic have traditionally referred to those discrete entities and ideas (e.g., number) most naturally represented with symbols. Geometry has referred to continuously varying notions that are more easily visualized (represented) in spatial or iconic form.

Why these subjects went their separate ways for so long is impossible to answer definitively; it is likely, however, that any reasonable hypothesis must ultimately rest on the nature of "things," "actions," and "relations" in the real world. Observables differ in one of two fundamentally different ways. They may be discrete or they may vary "continuously." Thus, each element in a set of black and white chips, automobiles, arrangements, or selections is discrete from any other element in the respective set. The first two illustrations of entities which vary continuously are equally profuse. Changes over time, for example, are assumed to vary continuously. The set of points on the number line or in "two spaces" and even the continuous process of aging provide examples.

> Thinking requires one to examine evidence, construct explanations based on the evidence, seek alternative explanations and value the tentative nature of explanations. The emphasis is on inquiry teaching.

This distinction is still pedagogically convenient, but it was possible to dispel notions of intellectual separation between algebra and geometry by using the *Geometer's Sketchpad* computer program as if it were a "tabula rasa" on which students construct pictorial (iconic) representations of geometric questions, analyze the icon by posing, "what if questions," and finally manipulate (animate) the icon through dilation, rotation, translation, reflection, or a combination of the aforementioned to determine if their initial analysis of the icon is preserved for several cases. This program made it possible for me to teach seventh graders algebraic methods to solve geometric questions.[1]

The pages that follow discuss my observations and thoughts about the effectiveness of the program to engage students in constructivist learning activities having had one year of experience using it with them.

Part I: Retrospective

The seventh grade mathematics program (the "tabula rasa"):
Geometer's Sketchpad breaks away from the mechanical drawbacks of the standard tools for studying geometry—paper and pencil, compass and straightedge—often limit students' drawings and obscure vital principles. With the Geometer's Sketchpad, any aspect of a figure which is defined geometrically, for instance, the midpoint of a segment, can be automatically

[1]The relationship between algebraic methods and geometric questions had become so intimate in the level II geo-algebraic that it was often difficult to distinguish them.

constructed by *Sketchpad.* Precise drawing is fast and accurate, revealing essential relationships with ease and clarity. Once students have constructed a figure, they can manipulate any of its original components. As they transform parts of their figure with the mouse, all related parts and measured quantities update continuously. Extensive text capabilities let students label and annotate their figures. Whereas a paper and pencil drawing demonstrates only one case of a geometric relationship, the Geometer's Sketchpad lets the students examine an entire set of similar cases in a matter of seconds.

By recording the figure in a script, students archive their construction as an abstract system of geometric relationships, independent of any particular drawing or diagram. They then can play the script back to investigate the construction in related circumstances and in special cases.

Program Goals

There are at least four goals of the seventh grade math program that emphasize meaningful learning of geometry, informally (1) to help students understand geometric relationships (how axioms, definitions and theorems fit together); (2) to help students integrate incoming information with their existing knowledge base; (3) to improve students' abilities to apply what they've learned to novel or complex situations (transfer); and (4) to improve their ability to retain information over time.

Pedagogy

We want to structure learning in ways that are more compatible with the roots of the thinking process. Thinking requires one to examine evidence, construct explanations based on the evidence, seek alternative explanations and value the tentative nature of explanations. The emphasis is on inquiry teaching. We define guided inquiry teaching as an engagement in extensive discussions and the active construction of defensible explanations for various observable phenomena. My role was that of guide and coach. I lecture infrequently, but my beliefs and goals were made apparent to the students during labs. Most of the time I did engage a student or small group of students in extended questioning to help them examine obstacles in their thinking. I tried to remain attentive to "moments" of intellectual understanding and confusion, enthusiasm and fatigue, excitement and discouragement, and respond appropriately.

Students' Responsibilities

At the beginning of the year each student was charged with the following responsibilities: (1) to determine how he or she learns best[2]; (2) to learn how to verify that something is true or not true through hypothesizing, experimenting, and observing; (3) to practice communicating findings in written and oral form; (4) to develop a strong search behavior attitude that extends beyond asking the teacher or another student for the answer; and finally (5) to value the effort that one puts into learning as much as one values the grades received.

[2] Lecture, one-to-one, or small cooperative group.

The Physical Environment

My primary teaching area housed four Macintosh II si computers for an average class size of 16 students. Had I only had access to the four computers to work with, the program would have evolved in distinctly different ways. But, having clusters of computers located throughout the Dalton community solved one set of managerial challenges and presented new ones. The "work" environment had to extend its boundaries into the larger Dalton community. That is, during each core math period, half of the students did their work outside of the assigned classroom. Supervision had extended beyond the four walls of my assigned classroom. I had to communicate with my students through the "net chat" feature of the computer system because some of my students were working in the adjacent room as well as on the fifth, tenth, and eleventh floors.[3] Faced with the challenge of saying a lot, but frugally, I was forced to clarify my own thinking and the students were forced to concisely pose their questions.

The word that comes to mind that best describes my experience with the extension classroom is "proximity." Independent and dependent thinkers performed significantly differently as their proximity increased and direct supervision decreased. Being away from my immediate supervision appeared to empower some students to orchestrate individual learning episodes. That is, the freedom to choose how, where, and when one would complete the assignment worked well for some, but did not work as well for students that could not discipline themselves (a very predictable consequence). To help the students who lacked self-discipline, I required them to work in my assigned classroom under my direct supervision. I had to have frequent discussions that centered around the issues of trust, respect for the work of others, and personal responsibility.

The decentralized learning environment helped me determine who were the independent thinkers (field independence) and who were the dependent ones (field dependence). The more independent thinkers in the three math classes had an average of ten labs with me during the entire year. And, during these labs, I was the recipient of the instruction.

Sample of Students' Work

Below is a paper that was written by one of our mathematically precocious students. The paper formed the basis of the lab that I was given by the student.

> For this problem, we were asked to explore whether or not the sine of the top angle of an oblique triangle times the two adjacent sides is equal to the area of the triangle. This essay will prove the hypothesis using logic and inference.

[3] Unfortunately, I did not have my own computer that would allow me to respond to them without disturbing the student work. I had to ask a group of student to allow me to use their computers to respond. If the question required a lengthy response, it meant taking time away from the students who were initially working on the computer. I often wished that I had had a "dumb" terminal for responding to questions and monitoring my students' work.

We did not fully understand the concepts of the sine relationship, so we did some research in our textbooks. From the research we found out that the sine of an angle of a right triangle is the relationship of two line segments to each other (a ratio). The relationship is the ratio of the side opposite the angle to the hypotenuse.

First, we tried to figure out another definition for the area. We used the textbook definition. "Half of the base times the altitude of a triangle equals its areas." From our diagram, that would mean that side AC times BD multiplied by one half equals the area. We still had to prove that the sine of angle B times line segment AB times line segment BC equals this.

We realized that you could find the area of the triangle in more than one way. We then figured out that it is possible that we could rotate the triangle, making a new altitude and base. These can also be used to find the area of the triangle. That is what we did to the triangle in the problem. We rotated it so that angle C was the top point and the altitude went down from there (see below). That means that we now had to prove that line segment CD times line segment AB divided by two is equal to the sine of angle B times line segment BC times line segment AB divided by two.

If both of the generics are written out as fractions (ratios), they would both be displayed over two. The reflexive property states that "a equals a." Therefore, we multiplied both sides by 2. "2a also equals 2a." That simplified the problem. Line segment CD times line segment AB must equal the sine of angle B times line segment BC times line segment AB.

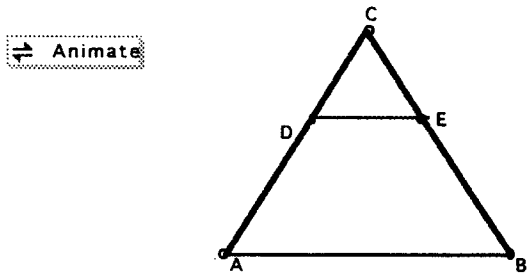
You can further simplify the problem because both sides of the generic have AB in them. If both sides are divided by the length of line segment AB, then that takes the "times line segment AB" part out of both sides of the equation. Now we had to prove that line segment CE equals the sine of angle B times segment BC.

We rewrote the problem again. Instead of using "sine of angle B," we used the literal definition of sine. That would change sine of angle B to line segment CE over line segment BC. The other part of that side of the generic is times BC. X/Y * Y = X, so (CD over BC) times BC equals CD. There is only one more line of the proof. It is "line segment CD equals line segment CD." The reflexive property proves that if the bottom parts of the generic are equal, then all the steps that come before it are equal, too.

You must realize that the math classes contained a range of abilities and interests in the subject. Clearly, the student who wrote the paper above is talented in mathematics.

The essay below represents the collaborative efforts of a group of students who did not feel competent in mathematics entering seventh grade and *who worked in the room with me*. Here are the problems that confronted them:

Animate something in the following figure to answer the question, "Does a line drawn across two sides of a triangle parallel to the third side divide the first two sides proportionally?"

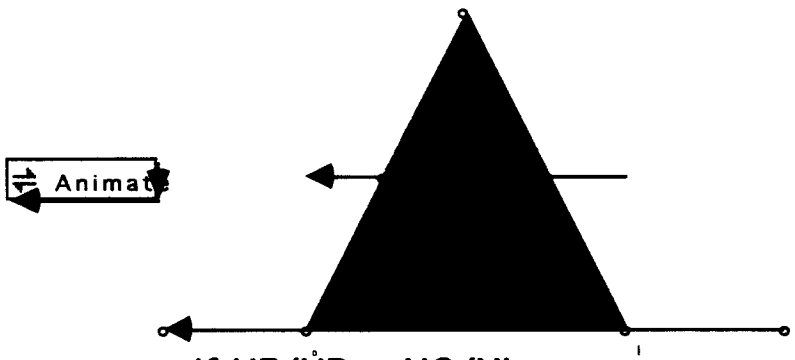


"If EC/BE = DC/AD then DC * B E = AD * EC"

Distance(E to C)/Distance(B to E) = 0.64
Distance(D to C)/Distance(A to D) = 0.64

Distance(D to C)*Distance(B to E) = 5.60
Distance(A to D)*Distance(E to C) = 5.60

Animate something on the following figure on the GSP to illustrate that, if a line parallel to one side of a triangle cuts the other two sides, the corresponding segments are proportional to the sides.



If HF/HD = HG/HI
then HF * HI = HD * HG

Distance(I to H) = 5.34 cm

The students responded:

At first, the above two problems seem to look the same, but when you read them over and over again you see that they are not the same, they are just similar.

The first problem asks you to show that when drawing a line parallel to the base of a triangle, the line cuts the two other sides proportionally.

To show this we started by animating a line that was parallel to the base up and down the triangle. When we first tried to do this, we ran into a minor problem: one of the endpoints on the line would move to the vertex of the triangle and the other to the bottom of the line it was on, then from there each would animate on the path that we had told it to. Thus the line would not remain parallel to the base. This appeared to be extremely strange to us, because from what we saw, the two sides were the same. Yes, the length of the two lines were equal, but what we had not measured was the slope of the lines. We did not really know what was our purpose when we measured the slope of the lines, but we had a feeling that maybe that was the reason for the weird animation. Sure enough when we changed the slopes so that they were also equal and then animated the figure again, the animation was fine.

After we showed the animation, we measured the distance between EC, BE, DC, and AD. We then took those measurements and found the ratio between the distance from E to C, and B to E, and the ratio between the distance from D to C, and A to D. When comparing the two ratios we saw that they were both 0.64; this meant that the "magic" number for this triangle was 0.64. Since we knew that the ratios were equal, to further prove that the line divided the two sides proportionally, we wrote the statement, "If EC/BE = DC/AD, then DC * BE = AD * EC." From what we had done and shown, the first part was true. We then had to show that the second part was also true. To do this we multiplied the distance between D and C to the distance of B to E and then we multiplied the distance between A and D to the distance E to C. After doing that we could see that they were equal which proved that the line cuts the two sides proportionally.

For the second of the two problems above, we did almost everything the same. The only difference was the fact that instead of looking at the ratio of the side of the small triangle to the side of the trapezoid (which was made by the line parallel to the base), we looked at the ratio of the distance between H and F over the whole length of the side, or the length of one of the small triangle's sides as compared to the corresponding side of the big triangle.

From what we did, we can conclude that in fact if you draw a line parallel to the base of a triangle, the line cuts the triangle proportionally, into two different parts.

After doing what the problem asked us to do, we looked at whether the ratio between the area of the big triangle to the area of the small triangle is the same as the perimeter of the big triangle to the perimeter of the small triangle. When doing this we saw that the two ratios were not the same.

It was very satisfying to observe each student gain a better understanding of his or her unique learning style. From the students' point of view the writing process was a demanding intellectual exercise. When I asked why, one student replied, "I don't like writing responses to the Level I and Level II problems because I find it hard to arrange my thoughts, but after I get it right I know that I understand the problem."

The Soft Environment and the Pedagogy

The manner in which I do my work in each math class is a function of how I view the physical environment. First, let me define work. When I am successfully working, I have found the means of unlocking the intellectual capacity of my students. I use the elements of the environment to carve a path towards an "understand." In most cases the student(s) and I carve a path that leads towards their understanding of geometry. In other cases the student(s) and I carve a path that leads towards our understanding of a new "discovery." Lastly, the student(s) and I carve a path that leads to my understanding of geometry.

The first type of pedagogy that lends itself to the above work represents two-dimensional thinking. I use this phrase because it requires that the recipient follow a series of steps (concepts, arguments) which will lead to an understanding of how to do something. There is a linearity about this type of interaction because each piece of the collectivity is manifested one at a time. For example, if I were to demonstrate a formal argument on how to show that the interior angle of a triangle is equal to 180 degrees, I would use a set of cognitive prompts that represent my understanding of the relationship and then systematically reveal each element of my understanding one at a time. The recipient observes my articulated currents of intellectual understanding and confusion as s(he) attaches meaning to the individual prompts and ultimately attaches meaning to the set of prompts as a collectivity.

Math class was communal, or public. That is, discussions about both math problems and social concerns were intimately linked. Students felt free to change between the two. At some point during the year, the Dalton Lab system went through a transformation.

The second type of pedagogy that lends itself to the above work represents multidimensional thinking and is analogous to a sheepdog and a herd of sheep. In particular, the sheepdog manages the herd by carving out the boundaries in which they can (or cannot) travel towards their destination. Then, multidimensional thinking requires that the recipient use the available resources and tools to navigate his or her way towards a destination. When using this type of pedagogy, I play the role of the sheepdog. The cognitive prompts that are used when engaged in multidimensional thinking are qualitatively different from those used in the first type of pedagogy, the difference being that, as sheepdog, I position myself on the periphery of the thinking process, listening and looking for signs of intellectual understanding. For example, during one class session, a student was working on a difficult problem involving proportion. After a series of questions from me, leading the student up the path, the student asked me, "Without assuming something, isn't it impossible to solve the problem? If something changes, can it still be solved?" This question is one of the fundamental

questions in geometry, and foreshadows a breakthrough into new ways of thinking mathematically. The student is finally able to ask the question, but not ready to answer it.

Part II: Prospective

Observations

I am satisfied with the results of the seventh grade math program this year, in particular with the effects of the assignments and the pedagogy employed to engage students in purposeful learning. These have empowered them with a sense of confidence and an introductory understanding of how figures behave in two-dimensional space. In addition, the writing and colloquia components of the program helped dispel some notions of intellectual separation of algebra and geometry.

> During their early intellectual development, all they wanted to do was touch, turn, open, throw, roll, push, and pull a concrete object until their curiosity was satisfied. I want to create pedagogical objects that elicit the same response with 'abstractions.

The seventh grade student treated the math assignment in the same manner they treat the concerns they have about the social structure. Math class was communal, or public. That is, discussions about both math problems and social concerns were intimately linked. Students felt free to change between the two. At some point during the year, the Dalton Lab system went through a transformation. Students began to give each other labs with greater frequency and spontaneously engaged themselves in colloquia. Their questions seem to have moved from, "What is the answer?" to "Would you explain this to me?" I feel that it is the writing component of the seventh grade math program that led the students to ask "why?" The essays told a story which included the problem, the plan, and the resolution. Some students wrote stories that told about their successes and failures, while others wrote about the solution to the problem.

Where Do We Go From Here?

I want to create an learning opportunity that includes all elements in it that one would deem essential. My thoughts are: If I can get the students to the computer, then I've solved 50% of my problems. The remaining 50% must deal with keeping them there—specifically, keeping 13-year-old, preadolescent youngsters curious enough to want to browse through the predefined, but not limited, tools. And, for them to want to explore the tools in ways that exhaust their preliminary cursory curiosity. Geometer's Sketchpad did work well as a stimulus. However, using the textbook as their primary reference source did not work. My students hated opening the book unless I assigned some specific work for them to do. Unfortunately, the majority of my seventh grade students opted for the easiest path to their knowledge rather than searching for the information that they sought themselves.

Why aren't students searching for information? I think that they aren't because they don't know what information they need and because browsing through their math text is timeconsuming. I personally want to rekindle the spirit of exploration. During their early

intellectual development, all they wanted to do was touch, turn, open, throw, roll, push, and pull a concrete object until their curiosity was satisfied. I want to create pedagogical objects that elicit the same response with "abstractions."

In his assessment of the 7th grade mathematics program, Professor Black of the ILT evaluation team recommended that I create a set of problems that relate to the "real world".

As it stands now, many students are desensitized to the packaging of instruction as we presently deliver it. I want to "package" instruction in a more engaging form and at the same time preserve all that we value in terms of content and process.

From my own experience observing my daughter explore her environment, I noticed that she was most intrigued with the objects that she could move and that looked different (e.g., she was fascinated with the doll that had to be constructed rather than the one that had a predetermined purpose). If "newness" is the key to "attention," then traditional textbooks lack a fundamental ingredient because students have seen pictures of fractions and decimals since formal textbooks were introduced to them, yet refuse to explore their contents until they have been instructed to do so. Therefore, the next generation of assignments and program goals will be designed around the issues pertaining to intellectual trust.

The Plan

Observing the students work through the assignment, it became clear that time was spent between two activities. The first was time spent on the task solo or in small work groups, and the second was watching others work. The latter was used to observe a procedure or listen to a discussion about a problem. It seems to me that the students were listening and looking for hints. Therefore, the first change I want to make is to create a series of hints in the form of QuickTime movies. The videos will focus on the colloquia among students as they discuss their problems, describe their thinking processes, and find a solution. Access to the "Hint Library" of QuickTime movies is granted only if the student can intelligently answer some basic questions about the problem, for example, after listing the givens and/or implied information in the problem.

Together we are plannng a National Science Foundation grant proposing to develop such problem sets for the seventh grade mathematics project...

For students who are more receptive to written words, a second hint library will be developed that includes written responses to the Level I and II problems and/or a transcript of the QuickTime movie. Again, access to this library is granted only when a student can intelligently answer some basic questions about the problem.

Part III: Concluding Remarks

The *Euclid Project* (the seventh grade mathematics program) emphasizes the constructivist approach as the major form of pedagogy. Students are seen as active learners who construct mathematics knowledge based on their reflection on prior knowledge and experience. The constructivist approach recognizes that areas of study are not compartmentalized—rather

they are interconnected and must be drawn together in the classroom. Using the ***Geometer's Sketchpad*** computer program as a "tabula rasa" tool, we were able to dispel somewhat the notion of intellectual separation of algebra and geometry, and begin the integration of mathematics.

In his assessment of the seventh grade mathematics program, Professor Black of the ILT evaluation team recommended that I create a set of problems that relate to the "real world." He suggested taking photographs of concrete situations that simultaneously display physical and geometric relationships. The program would allow geometric relationships to be revealed after dissolving away the detail, leaving only an outline of the figures. The outline of the figures represents the "geometry." Students would then study the outline looking for the embedded mathematics or address the mathematics specified in an assignment.

Together we are writing a National Science Foundation grant proposing to develop such problem sets for the seventh grade mathematics project and the hint library. Therefore, the next version of the *Euclid Project* will be contained exclusively on the computer, on HyperCard or SuperCard. The components of the next version of the *Euclid Project* will include *Euclid's Tool Books*, a hypertextualization of most of the geometry generally found in traditional geometry textbooks. It is a reference resource that allows children to do more thinking while minimizing their need to recall large amounts of facts. *Euclid's Tool Books* will be designed to bring together arithmetic mastery and mathematical thinking.

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End-of-Year Report—The Text-Based, Technology-Supported 8th Grade English Classroom: Molly Pollak

Part I: Retrospective

The thesis statement for my year is that students started to think independently, become engaged in the work and write more clearly than ever before except that they didn't know it. I succeeded in making them ask the questions, become independent researchers, view each paper as one version of the work which automatically needed revision. I did not always succeed in teaching them that this was, in fact, learning. In their very candid end-of-the-year evaluations I received several comments such as: "I don't feel as if I am being taught." While my goals for transforming my classroom into a research center, a community of readers, writers and researchers were met, some students were still waiting for me to go to the blackboard and *"teach"* or tell them the answer. Eighth grade traditionally suffers from the "will this prepare us for High School" syndrome, and I certainly hope that as they arrive in the *Bible* or *Macbeth* classes they will see that they have been abundantly well-prepared. On the other hand, in a session with Dr. Judith Davis who did an evaluation of my class, the students said, "The teacher isn't just telling you . . . the kids were saying the ideas and the teacher was saying, 'Oh, that is interesting,' rather than the teacher saying it and the kids listening to the teacher and saying, 'Oh wow, she knows so much.'" While experientially they know something different has happened, they still want answers, grades, and "can I take this to Harvard?" (No, but go straight to Yale.)

While my goals for transforming my classroom into a research center, a community of readers, writers and researchers were met, some students were still waiting for me to go to the blackboard and *"teach"* or tell them the answer.

Doing the textual analysis took a long time. By and large they were very thorough and when the text was on-line they did it in footnote form from the actual text which was excellent. They started to experiment with *Novell* and charting so that they could chart the action in some of the novels with complex plots. They also used HyperCard to create better ways to share their work. They also discovered the networked CD-ROM material on Rodney King and other Civil War projects and incorporated it into their work.

The configuration of the room with tables tended to simply be in the way since the majority of the time was spent clustered around the computers. Two more computers and a conference table should alleviate these problems next year.

The Physical Environment

Four computers in my classroom were not enough. Too often I had students all over the building using those in other rooms, so that I either spent too much time going to check on them or monitor their progress, or I had no access. The configuration of the room with tables tended to simply be in the way since the majority of the time was spent clustered around the computers. Two more computers and a conference table should alleviate these problems next year.

The technical support that Bob Matsuoka and Toby Sanders provided proved to be invaluable in a new way this year. When I was a novice, I needed more "my computer froze" help; this year we used them much more often to teach us how to digitize, use QuickTime, and develop HyperCard programs. Some hardware problems also occurred, but I became much more adept at fixing minor ones this year. Major network problems, of course, still needed expert help.

The biggest technical problem was overuse of the printer by kids in other rooms or my kids doing work for other classes which required a print version.

I did not have access to a demonstration computer, which I plan to use next year. This will also help the computer crunch.

The Soft Environment

Microsoft Word and *HyperCard* remain the two most used items in my room. Students used the scanners and the laser discs intensively for some assignments and projects. What is missing is a strong database tool for historical research and the O.E.D. When mining literature for its deepest meanings, often historical context is crucial, as is word origin and complete definition. Also missing is an adequate editing program. Since each paper is read by at least three editors, a uniform approach to comments is crucial. I hope to test *Mark-Up*, a commercial program for this purpose.

For an individual Project Manager, Molly Pollak is unusually aware of other projects and of the *Dalton Technology Plan* as a whole. The language of her report applies in principle to the other projects because, in practice, as a teacher and developer, she collaborates constantly.

When a paper or a project stayed electronic, i.e., written, reviewed, presented and handed in on the computer, it was very successful and the student could trace its progress thoroughly. A total paper trail in the traditional mode also worked, of course. More complex was a mixture of these two methods because the entire thread wasn't available.

All four of the computers in my room were in use every day all year. The standard procedure was to have groups of four clustered around each machine doing collaborative work. At times, one or two members of each group worked independently and had to seek other computers in other rooms. Often this resulted in time wasted on simply finding a machine. On days when we had full class discussions, group members took notes on the computer. On test days we had to have a lottery to see who would have the privilege of testing on the computer. The biggest technical problem was overuse of the printer by kids in other rooms or my kids doing work for other classes which required a print version.

The Pedagogy

I am fully convinced that papers on topics developed by the students themselves, which come out of their own investigation of the text, and which are edited and re-edited not as

punishment but as a matter of course, are clearer, more articulate and certainly "owned" by the writer in a very different way. When one student said in the evaluation, "I definitely can read differently and better. I would not read the same," it also applied to writing.

I am very concerned, however, that at the tender age of thirteen when they arrive in my classroom they are already so programmed to think that learning is only spitting back verbatim what they have been told. Next year I will have my first set of students who are veterans of *Archaeotype* and *Geometer's Sketchpad,* so perhaps they will arrive with their sense of adventure and exploration intact.

> I would like to establish a class database, some of which will stay in place year to year so that research and resources can be reused.

Outside resources interest me a great deal. When I first started thinking about teaching with this method, a great part of what interested me was the computer's ability to hook into resources far beyond the building. I envision a time when a student studying *A Gathering of Old Men* could call up a copy of the Civil Rights Act or an article on African-American service in World War I and II from either an outside source or a database on the network. This has not happened yet—even the encyclopedia is rudimentary.

Because of the nature of the class, other teachers became an informal and accessible resource. For example, Garret Eisler, who teaches history but also happens to be an actor and director and something of a Shakespeare buff, was able to drop in and help various investigations of aspects of *Romeo and Juliet.* Students would seek him out or pull him into the class to run ideas by him and quiz him about the actor's perspective. In my traditional classroom this would have taken the form of an invited guest, a one-shot presentation which was often promptly forgotten or not seen as an integral part of the curriculum. When one of my eighth graders infiltrated the twelfth floor and got Bob Matsuoka to come down and help with a thorny *HyperCard* problem, I knew that school as a resource had arrived as a concept in my classroom.

Part II: Prospective

Next year I plan to be clearer from the beginning that all old bets are off and that the requirements in this class do not rest in remembering what I have said. I think that my agenda must be crystal clear, i.e., that mastering the use of the computer is not a secondary skill, it is a major skill; that if it is the answer they are looking for, it resides inside them not on the blackboard. If I include this in Eighth Grade, Malcolm Thompson won't have to include it in Astronomy for juniors and seniors!

Two additional computers and the conference table will help to alleviate some of the space problems and use of time. My classroom has basically turned into a continuous working Lab: Now I need to codify that for the student at the beginning of the year, i.e., ask them to keep a log of how each period was used and have an evaluation system on-line to which they, too, have access. So, if I read a paper, comment on it and put those comments into a file on each student, the student can check his or her file to make sure that the work is

up to date and the expectations are clear. I would like to establish a class database, some of which will stay in place year to year so that research and resources can be reused.

Use of time and deadlines are both complex issues at Dalton. I would like to develop a format next year which is both tighter and more independent. I have been looking more to the scientific inquiry models rather than the traditional English ones. I believe that the answer for structure is closer to the genuine laboratory experiments with data (the text), research (background, history, vocabulary, interview), Lab report (the assignments) and scientific journal article (the papers). In another borrowing from the scientific model, I will list the skills that should have been mastered at the end of each text (including the computer skills).

Conclusion

By becoming a learner among learners, a writer among writers, and a resource among resources, I have expanded the possibilities infinitely. I used to want to create excitement and originality by simply seeking new books to teach. I now have become excited by the nature of the learning and the learner in a new way which I feel will ultimately help us to answer the important questions about learning. As one of my students said, "The only thing about the computer is that you can't go back. . . . There are teachers out there who aren't doing it. . . It's hard to go back." We are not going back; and we must continue to look carefully at just how we are going forward.

* * *

Playbill Report: Romeo and Juliet: Jacqueline D'Aiutolo

Overview

Because this unit is the first introduction eighth grade students have to a Shakespearean play, it necessitates a structured, close reading of the text. I, therefore, approached the unit in my usual, "traditional" manner of reading the play aloud in class and assigning individual parts to students to have them trace and interpret their roles in each act before passing them on to another student. Careful attention was made to the language of the play and close reading and analysis of the passages was a primary focus.

The assignment was structured to allow for oral reading of each act followed by: explication of key passages by small groups on the computer, a group-articulated "issues list" following each act, a short collaborative paper exploring one of the group's individually defined topics, and the viewing of the Zefferelli and Cukor films for further understanding and interpretation. The unit culminated in a collaborative paper connecting a literary analysis with an historical implication, and an individual or group project.

Papers included such topics as: an analysis of the relationship between Juliet and her nurse incorporating a treatment of the role of women in Elizabethan England; love overcoming fear in the balcony scene incorporating a treatment of the differences in the way girls and boys were treated; a comparison of the villains in *Romeo and Juliet* and *Much Ado About Nothing*; political and social factors affecting plot and theme in comparison to *West Side Story*.

Individual projects included: Elizabethan music research papers with piano and flute recitals; ballet of the "potion scene" based on the Dances Patrelle choreography; manuscript calligraphy; dramatic scene presentations; research on Elizabethan costuming with a "fashion show"; as well as *HyperCard* presentations linking text analysis with film interpretations. Project choices were made based on the students' individual interests and were not limited to technology-based presentations; therefore, students having a special talent in acting, dance, music and art were encouraged to work in those disciplines.

Part I: Retrospective

The Physical Environment

The Middle School core structure allowed for more flexibility with the deployment of time, space and equipment. Although there was an unpredicted overlap with the Social Studies African Assignment, and the usual network mishaps, the overall management of these issues was relatively successful. The ability to negotiate with the other core teachers to allow for additional English periods was particularly helpful during the execution of papers and projects. The availability of the computers, however, was somewhat hindered by the room assignment and the use of the room for other grade-level activities. At least one computer was down almost every day due to "student tampering" which seems to be aggravated by the lack of security and use of the room for both internal and external meetings.

The Soft Environment

When the information on Elizabethan music was insufficient, the students went directly to the Music Department for pieces as well as books. When the group researching Elizabethan costuming decided to do a fashion show, they immediately went to the Drama Department to find Lynn Hutton, not only to discuss their idea, but also to borrow books and costumes.

Having the text of the play on-line gave the students the ability to read from the screen during the oral reading if they chose, and the ability to scroll directly to a passage for explication. This, of course, facilitated group conversation and interpretation. The "notecard" capability was particularly valuable for making the groups' issues list as they analyzed the play and explored the background information, recording their ideas as they proceeded. "Shakespeare's Life and Times" was a wonderful resource which gave them a starting point for research which then spurred them into seeking other information. The "notebook" was used for the drafting of the collaborative paper, and the digitized clips from the three films were valuable resources for interpretive linking. The "picture archives" were not used as consistently as other materials, although they did inspire one student to scan in additional artistic renderings for his individual project.

The Pedagogy

This new educational environment has the capability to foster intellectual freedom for students as it stimulates and motivates them to explore and question on their own. Eighth graders especially, because they have not been exposed to Shakespearean literature before now, are very curious. Each group member entered into conversation stemming from his/her own individually-articulated questions.

Although the students were provided with a set of teacher-imposed questions to guide their reading, more often than not, they found their own points of departure. They were eager to formulate their own list of issues which would then serve as a springboard for further exploration and culminate in collaborative papers. Again, the necessity for the group to work cohesively and to make choices was extremely valuable for students at this age.

The limitation of the information available in "Shakespeare and the Globe" and "Shakespeare's Life and Times" was closely related to the educational resources beyond the students' digitized environment. They became motivated to seek outside resources. When the question about the role of the nurse in the society could not be sufficiently answered in their digitized world, the library became their resource. When the information on Elizabethan music was insufficient, the students went directly to the Music Department for pieces as well as books. When the group researching Elizabethan costuming decided to do a fashion show, they immediately went to the Drama Department to find Lynn Hutton, not only to discuss their idea, but also to borrow books and costumes. For this age level, the limitation of the digitized resources may be more valuable to motivate the students to pursue other avenues and may activate their intellectual curiosity beyond the classroom computer.

What continues to be of great value is the way the project fosters group collaboration and decision making, as well as process-oriented writing. Students are required to exchange ideas and to listen to each other, to decide on paper topics, to divide research tasks, and to revise and polish their final drafts. The peer-editing component as well as the group dynamics strategies are as valuable as the inquiry-driven, open-exploration approach to the text.

Part II: Prospective

My plans for the future are to incorporate the "*Playbill*" tools into my curriculum more consistently before the *Romeo and Juliet* unit. For example, I plan to do more group writing, peer-editing, and collaborative papers beginning with the first short-story unit.

I also plan to do more interdisciplinary interpretation during the study of other literary works. For example, I will be incorporating *Betsy Brown* by Ntozake Shange into my Adolescent Unit. This novel lends itself to an interdisciplinary approach, and is a wonderful vehicle for the students to research Afro-American poetry and music. Each chapter makes references to poets and musicians, and my plan is to have each group research and analyze representative works of each, and to build their own *HyperCard* stack, which will be the beginning of a technology-based Poetry Project.

Although the computers will remain in a less than desirable space, they will be more readily available to me, nonetheless, to begin process-oriented writing and group dynamics strategies earlier in the year, as well as to expand my other units into technology-based programs and sequenced skill development activities.

For example, I hope to add more films to my course in an effort to give the students heightened interpretative skills. I also plan to add selected pieces of literary criticism into the curriculum, perhaps beginning with *Catcher in the Rye*. Shakespearean criticism may be too difficult for eighth graders and may not be valuable as an addition to the *Romeo and Juliet* unit, but may be more accessible for other literary works and would achieve the same goal as we look toward preparing the students for what they will encounter in the tenth grade *Macbeth* Project. Art History and Interpretation may also be incorporated into my eighth grade curriculum as a prelude to *Art and the Bible* in the ninth grade.

Conclusion

The teacher as facilitator, not as central authority, continues.to be central to my interest in this emerging technological environment. I continue to explore with my students, questioning and probing the material as we dig deeper together.

This new role, however, puts the teacher in a demanding position which is as stimulating as it is challenging and time-consuming. As we foster intellectually-free students who consistently question the material, we must not only accept ourselves as learners, but we must also be knowledgeable on where the answers may be found. We must be able to direct the students to the information, whether it is easily accessible through their digitized environment or through resources outside the classroom or the school.

The teacher's role in this world is delimited for (s)he must be willing and able to anticipate the links the students may make, as well as to meet the unexpected connections and work together to pave the avenues upon which the student may travel to find his/her answers.

We must consistently direct the students to ask the questions, and to resist the temptation to provide the answers. We must accept our role as seeker rather than as provider.

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Annual Report on the Status of *Archaeotype*— What We're Doing and Why: Mary K. Brown

Introduction

Carved Stone Depicting the Goddess Ishtar

Archaeotype is a series of simulated archaeological excavations developed to deliver to the learner the original sources upon which the grand narratives of Ancient and Modern History stand. We have created these simulations in the belief that History is an intellectual construct, a product of judgment, a part of the world of ideas, whose truth may be judged only on the basis of clarity, coherence and rationality of inference and argument. History for developers and students alike is what the "evidence obliges us to believe."

Archaeotype was designed by two archaeologists to deliver to the learner in a tightly controlled scenario several evidentiary sequences of closely interrelated primary sources that could be combined to produce a student's version of narrative history. While the sources provided in both excavation simulations will support a variety of well-reasoned contentions about events taking place within the simulated sites, the developers designed the simulations with particular historical events and circumstances as well as the processes necessary to decode the residual traces of those events and circumstances clearly in mind.

Thus, the first step in the development process was to ask and answer the question, "What do we want them to learn?" Once this question was answered, the objects, texts and process necessary to support such a learning could be amassed. There is no artifact nor any fragment of text either in the Assyrian or the Greek version of the simulation that is not reinforced by at least three related or supporting artifacts or textual references. There is no artifact or text that is not accessible to the student by the application of the "prelearned" process of decoding. The web of relationships is very tight indeed. The replication of similar artifacts, texts and process facilitates the learner's devising coherent and well-substantiated answers to self-imposed questions. Moreover, the artifactual, textual and processual redundancy

helps the student notice when there is a question to be posed.

> *If I had lectured for three weeks, or six weeks, on Assyria, the students would have never remembered more than a fraction of what I had told them.*—Neil Goldberg, Apple's *Imagine* series.

It is worth noting here that a conservative estimate would show that the developers tried out and discarded roughly ten examples of each artifact for every one finally included as evidence in the excavation. Moreover, the process applied to artifacts and texts predates *Archaeotype* and was originally developed to give intellectual access to larger than lifesize ancient near eastern artifacts housed in the Metropolitan Museum of Art. Weighing and measuring objects and taking note of their substance are familiar to students from their early days excavating at Dalton's First Program. Thus, there is an intellectual, visual and processual coherence to all the materials used in the simulation that is difficult to imagine unless one is trained in the field. To the student, of course, the illusion is one of great freedom to explore because of the quantity of the data and its unfamiliar nature.

This process of intellectual "filtration" of potentially includable source material is a continuing one. Whenever a clearly superior piece of evidence is found by the developers, it is either substituted or added to the program. Much of this addition goes on in the classroom and outside the software because changes to the program during the school year are difficult to make. One might even say that the further in time we move from the first deployment of *Archaeotype* in the classroom, the more the student arguments will be based upon research materials provided them in one-to-one or small group discussions with their teachers and other experts rather than in materials that can be found in electronic form.

Furthermore, and this is most important, the developers carefully observe the students' reaction to the primary data that they are given. Objects that lead reason astray are removed. Those that contribute to a clear understanding of the materials under study are retained and strengthened. The choice of which items will be included in the simulation is based upon the assessment of that object's contribution to a clear and coherent understanding of the events being portrayed. The best evidence will result in the clearest historical statements. The process of reasoning that leads to the deployment of the evidence and the subsequent development of hypotheses and statements is pretaught and overtaught. For these reasons, most student interpretations come close to the developers' original understandings of the meanings of the sites. For these reasons, too, students are able to apply the methodology that they have internalized in dealing with original sources in *Archaeotype* to other endeavors. The two archaeological simulations, Greece and Assyria, are proceeding, each on its own three-year task cycle over which are spread the following objectives: 1. devise concept and modes of work; 2. develop content and software; 3. test model in the classroom and solicit feedback from students, experts and knowledgeable users and observers; 4. revise model, making changes, expansions or deletions derived from testing experience; and 5. validate revised software to ascertain desirability of any changes made.

Part I: Retrospective

The Pedagogy

Pedagogy informs the *Archaeotype* computerized excavation simulations and not vice versa. The excavations were devised to deliver a particular intellectual product to the students in a particular way. The excavations are part of a whole-year course in Ancient History. They are embedded in that course and depend upon it as it does upon them for reciprocal understanding and thematic reinforcement. The methodology of approach to each discovered artifact used in the simulation is the methodology used to approach the Assyrian artifacts in the Metropolitan Museum, the classroom exercises devoted to understanding differential recovery, primary sources, intellectual bias and the close reading of Egyptian, Ugaritic and Old Testament texts. The richness of the materials makes it possible for each teacher to suggest and have students discover a multitude of themes depending upon the interests, knowledge and concerns of the particular teacher and the particular group of students.

We might note here that students will not always come up with recognizable lines from the familiar grand narrative tradition when developing their own hypotheses. Unfortunately, some hypotheses, while logical and coherent and clear, can be said to be categorically incorrect. For that reason, informed guides are vital to the success of the students' intellectual explorations.

The relationship between *Archaeotype* and the greater world of archaeological and historical knowledge is clear. *Archaeotype* is a filter for the enormity of data available in books, movies, photos, universities, museums and ruins. Moreover, it is a filter that presents most of its material in a way that is conducive to coherent conclusions about the significance of the data. Were one to choose ancient objects at random, one might come closer to the chaos that an archaeologist actually encounters in the field. That field archaeologist, however, has a tool available that the student does not. He/she has developed over many years of study a personal *Weltanschauung* of the ancient world. It is this coherent construction of ancient reality into which each artifact found is fitted, reciprocally altering the meaning both of the part and the whole with each addition. It is this same coherent construction of the ancient world that the teacher both shares with his or her students and helps to develop within them. *Archaeotype* is a paradigm of university-level research with none of the warts. Everything, almost, makes sense.

As more and more faculty have involved computer-assisted learning in their courses, the call on the "extra" computers in Lab and Library has become overwhelming. During the first year or two of *Archaeotype*'s deployment, it was rare, indeed, to find a student who couldn't find a computer on which to work. Now, such situations are routine despite the institution's enormous investment in additional hardware. This relative paucity of resources comes at a particularly difficult time for *Archaeotype*.

Most useful to our students are those things that help them develop a sense of coherence and significance about the primary sources with which they are confronted as they study the emerging problems presented by an ever-increasing artifactual and textual database. Gen-

erally speaking, it is the teachers and experts who guide them through books and digitized databases, ancient texts and modern films, museums and galleries. We have never encountered a resource that has not been of great value to at least one student.

To conclude briefly, we must say that pedagogy is and must remain the parent of *Archaeotype*. The program is tightly structured and replete with opportunities for repetition and reinforcement and wonder. It is reciprocally self-reinforcing for process and content and, while it gains greatly from being embedded in the intellectual curriculum from whence it springs, it is quite capable of standing alone, less rich perhaps, but making good sense, nevertheless. This good sense derives from the fact that the software presents a paradigmatic slice of ancient reality in a way that invites coherent explanation and the teachers and experts provide students with the tools, skills and guidance they need to construe the evidence presented in artifactual form into a narrative so clear and coherent that the students and their audiences are obliged to believe.

The Physical Environment

While the classrooms in which we deploy the program called *Archaeotype* have not changed over the past four years, both the places in which we deploy the supporting databases (*viz. Perseus*, the *Louvre*, Nova video disks and computerized text files) and the manner in which these databases can be used have changed because of rapidly expanding demands on the technological resources during this last academic year. From the point of view of *Archaeotype* students and faculty these changes have complicated matters. Briefly stated, the project suffered from the following: 1. the reduction of designated hardware available in the two Social Studies classrooms and the reduction of access to peripheral hardware outside those classrooms; 2. program and network instability resulting in system crashes; and 3. the inability of the overworked technical staff to meet the demands placed upon them by network crashes, program bugs, teaching obligations and confused communications.

In the 1990-91 academic year, two fully-equipped Social Studies classrooms were the only venues in which *Archaeotype* was taught. By fully-equipped we mean to say that all the relevant textbooks, large and small maps, historical atlases, entry-level encyclopedias, teacher-provided literature and the like were housed in two Social Studies classrooms where students and teachers met to pursue their studies. In addition to these tools, which one would expect in any constructivist History classroom, there were also to be found in each of these rooms five computers and a printer connected by a small local network, a laser disk player, a 13" color TV and a CD-ROM player. Furthermore, because few other faculty were using computers to teach within their disciplines in the Middle School, many of the computers in the "Middle School Computer Lab" and the Middle School and High School libraries were available for student use during Lab or classtime for composition.

This situation has changed over time. As more and more faculty have involved computer-assisted learning in their courses, the call on the "extra" computers in Lab and Library has become overwhelming. During the first year or two of *Archaeotype*'s deployment, it was rare, indeed, to find a student who couldn't find a computer on which to work. Now, such

situations are routine despite the institution's enormous investment in additional hardware. This relative paucity of resources comes at a particularly difficult time for *Archaeotype*. Whereas the original Greek version was deployed only in two classrooms and all student notes and research data were handwritten and kept in hard copy, the current version of *Archaeotype* enables, but does not require, students to take down their notes, comparative research information as well as related images, in digitized form. They now maintain their notebooks on the computer. When there is no computer available or the classroom is devoid of the multimedia station, students are deprived of the possibility of working with their own materials.

Two further changes this year aggravated this situation. A sampling of downtime either of the program or of the network during two, noncontiguous, single-week periods indicated that computer functioning was impaired in some way an average of ten times during any two-and-a-half-hour core curriculum period. Many of these educational blackouts were very brief. But one, an intentional shutdown brought on by student hackers who had damaged some faculty files, lasted several days. If one pictures the students as overtaxed executives working in a hot medium, the level of frustration caused by system instability can perhaps be imagined. Instability of an overburdened system was the number one item of distress for the sixth grade, as reflected in an end-of-the-year poll. Inability to complete work in class periods as expected puts additional pressure on lab time with teachers when the old "extra computers" were no longer available. Often, if a crash occurred it was not fixed during the instructional time of the class when it occurred, for it was often difficult to locate technical staff in time. We might also mention here, almost in a minor key, the lack of adequate spare parts —mice, keyboards, etc.—as a new problem this year.

A related change made this year that created difficulties was the removal of the fifth computer and laser disk player from one of the Social Studies classrooms and the deployment of the laser disks and networked *Perseus* database in the 10th floor Glassroom computer lab on the assumption that students could make their way through this comparative data alone. The result was that only those students who used the Louvre in the classroom with their teacher and those who were sent to that teacher from their own classroom were able to take advantage of these materials.

The deployment of the new *Perseus* was useful in some ways but destructive in others, as much of the material that was excluded from the commercial version is referred to in the *Archaeotype* assignment and for some objects there simply are no other *comparanda* (comparable artifacts). The decision to deploy the new *Perseus* was made, presumably for technical reasons, without discussion with faculty, another instance of the tension between the demands of the system as a whole and the educational demands of particular projects.

On the brighter side, we may cite the introduction of color monitors into the classroom. They are extraordinarily enticing to the students although many classical archaeologists themselves prefer black and white because the definition is better and color is not a major factor in classical sculpture or painting as we generally study it. Color can be risky because it varies with the way the computer is set up or the type of film used to photograph the artifacts,

the light reflection in the room, the background color of the monitor, etc., etc. Objects that are, in fact, exactly the same color can appear to vary in hue. Classical art, and Assyrian art especially, are relatively linear and at the professional level can best be studied in a medium that emphasizes their graphic nature. On the other hand, color makes artifacts look gorgeous and in the case of wall paintings is indubitably superior to black and white. Thus our decision to go with the aesthetically pleasing rather than the scholarly correct in this instance proved well-considered. Assyria is hardly imaginable in black and white.

In the second place, a most useful change came about when the new *Perseus* laser disks were finally found. *Perseus* was then made available over the network and each student could access it in his or her teacher's presence in class and lab, gain some preliminary marching instructions and work near to but not under the direct supervision of that teacher. The teacher or expert was thus always available to help when help was needed.

Many and brief interactions between teacher and student characterize the best type of "exploration" a student can undertake in searching for comparative data in support of his or her hypotheses. Having *Perseus*, the Louvre and the Nova segments in the classrooms where the teachers are is a *sine qua non* for excellent guidance of students through new and difficult materials. This is now possible only for the new version of *Perseus*, not for the, in many ways superior, old version, nor for the Louvre or Nova. To the degree that it is possible to deploy these databases in the rooms where the teachers are teaching and students are learning, we have improved our delivery of services to our students. To the degree that students must navigate these databases alone and unguided, we have not.

It is worth noting here that these interventions by the teacher are generally brief. Without them, however, a student can too long remain mired in an unintelligible bog of software, hardware or content and thus waste a great deal of time. Anything that breaks the concentration of students, interrupts their work and destroys the illusion of the excavation simulation, whether it be a glitch in the program or a crash of the network, must be avoided at all costs.

Over the life of the project, we must unfortunately say that our resources have decreased. As we have pushed the program to become more hardware-dependent, less hardware has become available to us and we have had much less control over the hardware that is available. That this has been due in the main to the democratization of computer usage in the school may be true but does not in any way ameliorate our situation. Not only have we lost a multimedia "station" in one of our Social Studies classrooms but we have also lost access to the large number of undesignated computers that were once available to students. In fact, even now sixth graders must vacate their classrooms on the button at lunch hour so that a seventh grade class may have access to the machines. Those few extra minutes a day with a teacher are all many students need to become astute historians. This type of reduction in services bodes ill for next year when Lab time has been reduced and Science classes are being scheduled in the Social Studies classrooms. What this means is that students will not be able to spend the enormous amounts of informal Lab time with their instructors in small groups and in one-to-one situations that they have heretofore enjoyed in settings where the technical resources are

immediately available.

The Soft Environment

The students operate in an imaginary world created for them only in part by the software. Archaeology itself has a panache that is more than adequate to draw students into a closer look at what archaeologists really do. Indiana Jones and Jurassic Park entice. We have only to maintain the illusion. Once inside the imaginary world created in part by the software, in part by the child's imagination and expectations, the student becomes an apprentice archaeologist. At that point, his or her aims are the same as those of all scholars — *viz.*, to create order out of chaos. However, the steps into the world of apprenticeship begin long before the student starts to "excavate." The culture at large sets the tone. The teachers exploit the students' interests in the "ancient, unreal, unknown and unknowable." But, the students themselves must do the work. For that to happen, the teachers and specialists must introduce them to the tools of the trade.

Interest alone does not give access to the past. Concrete tools are necessary to decode both texts and artifacts. As the student steps into the world of the image, he/she is armed with the tools necessary to create his/her own "grand historical narrative." Lengthy study sessions in the Assyriological collections of the Metropolitan Museum of Art, close readings of historically relevant passages of the Old Testament, as well as exercises in student creation of primary sources preteach the process/tool that the student will apply to his/her findings as an apprentice. The most important tool the student brings to bear on any question is an informed and disciplined methodology and mind.

Once excavation begins, each student is confronted with an ever-increasing body of artifacts which have no apparent relationship to one another but are, in fact, closely connected both to one another and to the comparable objects presented in the digitized libraries created to support an understanding of the excavation. The tools the student uses to decode the presenting artifacts and texts are the "prelearned" processes of "observation, categorization, inference, hypothesis, research for *comparanda,* and presentation to colleagues for substantiation or refutation." This series of skills is systematically practiced in the semester before the excavation is begun. Repetition and consistency are the keys to excellence here. Teacher assessment has shown that students who cannot lay out a passable recipe for problem-solving consistent with what has been taught by the end of December will have substantial difficulties bringing the meaning of "excavated" objects to ground once digging begins. Comparative data are available in digitized form in one classroom, *viz.* the Louvre, *Perseus* and Nova segments. The second classroom has only a networked version of *Perseus* and thus students are deprived on the video versions of analogous sites and consequently an alternate way of supporting their hypotheses.

When students are excavating both in Assyria and Greece, the most useful tools for the categorization of an object and its placement in its proper historical sequence are the faculty-created digitized libraries that support the excavation. These have been designed to give answers to the many literal questions of typology and chronology that the excavations'

artifacts raise. Bear in mind, however, that the contents of these libraries are only accessible using the key "prelearned" tools of observation/hypothesis and the like.

Second to these libraries in usefulness are the specialists themselves and their guidance of students through specialized books and digitized databases such as the Louvre and *Perseus*. Brief, directive or guiding interactions with a supportive senior colleague — and this, given the simulation, is how faculty and learned visitors are perceived — is almost always the preferred way for the student to learn. We have, in fact, begun to station one archaeologist in the Middle School Library to help interpret trade books and *Perseus* and the second in the classroom with the preponderance of scholarly texts and digitized databases in order to ensure that students from all classes have access to equally sophisticated data, direction and interpretations.

Students are able to access *Perseus*, the Louvre and the digitized databases attached to the programs independently. They are not able, however, to adduce evidence from these sources in support of their hypotheses without the help of a teacher, particularly when they begin the research process. For that reason, students are sent from classroom to library to classroom in order to take advantage of the specialized resources — digitized, hard copy and live—situated in each. As the year continues, less guidance is needed, provided that the topics remain related and the process necessary to access them remains the same. Students master methodology. Content, however, remains mysterious, just mysterious enough to entice the student into further productive inquiry.

Finally, this application of the "prelearned" process brings each student, each team and eventually the entire class to a consensus about the historical narrative that these "excavated" objects and texts can support. Biweekly colloquia, firmly structured around a "hypothesize, refute or support" format reinforce the process used to develop interpretations. Neutrality is rarely permitted, although the category "ambiguous" is occasionally used.

Reasoning by analogy rather than syllogism is introduced late in the year. It is supported by various videos when available and is the tool used to develop a brief research paper. It helps the students see the big picture and validate their own hypotheses. It clarifies for them many intellectual loose ends left over from the dig.

The most used tools in the Greek excavation remain the hand with its pencil, the mind with its disciplined process and the computerized print-out of the image to which the hand and mind are applied. To date, the speed of work possible on the Greek materials and the rapidity and comprehensiveness of handwritten notes in a team observation situation are preferred by students to the electronic notebook that the Assyrian site provides. That is not to say that a reinvented digitized notebook has not been requested by the children. However, for the time being, pencil and paper combined with a computerized image are far superior to the new notebook for brainstorming observations and categorizing information if only because they allow contributions from more than one student at a time whereas the keyboard remains a solitary tool.

The least used tool in the Assyrian excavation was the area of the digitized notebook devoted to the copying, paraphrasing and summarizing of textual evidence. This was partially because the texts were not available to the students when the excavation began but also because close reading of texts, whether primary or secondary, is difficult, time-consuming and can be tedious even after the student has mastered the process of word searches in *Word* and in the *Archaeotype* program itself. Despite the fact that many students eventually realized that a single text can save hours of observation and hypothesizing about an artifact by giving a clear interpretation in words rather than images, they never used the text pages of their notebooks to save this data. Rather, they placed it directly adjacent to the image of the object under study, in the "Images" section of the notebook. We expect to substantially alter the notebook over the next year or so to more accurately reflect the way today's students use it.

In addition, the artifactual libraries of the Assyrian excavation were underutilized, especially once students realized that texts were of easier access and gave unequivocal "answers." The problem with the libraries stems from their very richness and the slowness of the system in bringing up the images. We are developing a renovated library arrangement that will divide the materials into smaller units so that they are somewhat more readily accessible to students. At the moment it can take up to two minutes to access a single image in a library once that image is found. Many students were unable to access more than one item per class. When compared to databases such as *Perseus* and the Louvre and the libraries in our own Greek excavation, the color images developed to support *Archaeotype*'s Assyrian artifacts proved frustrating for students to use and often went unconsulted. "Make the program faster" shared top billing with "stop the crashes" as the number one suggestion by students and faculty when questioned at the end of term. At the same time, all students requested more libraries and more comprehensive data in those libraries that are now available to them.

Part II: Prospective

The academic year 1992-93 has seen the development and testing of an Assyrian version of *Archaeotype* but not yet the revision of the Greek site which was put off until the alpha testing of the much altered Assyrian version could be done *in vivo*. As one can see in the attached flow chart, during 1993-94 we hope to devote our energies to the revision of the Assyrian site in line with many, but not all, of our 1992-93 test observations and results. For example, we will complete those artifactual libraries that remain unfinished, provided the funding is available for acquisition of the necessary resources, including literature and specialized personnel to be utilized at the discretion of the development team. We will redesign the libraries to be of easier access by the student to the extent possible, given the limitations of the current network arrangements, while beginning conversations about possible network project personalization that might improve the viability of the Assyrian site in the classroom. We will redesign the notebook to be more consistent with student preferences and add to or correct some minor content aspects of the site.

> Teaching history from secondary sources has always seemed to me something of a lie. I believe the introduction of young people to the methods of creating history as a historian does will help students decide for themselves what the evidence obliges them to believe is their own true story.

Unfortunately, time and teaching loads will probably not permit us to revise our teacher education methods and thus make the program less dependent upon the presence in the classrooms of two professional archaeologists. We had been scheduled to have available by September 1993 a teacher education package, but we will have to proceed without it.

We expect to have revised versions of parts of the software, mainly the renovated libraries and notebook, available for beta testing by a select group of students in the fall before integrating any changes into the Assyrian simulation. We will collect data, make necessary revisions and run the final model in late November or early December of 1993.

As for Greece, it remains the student and faculty favorite. Its speed, simplicity and richness of artifact base make us reluctant at the moment to do more than expand the unfinished libraries to include women, blacks and architecture as well as the relevant ancient texts. We will then run the expanded version of the original model, revise it based upon student, teacher and expert observations, debrief the team, analyze the observations and correct for the final model.

1994-95 will be devoted to two questions: 1. Is it possible or necessary to convert the Greek version of *Archaeotype* to color without an unacceptable loss of the speed of information access? 2. Is it possible, necessary and desirable to introduce a digitized notebook into the Greek equation based upon the potentially revised Assyrian version? Speed of access, of course, is directly related to the amount of information that can be brought to bear upon any topic under study. There is no point in talking about the richness of the database if it is so slow as to be virtually inaccessible. To slow down the Greek site to the speed of Assyria or to replace its simple longhand notebooks with the as yet clumsy digitized version used for Assyria would be foolish, indeed, and fly in the fact of our systematic revision of the software on the basis of experience in the classroom. Nevertheless, the question must be addressed by our development team and ways found to meet the aesthetic desirability of color in all its glory. Should we decide to introduce color, we may well have to change a substantial number of artifacts now included in the excavation simulation itself and not only in the supporting libraries. Many of these artifacts are not available in color photographs and the closely interrelated nature of all the artifacts in the site and its supporting libraries, carefully filtered as they are for coherence and contribution to an emerging narrative, will make occasional substitutions difficult if not impossible.

Thus, we would see the introduction of color and a new notebook to the Greek site — the notebook possibly one in which students can use hot pads and electrical pencils to take machine-readable notes when brainstorming their observations — as a new beginning of our standard three-year task sequence of devise, develop, test, revise and validate.

In the best of all possible worlds, during the next year or so we will devise the concept and modes of work as well as develop some of the content for our third archaeological site — the late Roman excavation with Celtic underpinnings that tapers off into medieval trade goods joining Asia, Africa and Europe via the eastern and then the western Mediterranean. This site, long-planned, represents the third leg of our historical tripod. It will bring the student to the verge of the renaissance and the edge of the "New World."

If we are able to complete all these tasks during the coming years, our expectations as educators will be well met. We will have gone some way toward providing our students with historical content derived from processes commonly used by the graduate student. We will have translated these processes and contents into a language accessible to a child. I have always disliked lying to children. Teaching history from secondary sources has always seemed to me something of a lie. I believe the introduction of young people to the methods of creating history as a historian does will help students decide for themselves what the evidence obliges them to believe is their own true story.

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Dalton Technology Plan Enhancement Proposal: Jacqueline D'Aiutolo

Overview

Teaching four classes on three different grade levels in both the Middle School and High School, working with three of the *Playbill* projects, *Romeo and Juliet*, *Art and the Bible*, and *Macbeth*, puts me in a unique position to work directly with the sequencing between the eighth, ninth and tenth grades. My proposal, therefore falls into two parts. The first part is to address the sequencing in terms of assignments and implementation of the suggestions in Professor Joseph Voelker's evaluation which calls for a movement "from closed to more openly framed programs". This might necessitate small additions and changes in the interface of the *Romeo and Juliet* program to help the students gain "mastery of the manipulations" in preparation for the ninth and tenth grade programs. The second part of my proposal is to work more closely with the technology in my eighth grade classes throughout the year, expanding its use in the writing process and in collaborative learning exercises before the *Romeo and Juliet* unit.

Phase I

In my High School classes, the computers are readily available in my classroom, thus the projects have been much more successful this year. Scheduling of rooms for next year has determined that my ninth and tenth grades will again be in computer-based classrooms.

This is not the case, however, in the Middle School. Scheduling of the *Romeo and Juliet* unit was difficult, and, although I found my most successful writing units were done when my classes could use the computers, I did not have the technology readily available for use.

> The logical challenge of sequencing courses brings the rationale of sequenced assignments to a level where a genuinely cumulative educational experience can be conceived. That conception stands in sharp contrast to the one in which the consumption of instructional episodes is marked off by tests and evaluational labels from other such episodes.

I, therefore, propose the following deployment of the technology:

1. Ideally, I would like the acquisition of four new network computers into room 805. This would allow the computers in 803 to be shared between the social studies and possibly the mathematics core teachers during specific units, and for me to have computers for ongoing use throughout the year.
2. If this is not possible, I would like the computers deployed to 805 since this space is much larger and more secure; it is used less often for meetings and by outside organizations. Although 803 is a double room, the stationing of the computers makes it impossible for effective large-group use. Keeping 803 with a network line, however, is important for the use of the presentation equipment for large groups.

Phase II

Part One: Sequencing

Clearly the three *Playbill* projects are facilitating educational experiences which are constructivist, collaborative, and cumulative. I would like to look more closely at each of these projects to construct navigations, explorations, and assignments which build more directly on each other.

For example, the *Art and the Bible* Project requires students to manipulate the paintings. The *Romeo and Juliet* project has just introduced Archive Pictures which are manipulated in the same way. The interface, therefore, is properly sequenced. Furthermore, each requires a certain understanding of artistic interpretation which should then be built from a more defined set of questions to a more open-ended inquiry. An assignment of this nature would be ideal in the eighth grade program, preparing the student to link art and literature.

The *Romeo and Juliet* Project introduces three films by Zefferelli, Cukor, and Wise and Robbins. Assignments which could introduce them to film criticism in a more closed, finite array of inquiries would better prepare them for the less delimited, open-ended interpretive debate in the *Macbeth* Project between the Welles and Polanski films.

Investigation into pieces of literary criticism which would be accessible to eighth graders could better prepare them for the array of scholarly material they will be using in tenth grade. I would, therefore, select a few such pieces and work directly with the students on how to interpret critical material.

Any changes in the *Romeo and Juliet* interface and any scanning of additional materials would be limited and would not need to be completed before February of 1994.

Part Two: Expanding the Use of Technology in the Eighth Grade in the Collaborative Writing Process

If computers were readily available in my classroom, collaboration and peer editing could be an ongoing procedure throughout the year. For my first Short Story assignment, students could begin to construct their first essay in a collaborative manner. The "notecards" and "notebook" could be used during both large and small group discussions, allowing the students to formulate their own individual and group areas of inquiry and bringing them toward defining original theses for writing assignments. Groups could be formed early and continue throughout the year, fostering more effective collaborative learning techniques.

Students could use their labs more effectively to continue explorations in my classroom-based computer environment where I would be available for consultation. Since I conduct my High School Labs in 805 as well, having the computers available for use would enable me to conduct further explorations during the *Playbill* units, as well as to help my High School. and Middle School students revise their essays on the computer. Since all of the students have the opportunity to revise each paper, the process could be more conducive if they could work with medirectly on the word-processing system.

Plans for assessment are to have both internal and external evaluations, as was done in the *Macbeth Playbill* Project.The schedule for achievement of these objectives is that each student in the eighth grade will have mastered word-processing, achieved a sufficient level of computer competency to operate the programs, and gained skill in collaborative learning and peer-editing techniques before (s)he enters the High School.

Conclusion

As technology-based programs move into each grade level, the need for sequencing is essential. If students are comfortable with collaborative learning techniques, inquiry-driven assignments, formations of theses without delimitation, as well as *HyperCard* interfaces which are similar and unintimidating, digitized information processing becomes more of a reality. My proposal to investigate each of these programs more closely, to write assignments which are sequential in nature, and to expand my eighth grade curriculum to make it essentially technology-based will be worked on during the summer of 1993, but will continue throughout the 1993-94 school year.

Proposal for Room 711, English 8: Molly Pollak

I. The Concepts

Originally I requested eight computers and received four. Now I believe the number is six for the room. I think that it would facilitate group work, but make it possible to move to some individual editing and inputting work from home.

Currently, my students are using six computers per class; however, this has been a result of their resourcefulness as they scavenge the building for free machines. Unfortunately, there is a trade-off to this arrangement: I waste too much time running up and down the stairs.

As I said in my project update: I feel I need six networked computers in my classroom. I also would like to have regular access to the tools I have discussed such as the OED and an encyclopedia; this may require a CD-ROM drive in my room. Currently, my students are using six computers per class; however, this has been a result of their resourcefulness as they scavenge the building for free machines. Unfortunately, there is a trade-off to this arrangement: I waste too much time running up and down the stairs. This works for textual analysis and initial group work; I need, however, to be able to move to two students per computer for editing and writing. Furthermore, I think that Labs and individual work with students would benefit by a seventh computer on my desk. As it stands now, I cannot read or comment on student work while a class is in progress because all the computers are in use by groups. If I could pull one or two kids away and work with them on "my" computer, that time would become even more of a genuine Lab. If this were also a demonstration-size computer, then it would serve to share class work with the class as whole.

Rather than a configuration of tables which are inefficiently moved to the center to make room for the groups working around the computers, I would like to have a conference table in the center of the room. It would serve several purposes:

- To facilitate round-table discussions when we do come together as a class to discuss the group's findings and research.
- To be a place in the center of the room where people not on the computer can work in pairs or alone.
- To take up less space in the room than the current configuration of tables since the bulk of the time in the room is spent at the computers.

Finally, I would like a smaller desk to make more room for the groups at the computers.

II. The Equipment

Conference Table
Office products catalogue: Broadway Office Products 1993 P.100
Two Marvel: MV-69027 (gray) Peninsula Work surface: 72" Length (each with one rounded edge and one flat edge to form an elongated oval and form a conference table.) It will need two extra supporting legs: MV-69298 (gray) Peninsula Adapter Leg.

Whiteboards
Only 1 of the current blackboards needs to be replaced. Then I'd like to hang the mural (that is currently the back of a bookcase) in lieu of the other blackboard. The bookcase will have to be dismantled as it is absolutely unnecessary.

Desk
A smaller desk which would hold my computer and has lockable drawers. Broadway Office Products 1943: p.94 Case Casard: BU-WC 13 18.

Computers
Two more networked Macintoshes for student use, plus one for teacher use. (A display system would be excellent.) I also think that a permanent videodisc player would also enhance the multimedia aspects of the program. I would like the kids to start using the visual possibilities of hypertext much more extensively.

Scanning Needs
I would like the texts of all the books I am teaching on-line so that when the students do textual analysis, they can have the text on the screen to annotate, footnote and refer to.

Data Base Needs
A good encyclopedia, one that would give a detailed explanation of each of the entries, the Plague, for example. The Groliers is too vague and too much of an overview to be helpful. My students need access to specific dates. If a student is researching the relationship between the Plague and the Globe Theater, both entries need to be substantial to be useful.

Software Needs
Inspiration (2 copies)
Mark-Up (one copy)—I still want to try this.
O.E.D.—whenever it comes out.

III. Project Management

I can meet all of the following criteria for management of my programs and equipment with the exception of reinstalling the system and that's only because I have not been shown how. I certainly would have no problem learning it.

- how to check cables (power, keyboard & mouse, etc.) if the machine isn't running.
- how to force-quit a program or reboot the machine when it freezes.
- how to reinstall the system when the machine doesn't come up because the system is corrupt (question mark on start-up, or unhappy Mac face).
- how to access the network and recognize associated rights.
- how to use my particular software—where it is, what steps are needed to prepare it to be used by students.

IV Other plans for integrating curriculum which would be facilitated by the above suggestions

Integration with the Math program:

> *You can't read as many novels, if you do it the way I'm doing it. You spend so much time examining the text, there's going to be fewer. What does that mean? I don't know exactly what that means. Does it mean we have to stay in school longer to read more things? I don't know. But I think that there's something going on in the world that we as educators must pay attention to...*—Molly Pollak, Apple's *Imagine* series

We (Nina Goldberg and I—if her Algebra program gets approved) are planning to integrate the writing of essays in Math and in English so that the skills are coordinated. An essay on an Algebraic function would be written in Math, edited in English and read by both teachers. A unified document on "computer culture" will be written by both teachers so that both rules and best uses of the network will be coordinated. I would like to see this as the beginning of a "networked" curriculum that extends beyond the traditional Social Studies-English configuration.

Conclusion

In conclusion, I feel that a year and a half with the technology has shown that we are only at the tip of the iceberg. This is only the beginning in creating a classroom that works *with* the technology rather than against it.

Proposal for Adopting Computer-Based Instructional Program for Eighth Grade Algebra I: Robert E. Mason IV

Introduction

Mathematics is concerned with reasoning about certain special concepts, the concepts of number and the concepts of geometry. Reasoning about numbers—if one is to go beyond the simplest products of arithmetic—requires the mastery of two faculties, vocabulary and technique or, one might say, vocabulary and grammar. In addition, the entire language of mathematics is characterized by the extensive use of symbolism. In fact, it is the use of symbols and of reasoning in terms of symbols which is generally regarded as marking the transition from arithmetic to Algebra, though there is no sharp dividing line.

The task of learning the vocabulary and techniques of Algebra may be compared with that which faces the future musician. S/he must learn to read music and s/he must develop the technique for playing an instrument. Since our goal in mathematics is far more the acquisition of an understanding than the attainment of professional competence. The problem of learning the vocabulary and techniques will hardly be an insurmountable one.

Rene Descartes overcame the distinction between geometry and algebra at the level of mathematical theory. Dr. Mason has an educator's interest in the same idea. His experience with *Geometer's Sketchpad* has reinforced his sense of the centrality of student-constructed examples in the teaching of mathematics. Colleagues in the Science Department have learned the same lesson, and a long-awaited collaborative effort may at last be undertaken.

In general, mathematical literacy, by which I mean understanding, is worth far more than technical proficiency. Hence, there is a valuable but limited need to emphasize drill, and the selection of exercises is, in general, based on the principle that a few, well-chosen and thoroughly explored questions are worth more than a thousandfold hastily done and poorly understood symbolic manipulations. To avoid mechanical imitation of ordinary procedures, we intend to design questions which may serve as a guide to manipulations, in the hope that students will be encouraged to construct their understanding, a practice that is not presently practiced among students in our Algebra I classes.

It is true that for various pedagogical reasons we must break down the study of Algebra into separately taught concepts, but this compartmentalization should be compensated for as much as possible. We must overcome the disconnectedness which kills the vitality of our curricula. To help our eighth grade Algebra students see the relationship between the theory of equations and the theory of functions we propose that they experience a new pedagogy that encourages analysis of the similarities and differences of various types of algebraic expressions and equations and the application of functions, to the physical world.

Rigorous proof of algebraic algorithms is not nearly so important as proving the worth of what we are teaching. The logic of discovery is far more exciting than the logic of the discovered. Therefore, we hope that the formation of concepts, the determination of the goals of the mathematical activity, and often even the methods of proof are derived from intuitive

settings. Very little attempt is made to provide formal, complete definitions or to supply what mathematicians would regard as rigorous proofs. Formal definitions are normally of little meaning to anybody but the well-trained mathematician, and proofs considered rigorous from the standpoint of the professional mathematician go so far beyond the needs recognized by eighth graders as to bewilder them and cause them to lose sight of the essential problem.

The real emphasis throughout the new eighth grade Algebra program is on building a cohesive and conceptual algebraic edifice. Even where specific topics are being covered, a concerted attempt is made to show how these topics fit into an overall structure or conception. Several techniques will be developed to accomplish this. First, basic mathematical ideas recur in new guises throughout the assignments. Relations, operations, and systems of arithmetic are not only treated as important "primitive" concepts in their own right, but are used throughout the course to help unify the study of Algebra. It has been our experience that this makes it easier for the student to see the similarities as well as the differences which exist among numbers and symbols. Eventually, greater attention will be given throughout each assignment to the relationship between mathematical ideas and reality.

For most students, mathematics is not self-justifying. The mathematician in us must not presume that what interests us necessarily interests our students.

Each assignment will contain a unique analysis of the processes detecting regularities and making inferences which, although not normally considered to be part of mathematical content, are extremely crucial in *doing* mathematics. In many ways, these process skills sets the tone for much of the rest of the course. For one thing, they illustrate the advantage, especially for students, of thinking about mathematics in terms of the kinds of behavior which knowing mathematics makes possible. This point of view recurs throughout the set of assignments and helps provide further insight into both the mathematical ideas themselves and how they might be taught to students.

The arguments given for the computer-based approach and goals of a course, based on the proposed software program, are not intended to imply that there is one best course for all students. There is no doubt that some students will respond to the new program challenges and not be too concerned with ultimate significance. Others will work for grades and be content if they earn them, no matter what they learn. But several years of experience with teaching mathematics has convinced me that most students will respond to a constructivist approach to learning mathematics.

For most students, mathematics is not self-justifying. The mathematician in us must not presume that what interests us necessarily interests our students. It is my conviction that it is the failure of the students to see the full significance of mathematics that has caused them to dislike it, do poorly in it, and shrink from further involvement. On the other hand, if we do succeed in interesting students in our subject, we may get them to appreciate its values as a discipline, an art, and an engaging intellectual activity.

Two Basic Process Abilities in Mathematics

Although the following statements provide an umbrella under which we will work, they are certainly not very specific concerning the kinds of competencies that might be involved. None of the following prescriptions clearly distinguishes between the general processing skills involved in doing Algebra and those abilities more likely associated with mathematical content. We feel that they are appropriate guidelines to use as we write math assignments. The two basic kinds of processing skills are:

1. The ability to *detect* mathematical regularities and
2. The reverse ability, to *particularize,* which involves constructing instances (examples of given regularities).

In the following page of this proposal, we will first consider each of the two kinds of abilities in turn.

Discovery—The Ability To Detect Regularities

One of the major aims of the Middle School mathematics instruction is to improve the student's ability to detect regularities in displays of various kinds. In other words, detecting a regularity involves perceiving a pattern or drawing out or abstracting that which is common to a number of examples. This abstraction process is often called reasoning by induction. In the literature on cognitive style it is generally referred to as field-independence and field-dependence.

The presence of a regularity in a display implies the existence of some common underlying rule or rules, which, once discovered, makes it possible for the learner to behave in ways not previously possible. More specifically, we can determine whether or not a particular regularity has been detected by testing the learner on new examples. If s/he responds to the new examples according to the underlying rule, s/he is then said to have detected the regularity. If s/he cannot, then s/he has not detected the regularity.

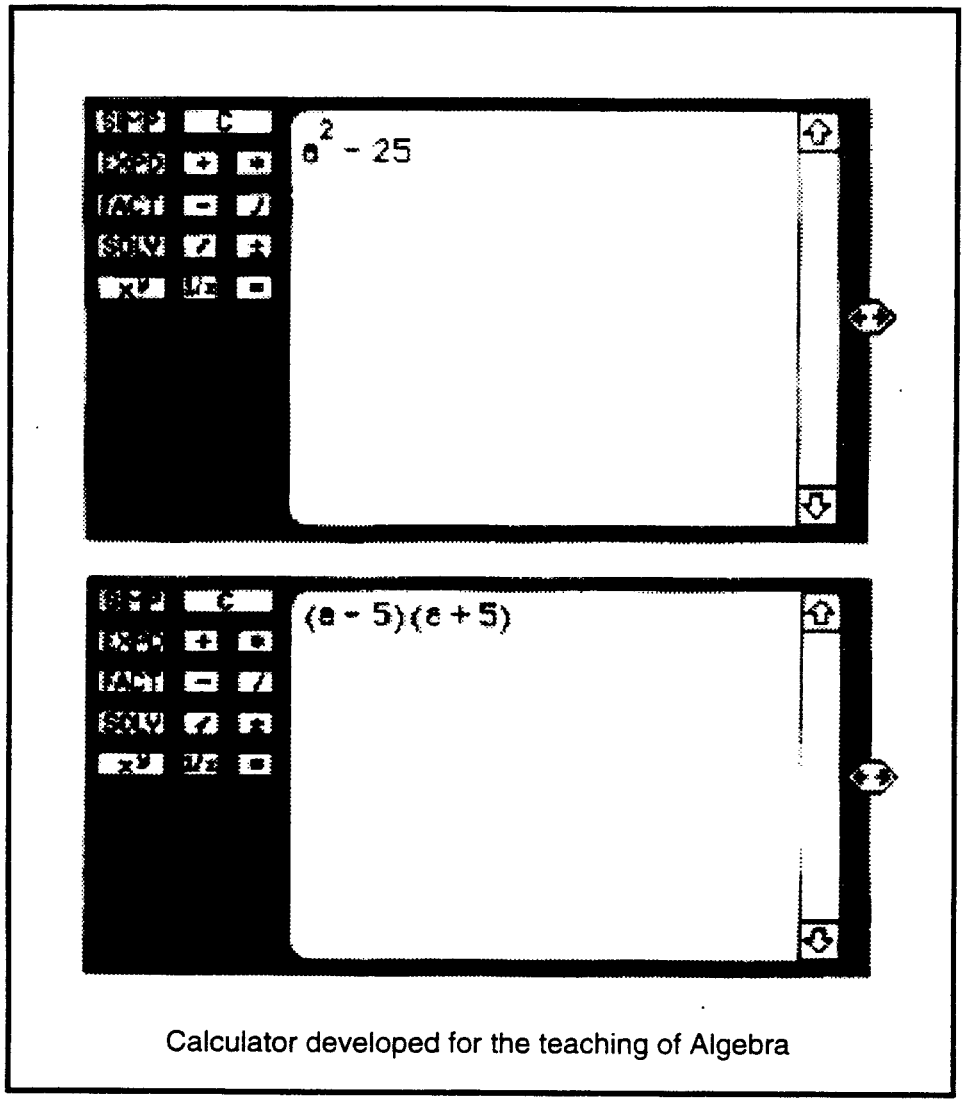
An example

One of the techniques we will use to promote discovery involves the sequential presentation of examples. From these examples, the student is required to discover the regularity in question.

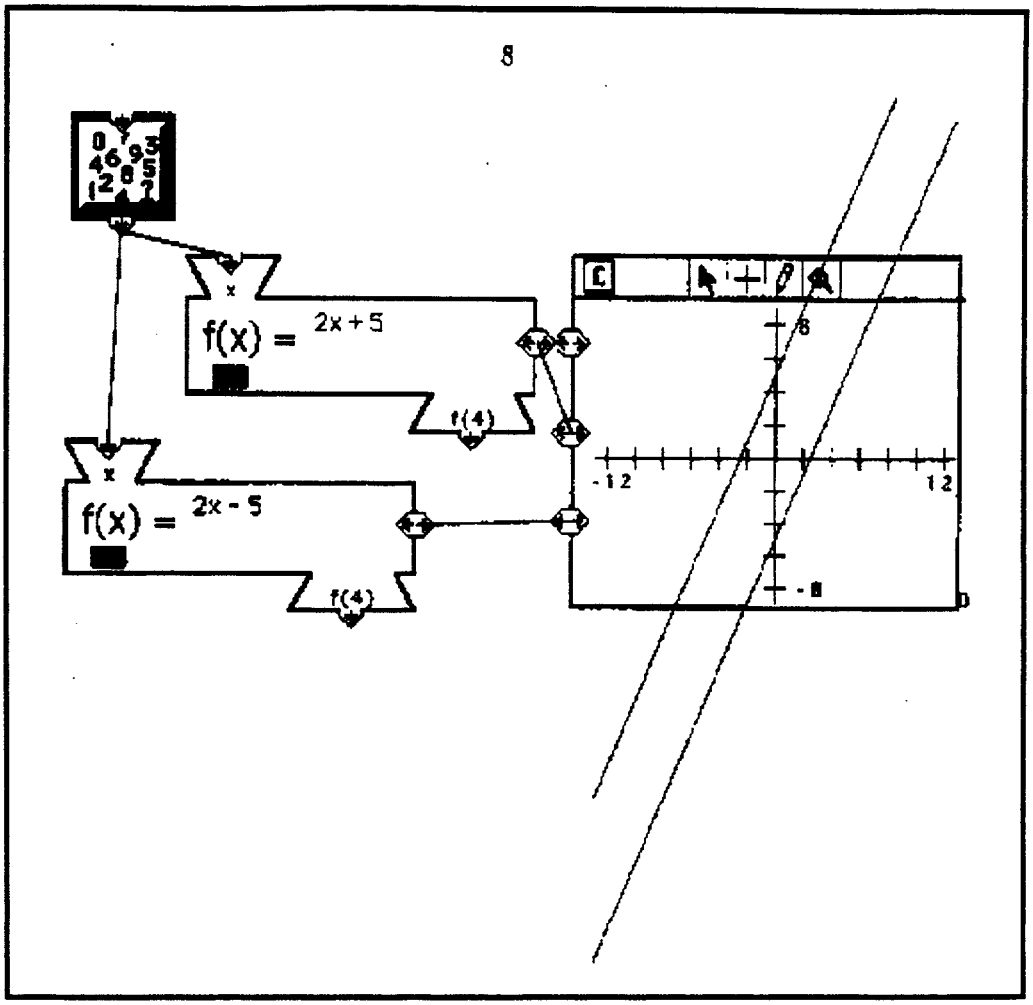
(1) Consider the regularity evident in the display opposite. Having examined several examples, can you predict the factor of the polynomials $9x^2-1$ and a^2-b^2? If so, you have probably detected the relationship between the various terms of the polynomial and their respective factors. If not, consider the coefficient and exponents in each linear term and the constant term. What happens when you take the square of both?

We attempt to convey by illustration what is involved in detecting regularities. Its essential nature, we have seen, involves going from a set of observations to a rule or rules that characterize certain aspects of these observations. Once detected, a regularity makes it possible to respond appropriately to new examples of the regularity, examples that the learner may never have seen before.

Although techniques for detecting regularities are notoriously hard to pin down, they are clearly important to learn. But detecting most regularities depends, at least in part, on the prior acquisition of information that relates specifically to the regularity in question.



Calculator developed for the teaching of Algebra



With the aid of the new software students can construct examples, manipulate them and analyze them in a computer environment that is forgiving and encouraging. For example, given the above display we will write assignments the explore the relationship between the two lines. Students will be confronted with questions that ask them to:

Predict which line belongs to which problem. Why? What is the relationship? Does slope matter? What makes a line appear at a certain place on the graph? Can you predict what 2x +7 would look like?

From an Introductory Assignment on Polynomials

The largest money matters most adults deal with are: salary or wages; payments on loans for cars, trips, etc.; insurance; social security payments and benefits; home mortgages or rent.

Each of these items involves paying or receiving money each month or every few months or every year. But how much total is paid or received? The answer is not easy to calculate because interest is involved. Here is an example of this kind of situation:

Each birthday, from age 12 on, Garnette has received $50 from her grandparents. She saves the money and can get an annual yield of 7%. How much will she have by the time she is 16?

Solution

It helps to write down how much Garnette has on each birthday. On her 12th birthday she has $50. She then receives interest on that $50 and an additional $50 on her 13th birthday.

$50(1.07) + 50 = \$103.50$

Each year interest is paid on all the money previously saved and each year another $50 gift is added. The totals for her 12th through 16th birthday are summarized below.

Birthday		Total
12th	50	=$50
13th	50(1.07)+50	=$103.50
14th	50(1.07)2+50(1.07)+50	=$160.75
15th	50(1.07)3+50(1.07)2+50(1.07)+50	=$222.00
16th	50(1.07)4+50(1.07)3+50(1.07)2+50(1.07)+50	=$287.54

The total of $287.54 she has by her 16th birthday is $37.54 more than the total $250 she received as gifts because of the interest earned.

Letting $x=1.07$, you can write the amount of money Garnette has with the expression $50x^4 + 50x^3 + 50x^2 + 50x + 50$ dollars. This expression is useful because if the interest changes, you only have to substitute a different value for x. We call x a scale factor.

Program Specifications

- Purchase network version of The Wings Algebra I and II program. Toby Sanders has this information.
- Nina Goldberg and Felicia Metz are presently teaching Algebra I in the middle school. I have a commitment from both teachers to develop curriculum material during this coming summer vacation. We plan to write assignments during the second two weeks of July and the first two weeks in August.
- Nina is purchasing a Macintosh system for her own use this spring. Felicia would like to borrow a Mac II SI for the summer.
- We plan to write assignments for the form of the pedagogy (constructivist) that was described in the previous section of the proposal for the following topics that are traditionally taught in eighth grade:
  a. Introduction to the Software
  b. Linear Equations and Functions
  c. Polynomials and Factoring
  d. Systems of Linear Equations
  e. Rational Expressions
  f. Inequalities
  g. Radicals

Hardware Needs:

At least six Macintosh II SIs available for two groups of 45 students.

As his Final Report demonstrated, Dr. Mason has done pioneering work in the use of the reflective "math-essay." A glance at Molly Pollak's proposal, and Nina Goldberg's role in both, suggests how unanticipated interdisciplinary links are forged in this environment.

Ecotype Development Proposal for 1993-94 Academic Year: Malcolm Fenton

The first prototype of *Ecotype* was completed on schedule in March '93, and has been running for the past 6 weeks in my two 6th grade classrooms. Only long-term testing and evaluation will indicate whether the program is of lasting educational value. This process began with the recent visits of Dr. Michael Rampino of NYU to evaluate *Ecotype*. (Dr. Rampino's evaluation is not complete at the time of writing.) Initial indications in the classroom are that *Ecotype* is a valuable educational tool that promotes and supports exploratory, interactive learning (see *Ecotype* Diaries for further details).

> *What we're trying to do is create an environment where in some way the student's action precedes the teacher's. And then in that context they find things that the teacher couldn't begin to predict. And the success of the teacher is really in their capacity to respond to young people, as they pursue lines of inquiry within an arena that the teachers define the general limits of. It's a radical transformation of the way that teachers are traditionally viewed.*—Frank Moretti, Apple's *Imagine* Series

Harry Lester, who is aware of this positive beginning, has agreed to use *Ecotype* in his classes next year. This is a big step for the project, and one that is a direct result of Harry's customary forward-looking and open-minded approach to teaching. As our current teaching assignments for next year stand, *Ecotype* will be taught in all of the 6th grade science classes next year. This all depends, it must be noted, on the installation of computers in a Middle School Science room—please refer to that proposal for details.

This proposal follows the guidelines recently issued by the New Lab.

1. Relationship of the project to the Dalton Technology Plan.

The educational philosophy behind *Ecotype* and its close connections to the Dalton Plan were detailed in depth in the proposals submitted to the New Lab in the spring of 1992. *Ecotype* has already met many of the objectives that were set at that time, objectives that closely parallel those of the Dalton Technology Plan.

It is now possible to characterize the learning that is going on in the *Ecotype* classroom. The learning is certainly cumulative, collaborative and constructivist. It is based on the concept of the Assignment. Each class period is in itself a series of Dalton labs, as the teacher works with individuals and with small groups to further their research. Several salient features of *Ecotype*, observed in this initial trial, are listed below.

A. Students are asking and attempting to address their own questions. These compelling questions are springing from the program, and the program and the class reference materials are supporting most of the subsequent research.
B. Students are learning about earth science in a contextual environment. Their knowledge builds as they do their own research and as they confer with their peers. Instead of spending one or two classes on a topic, they are spending many classes addressing a

number of related topics, and discovering the connections. Many of the most interesting questions can only be answered through gathering and analyzing data over time, from research partners, and from other groups. An understanding of the subject is built by the individual student in a cumulative fashion, absorbing facts, ideas and insights as his/her research progresses and new needs arise.

C. Students are working intensively with one another. They have to communicate extensively and effectively to solve the challenges that confront them. They work in small groups for most of the time, they rely upon each other, and sometimes the entire community comes together for a conference.

D. Students are learning to use the scientific method—not through a series of lectures and predetermined "experiments", but in a learning environment where the scientific method is the only method that consistently works. Students have to be objective, they have to observe and record carefully, and they have to construct and test hypotheses if they are to succeed in producing valid research. This is because there has been a concerted effort to construct a program that has factual integrity, and to reproduce an environment that is as close as possible to a research unit in the classroom.

E. Students are defining and carrying out their own research projects. The original Dalton Plan was focused on child-centered education, on learning that is centered on the individual. Ecotype fulfills this goal—students are following their own questions, learning at their own pace, and becoming familiar with the scientific method in the process.

2. Narrative account of the development of the project

Enclosed (in original document) is a copy of the brief history of the project that I wrote for the project's first evaluator, Dr. Michael Rampino. This summarizes the development of the project to its launching. The *Ecotype* Diary that I have disseminated on c.c. Mail gives an account of the project since classroom trials began.

3. Existing software and its relationship to the project

Neither Rachel Bellamy nor I have yet encountered any earth science-based program that resembles *Ecotype* in structure, content or pedagogical method. The closest parallel in any subject that we are aware of is *Archaeotype*. We owe our *Archaeotype* colleagues a considerable debt for their pioneering efforts in this new teaching approach. However, *Ecotype* has been developed entirely separately from *Archaeotype*, and is not derived from it.

4. Development Plan

The continuing development of *Ecotype* for the 1993-94 academic year is largely predicated on the teaching load that is given to Malcolm Fenton, and the decisions that relate to Rachel Bellamy's involvement in the project. As project manager, on a full teaching load, I can undertake the following in the next academic year.

- Train Harry Lester in the use of the program, and familiarize him with the contents. Harry needs to become fully familiar with the operation of Macs and of *Ecotype* before he embarks on this project. He also needs to be familiar with the scientific content, and to be made aware of what research questions are likely to arise, how to recognize the lines of profitable inquiry, and how best to foster the research.
- Complete and install on-line texts. These include the fossil and rock guides and the geological time-scale which are to be placed as "poster-buttons" in each of the labs.
- Continue the development of noncomputer teaching materials. This is an important area—there are ways to help children organize their data that require some careful planning. Notebook and record card design, videos and books, library materials and written report formats all require some analysis and change.
- Alter the existing *Ecotype* curriculum. Some changes are needed here, especially to the introductory curriculum and the addition of some video and experimental materials.
- Alter the existing scientific content on the basis of classroom experience. This will entail research, followed by the drawing of some new images, the alteration of other images, and the alteration of some data sets on the existing locations. These changes will then have to be inserted in the program.
- Establish an electronic notebook system and perhaps a *HyperCard*-based recording system. This need not necessarily entail major changes to *Ecotype* itself. It should be possible to set up a notebook and recording system that can be used and shared over the network that is independent of *Ecotype*.
- Running the second set of classroom trials This will have to be done in a new environment, and set up in such a fashion such that Harry can use it without difficulty. Harry will also require my ongoing support as the trials progress.

It is important to note that, while *Ecotype* contains more than enough material to be used in the classroom, the scientific design is not yet complete. The program has all of its twenty horizontal locations completed and five of its vertical locations. Ultimately, fifteen more vertical locations are planned to connect all the horizontal locations. Completion of these locations will require a substantial amount of time—beyond that available to me if I teach a full load. I can write with authority here—the preparation of the existing scientific design has been a huge task. Planning sequences, selecting fossils and rocks, drawing fossils and thin sections, scanning, altering images on *Adobe Photoshop*, planning and selection of numerical and other data and the final assembly of all the images and data into a whole that has scientific integrity and educational potential takes weeks of focus and effort. This process cannot be aided by an assistant, since everything is interconnected, everything is refined as it is developed, and it is vital that the work is done meticulously, since a single error can cause a very large amount of extra work. I would like to discuss this issue with you.

Future programming of Ecotype

The program software has been entirely written by Rachel Bellamy, using *SuperCard.* The program has proven robust and effective in the classroom. There are some minor bugs, but only one part of the program has died entirely, and this happened at a time when both the network and the machines in Room 1103 were having some serious problems. The exact cause remains unknown, but the remedy was simple—a new copy was taken from the master file, and there has been no recurrence of the problem. Overall, we have encountered more serious difficulties with the network than we have with the program itself.

Rachel's code, therefore, has proven very successful in this prototype version. Nonetheless, the program's code will probably require some changes. These include the following tasks.

- Tracking down and attempted elimination of existing bugs. This process in particular requires someone who is thoroughly familiar with the code, and who can make changes that will not in themselves cause further problems.
- The insertion of on-line texts (see above).
- Alterations of the existing scientific design (see above).
- Integration of *Ecotype* with an electronic notebook (see above).

In addition to all this, it may also become necessary to radically restructure the program in some way, although there seems no immediate need to do so. Rachel is the only person familiar with the complex code that is necessary for *Ecotype* and is, therefore, the person who can readily alter that code. If another person were to be assigned to alter the code, then it may take some time before he or she was familiar enough with the code to do this effectively. The choices that confront the school are therefore important ones. I recommend that Rachel be asked (and paid) to continue to program *Ecotype*. Otherwise, it is probable that the above tasks will not be adequately completed over the next few months.

Note: A need to restructure and/or rewrite portions of the program might arise if six copies of *Ecotype* had to be stored on a local drive. This will probably not become a problem since Harry and I will teach our 6th grades at the same time, and so only three 6th grade classes will be able to use *Ecotype* over the same period of time (if there is only one room). This in turn means that only three copies of *Ecotype* will need to be stored on a local drive at one time. This will only take up 30MB of the proposed 120MB drives, so it will be very possible to run *Ecotype* without running it over the network (where, like many another program, it is slow) or using up too much of a drive's memory. The proposed computers will be dedicated to Middle School Science, so this temporary use of 30 MB of memory is probably justified. So far, running the program off the hard drives in Room 1103 has proved by far the best option, because of the increased running speed, and also because the program is far less vulnerable to the network breakdowns and other problems that occur from time to time.

Project implementation

The educational objectives of *Ecotype* are stated in the original proposals for the project. A sample assignment is attached (in the original document). As stated above, the running of *Ecotype* in the 6th grade classes next year is largely dependent on the installation of computers in a MS science room (see separate proposal). It is anticipated that additional reference texts and videos will need to be purchased for *Ecotype* next year.

The precise structuring of the *Ecotype* curriculum for next year will be determined at the end of this year, once the course is completed, the evaluator's report is complete, and all data are gathered for the end-of-year report. The structure of the Middle School schedule will influence when *Ecotype* will run in the various classes.

Student performance will be assessed primarily on the basis of their notes, classwork and written reports. They will also complete forms that give their own assessment of the project. In addition, I request that assessment by outside evaluators be continued and extended.

Internal evaluation of the project will include a midyear and end-of-year report, following a similar pattern to this year's work. Harry Lester will also be able to offer his assessment of *Ecotype*.

* * *

Proposal- *Wall Street Explorer*: Marsha Stanton

The Wall Street Explorer is a program that was created by Marsha Stanton and David Hoppe. It uses the spreadsheets and graphs from *Excel*. It was designed to be included in mathematics classes, but would be enhanced if integrated into social studies and English.

The Three Phases of the Program

1. Phase one: Students select an industry and identify companies within their industry. They choose up to four of these companies that they will follow. Students enter the names of their companies onto their *WSE* program, which is on the network.
2. Phase two: Students enter closing prices for each of their companies. They compute averages and net changes. Graphs are analyzed and compared. Information is collected from newspapers, magazines and the companies. Students discuss the current affairs of the industry and decisions that the companies are making. They predict the effect these events will have on their stocks.
3. Phase three: This is the investment phase. Students select any of the stocks within their industry and *purchase* the stocks that they think will increase. They may invest up to $5,000. They determine how many shares they should buy. They watch their stocks, enter closing prices, continue to discuss news items and analyze their graphs. This phase lasts for at least three weeks. They see if they have a profit or a loss at the end.

Implementation

> In an educational culture in which understanding and skill are continuously exercised in a perpetually extendible environment of tools and information, curricular innovation becomes the norm. Sixteenth century Protestants made sure that their children were literate so that they could read the Bible; by the eighteenth century they were reading Voltaire. Spreadsheets were not created for educational purposes....

This would be appropriate for fifth or sixth grade. I have had good results in my fifth grade class this year during the program's development. The entire fifth grade could include this in their curriculum. Students learn how to use the network, they familiarize themselves with a spreadsheet, they apply skills that are included in their math classes. These include computing with fractions and decimals, renaming fractions to decimals, finding averages, and net gain or net loss. Network computers would need to be made available for the classes. One New Lab person may be needed to assist from time to time, particularly at the beginning.

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Network Proposal: Sandy Schwabacher

Over the course of this year we have noticed how integral the network has become in the Middle School curriculum. The core subjects are utilizing the system extensively not only for word processing, but also for *Archaeotype* and *Geometer's Sketchpad.* In addition, Marsha intends to use bulletin board systems to communicate with Chula Vista about math and *Archaeotype.* Our students frequently try to locate available networked computers during preceptorial sessions to work on their assignments with us. Often, however, as we work with more than one student at a time. we cannot leave the rooms to search out available hardware. Inevitably, some students suffer.

We know that we would work more effectively in our preceptorial rooms, 706 and 716, were each to be equipped with two networked computers. It would also be helpful to have a Deskwriter printer in each room. At the present time, Room 706 services students in grades five through twelve, and 716, students in grades four through eight. When we are connected to the network, we will not need any unique software because students would already be using existing programs, since all work done with preceptors is curriculum-related, and skills are closely coordinated with subject area teachers. We realize that there would be a demand for the new machines but feel that preceptorial students should have priority to use the computers if more than one student, or group of students, needed them at the same time, because they are the ones in need of our individualized support.

Over the course of this year we have noticed how integral the network has become in the Middle School Curriculum....Our students frequently try to locate available networked computers during preceptorial sessions to work on their assignments with us....We know that we would work more effectively in our preceptorial rooms, 706 and 716, were each to be equipped with two networked computers. It would also be helpful to have a Deskwriter printer in each room.

For your information, rooms 706 and 716 are open from 7:45 to 3:30, and sometimes later. Computers would be available throughout the day when they are not being used by preceptorial children. Students would be welcome to use computers when not in use, even when we are working with individual students and/or small groups. We are constantly being asked if our existing computers are on the network. Clearly, more support to a greater population would be provided if computers were on the premises and we would be able to provide supervision. There are several other benefits to providing us with networked computers: one would obviously be that preceptorial rooms, as well as our support, would be available to a greater number of students without possible stigmatization. Another is that new students, often referred to the Preceptorial Program, could learn the "computer ropes" from a preceptor.

Due to the distractibility of our students, as well as the small sizes of the two rooms, we will of necessity have to control the noise level and/or the group size of students who would be using the network computers.

All preceptors have a minimum level of competence with computers. Marsha is already a network user and I am eager and willing to learn, as are Francee, Ilene and Julia. We are planning learning sessions with colleagues who are network users. I already have a Mac Powerbook and am familiar with hardware and accompanying software.

We look forward to having the Preceptorial rooms become part of the network.

* * *

New Lab (Enhancement) Proposal—Fifth Grade Houses: Carole Brighton, Susan Jaxheimer, Rosemarie Keller, Peter Khouri

Rationale

The 5th Grade houses have been largely unaffected by the implementation of network technology that has been introduced into the Middle School. Teachers have been reluctant to use various software applications due to the lack of space, a catch-as-catch-can hardware set-up, and temperamental machinery that represents the state-of-the-art, vintage '83. Numerous equipment failures, a lack of appropriate software and routine disappointment of students as to the capabilities of the hardware create hurdles to effective and innovative technology use. Basic word processing, file transfer and printing are so cumbersome, the majority of students would prefer to use equipment at home. Apple 2E and GS technology, as currently configured, denies use of truly innovative and powerful applications software and networking possibilities.

Proposed Curriculum Applications

House advisors for the 5th Grade would like to incorporate aspects of basic keyboarding, math applications, social studies software and *Logo* into the curriculum through the use of a computer laboratory.

Keyboarding

A formalized keyboarding program was begun in 1992-93 using *Mavis Beacon Teaches Typing*. Such a program is best taught in an intensive manner that emphasizes short, frequent sessions. As configured, it is at best trying to coach children in this activity in four different rooms. Scheduling conflicts required children to give up one gym or dance period a week in order to achieve a goal of touch-typing of 25 wpm with 95% accuracy.

Math/Geometry

A networked version of *Logo* in a lab setting would provide a highly graphic and motivating method for teaching basic geometric constructions, angles, symmetry and problem solving strategies. Peter Khouri is a trained *Logo* instructor who could assist his peers in the use of *Logo* as well as in the development of appropriate materials.

Social Studies

A networked version of *Sim City* and hypermedia software could provide highly complementary social studies concepts to our current curriculum of early civilizations. After examining the Sumerian and Egyptian civilizations, the concepts of organization and balancing resources within communities could be applied to a modern city via *Sim City*. This highly interactive program provides opportunities to view the problems of civilization from a modern perspective.

Logo

A resurrection of the *Logo* program could teach basic concepts of logic, programming and

various problem-solving strategies. The strength of *Logo* lies in its cooperative learning environment and its ability to challenge a wide variety of intellectual capacities.

Proposal

Configuration

For the four 5th Grade houses it is proposed that a 10-12 computer laboratory be constructed in a space contiguous with the present class configuration. Additionally, each house would be networked with its own networked computer.

Rationale

Class size averages 20 students; 2 students per machine balances the needs of young students to play an active role in software use and model a cooperative learning environment. More than two students per machine tends to establish passive participation in mixed boy/ girl groups or disenfranchises those who are less computer-literate than others. Given the relatively large student enrollment of 5th Grade houses, 10-12 computers in anything but a laboratory creates difficulties that detract from a suitable learning environment.

Hardware

Each house would have a MAC IIvx with CD-ROM or updated machine. This machine would be used for teacher demonstrations, and one-on-one instruction and research activities. The laboratory would have 10-12 MAC IIvx or updates depending upon space available. They would be wired into the Dalton network. A laser printer and impact printers would permit printing.

Rationale

Current Dalton MAC standards will accommodate the present needs of 5th graders in math, social studies and *Logo* software applications. As opportunities increase for use of CD-ROM technology and distance learning possibilities, the system should easily accommodate these needs.

New Lab Proposal—An Enhancement of the Fourth Grade Writing Project: Monica Edinger

This project began at the end of the 1991-92 school year with the procurement of ten Tandy portable word processors. I used them successfully with my class in a writing workshop setting. The success of this pilot led to the enlargement of the project during the 1992-93 school year with forty Tandys and one Mac SE for the four fourth grade classes.

The Tandys were divided, each half shared by two houses. Three teachers—Monica Edinger, Tom Doran, and Pamela Ness—used the Tandys extensively in writing workshop situations. On most mornings a visitor could walk by the fourth grade classrooms and see the Tandys in use: two children conferring over a Tandy in the hall, several children working intensively alone on Tandys at desks, a child deep in discussion with a teacher over a paper copy, still other children printing out copy, others changing and recharging batteries, a whole group sitting together and sharing stories from Tandys. Tom and Pamela were both new to technology in the writing classroom when they began using the Tandys. Both were quickly convinced of the opportunities they provided for new, innovative methods of teaching writing and to empower students in the progressive tradition.

> The advantages of the technology for teaching of writing grow, as it were, more abstract as students mature, but the theme remains — the liberation of expression. Whether the concern is small-motor control in the First Program, peer review in the Middle School, or the logic of evidential support in the High School, the flexibility of the digitized environment offers solutions which reach across the curriculum.

The Dalton Plan is alive and well in the Tandy classrooms. Our young students are working with remarkable independence, having conferences with peers and teachers about their pieces (Lab), working through teacher-or student-designed writing topics (Assignment) within their classroom community (House). Assessment by teachers and students has been constant throughout the project. Teachers are "kid watchers" (Ken Goodman's term) and are constantly alert to the growth of their young writers. Ilene Lewis and Julia Stokien, Middle School preceptors, have also been major players in these classrooms, especially with the more reluctant writers. Their observations of the way our students are developing via electronic means are clear: obstacles like graphomotor and spelling difficulties are greatly reduced with the Tandys.

Critical to the success of the project has been sufficient machines to provide one per child during writing periods. My original argument for the project stemmed from that belief. The school, understandably, was always concerned that such resources were being well used. Since the other New Lab projects involved situations involving groups of students at one computer, this project was different, with each student needing a machine during the writing periods. This year has clearly shown the success of the project. The enhancements that I propose are based on teacher suggestions and my research into ways to further expand the possibilities in using technology for communication.

Enhancements for the 1993-94 School Year

1. Twenty-five portables for each of the three classrooms that have used the Tandys this year.

Throughout this year teachers in the project have done an ongoing assessment of their students' growth as writers through "kid watching." Writing workshop is all about process; thus, observations of the children during workshops tell us more about their growth as writers than only viewing their polished, published, finished work. The three teachers who used the Tandys can describe eloquently the growth they have seen in their students as writers. Some teachers have documented this growth by having their students keep drafts of work, notes of their revisions, and periodic reflections on their growth as writers via self-evaluations.

The fourth grade at Dalton is in a unique position. They are the first grade of the Middle School and come from the small, intimate environment of the First Program to the busy, big world of Big Dalton. Familiar with having two or three teachers working with their classes of twenty, at Big Dalton all is changed. Suddenly there is one teacher with twenty children and a huge building with many big people. The fourth grade house advisors attempt to create a warm, safe, nurturing community for these children, to help them make the transition to a very different place. Usually fourth grade is part of a lower school and our fourth graders are still very young; Big Dalton can be very overwhelming for them. As a result, the house teachers do all they can to limit fragmentation of a student's day. Peter Sommer has done a lot to change the fourth grade schedule to give them more time in House, more opportunities for integration of disciplines. Still, the limited space of Dalton forces these fourth graders to move all over the building, seeing many different teachers.

While the four teachers succeeded in sharing the Tandys this year, this did constrict their schedules. Tom runs a classroom where children make choices during the morning in different subject areas. Thus, some might be reading, others writing, still others working with Tom on a math problem. Having to share the Tandys with me constricted his students' abilities to make such decisions and limited his ability to use them in more ways. I too found that I had to use them only for writing workshop although I had wanted to use them for other projects. I worried that one might break, that something might happen to Tom's students' work. Pamela did not have this problem because she ended up having her own class set since Doug Brin did not use them much.

My familiarity with similar projects in other schools and my observations of how Tom and Pamela used the Tandys make me feel certain that giving each class their own set will provide a new environment where the portables will be used in new and creative ways, far beyond the writing workshop. No longer will we have to be sure to stop using them at a certain time because they need to go to another class. Even more exciting is the potential for using them beyond the confines of the fourth grade classrooms. For example, we are planning a new fourth grade program with Judy Stetcher whereby the children will study Dalton and New York City as cultures and communities. The portables would be ideal for them as they research, interview, and learn about these communities. The science and math teachers have

also expressed interest in having the students write on the portables in their classes. Thus, the students would understand more about different kinds of writing and do more of it in content areas, "writing across the curriculum," as current jargon has it. The likelihood of more team teaching, more interdisciplinary assignments, more creative assignments is certain if each house has its own set. Those of us who have used the Tandys have proven their worth in our writing workshops and we have also shown how the new technology inspires us to design new and creative assignments. There is no doubt that we will do even more of this with our own sets.

The recommendation for twenty-five per house is because we might have twenty-one students in a house next year and because we need to anticipate breakage. Other projects that I know of have always had several extras in reserve in case of breakage.

2. *A Mac workstation for each of the four fourth grade classrooms.*

These computers would bring the fourth grades onto the Dalton Network so that teachers and students could communicate via e-mail. The workstation would also need to have at least one printer (or more) to print directly from the Tandys as well as from the Mac. (Currently we have one new Panasonic printer provided by the Middle School and two old printers, one donated and one on loan, which are on their last legs.) Each class would need a copy of Microsoft *Word*. Individual teachers would need to make their own choices and decisions about other software. For example, some classes might want to use *Mavis Beacon* for keyboarding instruction, Pamela has expressed interest in the *Voyage of the Mimi* software, Tom is developing a geography database with his class already, and math and science teachers might want to have software on the computer for student use in the classroom.

3. *Telecommunications*

Set up phone lines so that each classroom can have accounts to national and international networks. We are all interested in networks that connect our students to the outside world. I am currently part of a pilot Scholastic Network that will go on line next fall and provides many opportunities for students to explore far beyond New York. Children's authors are on the network, children are doing group stories, etc. I will be part of the planning and implementation of the Scholastic Network which now runs through America On Line. Learning Link, TERC's Global Lab, and WCU MicroLink, and LitNet are other possibilities.

4. *Basics to make the program run more smoothly*

   a. At least five AC cables for each of the three houses that have the portables. This makes it possible to use electricity as well as batteries for power. (Pamela's classroom would need more outlets.)

   b. More rechargers and batteries. (Pamela asked for longer running batteries. I don't think such a thing exists, but if so we want them!)

   c. Storage for the Tandys. Currently we have two large, awkward cabinets for the Tandys. Our rooms are small and our children spend a lot of time in them. We all do what we can to create inviting rooms where children have space to move around.

do different tasks. Pamela has a cabinet that comfortably houses all her equipment. The cabinet that Tom and I share is not so good. We have to keep the Tandys on the top shelf and I worry that the shelf will crash or students will knock it down (it is really too high for them). Tom and I each need our own cabinet, one that is low so that children can easily print, use the workstation, and store their portables safely.

Analysis of GSP/Proposal for 1993-94: Deborah Coons

To look for the future of this curriculum for the seventh grade, I need to consider the major drawbacks or failures of the first part of the year and propose possible solutions. Many of these problems center around time management issues, room schedules, and available resources. I hope to present each problem with a solution or possible solution(s) for the future.

First, the environment of the Dalton school has some major drawbacks. To have a classroom with computers being used by classes that have no use for the resource is a waste of the technology. Whenever I am free to experiment with the program or have a conference with my colleagues, my room is not free. I understand that this is a common problem at Dalton. I am not sure if the problem can be solved, but I suggest that when room schedules are finalized, consideration of "computer rooms" be a priority and that these rooms be made available during a time when the teachers are also free to meet as a core or a cluster. I realize that the Glassroom and the 5th floor computer rooms are available to me, but to try to complete class preparation in these rooms is an impossible task. The space is too small for the use of books and materials. Ideally, a technology-filled core room, available during our preparation periods, would allow for more curriculum development by teams. For example, Cameron Hendershot and I have talked about the use of statistical mathematics and graphing for historical data. We conveniently have the same time free to explore our ideas, but we have no room with computers and ample space and privacy in which to experiment and collaborate on this endeavor.

Second, the management of my time and efforts needs to be improved tremendously. At present, I have four computers in my room. If that were the only resource for this course, I would find it daunting to even begin such a full grade endeavor. Four computers for a class of 16 to 20 students is an impossible ratio. One computer for five students accomplishes the following experience:

...we must consider that the cost of two more computers per room will be a small price to pay for a quality educational environment. You will be providing each teacher with the needed "chalk and blackboards" to create and improve the technology-based curriculum of the future.

11/9/92 Today, I watch a group in my high math class try to work as a team. There were five very responsible students in one group, two girls and three boys. The group sat at the computer closest to the window and the printer, and began the investigation. They all read about the problem and reviewed the definition of similar triangles. Two of the boys started fighting over who would be first to use the mouse and construct the triangles. Five minutes later, I returned to the group and found the girls talking about their hair and one of the boys "playing the drums" with his pencils. I redirected the group members to discuss how the animation should be done and how their group should prove

similarity. They engaged in conversation about the problem, but, ten minutes later, when I returned to the group, I found a different group member setting up the animation of the triangles, and the rest of the group talking about an upcoming dance. Another ten minutes pass, two kids are collecting data and the other three decide to go to the fifth floor to collect a print-out of the problem. When I mentioned to them that they did not need three people to collect one piece of paper from the printer, they responded, "We have nothing else to do, Joe and Mark are the ones completing the problem. We have nothing else to do." The most frustrating part of this experience happened a week later, when the written component of the experiment was due. Two members of the group realized that the data that the group collected were not valid proof of the investigation. One student wrote about what was supposed to be completed through the experiment, but never referred to the data (work completed on G.S.P.) and never realized that the investigation was insufficient. The two students who did most of the computer work were able to explain what they constructed and animated, but were not clear about similarity and how to prove two triangles similar.

The above scenario sounds very dismal. Four to five students per computer is not adequate for the following reasons: there is too much opportunity for socializing, not enough space around the computer, and a lack of hands-on experience for each child—all resulting in a lack of interest and lack of learning.

Now, Dalton has provided the Glassroom on the 10th floor and the 5th floor Computer room for my class to use. Both rooms have 4 to 6 computers and the entire seventh grade gets to share the space during the same time. Very often, however, the rooms are also reserved for a fourth grade class or a high school class. Such a juggling act of space is less than ideal for teaching and learning. Let's just say I am able to find enough computers from these resources and I have my students in groups of two or three. But, as the following illustrates, this is no easy task.

2/16/93 I am not sure what I just accomplished during that forty-minute period. I started in my room and three groups went to the 5th floor looking for computers. I began working with Kenji's group when, on Sara's monitor, I get a message from Mark's group on five that they needed help. I finish with Kenji's group and walk out the door. There I meet Meredith's group who said there were no free computers on five and they were going to ten. O.K., I go down the stairs to five and help Mark's group for a few minutes. Just as I get there, Sara walks in and says she is having trouble with Betsy in her group; she needs my help. So, I finish with Mark's group and head back to my room on seven. Sara and Betsy are very frustrated with each other and with figuring out how to animate one of their problems. They are showing me their animation and a message comes up on the screen that Meredith needs some assistance. The message freezes the screen and Sara and Betsy need to reconstruct their problem. This only adds to their frustration. I finally calm them down and move on to the tenth floor to help Meredith's group. By the time I get there to help them, the class is over. So I keep them a few minutes late and they are disappointed that their class time felt like a waste. Meanwhile, I am late to start my next class back on the seventh floor.

Because each grade level has two rooms of four computers, I can use the sixth grade or the eighth grade computers only if these rooms are not occupied by House or core meetings. I may have these rooms two days per week. During those two days, it is ideal because the rooms are on either side of my classroom and the ratio of kids to computers is 2:1. The students can easily contact me and do not spend time trying to locate me. If a group is having difficulty working together, I can easily manage the situation. Each group is focused and is using the class time productively. The space is an ideal working environment. Sharing other classrooms is helpful, but it does not solve the problem. The only solution I see to truly maximize my efficiency with a technology-based curriculum is to have more computers. Ideally, eight computers in a room would be optimal. Unfortunately, I realize this does not allow the most cost-effective solution. It would seem helpful if six computers were in each room, thus minimizing the cost and maximizing the teaching and learning. It would also account for the number of times that the computers break down and we only have three or two computers working in the classroom. I recognize that computers are expensive teaching tools for the school. However, if the administration and New Lab philosophy for the school is to work

towards a computer-based curriculum that maintains a high level of learning by all students, we must consider that the cost of two more computers per room will be a small price to pay for a quality educational environment. You will be providing each teacher with the needed "chalk and blackboards" to create and improve the technology-based curriculum of the future.

* * *

Technology in the High School

The High School Learning Landscape: Excavations and Excursions: Judith Sheridan

The language the High School faculty has chosen to employ in these reports and proposals describing the technology-based assignments and courses they have created reveals the power, attraction and reasons for the proliferation of the pedagogy supported by the Dalton Technology Plan. For example in describing the activities of students engaged in the *Playbill/Macbeth* program, Jacqueline D'Aiutolo says, "We proceeded to read through the play, discussing character, plot and theme before beginning our 'dig' into each act." In discussing the advances of *Project Galileo*, Malcolm Thompson characterizes the product of data collection as an "information landscape," and calls his assignments a "sequence of excursions." Andrew Glassman finds an analogy in his work with students in Russian Literature with Thompson's Astronomy project. Glassman says, "Just as we use *Voyager* software to help students actively investigate what is happening in the sky, this program gives tools and information to investigate what is happening in the socio-moral order.... With such a program students have a chance to be active investigators instead of receptacles."

Students at work in such classes as Architecture, Astronomy, English, French, and Physics are engaged in dynamic exploration facilitated by computers. This active approach to learning has always been at the heart of progressive education, which is Dalton's heritage.

These are only three citations; there are many more examples in this report which help make the point that the language of learning has become "digging, traveling (excursions in space), and investigating." Students at work in such classes as Architecture, Astronomy, English, French, and Physics are engaged in dynamic exploration facilitated by computers. This active approach to learning has always been at the heart of progressive education, which is Dalton's heritage. Students learn how to answer or create solutions to difficult problems and questions, many of which they have formulated themselves. Students wonder and learn to research, to record, to evaluate, to quantify and qualify, to look for contexts and subtexts, and by so doing they are validated by the authenticity of their quests and their methods.

All these projects utilize multimedia approaches to give students access to information in art, history, literary theory, and philosophy. The information has spurred students on to research further and the data bank of information increases in a way which will enrich and assist students studying these areas in the following years. The idea of an ongoing community of learners is being realized.

This academic year has continued to be most productive. The *Playbill* Project, which initially focused on the teaching of *Macbeth*, now has moved on to include assignments on the Bible and Art and on Russian Literature. Next year there are projects being planned by Steve Bender in the elective offered to High School seniors in Cinema centering on *Citizen Kane*, and by Warren Johnson and Jean Gardner in the teaching of American Literature which will incorporate visual art, music, and significant cultural

documents about the American West that will inform the teaching of Willa Cather's *My Antonia*. All these projects utilize multimedia approaches to give students access to information in art, history, literary theory, and philosophy. The information has spurred students on to research further and the data bank of information increases in a way which will enrich and assist students studying these areas in the following years. The idea of an ongoing community of learners is being realized.

In the future, the *Playbill* armature will be employed in the study of foreign languages as well. Sol Gaitan has a promising project under way in the teaching of the works of Federico Garcia Lorca; hypertextual links offer the possibility of helping students understand a foreign sensibility otherwise more difficult to achieve.

In addition, in place in the Language Department is a successful testing of MIT-produced *A la recontre de Phillipe*. Students were able to interact with a sophisticated video story and hear French as it is spoken in France, with varying dialects and rapidity. Caren Steinlight's enthusiastic review of the project she initiated at Dalton conveys the exciting possibility of learning and teaching with this program.

This year also witnessed the development of computer-aided design programs in the teaching of Architecture, Video Arts and a course in Computer and Art. The exploration of the potential of these programs is again an ongoing task entrusted to Rob Meredith and E. Jay Sims. Their reports attest to the creative possibilities of these tools.

In the ScienceDepartment, Malcolm Thompson's *Project Galileo* continues to provide students with the opportunity to study astronomy by investigating images transported from working observatories. Thompson has employed the Dalton Plan, its Assignment-based methods and the Lab setting, in a way which validates the ideas of the school's founder, Helen Parkhurst, in the context provided by the new technologies.

This year the teaching of Physics was enhanced by assignments in programming which allow students to understand the materials more thoroughly, with greater reliance on analysis rather than formula. The faculty who teach Chemistry are engaged in a summer project which will lead to new assignments to be used during the next academic year which will employ some of what has been learned by observing the success of the methods of the Astronomy course. They plan to move in the direction of greater use of experiments and the tools of analysis that technology makes available to young students of science.

The Civil War project and its operating tool *HistoryMaker* will be expanding next year, as it is incorporated by Mike Hyatt into his teaching of American History and his elective offerings to seniors. This plan is the natural evolution of a project that has been highly successful over time.

In all that is happening in the High School it has become clear that the classroom is no longer confined to four walls. Through the use of E-mail, discussions with teachers and students will occur throughout the day and evening. Students' work has become increasingly collaborative, and questions and suggestions for revision and change are now the province of classmates as well as instructors. Peer review and enthusiasm for revision are the natural results of these programs and projects. Students are not content with pat answers; they have been given the means to probe complexity. This is eloquently communicated by Steve Bender who writes about the movie *Citizen Kane* and states, "The film teaches us (I think) that there are only versions of the truth, not a single univocal one. The reporters tracking 'Rosebud' can be seen as a metaphor for conventional students, diligently digging around for a meaning that might not exist." Truly, the process of learning has become the focus of attention.

Finally, what emerges from these reports is the enthusiasm of the faculty who are teaching and are learning in turn. Caren Steinlight ends her report in a way echoed by others who have been working with interactive tools of learning: "I have learned more than I ever could have imagined, and I feel excited and optimistic about the future. My students learned a great deal of French, and they also learned quite a bit about learning itself. So did I." That statement summarizes the nature of the success of this year's efforts.

Playbill Report—Art And The Bible: Jacqueline D'Aiutolo

Overview

Ninth graders were particularly engaged in the connections they could make between the Old Testament and Renaissance Art. They were eager to work collaboratively, to link the text and paintings, to engage in peer-editing of final papers, and to make HyperCard presentations to the class. They found the paintings compelling, but they had to be directed to explore the two translations for comparative connections.

Part I: Retrospective

The Pedagogy

The students were given a set of teacher-imposed questions to guide their inquiry into the Old Testament material. Each Biblical story was framed with a finite array of choices for inquiries with directions which paved their paths through the material. They were guided through, alternating between the literature and the art as the path from which they would make their connections. They worked in small groups of their own choosing (this practice was successful in the tenth grade as well, but I formed the groups in eighth grade because of the nature of the class and the developmental factors). Each group could opt to write the final paper collaboratively or individually, but all four groups decided to write group papers. They recorded their findings on "notecards" which were then put into my "drop file" for assessment. The unit culminated in a 5-page paper with the formation of the thesis coming from the group, without my delimiting it. They then presented their HyperCard papers to the class on the large-screen presentation equipment. The groups were obligated to engage in peer-editing as a part of the writing process.

The students made high-level interpretive connections between the art and the literature. Their ideas about the paintings and the connections to the Biblical text displayed a freshness and an originality, albeit a lack of sophisticated knowledge of art history. Incorporating more background material on the artist, the historical time frame, and some material on what to look for in a painting may prove helpful as the project is enhanced for next year.

Time is the issue to consider. To allow the students to work as intensely as they have in this unit, more time must be allotted for the *Bible*. Of course, as one unit is expanded another is curtailed. This continually poses an important question for us to consider as we move in this technological direction. The spaces used would be greatly enhanced by smaller fold-down desk-top chairs which could be moved more tightly around the computer. Some students found themselves outside the computer-loop because of the physical dimensions of the chairs. Also, a small conference table in the center of the room would allow for more computer area space as well as allow for discussion-focused classes.

Collaborative writing proved to be quite successful in this project as well as in the *Romeo and Juliet* and *Macbeth*. Group papers were more deftly executed and the discussions on the ways to improve the prose style were particularly stimulating in this class. Students actively engaged in the attention to detail, and were motivated to refine and

polish their prose. It will be important to assess the carry-over into individually constructed papers which must also be required.

> One of the best ways to assess the success of these projects is when I walk into my classroom, I find my students are already actively engaged in their groups with the programs running and the conversation flowing, without any notice that the teacher has arrived.

The timing of this unit was much longer than anticipated. We spent four weeks on just the Old Testament in a six-week unit which usually incorporated even more selections from the Old Testament, as well as the Gospel of Luke. Overwhelmingly, however, the students felt that it was time well-spent. They found the links to the paintings rich and rewarding, but failed to make the expected connections to the different translations. My assignment in the Fall will try to lead them into the explorations more directly through the differences in the language.

The Physical Environment

Time is the issue to consider. To allow the students to work as intensely as they have in this unit, more time must be allotted for the *Bible*. Of course, as one unit is expanded another is curtailed. This continually poses an important question for us to consider as we move in this technological direction. The spaces used would be greatly enhanced by smaller fold-down desk-top chairs which could be moved more tightly around the computer. Some students found themselves outside the computer-loop because of the physical dimensions of the chairs. Also, a small conference table in the center of the room would allow for more computer area space as well as allow for discussion-focused classes.

The Soft Environment

Students found the paintings compelling, and had to be forced to look at the text more consistently. Many wanted to have more modern artistic renditions scanned in as well. Perhaps these could be organized according to themes—for example, the role of women, heroes and antiheroes, sibling rivalry, wilderness motifs, etc. Also, the incorporation of music will greatly enhance the program and the background information, as well as a guide on how to "read" a painting.

Conclusion

The *Bible* seems to be a perfect candidate for a HyperCard study. The individual stories are discrete, and students are not overwhelmed by the vastness of the material as they can be by a Shakespearean play. There is not the need to "break down" the text into manageable pieces as there is in *Macbeth.* Students are completely engaged in making links between art and literature, and seem to feel that there is a natural connection.

The writing process is greatly enhanced by the collaborative approach, and students are learning to work more cooperatively as they engage in group research and decision making. They are learning to formulate their own compelling questions which drive them into pursuing their own areas of inquiry.

The teacher's role, however, continues to be expanded as the facilitator who "guides" the inquiry without delimiting it. In all three *Playbill* projects, *Romeo and Juliet, Art and the Bible,* and *Macbeth*, the Dalton Plan as it was originally conceived seems to be regaining its vitality.

One of the best ways to assess the success of these projects is when I walk into my classroom, I find my students are already actively engaged in their groups with the programs running and the conversation flowing, without any notice that the teacher has arrived.

* * *

Report on *The Ninth Grade Bible Project*: Warren Johnson

The *Art in the Bible Project*, which I currently teach in the ninth grade, was initiated last September when I became aware of how the new technology could be used to bring together materials related to the *Bible*. My aim was to begin to build a resource for interdisciplinary study, which would include painting and music as well as literature. Because the *Bible* exists in so many radically different translations, Hypertext, which allows the easy juxtaposition and connection of different documents, is well-suited to the presentation of these different translations, and to the teaching of language. In addition, paintings can be wonderfully reproduced on the computer screen, and the new technology is an ideal medium for interdisciplinary study, which used to be comparatively awkward.

The *Art in the Bible Project* exemplifies the way issues of concern to advanced researchers can be recast so as to bring young students into the orbit of excitement only original scholarship can generate. Issues of translation and interpretation are brought to life when assignments propel students to compare representations bearing on the same topic, but drawn from different mediums — and not in a one-shot slide show. The juxtaposition of these materials on the screen has a profound and enabling effect when students engage them as elements of their own projects.

My belief—now a belief confirmed by experience—is that the ease of juxtaposition on screen deeply affects and aids the way we perceive what we see, making the experience of learning more thorough.

In addition, I had a strong desire to experiment with new forms of writing and styles of argument. As I will discuss, the technology has great potential for the teaching of research and writing. Hypertext, or Hypermedia, involves new ways of arguing, and this project introduced the students to them. In the end, three student groups each produced a Hypermedia essay, an interdisciplinary essay which was linked to different translations of the *Bible* and to numerous paintings.

Part I: Retrospective

The Physical Environment

The physical environment for group work is far more important than I would ever have thought prior to using the computer in the classroom. The main issues seem to be: i) accessibility of the keyboard and the screen; ii) the arranging of the students so that they can see and relate to each other during intensive group work; iii) placing the groups at a sufficient distance from each other so that they don't interfere with each other's work.

Originally, I divided the students into two groups of five and one of four. It is impossible to arrange five students around a computer so that they can all see the screen *and each other*; consideration needs to be given not only to the shape of the desk, but also to the kind of chair the students sit in. A couple of weeks into the project, rather small desk/chairs were replaced with ones with much larger desks, which had the effect of making it even more difficult to arrange the students around the computer. Eventually we all reconciled ourselves to sitting

Allegory of the New Testament

Vermeer's "Allegory of the New Testament" (1632-75), which the students also see when they visit the Metropolitan Museum of Art, is one of hundreds of images used in the interdisciplinary study of the Bible in the ninth grade which takes advantage of New York's cultural richness. The way in which this painting tells the story of the Gospels supports discussion about the meaning of "allegory."

with our backs to one another and twisting around in conversation, but I must say I thought this arrangement was always rather uncomfortable; always, too, it contributed to isolating a couple of students while others took charge.

Yet, in spite of what seemed to me to be difficult circumstances, three solid groups eventually formed and each one produced a Hypermedia essay with links to both the *Bible* and the paintings. In fact, when a fourth computer was introduced to the room, the students, who had complained that another computer would make their lives easier, *refused* to reform into four smaller groups because they were in fact all working quite well together! (More on this in "Pedagogy," below.)

The size of the computer screen is another important issue. Multimedia projects which involve relating a number of different sources and creating webs of connections need large screens. Without them, paintings, Biblical text, notebooks, notecards, catalogues, etc., must be placed on top of each other so that the various things cannot be simultaneously viewed., and energy is constantly going into the juggling of materials.

There weren't any changes in the physical environment during the six weeks of the project; but some are planned for next year.

The Soft Environment

At present, the *Art in the Bible Project* consists of two translations of the *Bible*, the King James Version and the New International Version; and some thirty color paintings which have been scanned and are equal in quality to what we see in good art books.

The technological environment consists of a number of different tools for writing and research.

1. *The Card Catalogue*. The card catalogue is a kind of backbone for the body of materials in the project and is in constant use as an easy and direct way for the students to navigate throughout the project. Each card gives the title and artist of a painting. The students can press buttons labeled "view picture" and "go to text"; that is, the catalogue links all the paintings to chapter and verse in the *Bible*.
2. *The Link Tools*. The link tools are an exciting development because the students love to use them. Using a very straightforward procedure, students can create links, in their own written work, to both paintings and textual materials. Whether the students are recording observations informally in notecards or writing essays, they use the link tools to make connections between their writing and their sources.

   An issue for discussion is the way in which the activity of creating links while we are writing affects the formulation of thoughts and the expression of ideas. Only one link can be made from a word or phrase to any object, whether text or painting, and this inhibits the creation of webs of connections. For example, in order to link a paragraph in an essay to both a painting and a particular passage from the *Bible*, one must create two phrases, one to link to the *Bible* and another to link the painting.

Revision is also notably affected by the linking process. A drawback is that once a sentence or paragraph has been linked to a painting, say, the written textual commentary cannot be altered. The problem is solved by making links from single words or short phrases. The lesson here is that one must quickly learn to understand how the link tools work, preferably before one begins to write. I didn't, nor did the students, and the result was that we learned along the way. Still, the activity of linking is something that is on our minds as we write and continues to affect in subtle ways the manner in which we express our ideas.

3. *The Notecards.* The notecards are equipped with a number of functions which, when fine-tuned, will work well to help to teach the students important organizational skills connected with research and writing. These functions include: "Sort"; "Mark Cards"; "Collect/Print." These features could and should be used to teach the students techniques of categorizing or organizing areas of inquiry, but they got little use this year because of limitations that can be corrected. "Sort" works by putting all the notecards simply in alphabetical order according to the first letter of the title entry; the function can be improved by aiming it to the work so that it sorts according to a word in the title. With "Mark Cards" one can identify all the cards containing a word; however, there is not a way to gather them together. The "Collect/Print" feature simply collects and prints all the notecards, in order; it needs, therefore, to be connected to the "sort" and "mark cards" feature in some way.

4. *The Notebook.* At present, the notebook appears in the form of a relatively large page, compared to the notecards which appear in the form of small conventional notecards. Rather quickly, the students gravitated toward using the notecards, rather than the notebook, as their way of recording observations and making links. A couple of weeks into the project, the notebook was still not being used, and I asked the students to keep track and record their method of proceeding in the notebooks, and to discuss how their method of proceeding was affecting the way they were perceiving the *Bible*. This request determined the relative status of Notebook and Notecard, though of course this status was also determined by their appearance and size. A few weeks later, the students began using the notebooks to produce their hypermedia essays.

   As with the notecards, the Notebook has marvelous potential for the teaching of writing because of the way in which the technology encourages the development of techniques of recording observations, organizing material, and revision. Using the "Cut/Paste" feature, the students can move text back and forth between their notecards and their essays. Ideas which are recorded in the notecards during initial group discussion are revised when they are moved and recorded in the Notebook. The ability to arrange a variety of documents on a single screen allows us to see, simultaneously, the various stages of the development of our work.

The Pedagogy

For me, one of the most important aims of the project is the creation of essays in Hypertext/Hypermedia. A powerful moment happened at the very end of the project, when

the students had completed their essays. By this point, of course, they had learned the technology; all the essays were full of links to the two translations of the *Bible* and to numerous paintings. But then one student asked a surprising, to me unthinkable question: "Well, now that we've done it, so what?!" I responded by suggesting that we "read" what they had "written" by going through the documents and activating the links as we encountered them. When the students did this, I "saw the lights go on," as the saying goes. Working with the new technology allows them to discover the experience of reading—and hence of thinking and making connections—in a new, different, and exciting way. As a number of them said, "Oh, *now* I get it!" The pedagogy then, needs to be oriented toward achieving this kind of ending.

The overriding idea behind *Art in the Bible Project* is that the various translations and the paintings all reflect interpretations of the original texts. The structuring questions in the assignments are geared toward allowing the students to discover and see differences and to then to discuss what they mean. Bringing together different materials into a classroom—through slides and different texts, for example—is not the same thing as bringing together the same materials on the computer screen; the immediacy of the juxtaposition on the screen has a profound effect—and a profoundly enabling one—on what the students see. In addition, of course, their notes and essays also exist side by side with the sources and become linked to them, so that their own interpretations become part of this visible web of connections.

While discussion of technology-based education usually excites anxiety about the intrusion of the inhuman into what we have always thought of as a profoundly human endeavor—this was certainly an anxiety of mine, originally—it turns out that collaborative, group work with the materials that the technology brings together makes the personal development of the students a much more important aspect of their education than it was before.

Perhaps the strongest motivating hook for the students is the use of the technology. The students love to exercise their ability to create links, to cut/paste notes into essays, to collect/print. As I have said, these functions immediately engage the students in the activity of research, writing, and revision. Icons for these various functions *visualize* and *distinguish* the various acts and activities in research, writing and revision; in these things lie their value and their educational potential.

The contrast between various translations of the *Bible* presents immediate and compelling issues which the students love to engage. Where one translation uses "mind," another uses "heart"; where one translation uses "soul," another uses "mind." Questions which ask the students to discover differences in the translations and debate their significance almost invariably lead to animated group discussion. The questions must, however, direct the students' attention to particular passages, even to particular verses in the *Bible*. To ask students to simply "read and compare" an entire chapter in two different translations does not provide nearly enough direction at this stage. When differences at the level of single words have been addressed, the ways in which language affects our perception of things like characterization, plot, and theme also become important. The hypertextual environment in this way becomes a medium for encouraging investigation of these conventional literary

issues. The difference between the conventional classroom and the new one is that in the hypertextual environment the students are discovering issues more than they used to, and the energy that comes from this, especially the energy that comes from group debate, feeds into discussion of literary matters like characterization or plot.

The contrast between visual and verbal representation of Biblical scenes raises an immediate and pervading question about the nature of different kinds of representation and what various media can accomplish. The students love to engage this issue, which this year led to numerous group discussions—and group essays—in which they explored the power and limitations of language and visual images.

Of course, a wholly new area of pedagogy involves teaching the students how to use the computer. As I have said, the majority of students are attracted to the various functions and tools; they want to learn how to use them and they master the technology surprisingly quickly. Others, however, hold back. Here, an age-old motivational hook proved to be invaluable: the announcement that everyone would be seeing me in lab, where they would show me what they could do and we would also go over any skills that needed to be learned. Prior to this announcement, some of the students were content to sit back and let others take charge of the technology, however much they were contributing to the discussion and generation of ideas; after this announcement, the students started teaching each other the skills they needed to know.

Part II: Prospective

The Physical Environment

The environment that has been created in Rm. 1103 shows how an almost ideal physical environment can be created which solves some of the problems I encountered this year. The suspension of the computer screen in the area above the desk, so that everyone viewing it can look up and see it immediately, solves the problem of arranging people to do group work: in addition, 1103 has the large 16" screens which, in my view, are the screens of choice. Next year, we will be getting some of them in a room on the sixth floor, but we need to give some thought to how we can mount the screens so that they can be seen as well as they are in 1103. Thought needs to be given to the kind of things to which teachers in the past have never had to give a thought, including the kinds of chairs and desks that are to be used.

The Soft Environment.

This year I identified several areas of development which we have begun working on and will be in place by the time we begin to use *Art in the Bible Project* next year.

1. *Manipulation of the Paintings.* As I have said, one of the great values of the project is the way in which it encourages students to link to their evidence and incorporate it in their Hypermedia essays. At present, when we link a sentence in an essay to a painting, the link is to the entire painting. Yet the paintings can be manipulated in such a way as to

allow us to focus on a particular area; usually, in their essays, the students are talking about the significance of a particular gesture or expression. Early on, they identified the need to be able to preserve the area that has been isolated and analyzed in the text of the essay in the link. This is possible to do, and it should prove to be a very valuable tool. The Hypermedia essay, with the links displayed, will thus reveal the process by which the students focus on details in their discussion of literature and art.

2. *Enhancing the writing process within the digitized world.* The various tools and functions will be modified to enhance the writing process by allowing for more communication between students and between students and teachers, and by making the digitized world more functional for the various activities in writing and research. Since Hypermedia essays are readable only in a digitized environment, the environment needs to be developed to make both writing and reading possible.

The Notebook. At present, the notebook is simply a "page" on the screen, but there is no way for anyone to write comments on an essay or respond. Late in the project (too late to be used this year, since I didn't get the idea until I found, by experience, what kind of modifications are needed), we modified the notebook to consist of two manipulable fields: one for the essay and one for teacher/respondent comments alongside the essay. In connection with a newly created "drop file," the students next year will be able to send me their notebooks for my comments; reading their essays on screen, I will be able to activate the links they have made and the webs of connections they have created. Using the computer, I will then be able to return the Notebook to the students. In the near future, we can expect to see the students writing in new ways. Not only will essays incorporate links to various media and sources, they will also incorporate links to different lines of argument and areas of study. Argument, rather than representing the comparatively linear mode of investigation we are used to, will become a much more multidimensional thing.

The Notecards. The various functions, including "Sort," "Mark Cards," and "Collect/ Print" can be improved as I have indicated in the discussion of the soft environment in the "retrospective" above. They can be made to work by identifying words, which will of course indicate the area of study.

The Pedagogy

Both the Assignment and the materials included in the soft environment need to be developed. This past year, my main discovery was in the need for ways to organize the material so that the students can work with it.

1. *The Assignment.* The assignments need to be modified in a number of ways. Specific areas of study need to be defined and more specific questions need to be asked. For example, both the Old and New Testaments can be divided into a number of narratives or stories. Also, the assignment needs to integrate the discussion of the sources with exercises which involve the use of the tools and functions, so that the use of the technology is taught alongside the *Bible* and the artwork. Since, as I have said, the tools represent various aspects of writing and revision, this kind of integration involves

nothing more and nothing less than using the technology and the assignment to integrate the writing process.

2. *The resources.* The project has great potential in the area of art history. Before it is used in the next academic year, we will be adding biographies of the different painters and their periods. In addition, we will be adding about twenty paintings in order to include more historical periods. Hence, the ways in which the paintings are related to views of a particular historical period will become a new topic of study. In addition, we will be developing the topic of authorship by including *The Book of J* and some essays on Biblical scholarship which explain the relationship of the different writers of the Old Testament to the history of Israel.
3. *External educational resources.* Since the Metropolitan Museum of Art has many holdings, next year I hope to make more use of the museum than I did this year.

Conclusion

Collaborative work using the new technology profoundly changes the way we learn and what we learn, but with experience, I begin to see that there is rather more continuity between the "old" and the "new" than I originally thought.

While discussion of technology-based education usually excites anxiety about the intrusion of the inhuman into what we have always thought of as a profoundly human endeavor—this was certainly an anxiety of mine, originally—it turns out that collaborative, group work with the materials that the technology brings together makes the personal development of the students a much more important aspect of their education than it was before. A delightful moment in the project was when the students refused to regroup into smaller units when a new computer was introduced into the room. Another was when students who had mastered the technology started teaching things to others who hadn't, in preparation for labs with me. In class, in conversation with individual students in lab, and on written reports, I found myself discussing how the students were relating to and treating each other. Things like kindness and consideration for others become educational goals for everyone—the teacher included.

A great discovery then is that the role of the teacher is not diminished but greatly enhanced by the shift to group work. Prior to the initiation of the project, the class was arranged in the way that is usual for me: students sat in a circle, with me being a part of that circle. When the students work in groups, the intimacy of the teacher-student relation is surprisingly enhanced. As the students work with the assignment, I move from group to group, joining in the conversation. Doing this, I found myself suddenly aware of how I was making a greater connection with individual students as I talked with them in these smaller groups. For one thing, I'm required to sit with them, rather than speak to them across a room; for another, a conversation, a true conversation, is much more possible with a group of four or five than with fifteen. Similarly, I found myself having wonderful labs with the students individually. In the presence of a computer screen, the relationship between the teacher and the student hardly disappears; the technology simply becomes the new medium for communication.

Still, it needs to be noted that the larger group of fifteen has its value; it seems to me that classes using the technology need to modify group sizes, and plan, in the assignments, activities for different groups. The groups shouldn't become restrictive, and students should be getting to know many rather than few others. Certainly, there came the point when my students said "Can we have a good old-fashioned class discussion, with everybody?" It was a need I felt too. Dividing classes into groups makes them, in a way, harder rather than easier to manage, especially when the students are in ninth grade. I remember when chaos erupted in one group while I was working with another, conjuring, in utter frustration, visions of videotapes of Malcolm Thompson's Astronomy students working away assiduously. Clearly, the age of the students is something to keep in mind!

A very important and profound development is in what happens to the particular ideas that are generated in this new style of classroom. When students discuss questions without the immediate guidance of the teacher (apart from what is in the assignment), they come up with surprising issues and answers. I became more aware of something I always knew about, namely, how manipulative the "Socratic" method of teaching by asking questions really is. Suddenly, I found myself aware of a certain kind of individual creative flair in the students that I hadn't seen before.

Some important questions remain. I have had to give up certain things in order to get others. I have mixed feelings about this. The addition of art history to Biblical study greatly enhances it and only adds to the students' appreciation; however, spending more time on art history, which last year consisted of a slide presentation in one or two classes at the end of the unit, means spending less time on the literature. Time must also be spent teaching the students computer skills; and, as I have said, considerable energies, on everyone's part, go into the development of collaborative work. This year, the students read fewer Biblical stories than they did last year. How can the gains be measured against the losses? The issues are probably not quantifiable.

One final point. Kids love the technology. There wasn't a day when I walked into the classroom that the computers weren't already on and students already at work! As teachers, we're raised to love the romance of old books and libraries, but our students have not had the same experiences—one of the most unsettling aspects of my experience this year. As I finish this report, I'm already thinking about how I'm now going to head up to 116th Street, where I'll take up pen and paper and rummage through the stacks in Columbia University's library. Clearly, I am on a path between different worlds, and it seems I have the best of both of them.

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***Playbill* (Macbeth Project)—Year-End Report:** Steven Bender

Part I: Retrospective

The question "what has happened so far?" strikes me, in a way, as a trick one. So much has happened that the question is virtually unanswerable. Looking back at the report I wrote at this time last year, I cannot believe the strides the project has taken to become a valuable and well-integrated part of the 10th grade English curriculum. There are still some problems, to be sure, but these strike me mostly as matters of "fine-tuning", of continuing to shape assignments and reflect upon the kinds of tasks that we ask our students to do. The problems last year seemed major and, at times, overwhelming (surely we'd never have *Playbill* workstations in our classrooms, certainly students would continue to rebel against the idea of graded group work, etc.). Looking over my shoulder today at these hurdles, they seem pretty distant.

The Physical Environment

The three most helpful things were:

1. *Having four workstations in the classroom (612).* This circumstance basically solved the problem of space and access. It also transformed the classroom into a "laboratory" environment that benefited the unit enormously. Having the capacity to go to the computer to trace a word or find a critical resource gave students a newfound power: there are always more "experts" (including Orson Welles and Roman Polanski) in the room than the teacher. Being able to have my students work in their classroom gave them, I think, a sense of comfort, and allowed me casually to monitor their work and chat with them in a way that was impossible when they had to be dispersed in 509 and the 11th floor.
2. *Obtaining another "demo" system.* Knowing that a demonstration system was parked across the hall in the History Lab and was likely to be available made me make more use of it. The students always preferred looking at the "big screen" and always exhibited a sense of pride at being asked to man the controls.
3. *Carving out matters of time with the students.* "Time" was the big issue last year. This year (especially in the Spring semester), rather than let students complain about time, we worked on viable timetables for assignments, revisions, etc., together. We reached a consensus on what was really "doable", and then we did it. Amazingly, I received very few complaints from students about the restraints of time.

Three obstructions (quibbles, really):

1. *Room 612.* This room does not strike me as the ideal environment for a project of this kind. The room is stuffy, noisy (air-conditioning noise from outside, whether the air conditioner in the room is on or not) and the desks inappropriate for intimate gatherings around a computer.
2. *Tracking down the demonstration system.* Too often, I had to hunt for the demonstration system because the previous user had not returned it to the History Lab. This can lead to

fifteen valuable minutes of class time lost. I think that we need to clearly articulate the policy of "use and return."

3. *Time.* Although time has been less of a problem, I still think that all involved in projects of this kind would get more out of the occasional double period than the normal 45-minute classes.

The Soft Environment

The digitized world in which *Playbill* students work remained pretty much the same (major changes are noted below)—the major resources include a glossed text of *Macbeth*, a sophisticated word-search engine (the Text Browser), a critical library of *Macbeth* criticism (including an extensive bibliography), two *HyperCard* stacks on Shakespeare, and three film versions of the play. We also provide students with digital notecards and a notebook.

> If this year has taught me one thing about pedagogy in the new technology-rich environment, it is that the students need to be empowered so that the structuring questions and motivational hooks come from them, though my natural tendency as a teacher is to try to answer my students' questions.

Students learn quickly that it is quite simple to access most of these resources by simply pulling them down from the Resource menu. The tools that get the most use tend to be the Text Browser, the notecards (new this year—for some odd reason, students are intimidated by the Notebook, but not by the notecards) and the films. They are less comfortable with the critical essays—understandably, they get overwhelmed; the teacher needs to make an active effort to point students to appropriate essays and to help them ask the right questions of the essays. This year, we made the essay and bibliography stacks "friendlier" by organizing them more logically and clearly; students definitely appreciated our efforts here. We also introduced them to the technology and how to read a critical essay during the initial unit on *Oedipus Rex.* Still, I need to think harder about incorporating the critical resources we have gathered into student assignments.

A major change in the soft environment this year was the incorporation of *QuickTime* video clips from the three versions of the film into the program. This liberated students from the need to have the laser discs (and a computer attached to a disc player) in order to do much of their work. Unfortunately, these clips are problematic—when there is little traffic on the network, they run fine. On busy afternoons, they can be atrocious.

It should be noted that all the technical changes I wanted to see in *Playbill* were facilitated by the work and good spirit of Adam Seidman.

As far as acquisition goes, we inherited a good deal from Steve Taylor and Peter Sommer, purchased a couple of commercially available *HyperCard* stacks, and scanned an ungodly amount of critical material and video in-house. The process of getting resources scanned was aided enormously by Judith Sheridan's overseeing of the *Playbill* group, and by Eileen Gumport's talent and dedication to the project.

The Pedagogy

If this year has taught me one thing about pedagogy in the new technology-rich environment, it is that the students need to be empowered so that the structuring questions and motivational hooks come from them, though my natural tendency as a teacher is to try to answer my students' questions. This year, I tried harder to imagine that most of these questions were really unanswerable, but that we could try to work (alone, together, in large groups, in small groups) to get at possible answers. As questions arose about the complexities of *Macbeth*, I tried to raise the level of complication, rather than narrow it with simple, authoritative answers. Now my response to a student's question might be, "How do you think we can begin to address that question, given the resources at our disposal?" A question can lead to a discussion of how a student might direct his/her actor to present certain lines. We might then compare/contrast that version with the versions *Playbill* makes available to us. As a teacher, I try to emphasize that we are dealing with questions of interpretation and multiplicity of meaning. If students are too taken in by the "authority" of Welles, or a Shakespearean scholar, I might try to problematize those interpretations; I've found myself telling students I disagree with material I really agree with, simply to free them, to open up the possibility of disagreement.

Students liked the fact that they had a hand in creating assignments, that they were investigating aspects of the play that they were genuinely interested in and had questions about. Structuring the assignments so that they were short and doable, and always being open to revision of writing assignments (in fact, building it in as a required component of most assignments) played major roles in this year's success with students.

> Looking back at the report I wrote at this time last year, I cannot believe the strides the project has taken to become a valuable and well-integrated part of the 10th grade English curriculum.

I would like to see students using educational resources beyond the *Playbill* environment; still, there is more information in that environment than any student is likely to employ. Since we have, in a sense, brought the library to the student, I don't think the students have felt a great need to go beyond *Playbill* to complete their assignments. I have made use of in-house "experts": Alan Kennedy talked to my class about directorial choices and Liz Davis spoke with them about creating the character of Lady Macbeth for the Dalton production. Some students told me that they had many conversations with various adults and peers not in my class about *Macbeth*.

Part II: Prospective

My plan for the future of the *Macbeth* project in my classroom is to continue moving in the directions I've outlined above. I will continue trying to establish a sense of ownership of the project in my students in the following ways:

1. Structuring individual assignments according to genuine student interests and questions that are raised in class.

2. Building in more required lab time to talk to groups and open them up to new possibilities.
3. Getting all my students on e-mail so that we can "chat", etc., in a less formal manner outside the time/space boundaries of the classroom.
4. Beginning to put student work on line so that students can share each other's work and see the impact they are having on the project.
5. Encouraging students to express themselves in ways that may be more suited to their personalities/group dynamic than the 3-5 page essay of analysis (videotape of panel discussion, productions of scenes, etc.).

My expectation for the future is that students will have more fun with this project and others like it as they come to realize that they are engaged in an authentic scholarly enterprise. The attitude and energy toward this enterprise this year was far more positive. I think that I am more sensitive to the needs of the students now that more of my time is being spent thinking about how to use the resources rather than putting the resources together, writing proposals, etc.

Conclusion

What is it like to be a teacher in this emerging technological environment? Challenging, enriching, nerve-wracking, fun, scary, stimulating and never dull.

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***Playbill* Report—*Macbeth* Overview:** Jacqueline D'Aiutolo

My continuing work with the tenth grade project forces me to redefine the way I teach and the way my students learn. Each semester I have tried a different approach, and this self-initiated pursuit of knowledge, which is at the core of the program, keeps me energized to gain new understanding about the learning process.

Part I: Retrospective

My first *Playbill* assignment was quite structured and posed a finite array of teacher-imposed choices for my students; my second approach was more open-ended and more student-directed. This semester I chose a combination of the two, and the result was quite successful in that it allowed for open inquiry propelled by the students' articulation of his/her own compelling question, but provided for the close reading of passages and class discussion which students need and enjoy.

The Pedagogy

My assignment structure began with the *Oedipus Rex* "warm-up" assignment, which was done without the technology because of the network shutdown. Interestingly, however, it better prepared my students in that it made them eager and appreciative of the tools the technology would then afford them for their study of *Macbeth.*

We proceeded to read through the play, discussing character, plot and theme before beginning our "dig" into each act. The students viewed the two films, by Welles and Polanski, in their entirety at home, and in class we chose scenes from Act I, concentrating especially on the witches' scene, to begin our exploration of the director's interpretation. I then divided the students into small groups of their own choosing (a system which proved more successful), and they explored key issues which resulted in a short collaborative paper. Students were continually required to explicate important passages at home throughout the play. Each group of students was then instructed to carry on a complete investigation of a scene from each act to present to the class. They were forced to explore the architecture of the play and to pose their own questions which would guide them into a better understanding of the scene's relationship to the act and to the play as a whole. Use of the films and critical essays was required, as was explication of key passages. The unit ended with a paper, which could be written individually or collaboratively, on a thesis of their own choosing.

Conclusion

I was impressed by my students' ability to work collaboratively, with the highly intellectual level of their scene presentations (especially one group's choice to videotape an interview with the Macbeths), and with the deep level of analysis and the richness of the prose style in their papers. The obligation to engage in peer-editing resulted in a serious attention to detail.

In this semester's approach, students were given more options. They were allowed to form their own groups; they could choose to write individually or collaboratively; and they were able to decide on a group or individual grade. The *Oedipus Rex* warm-up and the

"traditional" analysis of Act I served as models for them to emulate as they began their open-inquiry into their scenes. The scene presentations served as vehicles through which the entire acts were analyzed while providing the groups with the opportunity to carry on their own creative "dig" into the text. Collaborative writing produced more deftly executed papers. The obligation to engage in peer-editing resulted in better composed papers. Students were more actively engaged in intellectual discussion, and their disagreements were focused more on questions of interpretation.

The teacher's role in this digitized role continues to be one of facilitator rather than authority. As the students become more comfortable in the **physical environment**, the teacher needs to become more familiar with the **soft environment**, within which the teacher and the students work together. For example, there are definite goals to be achieved by allowing the students to "browse" through a multitude of critical material in the hope that they will stumble onto what they may need, or, better yet, find an essay which will stimulate them into pursuing their own inquiry. It is, however, a frustrating activity for some students, and the teacher must be prepared to "guide" the inquiry. As we begin to let go of our roles as sole interpreters, we must, nonetheless, be even more prepared and equipped to steady the ladders upon which our students climb to greater intellectual heights.

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End-of-Year *Playbill* Project Report: Judith Sheridan

Retrospective

My involvement with the *Playbill* project began, in this academic year, in December 1992 when I asked if I could manage the proliferating English Department projects. As always when there are many proposed and ongoing projects in one area of study, problems pertaining to prioritizing support work and an equitable allocation of resources surfaced. The solution was very simple. Because at this point I was not actively involved in any one project, I felt I could bring order to the process. Steve Bender, who was working on the *Macbeth* project; Jacqueline D'Aiutolo, who was also working on *Macbeth* as well as the eighth grade Middle School project on *Romeo and Juliet*; Warren Johnson, who was creating the *Bible and Art* project; Andrew Glassman, who was creating a project in Russian Literature; Adam Seidman, High School Technology Coordinator; and Eileen Gumport, a Design Associate for the NLTL; and I met weekly. Those meetings, I believe, became a model for positive collaboration. During those meetings we scheduled the work that needed to be completed according to a timetable based on teaching needs, and we discussed pedagogical goals. Problems were quickly resolved, and realistic expectations were met. Luyen Chou or Tom de Zengotita were asked to attend when there were questions which they could best help resolve.

Projects

The *Macbeth* project experienced greater success than previous years as a result of a reorganization of data, shorter assignments and greater experience on the part of the instructors with guiding student group efforts and using the technological resources. *Art and the Bible* was initiated in the ninth grade curriculum with great success by Warren Johnson. This project will be adopted by all the ninth grade English teachers next year, and some of the resources may be shared by ninth grade World Civilization teachers as well. Russian Literature had a promising beginning. Unfortunately, the full promise could not be realized, in part because *Crime and Punishment* was taught before the scanning of materials had been completed. Andrew Glassman did find great promise in the use of these materials in his teaching of *Anna Karenina* during the spring of 1993.

Art and the Bible was initiated in the ninth grade curriculum with great success by Warren Johnson. This project will be adopted by all the ninth grade English teachers next year, and some of the resources may be shared by ninth grade World Civilization teachers as well.

Planned for the next academic year is an expansion of the *Art and the Bible* project and Russian Literature. In addition, Warren Johnson will be working with Jean Gardner on an interdisciplinary project on nature and progress in American culture, which for the next academic year will culminate in a unit on *My Antonia*. This project will eventually have widespread application. Finally, Steve Bender is developing a project on Orson Welles' *Citizen Kane* which will be the center of his film course taught in the spring semester.

Pedagogical Issues

Writing

The technology projects have helped the focus of writing instruction shift from product to process dramatically. Each English teacher has expressed his/her sense of why student writing has been improved.

Warren Johnson's thoughts about technology and its effect on the writing process center on the use of notecards (not paper but cards which are called up from within the program) as students work through the materials in the *Bible* project. These technology-based notecards encourage students to make the connection between thoughts and writing with an immediacy which enforces the idea that writing is a way of thinking. The notecards are the catalysts for discussion and an exchange of ideas which eventually culminate in essays. The essays are generated by the students' questions as they work through the material in the program (2 translations of the *Bible* and approximately 30 paintings illustrating scenes from it). This has led to papers which have a greater authenticity than those assigned by teachers based on teacher topics and has improved student work.

Steve Bender and Jacqueline D'Aiutolo feel that the nature of the group projects associated with *Playbill* has, this term, achieved one of its goals—inspiring peer review. Because one of the assignments is a group product, time is set aside for the students to rework the essays together. They observe that there are discussions focused on both the content as well as the form. Details such as punctuation and its appropriate use have inspired heated discussion in the group work.

Andrew Glassman believes his Russian Literature class has benefited from the work they have done finding links between the essays and primary documents he has provided as data for essays. Students find the links between philosophical tracts, for example, and the novels, make labs to discuss their ideas and their writing, and continue to make labs until the project is complete. That the links are generated by student interest again creates greater commitment and generates many more conversations about the essay and the expression of ideas than before.

Reading and Interpretation of texts

It seems to me that the goals in terms of the interpretation of literature which are facilitated by technology fall into what is generally known in literary studies as "the reception theory" of interpretation. Embedded in the technology are resources and tools which make readily available

> The explosion of interest in Hypermedia in the English department may be due, first of all, to work done on *Playbill.* But the battery of reports and proposals produced by that department makes clear that the sheer intellectual value of what the technology makes possible is a major motivating force. The influence of Brown University's George Landow, the New Lab seminars that followed his visit, the weekly meetings with Dr. Sheridan—these are aspects of a new educational culture in the school, a culture in which this faculty's long-standing devotion to arts and letters can bear a richer fruit. Abstract possibilities are becoming realizable educational projects of the highest intellectual quality.

primary and secondary sources, literary theory, video interpretations of plays, pictures and paintings. All these resources are designed to allow students to read with a special fluidity and make meaning of their reading, which calls on knowledge beyond the text itself. Obviously the approach is interdisciplinary. I like to think that there are parallels with the Civil War project which calls its primary tool History Maker. I think in literary studies the tool might be called Meaning Maker.

A definition of "reception theory" can be found in Terry Eagleton's book *Literary Theory*, and I believe it is instructive:

> "The process of reading, for reception theory, is always a dynamic one, a complex movement and unfolding through time. The literary work itself exists merely as what the Polish theorist Roman Ingarden calls a set of 'schemata' or general directions which the reader must actualize. To do this, the reader will bring to the work certain pre-understandings, a dim context of beliefs and expectations within which the work's various features will be assessed. As the reading process proceeds, however, these expectations will themselves be modified by what we learn, and the hermeneutical circle - moving from part to whole and back to part - will begin to revolve. Striving to construct a coherent sense from the text, the reader will select and organize its elements into consistent wholes, excluding some and foregrounding others, 'concretizing' certain items in certain ways; he or she will try to hold different perspectives within the work together, or shift from perspective to perspective in order to build up an integrated 'illusion.' What we have learnt on page one will fade and become foreshortened in memory, perhaps to be radically qualified by what we learn late. Reading is not a straightforward linear movement, a merely cumulative affair: our initial speculations generate a frame of reference within which to interpret what comes next, but what comes next may retrospectively transform our original understanding, highlighting some features of it and backgrounding others. As we read on we shed assumptions, revise beliefs, make more and more complex inferences and anticipations; each sentence opens up a horizon which is confirmed, challenged or undermined by the next."

The integration of what is known, and what is continually being learned, and the reader-centeredness of the approach to reading defined above seem to be exactly what the technology promises to students whose knowledge is enriched by what is provided in the various literature projects. One pitfall is that to remain reader-centered, the programs must be open to additions supplied by the reader/student. The more the student brings to a project from his/her own learning, the more authentic is the meaning made by the student. All the faculty involved in the projects worry about dictating a reading or readings more their own than the students' by what is included in the programs. Because of this awareness, the inclusion of student work as part of the ongoing data for future students is prized, as well as any of the research students have sought. Andrew Glassman makes the point that the data he includes is a springboard for library research by the student. That is an idea I feel must be kept in mind.

Summary

I have taken great pleasure in the success and productivity of this group. The collaboration has led to improvements in the existing programs as well as the fruition of new ideas. Pedagogical issues are foremost in the minds of those who use technology to enhance the course offerings in the High School.

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Final Project Report: Russian Fiction—A Context for Reading *Crime and Punishment:* Andrew Glassman

Retrospective

Two student comments stimulated this project. First, two years ago students said I should write up my ideas about the novel. Second, last fall, in the midst of discussing the novel with a new set of students, I asked questions they couldn't answer. What's behind Raskolnikov's idea of "extraordinary men?" "Fine questions," Michael Pollard said, "but we need more information." Soon I brought them photocopies of excerpts from Hegel's *Reason in History*, one of the novel's sources, and Freud's *Civilization and Its Discontents*, whose theory the novel anticipates. For the next week and a half we read Hegel and Freud, which was heavy going, leading a few students to dominate discussion. On the other hand, the results of that digression were extraordinary: increasingly active questioning followed by the strongest set of papers and exams I had ever seen in an elective at Dalton. Another result was a rush of pride in the students. Feeling students would be more comfortable with philosophy and social psychology if they worked at their own pace, I began thinking about a focused data base that would equip them to ask their own questions, not just respond to mine.

> Just as we use Voyager software to help students actively investigate what is happening in the sky, this program gives tools and information to investigate what is happening in the socio-moral order at a particular moment and how it affects an individual's mind. With such a program students have a chance to be active investigators instead of receptacles.

I began asking Robbie McClintock whether it was possible to tap into a data base such as the Library of Congress on line. When he explained that potential was not yet available, I realized that I needed to build my own. In fact, even if the LOC data base were immediately available, it might strike students as a *Dada*-base with no starting point, no means of locating pathways and relationships, no gravity or weight. Something in-between a fixed curriculum and infinite resources was what I sought.

The Physical Environment

1. *Start-up problems.* When I proposed this project last June, Gardner Dunnan, Frank Moretti and Luyen Chou were enthusiastic. No one was sure how the work should proceed, but we had spirited discussions and all agreed, beginning this year, I should spend time and energy developing a program that would provide a context against which to read *Crime and Punishment.* In the fall, it took time to enter my plans into the scheme and schedule of The New Lab, whose staff were occupied with preexisting projects. As the students in my Russian Fiction elective read Gogol and approached Dostoyevsky, I arranged community service credit for a student in the class who could scan passages from the novel into a computer file; then, when the student's proofreading methods proved ineffective, I found myself struggling to convert from IBM\PC experience to learning *Microsoft Word* for Macintosh as I took on the proofreading myself. After two and a half weeks of intense activity and considerable frustration, with aid from Adam

Seidman and Toby Sanders, I learned enough about *Word* to recognize how I inadvertently repeated Penelope's trick of weaving and unweaving the formatting of the passage as I moved from *Wordperfect* (the only program that ran on the computer I then had at home) to *Word* on the Mac at Dalton, where as a rank beginner I flailed at the controls if I tried to do the work in that program initially. When the first passage was mastered, there was nothing else to go with it, and the class was sailing through the novel.

At this point Adam scheduled a different student to scan the material I needed, but that student failed to perform. Finally, the *Playbill* projects were reorganized under Judith Sheridan's direction and we began to set priorities for the use of the staff's time. But with my students nearing the end of their work on *Crime and Punishment*, I felt it would be best to free the lab staff to work on the *Bible* project Warren Johnson would soon be presenting to give it a fair start and set up my project for future use.

Since virtually all the material that is now on line was not available during the first semester of 1992-93, it could not be used as this year's seniors studied *Crime and Punishment*. At the end of the semester, however, it became clear that half the students in Russian Fiction would take a second semester to work on new material, and I busily prepared texts for Eileen Gumport to scan, meanwhile busily thinking how to reapply this material to Tolstoy's *Anna Karenina,* the text students had chosen to study.

Unfortunate as the timing was, using this program during the second semester in connection with a reading of *Anna Karenina* revealed its flexibility and potential for broad application. The way I used the program this semester is as follows: instead of building a fixed pathway or directing all the students in the class to focus on a particular text at the same time, I decided to begin with only the broadest requirement that each student browse through the table of contents and find a passage that applied to his or her reading of the novel. From one assignment to the next, I talked with each student about the links they made and the way they applied them to passages of the novel; then we discussed further links that their arguments suggested. By the end of the semester, each student had read several pieces of philosophy and literary analogs; some had suggested additions to the files; and the class was unanimous in the opinion that having freedom to discover texts and apply them as they saw fit was vital to their forming a deep engagement with their own projects.

2. *Physical limitations.* We did not have computers available in the classroom. To use computers we had to schedule time in the microlab on the fifth floor.
3. Some students not only had little knowledge and adverse reactions to working with computers, but had computers (e.g., Amiga) that are incompatible with Macintosh.

Positives

1. Judith Sheridan got this project a place in the schedule.
2. Eileen Gumport has been efficient, highly effective and always gracious as she works on scanning and proofreading texts and pictures for the project.

3. Adam Seidman quickly placed my material in *HyperCard*. He also taught me and my students how to function in *Microsoft Word* and *HyperCard*.

The Soft Environment

To date, the *Crime and Punishment* project consists of texts arranged in *HyperCard* stacks, notecards and Notebooks after the model of the *Macbeth* project, Text Browser and linking tools, a set of pictures gleaned from New Media Archive, and student files.

Texts are arranged by category: philosophy, literature, backgrounds, parallel passages from three translations of *Crime and Punishment*, and two major excerpts from the Magarshak translation. The following texts come under the heading of philosophy: passages from Spinoza's *Ethics*, Hegel's *Reason in History*, Kant's *Groundwork for the Metaphysic of Morals*, Nietzsche's "Death of God" as well as passages from his *Geneology of Morals*, and Freud's *Civilization and Its Discontents*. Literature includes excerpts from Blake's *Marriage of Heaven and Hell* and Keats's letters. The category backgrounds includes excerpts from Dostoyevsky's letters and notebooks for the novel, a chronology and a map of St. Petersburg that needs to be reworked. An alias in this project's stacks opens the KJV Bible stacks. The pictures are nineteenth-century photographs of St. Petersburg and photographs of Doystoyevsky. Student files are simply Microsoft *Word* texts of their written responses to the reading and discussion in the course, but having it on line allows them to read one another's material and, at times, to come to class ready to share and debate points and issues already considered. (But some are uncomfortable sharing their work and reading it all would take them too much time.)

Acquiring texts has been a mixed enterprise: many I took from my personal library; a few came from Dalton's library; others I got from bookstores; library research has proved frustrating. Though Gardner Dunnan was able to arrange for me to use Columbia's Butler Library, I find its stacks have been plundered so that virtually none of the books I locate in the catalogue can be found and searches show them to be permanently missing. I'll try again at the NYPublic Library. Pictures came from the New Media Archive.

Gaining access to these stacks involves, first, one-time, following directions to drag the full set into one's individual account; then one can simply open the individual account to find the aliases and open the "Groups" folder through which the aliases allow us to access the stacks from the main server. Once the stacks are set up on the screen by clicking on "English Russian," setup stack, one has only to draw down the menu under "Resources."

I've already mentioned the available tools (Text Browser and linking tools). So far Text Browser is used regularly whereas linking tools have largely been avoided. The students in this semester's class have been computer shy and wedded to reading, interpretation and writing about texts rather than intrigued by technology and its uses, but their investment in this project will show momentarily.

Adam Seidman and I talked about the design I wanted for the stacks, about tools and note-taking devices available from the *Macbeth* model. Once I made my choices, Adam put them in place. He also taught me and the students in my class how to use these materials and our

accounts. One piece of scanning (excerpts from *Crime and Punishment*) was done by a student (Matthew Nathan). All other scanning and a great deal of proofreading has been done by Eileen Gumport.

Pedagogy

In 1967-68, I was jerked to attention, recognizing a revolution of consciousness that took place between 1601, when the English Parliament officially supported the concept of a king's divine right, and 1649, when Charles I was beheaded. For many years now I have been working toward an understanding of the way a particular piece of literature reflects its age and environment. Gradually a recognition has grown that, since the rise of skepticism in the seventeenth century, western culture has been slowly evolving an outlook in reaction to the loss of a certitude centered in Judeo-Christian faith, and certain texts reveal steps in the development of that cultural consciousness, which is plural and full of tension in each of its phases. I see *Crime and Punishment* as one of several nineteenth-century texts that mark a major step forward or downward, away from deep roots in classical epic and fast-fading tendrils in romanticism. In this project, by building a database of texts and pictures illustrating the intellectual (philosophical, esthetic, literary) and historical environment of St. Petersburg in the midnineteenth century, I'm trying to give students first-level access to the context in which Doystoyevsky imagined and wrote the narrative of *Crime and Punishment*. I'll also try to suggest some of its effects on later thinkers and writers.

I want students to find their own routes into the novel, its backgrounds, analogs and descendants. To that end, I want to set up the data base in such a way that, as their reading, writing and class discussion stimulate particular questions, they can see what is available to help them define issues, develop conceptual information, make surmises and working conclusions, seek connections to their own experience. The idea is that, once started, they will be in a position to continue entering that world, perhaps adding to the data base on their own.

If this description of purpose sounds ponderous and detached from current events, the point is to help students sense hidden backgrounds. Just as we use Voyager software to help students actively investigate what is happening in the sky, this program gives tools and information to investigate what is happening in the socio-moral order at a particular moment and how it affects an individual's mind. With such a program, students have a chance to be active investigators instead of receptacles. For reasons that I cannot fully explain, finding texts in the data base empowers students to read in ways former students did not feel equally equipped to do when they received photocopies of the same texts. In spite of delays and incompleteness, then, the data base has already proved invaluable as a resource and as a motivation to acquire new learning. One of the best indications of the program's value came when students complained that I had excerpted the texts. If she was truly to capture the relationship between Nietzsche and his audience, Debbie Coen said, she should read all of *The Geneology of Morals*, especially Nietzsche's preface. Other students agreed. I sent them to the library, telling them not only to read full versions of the texts I excerpted but to find others that should be included.

Another step may be to take or send students to the Russian Orthodox Church on Park Avenue or the 19th century Russian furniture and artifact store on Fifth Avenue or to a scholar in Slavic literature and history (once questions about copyright are under control).

1. What's been best is the power of the data as interpretive tools and as texts/pictures in their own right.
2. What's unclear is how to create links and orderly pathways without limiting students' freedom and spontaneity. So far, students have appreciated a lack of structure, freedom to investigate on their own all the resources available and create connections that fit their own intuitive reactions to the primary text. At the same time, I recognize my questions and connections as beginning points in what they choose to investigate, then they go off in paths of their own. The question is how to raise their awareness without controlling their vision.

Prospective

There are many items that I wish to add to the database which makes up the body of the program. I also intend to develop a matrix of materials designed to stimulate the students' search for useful links.

For the physical environment, it will be valuable to have the class assigned to a room that is equipped with Mac workstations, and that appears to be possible.

To make it easier to read one another's thoughts, I'll try using a billboard model in E-mail.

I want to encourage students more strongly to create their own projects, do research and build the data base. In part this may mean new approaches to writing, or alternatives to the traditional format for formal essays and exams.

Since some members of the class of '94 were in the initial *Playbill/Macbeth* class, I anticipate having to allay anxieties about the use of computers in the Russian Fiction course, especially about collaborative work. I'll think through these issues carefully over the summer and discuss them with interested parties. My instinct is to begin with a light touch as I did this semester but to give the students strong models of what the data base can do for them.

Conclusion

I see this project as being in an initial phase. Already it has excited students' curiosity and, in some cases (I hear) intimidated some students to know what material is being offered to them. I continue to see great value in a class discussion that is reflective and open to students' intuitions. Writing and reflection in private also can yield great progress. What the project suggests is the possibility of giving students more power to recognize where questions lie, more to be curious about, more awareness of the way an old narrative reenacts a cultural and spiritual crisis, more immediate connection to the past and alertness to the complex, evolving condition of the present. I find myself yielding some control, yet seeing students better informed, more actively excited and involved.

The basic model of this program should prove adaptable. Once its application to *Crime and Punishment* feels strong, I hope to work on similar designs for other texts, next time a text written in English.

* * *

***Project Galileo* Final Report 1993:** Malcolm H. Thompson

Introduction

> *Much of the knowledge I have acquired in Astro has evolved in my brain as I proceeded through a task. I acquire knowledge by wrestling with a problem until it solidifies and makes sense to me. Then I am able to move on and teach other students what I have come to understand. I think that is a crucial phrase — We do not "learn" as much as we "come to understand". This somehow makes the material more immediate and the struggle to understand becomes personal so the end product of knowledge is more rewarding and its quality is greater than that of other classes. I have come to understand a tremendous amount about the way I work and about what environment most benefits my learning. The Astro class has adopted the best process for a teacher to spark intrigue, understanding, excitement, and respect for a subject.*—Lizzy Davis, Senior drama major, the Dalton School.

The principal development laboratory for Galileo is Astronomy 310, a college-level, full-year "modern astronomy for humanities students" course based on extensive use of the new technology. Fifty juniors and seniors are enrolled. The content of Astronomy 310, cosmic evolution, roughly approximates that contained in college texts supporting some similar courses—Jastrow and Thompson, Kaufman, Seeds, Zeilik, etc. Many of these texts and journal articles are present in the classroom as references and for supplementary reading assignments. The course is more rigorous than most "Science for humanist" courses because of the designer's belief in the crucial role of mathematics in the development of real scientific literacy and because the availability of powerful software tools facilitates its use. Below is a list of the topic sequence:

1. Classical positional astronomy
2. The contents of the universe, the basic forces
3. Stars—The observational base of astrophysics
4. Stars—The theoretical base of astrophysics
5. Stars—Stellar evolution
6. Galaxies, the large scale structure, cosmology
7. The solar system—Earth and planetary geology
8. The origin and evolution of life.

Part I: Retrospective

The route to enhanced literacy in any discipline is intellectual engagement and action in the practice of the discipline. The new technology provides a substrate in which such engagement can take place in a vast and accessible information landscape. Within that landscape sequences of activities and excursions (tasks) are designed with sufficient latitude to encourage students to query and plot their own pathways to answers or problem solutions.

The Physical Environment

At Dalton, the astronomy workspace, consisting of Room 307 with six Macintosh computers, one MS-DOS computer, a printer, and a scanner, opens for business daily at 7:30 AM and is continuously available until 6 PM. During that time, students, in varying numbers, do their work in collaboration with the instructor and with each other. While the requirements are structured and specific, the environment in which they are fulfilled is more akin to a working enterprise than to a schoolroom. The operation, the pedagogy, is constructivist—students learn information and concepts because they need to in order to do what they have set out to do.

From the student point of view, the explicit goal is to complete the tasks. But implicit in each task are challenges which demand interaction with the instructor or with other students more knowledgeable or more accomplished with respect to the task. This is the heart of the pedagogy.

The course is scheduled to meet weekly in three 45-minute classes and one double (90-minute) laboratory session. The structure of the course, however, largely obviates the formal schedule, creating instead a workweek which is more or less seamless with respect to class and independent student work. In the ideal world, the schedule best suited for *Galileo* would incorporate larger blocks of scheduled time and opportunities to assemble the entire course (all sections) once a week.

The room—307—is adequate in size and in computer equipment. The program would be facilitated if the room had no other classes scheduled into it. There is also a need for a dedicated telephone line, to facilitate the increasing amount of communication with the rest of the world, relative to the project. The problem can be solved by making the summer day camp phone line (305) accessible in 307 during the school year.

The Soft Environment

For the course, a Macintosh-based information landscape has been created using a desktop planetarium program integrated with images from NASA, NOAA, working observatories, amateurs, Palomar survey plates, and with data bases from the Astronomical Data Center. The data-image resources are made accessible to students through existing software: image processors, spreadsheets, data base management systems, plotting programs, word processors, scanners, etc. With the exception of a few homegrown *HyperCard* reference stacks and one lunar phase program, no specific educational software was written. Virtually all student computer activity takes place with authentic data using the general software packages cited above. As a result, all students gain considerable computer exposure from the course. Most students—75 to 80%—develop facility with the computer as a word processor, image processor, numerical processor, and nonlinear information processor in *HyperCard*, although the latter needs further expansion. (For more on the soft environment, see Appendix #1.)

The Pedagogy

For each of the topics, a three-to-six week assignment defines a task stream which the students pursue individually or in pairs using the computers and other "hands on" materials. Experience has shown that the best (most manageable) unit of work is a work week. Assignments have been divided into clusters of tasks per week. Each task in the stream requires submission of a brief written report or computer output of a spreadsheet, graph, or graphics. Most of these are collaborative efforts by two or more students. These are evaluated immediately by the instructor, returned to the students for revision if necessary, and appended to an assignment final report, which is usually an individual effort. At the conclusion of most assignments an individual evaluation exercise is given.

Typically, the first class of each week meets in conference and the "week's work" is established according to task deadlines. Any other scheduled classes, to be used for demonstrations, lectures or mass activities, are identified; otherwise the students are on their own, although experience has shown that to help maintain the students' pace of work, they must be required to show up for scheduled classes. The amount of work required each week exceeds the time of scheduled classes by at least a factor of two.

The students, using professional level materials in a discovery format, develop a feeling of kinship with the practitioners of the scientific community.

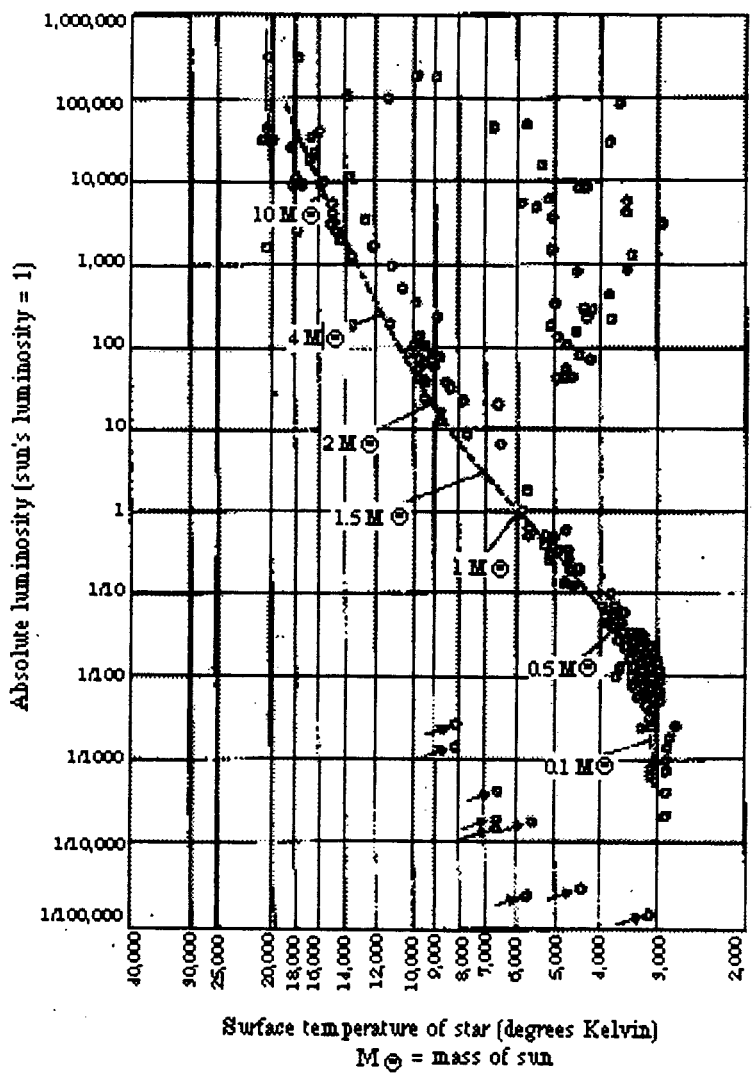
From the student point of view, the explicit goal is to complete the tasks. But implicit in each task are challenges which demand interaction with the instructor or with other students more knowledgeable or more accomplished with respect to the task. This is the heart of the pedagogy. The typical day is characterized by work on the computers, or with other materials, interwoven with a series of highly focused conversations among the small groups of students, or between students and instructor. In these encounters the content and the "sense" of the subject unfolds in the atmosphere of a scientific research endeavor.

The students, using professional-level materials in a discovery format, develop a feeling of kinship with the practitioners of the scientific community. They see their activity as an intellectually and socially rewarding six-to-ten-hour workweek in which their knowledge of astronomy and computers deepens from engagement in the inquiry. Productivity and the attainment of the status of "knowledgeable person" are valued assets in the community of collaborating learners (for more on design see Appendix #2).

Part II: Prospectus

The Status of the Materials

The successful outcome of *Project Galileo* is the translation of its three abstract intellectual pillars—The Dalton Plan, The New Lab philosophy and the New Science Literacy educational goal definitions—into a workable classroom environment. The universally positive student response strongly suggests that we are achieving what we set out to do in the summer of 1991.



Using a class-calibrated measuring device, students analyze stellar images on Palomar Survey Photographic Plates to determine apparent magnitudes and temperatures. Combining these data with distance data from the Voyager *Dynamic Sky Simulator* they plot the temperature-luminosity diagram, itself a fundamental tool used extensively by the astronomy research community. Mass data enter the diagram from subsequent stellar equilibrium studies.

In the fall of 1992 an expansion process began with the deployment of a computer-based desktop planetarium in the 4th grade classes and with a workshop for Dalton 8th grade science teachers (untrained in astronomy)....Plans have been made to conclude the 8th grade unit with the origin-of-life module in an attempt to bridge the gap between physical science and biology, the subject of the required 9th grade course.

The first six topic assignments have been designed and written. They all need more refinement; some holes need to be filled, and in two cases some reorganization is required. For each, more work needs to be done on evaluation mechanisms. About half of the seventh assignment—the planet part—is well along. The earth, the origin and evolution of life are still in the design phase, and I am working on these with Michael Rampino, a geologist and chairman of the Applied Science Department at NYU. He has a solid command of the resource base in these areas and interest in developing *Galileo*-type activities in them for use by undergraduates at NYU. This work, begun about one month ago, will require about a year to wind out through classroom testing in the Astronomy course in Spring 1994.

By the end of the school year 1994, or certainly by the end of the summer of 1994, all materials for the full Astronomy course will be completed. This state of completion is defined as a full set of teaching, evaluation materials and resources usable "off-the-shelf" in the Dalton Astronomy program. At that point, *Project Galileo*, as originally conceived, will be complete and the funding support for the Dalton course should transfer from the NLTL to the school science department.

Dissemination

In general, the next steps point toward dissemination and a development effort needed to construct a compelling and accessible product. There is a strong feeling in all of us that the outcome of the project activities is unique and potentially positive for the overall science curriculum of The Dalton School, for astronomy curricula in general on the precollege and college levels, for science curricula nationally and for the development of procedures for intelligently integrating the new technology into schools.

Twelve of the fourteen juniors in the course have requested a second year of astronomy, and an advanced seminar is planned for next year. Much of the seminar activity will be devoted to further expansion of the computer information landscape through individual and group projects. Part of the student responsibilities, however, will be to act as teaching assistants in the introductory course and those queried have shown considerable enthusiasm for the task. Developing a smoothly operating cadre of teaching assistants will reduce the burden on the instructor and also enhance the general aura of joint enterprise for the course.

In the fall of 1992 an expansion process began with the deployment of a computer-based desktop planetarium in the 4th grade classes and with a workshop for Dalton 8th grade science teachers (untrained in astronomy). They taught an eight-week astronomy unit using the *Galileo* format at that level in the spring, which had mixed success, but provided valuable insights guiding future development. Plans have been made to conclude the 8th grade unit

with the origin-of-life module in an attempt to bridge the gap between physical science and biology, the subject of the required 9th grade course.

The introduction of astronomy in the eighth grade, however, facilitates another innovative experiment. Next year's 9th graders, familiar with the technology and astronomy resource base, will be in a position to choose to move through the modules of the full course independently, on their own time, during their high school years. The developing structure of the materials is such that this can be accomplished using, in part, the cadre of senior teaching assistants and the regular astronomy instructor. The evaluation devices developed for the assignments will allow the students to be credited for each assignment as they successfully demonstrate mastery. When all are completed, they will get credit for the course. This kind of education and evaluation, based on the capability of the student product, not on longevity in the classroom-filling course requirements, is a rich and fertile excursion with broad implications—if it works.

> Given the landscape, the pedagogy and the student response, it is clear that the new technology is the ideal resource for re-energizing The Dalton Plan.

This spring a proposal was sent to the U.S. Secretary of Education to support dissemination of the *Galileo* materials and pedagogy to ten New York City public schools. A decision on the proposal will be made in August of 1993.

Conclusion

The presence in the workspace of multiple computers laden with resources and "friendly" access and processing software provides a second interactive conduit (in addition to the instructor) for information delivery. It also offers students a measure of control over authentic materials and the tools for manipulating them in a meaningful way. Under these circumstances, the primary role of the instructor changes from interpreter and chronicler of conclusions to mentor of individuals or small groups practicing within the discipline rather than learning about it as an alien activity.

Appendix #1: The Soft Environment

Resources

1. The apparent intuitive universe (plus much more) is available as a vast information landscape embodied in the *Voyager Desktop Planetarium.* It is essentially an easy to use, astronomical data array translated into a visual model that matches the real sky as seen from any place, at any time, looking in any direction. Astronomical events, past and future, can be recreated, viewed from the earth or elsewhere, and run for arbitrary time intervals. By "clicking" on any one of the tens of thousands of objects included, standard catalog data and up-to-the-minute data are instantly displayed.
2. The photographic (image) universe is available as a broad information landscape consisting of the Palomar Survey Plates, electronic libraries of images of individual objects (deep sky, stars, sun, planets), printed libraries, image collections, and catalogs.

all indexed by the coordinate system or standard catalog designation.

3. The measurable universe is available by direct measurement, sky and plate, and as a statistical information landscape of data basis from the Astronomical Data Center and elsewhere, data retrieved from Voyager Spacecraft, catalogs, etc., and actual measurement by the students.

4. The fundamental theoretical universe is available as a mathematical information landscape of equation frameworks (astronomical, gravitational, electromagnetic) and some conversion equations from the class. When computations are too complex (e.g., stellar structure and evolution) the outcome theories and computed results are in textbooks, journal articles, simulation programs, or lectures and class discussions.

Tools of Access

To acquire and use the resources of the landscapes in intellectual pursuits, software is available to the students by which they can access, explore, combine and manipulate the information.

1. Near the heart of the *Galileo* project is the Voyager program. It provides a crucial and facile link between the intuitive, apparent, real sky, and the formal scientific classifications and interpretations of that sky. It is a vast and exploitable landscape by itself and the primary specialized software deployed in the project. The Voyager is heavily used in the opening weeks of the course and then evolves to a reference resource as the year wears on.

2. The photographic (image) landscape is accessed through the physical Palomar Survey Plates, scanners and the powerful public domain image processing software—Image 1.26 and later versions. Some Adobe *Photoshop* images are included, and a specialized image library, from Sky Publishing (BT). Additional images are available from various sources on CD-ROM and over telephone lines via Internet. When images are imported into Image 1.26, a wide array of tools become available, including gray scale and color manipulation, enhancement and orientation manipulation, as well as various measuring devices for size and brightness which yield numerical data.

3. The data base landscape is accessed through Microsoft *Excel* and *Filemaker Pro* by Claris. The Astronomical Data Center provides about 180 arrays on CD-ROM, most of which are importable into one or both of the above programs. Other data are acquired from Sky Publishing or from printed sources which are entered into *Excel*. *Filemaker Pro* is used mostly for searches. *Excel* is used for graphing or combining and extending observational data using equations. Currently, the plotting programs are being explored for use with some of the data bases involving the spatial distribution of objects.

4. The theoretical, equation-based landscape is accessible from a *HyperCard* program containing the separate equation frameworks. The program is used as a reference by the students or they print out the frameworks—about a page each—and consult the hard copy. Included in the program is a glossary of variables and some reference numerical

data on spectral types, values of constants, etc. Computations are done with Excel, computer mounted calculators or handheld calculators including The Texas Instrument TI-81 which many students have from their math courses.

5. All students use *Word* processors extensively for writing reports, story summaries, etc. All have network accounts.

Appendix #2: Pedagogical Design

As each resource was initially acquired, its richness and potential value was immediately obvious to the teacher, but not necessarily obvious to the students. A group of advanced Astronomy students looking at the first Palomar Survey Plate littered with stars and galaxies—1563, the center of the Virgo Cluster of galaxies—were surprisingly indifferent to it. This experience led to one of the guiding principles in the development of the pedagogy. Identify the knowledge which makes each resource meaningful and interesting to a knowledgeable person (the teacher), then creates a task or activity which exposes the students to those ideas to make them knowledgeable as they interact with the resource.

> The classroom no longer is used as a mass education auditorium. It becomes an active workspace, sometimes resembling the floor of the New York Stock Exchange and sometimes resembling a quiet cell in a monastery, but always a place where you "do" things.

For each of the assignments, content goals are defined—sometimes explicitly for the student and sometimes not—as a set of specific behaviors. These are identified by asking the following question: "What behavior patterns can the student exhibit such that a knowledgeable person would have difficulty distinguishing him or her from a person literate in the subject or topic?". The form of the question is crucial. It provides a reasonable boundary on the intellectual goals, keeps the thrust of the process in the realm of behavior, and, to some degree, levels the playing field with respect to science and non-science types.

The overall behavioral assignment objectives define the essential behavioral experiences—tasks—which are then conceived and the resources needed are identified. Then resources are arranged or sought and tasks are designed to give the students experience in that kind of behavior. But the students who are generally illiterate in the topic are unable to do the tasks on their own. They need help. That is where the pedagogy of small groups, individual or collaborative interaction is stimulated.

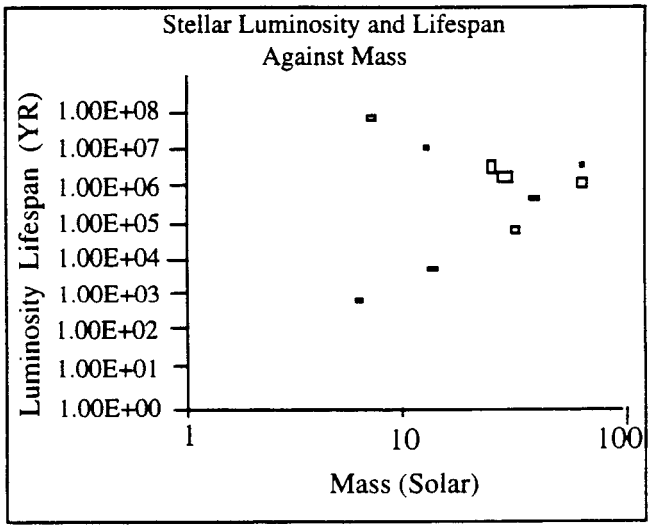
In the "pay as you play" atmosphere of the Galileo development scenario, the outcome of one assignment may dictate the task stream of the next. If a resource is needed, time is often short and the regular drumbeat of continuous weekly classes is unforgiving. Support services, operating at a more leisurely or considered pace and without the necessity to face the daily music, are relatively insensitive to the urgency felt by the teacher. "Hey, no sweat, I can have it in three weeks", does little for next Monday's planned performance.

The Classroom as a Laboratory for Teaching and Learning

It is at the task design stage that the sense of *Galileo* emerges. The tasks must provide experience in behaviors which are not in most students' repertoires; the students cannot accomplish the tasks successfully without assistance. The particularly simple response to that fact is just *Project Galileo*: the teacher helps them and they help each other; everyone, one way or another, completes the tasks. The classroom no longer is used as a mass education auditorium. It becomes an active workspace, sometimes resembling the floor of the New York Stock Exchange and sometimes resembling a quiet cell in a monastery, but always a place where you "do" things.

The students initially ascribe to conventional adolescent "wisdom d'ecole"—"if you don't know how to do it at the beginning, you are unable to start." They rarely see behavioral change as part of the scholarly formula in a science class. But the pedagogy of success and the atmosphere of productivity make the outcome inevitable. Sooner or later, every student realizes that you won't necessarily know how to do it at the beginning, but to finish, you just have to start. At any given moment all you really need to know is what to do next. The continuous task stream provides that information.

Mass	Luminosity	Lifespan (yr)
7.93949	1.40E+03	5.67E+07
13.93157	1.00E+04	1.39E+07
26.91535	1.00E+05	2.69E+06
26.91535	1.00E+05	2.69E+06
30.22471	1.50E+05	2.01E+06
30.22471	1.50E+05	2.01E+06
30.78778	1.60E+05	1.92E+06
51.9996	1.00E+06	5.20E+05



Students determine masses and luminosities of the brightest Orion stars. Mass is the fuel available and iluminosity is the rate of its burning. Mass over luminosity (with constants applied) gives a star's lifespan. The more massive the star, the shorter its lifespan because it burns faster in high gravity.

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Chemistry Final Project Report: Margot Gumport & Vivian Novakovic

It was the objective of this project gradually to introduce technology into the chemistry classroom, to:

1. Enhance the laboratory tools at our disposal,
2. Increase the media available for presentation, research, and study of concepts,
3. Provide another format for problem solving.

Our success was limited in all respects.

Retrospective

The physical environment

We used laptops as the space in the room was very limited and we felt the portability would not be a problem. We were mistaken for the following reasons.

a. The set up and replacement time was much longer than we anticipated.

b. The screens did not lend themselves to four student groups as we had hoped but were really only useful in groups of two.

c. The interfaces and probes required many more electrical connections than were available so the wiring in light of all the other equipment in use became hazardous.

d. When our experimental mode was most active, a compatible printer was unavailable, and this delayed a lot of our work.

The soft environment

a. What software we gathered was excellent and was well-used by some students to increase their understanding of concepts, particularly visualizing three-dimensional molecules. This refers to software that allows interaction in visualizing electron orbitals, molecular shapes, etc.

b. The data base software was good for the elementary students but not sophisticated enough for the more advanced students. This refers to the periodic table software. Again, the data base is good for the first-year students and we were able to have the students develop the periodic relationships on which the table is based much more effectively than the past searches for data in handbooks and source books.

c. Drill software has its place in developing speed and proficiency for some students.

The pedagogy

We got a good sense of the value of the laboratory probes. The students loved using them—rather like discovering the telescope after using hand lenses only! The great advantage of these tools is in getting results efficiently, plotting the results rapidly, and being able to spend more time on analysis than had been possible in the past since the busywork is completed so easily.

> Echoes in the realm of science of the liberation of expression being experienced in the arts and humanities: the tools which the computerized environment provide yield up to students the same benefits that make such tools essential to scientific researchers—they cut down on the tedium of rote tasks, of "busywork," and allow more time and energy for analysis and discovery.

The data bases parallel those used in other disciplines and so make the material appear to be more accessible. The students enjoy using them and they provide another effective tool.

To our surprise, some of the skill-and-drill material was good for some students. It is another way of reaching students and the more ways we can find, the better.

Prospective

We have attacked the physical limitations and hope that the new computers will make the laboratory work really well.

This summer, we will be adding to the data bases available and we will be planning problems to make the students access them. We are also planning to write our own skill-and-drill problems as we have not seen any which really are directed to our needs.

Using the astronomy course as a guideline, we will try to adapt the successes in that program to planning our research problems.

Conclusion

It is increasingly evident that the technology provides us with further tools for teaching. There is a tremendous amount of work to be done to realize the potential of this new powerful tool. We have just taken the first steps. With the help of students who find the medium less mysterious than we do, we hope to develop some challenging problems over the summer as we work on the new curriculum for the tenth grade.

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New Laboratory End-of-Year Report—Architecture: Rob Meredith

Overview

The computer is a powerful design tool, one that seems perfectly matched to the study of architecture.

The end of this busy year was a fruitful one for the architecture classes. I am somewhat stunned by the quantity and quality of the work which came out of the studio. Perhaps the culmination of the use of computers can best be seen by two Senior Projects produced using the *Form•Z* platform. One, by Abby Rowe, consists of a zoo for Australian animals with a detailed site in the form of the continent from which these animals originated. Abby employed the technology to render a meshed terrain model of her grounds which greatly enhanced her sense of the site and allowed for a rich interpretation of the project.

> I feel that this first year of integrating the architecture program with The New Lab's mandate to provide technology to the students has been an enormous success. It is an area where I feel that the two goals are melded together to form one of the strongest programs in the country.

Another very exceptional design was developed by George Soo. He initiated a complex program for the development of a museum of Asian art to be located on three parallel piers protruding into the Hudson River. This project included extensive research relating to the collection, the site and landscaping issues, as well as the formulation of the museum with all its functions (exhibition, storage, curatorial, restoration, museum shop, restaurant, rest rooms, stairs and elevator cores). This project not only represents the powers of the *Form•Z* program, but the successes of how students design and refine their projects with this tool. Perhaps more importantly, individuals are seduced by the process of designing with the computer. I am convinced that my students have spent more independent lab time and have been more fully engaged in their projects this year than ever.

The following is a detailed response to the framework established for the final report of New Lab projects, with the addition of one category which seemed to be absent from the criteria, but which I feel is of importance. The "Working Environment" seemed to present the lab this year with some of the most formidable problems, some of which I would like to remedy for next year.

Part I: Retrospective

Physical Environment

The Multimedia/Architecture Lab has been a wonderful facility in which students and faculty can conduct their work. The lab is generally in use most of the day with scheduled classes but also accommodates a variety of students from different disciplines and divisions who wish to use it as a serious work space during lab time and after school. The tripartite space works well at facilitating many groups and tasks at one time. The wet room functions for model making, silk screening and as a slide room. The front space permits some students to

work quietly while classes coexist in the architecture space.

Strengths of the Lab Space

- Large enough physical space to accommodate many students and activities
- Well-defined areas, appropriate work spaces
- Adequate storage for projects

Weaknesses of the Lab Space

- Computers mounted on arms are too high
- Location of CPU behind drafting tables is difficult to access
- Not enough bulletin board space for the display of art work/information

Working Environment

I have included this subject in the criteria of the evaluation primarily because it has been the most problematic area for this first year. There have been communication difficulties between The New Lab and the faculty who use the room. There hasn't been a successful system in place to address the problems of maintaining the equipment, and scheduling of Middle School classes in this space has complicated the logistics of working in this specialized facility for High School students and faculty. I would like to work out a way to hammer out these issues and strengthen the working environment.

Strengths of the Working Environment

- The studio is designed to have a variety of activities going on at one time
- The open lab structure has allowed students who are not normally in classes in this space to come in and experiment with some of the software

Weaknesses of the Working Environment

- Middle School classes scheduled in the space

  1. These classes take lab time away from High School students who can only use this facility to do their work.

  2. There have been severe problems maintaining the system and software platforms with some of the Middle School students disturbing information on the hard drive.
- There hasn't been adequate technical support for establishing regular system and hardware maintenance. Next year I want to schedule one period a week with the technical support person to review problems and upgrade system files.
- There needs to be a better way to implement a system for flagging problems with individual machines and addressing chronic problems.

Soft Environment

Form•Z has been a key component in the success of the architecture program this year. The software is both intuitive and highly sophisticated, which allows students to learn the basics of the program quickly then, as their knowledge grows their skills and abilities also improve. *Form•Z* seems well within the capabilities of our architecture students, and those who have more experience with complementary software have had the opportunity to import work from *Form•Z* into programs such as *Stratavision*, and Autodesk's *3D studio* (IBM platform).

Computer-generated three-dimensional modeling plays an important role in what may be the most sophisticated architectural design facility in any high school in the country. The virtues of such modeling are anticipated by the experiences of children in the First Program, who are likewise enabled to concretize what they imagine in a variety of graphical formats. "Visual literacy" is being cumulatively realized at Dalton, before academic researchers have agreed upon its definition.

Students have been able to dedicate much lab time outside of the classroom framework to produce some stunning work. There is an added collaborative working environment in the classes, as students readily share their individual expertise with others who might not yet know the details of specific programs. I feel as though the class as well as the teacher has accomplished more in this year than ever before.

The primary difference of designing with the computer seems to be the extreme flexibility of the method of building. Ideas and therefore forms can easily be changed or altered. This approach has greatly improved the students' abilities to work through ideas and evolve initial thoughts into successful compositions. Another strength of the program comes from its ability to view and adjust the view of the created object in perspectival space, and render it with colors, shadows, and attributions of transparency and opacity.

Because of the abilities of this software, students have ventured very little from it (with a few exceptions). It has provided them with extensive manipulative abilities and is basically self-supporting. Second-party software can be used for some enhancement, but it is not necessary.

Strengths of the Soft Environment

- The *Form•Z* software
- The use of computers seems to have a natural application when it comes to the study of architecture
- The specialized lab with support equipment and powerful computers (large RAM)
- The seductive magnetism of working with design components on the computer

Weaknesses of the Soft Environment

- Not utilizing more soft-and hardware

  a. Underused hardware resources

i. IBM workstations

ii. Digitizing tablets

iii. Plotter

b. Underused software resources:

i. *Stratavision*

ii. *MacRenderman*

iii. *Virtus WalkThrough*

iv. *AutoCad*

v. *3D Studio*

- Not having time to research new and existing software to complement what we have

The Pedagogy

Again, I feel that Dalton has made important strides forward by implementing computers into the architecture program. There seems to be a perfect compatibility between the computer and the study of architecture. It eliminates the rigorous tedium of executing elaborate designs, and instead allows students to place more emphasis on where it should be, on producing good design.

What has been somewhat interesting is how appropriate all of my existing assignments have been to the use of the new technology. I would like to expand some of the resource information surrounding each assignment to use more of the capabilities of the technology as a research and information tool, and provide additional references, both visual and contextual.

Strengths of the Pedagogy

- The curriculum works effectively with the technology.
- It challenges students and allows for personal exploration matched with the degree of knowledge and ability to work with the technology.
- The nature of the assignments allows students to explore a range of concepts relating to the study of architecture. Students more fully investigate the design potentials with the aid of the computer.

Weaknesses of the Pedagogy

- The computer-oriented assignments take more time to execute; first-year students experienced some difficulty in finishing projects with the new component of learning about the technology

Part II: Prospective

My plans for next year break down into a few simple but important categories: (1) To strengthen all the assignments, which includes changing some, supplying extensive support materials in the form of scanned resources, site details and visual references, and to shape

each project with the *Form•Z* platform in mind. (2) To integrate supplementary software into the students' working vocabulary. This would include *Stratavision*, which would allow for more detailed and finer rendering of each of the projects, allowing students to explore texture and bump-mapping capabilities, as well as a more refined lighting and viewing capability. (3) To support the beginning-level slide lectures with additional reference materials so that there will be a more fully developed historical component to the course. This is envisioned to include a CD-ROM library of architectural works, plans, and preparatory drawings and sites. I hope to eventually provide these types of reference materials for each assignment so that the students can better research projects similar to the ones they are developing.

Conclusion

I feel that this first year of integrating the architecture program with The New Lab's mandate to provide technology to the students has been an enormous success. It is an area where I feel that the two goals are melded together to form one of the strongest programs in the country. I was reinforced by The New Lab outside evaluation of my program and feel that Dalton has created a gem in its midst by nurturing this unique program.

I have had wonderful students, all of whom have embraced the new approach to technology and thus greatly expanded their knowledge and potential. They have been enormously enthusiastic and dedicated to working on the computers, assisting each other (and their teacher), and trying to develop the most exciting work possible. The enthusiasm has been energizing for all.

Finally, I would like to thank everyone involved with The New Lab, Dalton's faculty and administration, and the Art Department for their great assistance, support and understanding, without which none of this would be possible. This project has given me much personal satisfaction and a refreshed perspective on teaching.

* * *

Foreign Languages and Hypermedia, Year-End Report: Caren Steinlight

Introduction

I came to this project with a number of theories I wished to test. I believe that language, whether first or second, has more to do with dynamic tension, uncertainty of outcome, strategic interaction, than with abstract form. Language is a process, not a product. Students' goals should not be to master the subjunctive by next Friday; rather, they ought to be able to negotiate, convince, argue, plead, amuse, question, mock, communicate. But how? Student exposure to a second language averages three hours a week nine months a year, and the language to which they are exposed is often canned, distilled textbook talk, organized around some traditional notion of which grammatical structures ought to follow which others. Culture is some quaint tale of Hemingway in Paris or a tour of Bretagne, or a dialogue about lycée life and petit déjeuner.

The language teacher's challenge is to discover tasks, tools, materials, and techniques to motivate, stimulate, immerse students in authentic language and culture, to help them comprehend and also produce accurate language without overwhelming and embarrassing them. The more I read and saw and heard, the more convinced I became that the power of visualization, the nonlinear, interactive, iterative properties of multimedia would augment the effectiveness of language learning. When I played with MIT's *A la rencontre de Philippe*, I was reasonably sure that the several weeks of simulated immersion in an authentic linguistic and cultural context would enrich the learning environment enormously, and that students would benefit greatly from a high degree of exposure to natural language. They can have infinite repetitions without annoying anyone; they can work at their own pace and take as many or as few risks as their learning style or mood desires. I predicted that the students' ability to manipulate, participate and influence the outcome of the plot would make *Philippe* a powerful motivator, and that the tools to locate, repeat, transcribe, define, decipher, and alter would enable them to work as effectively as the university students for whom the application had been designed.

Part I: Retrospective

The Physical Environment

Time, space and equipment were all problematic and therefore interesting and instructive issues.

Time

Nine out of ten students felt that during the several weeks when we were engaged in the *Philippe* project, a bigger block of time twice a week would have been much more productive than four regular periods. Whenever I announced it was time to save their work, there would be groans of frustration all around. An interactive simulation requires set-up and adjustment time and then concentration and immersion. This cannot happen effectively in the remaining 35 minutes. This will be true in more and more classes in the Foreign Language Department and many others, and creating a schedule with modules that can accommodate technology-

intensive teaching will become imperative. I would add that standard school schedules have always been an impediment in language instruction; Rassias and other successful immersion programs are based on full days of language instruction and production, not four weekly sessions of 45 minutes each.

Space

Language teaching involves sound, so language projects need to take place in their own classroom spaces. Having a few classrooms set up flexibly would be enormously helpful in the future as we contemplate using multimedia in all levels of French and Spanish. Ideally, there would be at least two classrooms with a display monitor and five student workstations (all working), all with laser disk players.

In addition, an idea worth discussing is the creation of a Humanities Media Center, a space in which students and faculty could work on individual, departmental and interdisciplinary projects. This center should be staffed by someone who is comfortable offering the kind of support people in language and literature might need. I believe we could write a grant application to get outside funding for such a project. I would be eager to work on this with interested colleagues.

Equipment

Having Room 507 equipped with four workstations made my beta test of *Philippe* possible. When all four were working, my class of 10 students had no trouble, but when a hard drive was stolen or a mouse went missing or cables were messed up, valuable time was lost. When I used *Philippe* with larger classes, such as my regular French 4, my advanced French 4 and Claude Holland's French 5, overcrowding at workstations had a negative impact on learning. Ideally, only two students would work together at a station, because with extra splitters the sound quality, so critical in a foreign language, is diminished, and also I found that two partners seem to negotiate in French but groups of three seem to lapse into English more readily as they try to collaborate. In a class of 14 students, we would need seven stations with seven laser disk players. This becomes difficult or even prohibitive. Perhaps we could limit classes to 12 students and provide six stations someday. Or perhaps we could devise a High School schedule that allowed us to make a radical (conservative) return to Dalton's origins and become a lab school.

The last thing I would add about equipment before going on to more engaging issues is that it is reasonable to expect that a faculty member working on a technology-intensive project be responsible for knowing how to deal with cable problems, a frozen computer and so on. But in the rush to get 13 students set up and working productively, things happen that a language teacher may not be able to deal with. On those occasions, if Adam Seidman was not right next door in 509, part or all of the session was lost. I learned a great deal about hardware this year, but I cannot solve technical problems the way Adam can, any more than he can teach French.

The Soft Environment

My students, my colleagues and I used and/or explored a number of different materials and tools this year. The heart of my project involved the beta testing of *A La Rencontre de Philippe* (MIT) in my course, French Conversation and Composition—An Interactive Multimedia Approach, and to a lesser extent in two other classes. The experience was valuable in and of itself and instructive in ways I could not have predicted. Let me say at the outset that I love working with this tool, my students love it, and I can't imagine teaching without the inclusion of interactive hypermedia.

We began the semester with typical problems. MIT had to send us a number of iterations before we had a version without significant bugs. Sharon Ainspan (an intern) and I spent weeks learning what was in *Philippe*, what my students would have to master in order to use it, and finally how to work with it in a high school classroom. I found those weeks very worrying, but all the effort and phone calls to MIT paid off. On October 14th Adam demonstrated to the class how to access *Philippe* and how to find and use Mac tools, and on October 15th and 17th Sharon and I presented *Philippe*'s tools, scenes and characters and distributed the assignment. After several weeks of intensive work, I asked them what the coolest thing in or about *Philippe* was, and their answers were: ability to affect plot outcome and influence characters' decisions; realism and authenticity; high production values; map tool; answering machine and telephone. (I invite all my colleagues and others reading this report to see for yourselves just how powerful and extraordinary the tools in this application are, and how very engaging *Philippe* is.)

According to the students, the worst thing in or about *Philippe* was the eponymous Philippe (his rapid-fire, garbled speech); the fact that the critically important opening scene is so difficult; that you couldn't travel more in Paris using the map; that you couldn't go back and change previous decisions. Their suggestions to MIT were: make it a bigger, more complex game with more options, more scenes, more cultural material outside Philippe's immediate problem; they wished artificial intelligence could enable them to use phone messages to communicate with the characters (they had writing assignments requiring them to create such messages, but they were hungry for "real" communication with the computer!); they would have enjoyed visiting Parisian sites, perhaps by branching into CD-ROM tours of museums and monuments. Maybe some of them will, because of their early interaction with this nascent technology, be among the creators of the bigger, better materials that will surely come into being.

This brings me to another issue. A great frustration to me is that because IBM funded so many of the best projects in interactive multimedia, little of great value exists for the Mac platform as yet. All the developers promise their work will be ported to Mac, including Geri Gay (Cornell), Jack Abercrombie (Penn), Jim Noblitt (Chapel Hill), and Jerry Larson (Brigham Young). I considered the issue carefully. Does it make sense to test materials at Dalton if we can only run them on the one workstation with an M-Motion card? The answer is a resounding "Yes". The more our faculty is exposed to the best interactive multimedia,

the more likely it is that we will be able to develop our own materials and incorporate new applications into our courses. Issues like communication and task-based teaching, collaborative learning and interdisciplinarity arise from this exposure, and I do not want to postpone it until the best is ported to Mac. My understanding is that one of the goals of The New Lab projects is that we design or find materials that contribute to a constructivist model of education.

This spring I also used *Philippe's* auxiliary components. One section is three short scenes taken from the longer interactive fiction, which can be used for different pedagogical purposes and with different-level students. There is also a Multiple Functions Index, containing a catalog of paralinguistic and linguistic features that can be used to demonstrate cultural and linguistic phenomena. The very high production values of the video make all parts of the software engaging.

I also used several *Transparent Language* stories in my French Conversation and Composition class and Sol Gaitan used *Transparent Language* stories in several Spanish classes. This is a powerful tool for reading comprehension, as it enables students to read above their normal language level; all the help they need is in windows surrounding the text. It is not a classroom tool, but rather an at-home or in-lab assignment, to be done individually. It is useful for what is intended, reading comprehension. It cannot help in the oral or written production of a second language except by providing annotated examples.

I used several tutorial applications with individual students, and they were useful as a lab tool. HyperGlot's *Tense Tutor* and *Verb Tutor* are probably the best of the ready-made grammar helpers, and they use sound, which is essential in language software. But they are not fun, not very engaging, not really more interactive than a workbook, although the medium is itself more engaging to many students. I think this kind of software is valuable as a reinforcement for the many French and Spanish students who require extra drill in lab, and my colleagues in Spanish want us to acquire more. I hope we will be able to create our own exercises using an authoring tool such as *Dasher*, or *HyperCard*, and video clips.

I used several games with my French 3 students in the Middle School, and while they loved the idea of playing games in French class, and several were very eager to use the computer, no one seemed to find the *HyperCard* French article baseball or guillotine worth doing. With that age group, the competition is *Bollo*, and I couldn't offer death and destruction in color.

The Pedagogy

My experiment was not only to test a particular piece of software and the use of multimedia in the language classroom; it was also to test collaborative, student-centered learning. I wanted to explore both the teacher's and the students' willingness to regard language as a process, a tool in communication, rather than a product, and to accept the resultant errors and unpredictability. I was curious to test my ability to relinquish center stage and assume the role of facilitator and stimulator of language production. I wanted to see if Dalton students could work collaboratively, react spontaneously, select, interpret, intuit,

formulate, take a greater measure of responsibility for their own learning. Therefore, I alsospent time discussing with the class the issues of collaboration, group assignments, grading, differing learning styles, receptive vs. productive language skills, etc. All the preparation paid off. Students expressed (in French) their fears: being guinea pigs, relying on technology, dealing with native-speed French, working without knowing "how they are doing," and we were able to find answers. I asked them if taste-testing new chocolates for Godiva was being a guinea pig. We decided we weren't relying on technology, but using it and relying on ourselves and each other. We solved the grades issue by specifying graded parts of the assignment; these parts were individual and not group work. Students selected their own groups, and in nearly all cases they worked effectively.

The class spent about four weeks going through the full simulation twice and then doing various activities both in the program and in class. We had games in which groups challenged each other on points of information, vocabulary, strategy, etc. We had assignments in which they wrote messages to characters and letters purportedly from the characters. We found we were comfortable using the program as reference material for cultural, linguistic and paralinguistic details.

One of the many important things I learned is that students are not always capable of assessing how much they are learning; with *Philippe* (as with *French in Action*), students thought they had not learned a great deal until my questions and their answers proved otherwise. Two testimonies from students were particularly worth noting. One student took the new, experimental oral comprehension part of the French Achievement Exam, in which she had to listen to a tape of a telephone answering machine. She was emphatic that without the confidence and competence she had gained in working with *Philippe* she would not have done well. Another said he was able to understand the French in an American movie in which a Parisian waiter spoke rapidly. On a very concrete level, a week after the class finished the full simulation I had them do improvisational skits (which I videotaped); I was delighted to hear them use several highly idiomatic expressions acquired from *Philippe*.

Evaluation

The students, Sharon Ainspan and I all kept journals, logging both what we did and what we thought. We shared them (discussed them in French) each Friday. Sometimes we discovered we had all expressed similar frustrations: a missing mouse or cable or hard drive robbed precious moments from an all-too-brief class period; absent group members had notes or diskettes others needed.

On other occasions we noted delight with a character, plot twist or ingenious tool. The students were particularly struck by the contrast between their first, hesitant, even fearful entries and later entries full of detailed observations and analyses.

Students also completed three evaluative tasks. Midway through the full simulation, they wrote a prose assessment of the project, guided by issues I suggested. I asked them to consider the computer/video interface; their ability to work collaboratively; the plot, characters, tools, etc., in *Philippe*. Most of the students wrote very perceptive, thorough

analyses. During the first week in February I had them experiment with auxiliary components in the program, and then I gave them two assessment forms; the one designed by Athena at MIT emphasized student use of tools and particular branching and choices within the game, whereas the form I designed sought to explore issues beyond *Philippe* such as collaborative learning, student-centered assignments, the High School schedule (time and space issues), as well as the value of hypermedia tools in language learning. As there are only 10 students in the class, the results are statistically meaningless. Nonetheless, the near uniformity convinces me that my own observations were accurate.

Specific observations

- the division of linear versus global learning styles was divided about 50-50, with half the students saying they relied on such tools as transcription and glossary more and more and half saying less and less.
- All felt the authenticity of speech, locale, behavior, etc., was remarkable and enjoyed their safe foray into immersion.
- All noted the frustration of occasional technical hitches and many expressed the wish that there were more "Adams" available.
- 9 out of 10 felt a bigger block of time twice a week would have been much more productive than 4 regular periods; whenever I announced that it was time to save their games, there would be groans of frustration all around.
- On specifics, 7 agreed they had definitely improved their skill at listening comprehension with 3 saying perhaps a little. 6 felt their confidence had definitely increased and 3 said perhaps a little. When the two questions of competence and confidence in aural comprehension were combined, 9 students felt *Philippe* succeeded rather well, 1 felt films, tapes and dictations were more effective tools.

Spring semester, I used *Philippe* in French 4 and Advanced French 4. Predictably, the freshmen in French 4 were more reliant upon glossary and transcription tools, but they clearly enjoyed it. My Advanced French 4 students were very excited and arrived early for class, requested the laser disks during lab time and wished there were more games available. I also worked on *Philippe* with Claude Holland's French 5 class, and they loved it.

Part II: Prospective—Project Proposals and Plans

- Students and faculty in French and Spanish literature classes could make hypermedia webs as projects and use E-mail to discuss literature. Sol Gaitan, Tracy Christopher and I would start with small projects (a few poems, for example).
- Interested faculty could, using the *Playbill* armature, take authentic, high-interest video material available from the Pics/Iowa catalog, as well as films and slides, and create interactive assignments for all levels of French and Spanish. This is the project that would have the most significant impact on the greatest number of French and Spanish students on all levels, and I am eager to write a proposal outlining what I envision. However, there is no point in spending the summer writing such a proposal, as I had intended to do, if the Board has decided that there should be no new projects in foreign languages.

- Materials from Penn, Noblitt, Cornell, MIT, Brigham Young, and commercial sources will all be in use in many French and Spanish classes. These materials are provided at no cost as they are to be beta tested. Our students derive enormous benefit from exposure to state-of-the-art software, as does our faculty.
- Students and faculty will use E-Mail to correspond in school and eventually to contact native French and Spanish speakers world-wide through Internet.
- Faculty will learn to use foreign language authoring tools like Dasher and to write materials in *HyperCard* if we are funded to buy the materials and to attend workshops in authoring. I have, as of this writing (June 28), the rough draft of an Enhancement Proposal for this continuation of my project.

Conclusion

I'd like to close by saying that I have learned more than I ever could have imagined, and I feel excited and optimistic about the future. My students learned a great deal of French, and they also learned quite a bit about learning itself. So did I. I have been teaching French since 1974, and I am very excited as I contemplate the significant changes in curriculum and approach that are already under way. The Interactive Language Project has enabled us to be in the forefront of developments in the field, and I hope we will go on to contribute not only in the task of testing applications and theories, but also in the creation of our own materials for use in Dalton and perhaps elsewhere as well. I want to thank Mr. Tishman, The New Lab, the Administration, and the Board for their support.

***The Vergil Project*—Final Report:** Maureen Haviland, Frank Moretti, Bill Waldman

Part One: Retrospective

By the end of the Spring '92 semester, we had placed the *Aeneid* on the network in the *Playbill* format. In this format, students are able to keep notebooks, from which they can form links to the text, and are able to perform word searches in order to study the semantic field of a particular word in the poem. At the end of that semester, each student chose a passage (a list of suggested passages was provided) from the text to study and annotate in his/her notebook. Each student met individually with the instructor several times, and class time was provided both for instruction in using the system and for the students to work on their projects. Each student began by closely translating and metrically scanning his/her passage during an individual appointment with the instructor. During this discussion, the student and instructor exchanged preliminary ideas about interesting themes, linguistic uses, metrical effects, etc., in the passage. Each student was required in the study of his/her passage to make use of a number of resources not then available on the computer (but which are being incorporated into the prototype). Each was required to consult a number of commentaries, and to read at least two scholarly articles (those appropriate to each passage were suggested by the instructor) that were made available on reserve in the library. Thus, the projects, which were read by the instructor on the network, included a synthesis of the received scholarly opinion on the passage (in cases of controversy, students were asked to explain which positions they sided with and why), as well as the student's own observations on effects created by lexical choice, word order, metrics, sound, etc.

As the Fall '93 semester began, the Latin faculty began meeting to refine the list of capabilities they wanted to include in our system. The idea is to incorporate into a multimedia computer program all the resources necessary to study the poem in a number of contexts. The availability of the resources on the screen will have a number of advantages over the conventional book format. First, it will allow the student easier access to these resources. For example, we anticipate that with the availability of a computerized glossary, the student will spend less time on the rudimentary translation of the passage, allowing more time for interpretive and creative work. Second, the program will integrate resources that are too often paid only lip service in traditional literary interpretation, such as effects of sound, and related visual arts. The third advantage is that the program will allow the student to juxtapose these resources in a way that encourages an independent and individual synthesis, rather than a prescribed interpretation of the poem.

The process of developing the interface was extremely time-consuming, involving extensive discussion with the group as a whole with the computer staff, as well as examining other programs, such as *Transparent Language* (a basic language program that displays the text, as well as vocabulary and syntax—it does not include any of the literary critical resources or expressive tools that the *Vergil Project* will), and *MET* (a program that allows for student practice as well as scholarly research in Homeric metrics).

For our prototype, we decided to work on the final two hundred lines of Book Six of the *Aeneid.* This text is now available in three different "modes": basic text, meter, and rhetoric/ poetics. In the basic text mode, the text is viewed without any annotation. In the meter mode, the text is viewed with long and short syllables marked, as well as *caesurae* (pauses built into each line of poetry that delineate syntax, much like our commas, and contribute to the metrical variety of the poem). We are working on providing an audio performance of the poem in conjunction with the meter mode. In rhetoric/poetics mode, we are about to begin the process of creating links from the text to a series of cards that define various rhetorical and poetic devices and provide examples of these devices within our two hundred lines of text. The text for the supplementary cards has already been prepared, and the linking should be accomplished in less than a week. We have faced a pedagogical decision concerning rhetoric/ poetics mode: although we have the capability of adding a comment to describe the effect of each poetic or rhetorical effect, we have chosen not to do this, but rather to encourage the students to consider these questions for themselves. By being able to see a series of cards that present, for example, all the instances of enjambment in the passage, the student will be able to investigate independently the effect of such a device, and record his/her observations in a notebook, rather than rely on a "predigested" traditional interpretation. The student will be able to link from this notebook to text in any of the three modes.

In addition to the text in these modes, various interpretive resources will be available to the student. Vocabulary help will be offered at three levels: the basic vocabulary glossary, the more expansive *Oxford Latin Dictionary,* and the definitive *Thesaurus Lingae Latinae.* In addition, we have culled entries from several courses to create a glossary of all the proper names in the passage. Three line-by-line commentaries, excerpts of the metrical commentary of a fourth commentary, and a chart of Homeric parallels will also be available, as well as a number of scholarly articles. The commentary windows will be synchronized with the text, so that the commentary on the current line of the poem will be displayed automatically, freeing the student from the page-shuffling involved in reading commentaries in their traditional book form. The list of articles will be arranged by the book of the text they address, and will in the future be key-worded so that the student can more easily locate bibliography relevant to a particular topic of investigation. In addition, the word-search capability will allow one to word-search the commentary and articles; students will be able to form links from their notebooks to any commentary or article. All of the material for these resources has been inputted and is formatted to be imported into the program, but the time-consuming task of importing remains.

The system will also allow the student to access other art forms. It will include English translations of the mythographer Apollodorus and the geographer Pausanias (who relates myth in the course of his travels), so that the student will be able to compare Vergil's adaptation of a given myth to that of other authors. It will also include a database of photos of works of art. Although it would be possible to prelink the artwork to the poem, and to add cards containing commentary on the relation of the poem to the artwork, we have chosen instead to encourage the students to pursue their own explorations about these connections.

The student will be able to comment on these connections in the notebook, and to form links from the notebook to the pictures and to the texts of Apollodorus and Pausanias.

Part Two: Prospective

We want students to practice metrical scansion of the poetry. We envision a separate page of the notebook, into which students could copy a passage of text and then annotate it metrically, with their scansions checked by computer. We would also like to offer entries from the *Oxford Latin Dictionary* and the *Thesaurus Linguae Latinae* and include more articles in our database. With advances in the area of optical character recognition, this scanning may soon be more feasible than it is currently. At present, because the scanning and proofreading of text involving Latin has proven to be extremely time-consuming, we have incorporated the text of only two articles into the system. Bibliographic information on the remaining articles is provided on the computer, but the articles themselves will be available in photocopied form in the library for the time being.

We plan to have the prototype running by the end of the Fall semester.

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New York and the Civil War—Final Report: Luyen Chou and Thomas de Zengotita

New York and the Civil War is a course in transition. This report describes its evolution into *HistoryMaker,* a long-term project intended to develop the educational possibilities offered by the digital technologies for the study of history, conceived as an interdisciplinary nexus for future scholarship in the humanities.

Part I: Retrospective

It is in history, as it must be experienced at more advanced grade levels, that the possibilities and pitfalls inherent in the Dalton Technology Plan have always been most evident. In science and math, the range of data and the rigor of theory are well defined, and projects like *Geometer's Sketchpad, Ecotype* and *Galileo* can rely upon that predetermined focus. Simulation programs like *Archaeotype* provide analogous constraints, not because the range of reference is more constrained, but because the basis for student activity is given in the program from the outset. In specifically literary studies, like those inspired by the *Playbill* armature, the text acts as the proverbial hub to which may be attached, like so many spokes, contextual materials of all kinds, chosen to meet the needs of various age groups and assignments. But *New York and the Civil War* was conceived and implemented so as to confront directly the overriding issue for any educator thinking seriously about the consequences of these media for the future of our culture. How are we to place educationally motivated limits on the gigantic amount of "stuff" made available by this enormous informational power?

> *I could have learned about the draft riots, you know, from reading a book in a normal history course. I wouldn't learn how to go about finding the raw materials of history and really think about what are they - what do they mean to me?*—Matthew Nathan, Civil War student, Apple's *Imagine* series

That question can be seriously engaged only when students participate in the process of construction, as virtual codevelopers of their educational environment. In the long run, the "cumulative" aspirations of the Dalton Technology Plan implicate just that process across the whole curriculum and all grade levels. But, at these early stages, a more circumscribed and self-conscious enterprise suggests itself. The meta-issue of criteria for selection, most obviously essential in serious historical work, can be immediately appreciated by anyone who tries actually to create an historical account of some significant event or period using the enormous range of primary materials available. In *New York and the Civil War* students have always been asked, not simply to construct interpretations of what the media give them access to, but also to decide what the media should provide—and in what configuration, and to what educational end. Hence, the transformation to the general application we are calling "*HistoryMaker.*"

The DTP Annual Report of 1991-92 described the issue in more specific terms as it arose during the development of the project itself. The language conveys the atmosphere of struggle and discovery that has always characterized this course:

> Past efforts to construct a *Civil War* CD-ROM product suffered from what one student called "too much material and no way to use it." As the focus narrowed, first to New York and finally to the Draft Riots of July 1863, things got more promising...but a fundamental dilemma remained: one wants an environment in which the individual can wander at will through the cumulative curriculum, but one also wants enough structure so that the individual is not lost in a featureless morass of information spreading out in all directions behind the bottleneck of the computer screen....
>
> ...These imperatives are in perpetual tension...the narrowing focus raises questions about the larger context of historical studies. Assuming success at the level of the local event, how would one move from the draft riots per se "up" to the whole Civil War, American History, Modern History and so on?... Even with the focus narrowed to the Draft Riots, there is virtually no limit to the materials [that] might justifiably be made available... Could the Draft Riot tours be a model for entering a nationwide network? Schools everywhere might tailor entry into historical studies in analogous fashion. It doesn't have to be the NYC draft riots—it could be any definitive historical event that took place locally. Students might begin historical study by realizing the historical imagination in a local context and confronting from the beginning the enrichment of continuous reinterpretation in more and more inclusive contexts...

From the thematic point of view, that description applies as much to 1992-93 as to preceding years. But 1992-93 was very different, in certain ways, from preceding years—and for various reasons, some circumstantial, some intentional.

The Physical Environment

The physical environment as a whole has been greatly enhanced. The new Quadras, the Hewlett Packard Scanjets, the expanded printing capacity, the Development Lab on the 12th floor and, above all, the user-friendly workspace in 1103—all contributed substantially to the success of individual projects. And, because this course was committed to experimental scheduling, that general enhancement was specifically helpful to us. We experienced less of that rising pressure on resources that so many other projects have complained of in the other reports in this Volume—*and that was in spite of the fact that we did not occupy a dedicated space.*

The lesson here is simple, and it dramatizes the importance of concentrating on deployment during a period of consolidation and refinement. It is this: "If you can't get the space and the hardware in that space, change the time." Obvious, but not apparent to anyone who regards the schedule grid as if it were the law of gravity.

The Software Environment

The software environment was likewise greatly improved, and it improved even more over the course of the year.

The *Hypermedia Navigator*, the central engine for processing and displaying data and commentary, began with essentially the same features as in 1991-92. But, with the help of

several students, Bill Waldman had radically increased its transparency and flexibility. Stubborn bugs were exorcised, arrangements of tools and databases converged toward compatibility with Novell Network architecture, making multiuser access a reality, rather than an aspiration. We began the year in a soft environment with sufficient stability to sustain a competent student in uninterrupted project development.

Stimulated by specific student needs, Bill went on to improve upon that stable platform. The interface approached complete transparency, as the linking palette became uniform across media types. At the same time, hypermedia immediacy accelerated as it became possible to move directly to objects and object features without negotiating extraneous interface elements. Above all, a capacity for contextualized retrieval was provided, a capacity that included the possibility of multiple instantiation of objects, from the point of view of various aspects—parts of pictures together with complete pictures, frames of video alongside a running tape, excerpts of text framed next to complete and scrollable documents.

The Pedagogy

Conceptually and programmatically, the pedagogy this year was the same as in the past. The database inherited from the previous year was to provide the foundation for further research and for the construction of new and related projects of various kinds. The only planned change of real substance involved the acceleration of the introductory historiographical phase combined with an earlier beginning for training in *HyperCard*—the point being to launch students into research and project development earlier. But, at the practical level, several decisions were made, or forced upon us, that led to very real difficulties as the course actually got under way:

- We lost the content area expert we had last year and, in his place, took on another graduate student from Columbia's History Department who, like his predecessor, had an interest in the integration of technology and education. The difference was that the replacement was not at Dalton as a regular faculty member teaching other courses besides *New York and the Civil War.* Although the new member of the team showed extraordinary commitment and expertise, he was simply not familiar enough with the Dalton milieu, nor consistently available enough, to satisfy student needs for constant coaching and deadlining. The lesson of other projects with respect to the role of the teacher has been clear: not only does the *way* one teaches change, but the *amount* of time and energy required increases as "individual attention" becomes truly and fully realized in the context of student-driven projects. Far from replacing the teacher, the computer as deployed under the Dalton Technology Plan, actually places additional demands upon him or her.
- We had three seniors who had been in the course as juniors and, with theories of transgenerational cohorts uppermost in our minds, we decided to position them as mentors to the incoming students and virtual assistants to the new content area expert. For reasons partly personal and partly ideological, this arrangement did not work well, and

we were not as quick to notice the problem and move to rectify it as we should have been. Two of the three mentoring students felt very strongly that the course was developing in ways that were inconsistent with their experience of it the previous year—and there was a lot of confusion, wasted time and hard feelings as a result.

As a result of the factors just described, student projects did not get fully under way this year until the end of the first semester—about the same time as in the previous year. Once they did, prospects and achievements looked up immediately. Although the New York Historical Society, for well-publicized internal reasons, turned out not to be the resource it had once been for us, some newly developed relationships with key people at Columbia University, and with a start-up company called Archive New Media, gave us some rich vistas to explore. Of the five new projects undertaken, two managed to collect a considerable amount of primary materials, sketch out fairly detailed plans for their deployment, and create the digital shell for their assembly. The other three were brought, if not to a conclusion, at least to a point of complexity and depth sufficient to justify the whole process as an instance of authentic historical inquiry, in the eyes of a professional historian.

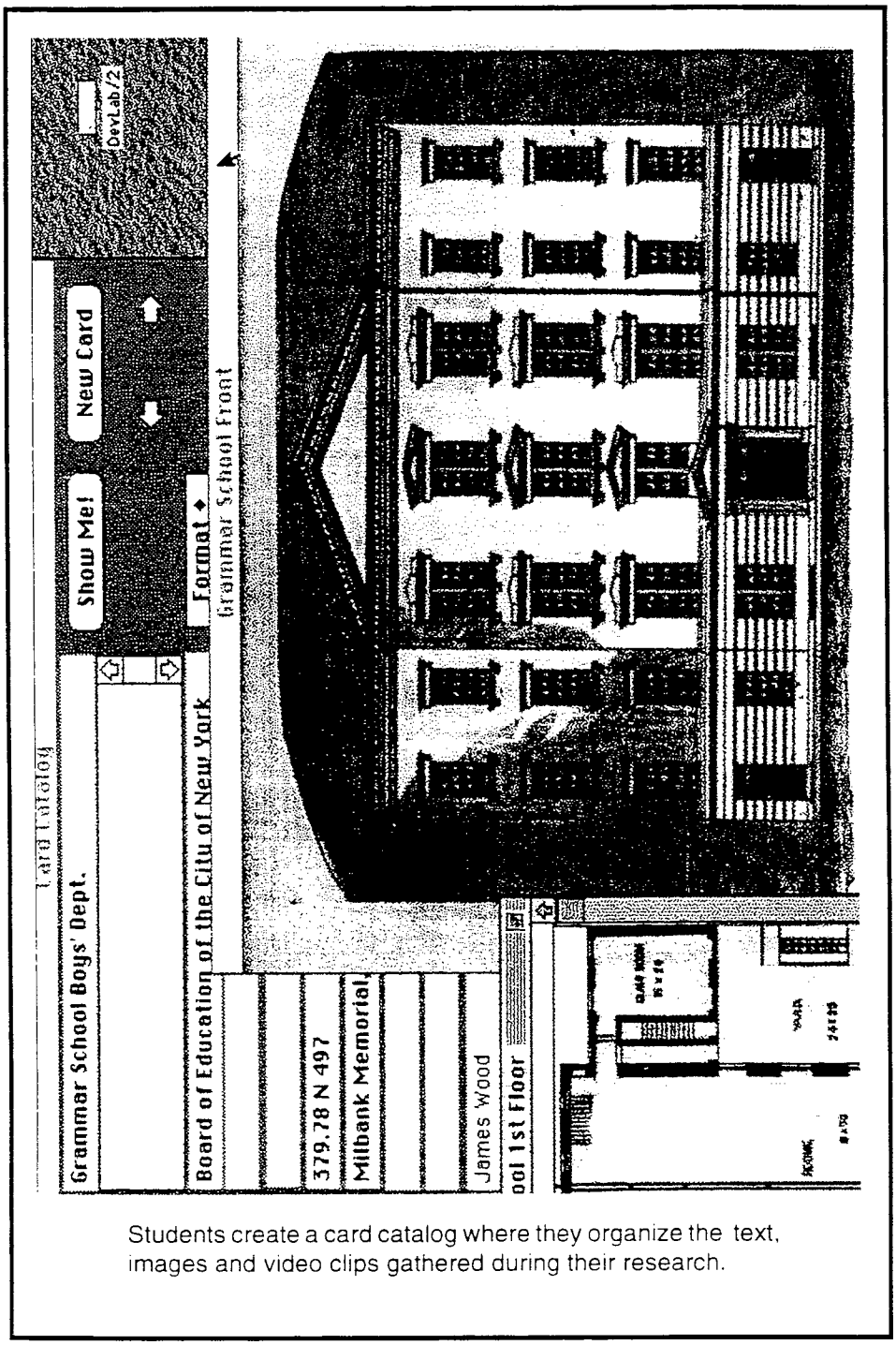
It is interesting to notice how the themes chosen by the most successful students gesture to the transformation of this course now under way. That is, they all point beyond the Draft Riots in one way or another, and toward a larger historical or topical terrain. One project began with Herman Melville's poem *From the Rooftop*, written by Melville as an eyewitness to the Draft Riots; moving hypertextually out into the cultural context, this project proposed a consideration of contemporary literature as a way to study history in the more conventional sense. Another project focused on education in NYC. Originally conceived as an attempt to view the Draft Riots through the eyes of contemporary educators, it was compelled by the nature of the data available to broaden its focus, to attempt an account of educational experience in New York over the course of the mid-19th century. This project was notable for its use of completely unprocessed primary materials gleaned from Columbia collections—a Superintendent's report to his Board, floor plans of school buildings. The third project, produced by a junior who will continue with it this coming year, involved a comparison of the Draft Riots with the so-called Orange Day Riots of the next decade. This project opens out into the whole history of Irish/English relations.

In all three cases, then, the same tendency was marked. The tide somehow turned as a threshold was reached. Instead of being driven by the sheer amount of material to narrow the focus, we found ourselves drawn by the nature of the new material, combined with the platform provided by previous generations of students, to reach out into larger contexts. The pedagogical process began to move, through these media, toward the study of history in a larger sense.

Part II: Prospective

Dr. Michael Hyatt, formerly Director of the Center for Afro-American Studies at Wesleyan University, has joined the Dalton faculty as head of the Interdisciplinary Studies Department. Dr. Hyatt is an historian with a special interest in the role of media and popular culture in American politics. He intends to place *HistoryMaker* at the center of his efforts to

create an integrated interdisciplinary program at Dalton. His evaluation of *New York and the Civil War Multimedia* (see Volume II of this report) contains a discussion of his long-term plans and expectations. But, whatever direction he chooses to take, it will unfold, at a minimum, in the following circumstances:



Students create a card catalog where they organize the text, images and video clips gathered during their research.

The Physical Environment

Once again, over the course of the summer, the quality of the digital environment has been enormously enhanced. The new server will greatly increase the quality of playback of *QuickTime* movies, decrease access time of large picture files, and provide much greater storage capacity for student researchers. The addition of more Quadras and sixteen-inch monitors will contribute to the fluidity with which students can manipulate multimedia in the *Navigator* environment. At the same time, as already mentioned, the demand for these resources has exploded—not only because projects have become more numerous and elaborate, but because the whole school is coming to take these resources for granted and to use them in the normal flow of activity. And space, as ever, is still at a premium. Therefore, the lesson that applied last year still applies: what slack there is, is in scheduling.

The Software Environment

The software platform is virtually perfected. Communication among participants in the project will be greatly facilitated by generally accessible e-mail service. A revised *Navigator* provides new linking features, the need for which became apparent this year with the *New York and the Civil War* students. The last aspiration of the developers of *HistoryMaker* is to incorporate a capacity for "autolinks"—the ability to attach complex context that will automatically accompany any given step in Hyperspace.

The Pedagogy

The primary weakness of last year's teaching arrangement has been directly addressed. Dr. Hyatt, a recognized authority in his field, will be working full-time with students involved in *HistoryMaker* in every area of Interdisciplinary Studies.

* * *

Playbill (English Dept.) Group Summer Proposals: Judith Sheridan

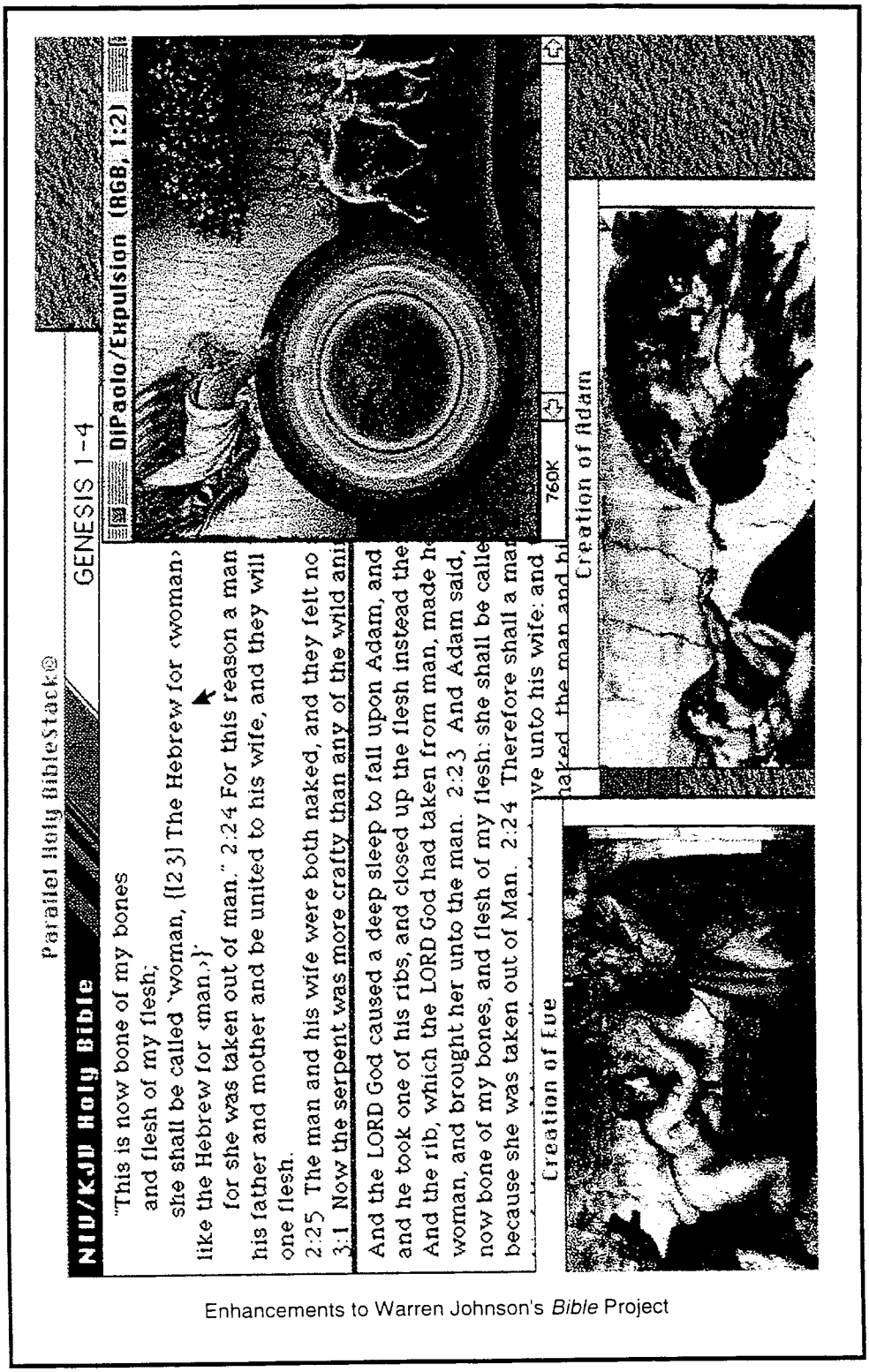
The four proposals the Committee will consider are outgrowths of what I judge to be a successful and productive year for the members of the group and the school as a whole. The purposefulness of the group was enhanced by the support of Adam Seidman and Eileen Gumport, who attended the weekly meetings. At the meetings, priorities were set, and problems with shared resources were resolved. I believe that this serves as a model of how change can be managed with positive outcomes, serious conversation about pedagogy, and support for each other by all its members. So with that I want to, in turn, lend my support to the proposals. All are thoughtful, all contain advances in the work which precedes them, all are proposed by individuals who have fine track records. In one form or another all these projects are under way.

Andrew Glassman's *Crime and Punishment* Project is an enhancement project. Andrew has had a year to work the library of resources he provided to encourage interdisciplinary thinking in his students' analysis of *Crime and Punishment* and *Anna Karenina*. His intention is to add to the resources and information he feels students will need to work in this fashion next semester. I think he is right to worry that the information will in many ways shape the reading. That he defines the concern makes me less worried about the problem. In addition, I think Andrew is right to suggest that students use what is available to them through technology as a springboard for further research. I would recommend that the students continue to add to the data base by including some of their research and that their essays provide a continuing resource, as well. I support his request for the Voyager version of *Crime and Punishment,* and for help in scanning, limited to excerpts.

His course is taught in the Fall term. The other projects are for courses taught in the Spring term or, in the case of the Bible are projects which will begin at the end of the Fall term or in the Spring. It will be important to keep this in mind.

Warren Johnson's *Bible and Hypermedia* project is also an enhancement. His needs involve technological modifications of a kind he spoke about throughout the term. The primary and secondary sources seem very much in keeping with his previous assignments. Information on the lives of the painters can be found in Groliers Encyclopedia on CD. Warren should check this out. He might also assign students the task of providing a biography (following Landow's example) and have students actively contribute to the data base. I also like his ideas about the use of the Notebook and suggest that what results from this improvement might assist a number of projects.

The proposal for *Interdisciplinary Cultural Studies on Nature and Progress in American Culture* is an ambitious one. Already, slides have been prepared for inclusion, and *My Antonia* is being scanned. I recommend careful prioritizing of resources. The amount of material is encyclopedic, and I worry about overkill. I'd like Warren and Jean Gardner to really think through how they are going to use this material and over what time span. Is a full semester going to be devoted to the study of this novel? It seems to me that to teach students to read paintings, to interpret music, to understand dance in an effort to guide them to use what



Enhancements to Warren Johnson's *Bible* Project

is available intelligently will require lots of time. This project might interest Mike Hyatt, who will be teaching American History and may have use for what is available.

Steve Bender's *Citizen Kane* project is also under way. The script has been scanned and he has begun to gather material. I have no doubt that his enthusiasm for the project will yield fascinating results. The inclusion of the number of clips via *Quicktime* that Steve requests is something for the technical staff to consider. I'm interested in the nature of what the students will be doing with this information. The course has a history of independent projects so that I am confident that students will be encouraged to use these resources creatively.

Final Note

All these projects provide opportunity for hypertextual work, interdisciplinary studies, a reconsideration of writing and revision, and collaboration among students. All involve in one form or another a multimedia library of resources. I think it is important to make these resources known to other departments so that they can share in what is available.

* * *

Crime and Punishment Project Enhancement Proposal for Summer Grant and Support: Andrew Glassman

Phase I: Development prior to classroom use

As I understand the situation, my project should not require the purchase of any new hardware nor any major software. *HyperCard* has been the software base for this project. Though I plan to examine *Storyspace* to see whether it offers advantages over *HyperCard*, I understand the latest thinking is that we might find special features in it to incorporate in our *HyperCard* program rather than a wholesale change, and I believe that program is already part of the NLTL network library. On the other hand, I have just discovered that a translation of *Crime and Punishment* has been digitized and is available from Voyager. Although I teach from the Magarshak translation, this software would save a great deal of scanning time. While I am not willing to compromise the quality of the translation we read, it should be valuable to compare it seriously to an older translation by Constance Garnett and to work with that translation on the computer. A single copy of the disc that carries the digitized novel sells for $24.95. Voyager is not yet clear about its site-licensing policy. Given the price, at the worst I hope it would be possible to buy five copies or so to make the disc available in classroom computers and at key locations in labs. Perhaps we can make a special arrangement with the company.

There are many items that I wish to add to the database which makes up the body of the program. I also intend to develop a matrix of materials designed to stimulate the students' search for useful links. I have consulted with Adam Seidman and Eileen Gumport about the time this enhancement plan would consume. Because print size, quality, and glossiness of paper, etc., affect the results, they say it is hard to predict the time precisely without having the materials in hand and actually scanning a page of each, but a safe estimate is to allow ten to fifteen minutes per page; not yet having texts in hand and/or needing to read and determine all the precise selections, I offer numbers of pages wherever possible. Within the first two weeks of the summer I plan to have selected the passages from the texts I can easily acquire—the rest of the definite acquisitions and any of the others that come that quickly.

Where not specified, the number of pages is not yet available. If the number of pages is too great, I'll look for ways to cut.

Definite acquisitions and additions

- A digitized version of *Crime and Punishment* available from Voyager and certain key corresponding passages in the translations by Coulson (20 pp.). Magarshak is done.
- Kant, excerpt on the consciousness of time and space, from either *The Prolegomena* or *The Critique of Pure Reason* (Approx. 20 pp.)
- A brief excerpt from Darwin's *Origin of Species.*
- Ivanov, "The Revolt Against Mother Earth."
- Belinsky's Letter to Gogol and other passages.
- Excerpts from Isaiah Berlin, *Russian Thinkers* (21 pp. minimum; 35 max.).

- Excerpts from biographical studies by Konstantin Mochulsky (25 pp.), Joseph Frank (pp. unknown) and Louis Breger (10 pp.).
- Selected essays on esthetics and literary criticism of *C&P* (e.g., an excerpt from Mikhail Bakhtin, *Problems in Dostoyevsky's Poetics*, (15 pp.; Nabokov's commentary on the Lazarus passage in *C&P*).
- Joseph Frank, "The Stir of Liberation."
- Edgar Allan Poe, "A Tell-Tale Heart." (4 pp.)
- Alexander Pushkin, "The Queen of Spades" (excerpt: 5 pp.)
- Brief passages of urban description from Balzac and Dickens (10 pp.).
- The Grand Inquisitor chapter from *The Brothers Karamazov* (23 pp.).
- Yeats, "The Second Coming;" "Crazy Jane Speaks With the Bishop" (1 p.)
- Dante, *The Inferno* (approx. 5 pp.). [Is this text available on the network already?]

Possible acquisitions

- Riazanowski, *A History of Russia* (brief excerpts).
- Walieki on Slavophilism.
- Schenachevsky and Herzen, "What Is To Be Done?"
- Sergei Nekayev, *The Catechism of a Revolutionary* (excerpts).
- Max Stirner, *Der Einzige und sein Eigentum.* (It is not yet clear whether an English translation can be found.)
- Napolean, *Histoire de Jules Cesar.*
- Material on the Russian Orthodox faith.
- Clips from the film of *C&P* directed by Henri Chenal.

Research potentials

1. Further photographs of St. Petersburg and Nineteenth Century Russian images from New Media Archive and from books.
2. Items listed as *definite acquisitions* are either in hand now or in print and readily available; my first step in working on the project this summer would be to collect these materials from library shelves and local bookstores, and I believe the last items could be in hand within two weeks. Items listed as *possible acquisitions* by definition are not certain to be found so quickly. My initial work this summer will include time searching for these texts and pictures.
3. A pattern of steady student involvement with the material and vital interaction with it depends on access to networked Mac computers. The Russian Fiction class is scheduled to meet during the "H" cycle during the Fall semester. Being scheduled in a classroom that houses computers would clearly be optimal.

Phase II: Implementation in the classroom

The essential concept of this program is to provide a context within which to read *Crime and Punishment.* The items listed above are meant to fill out the base of texts and pictures already digitized and carried under "English, Russian" in the Playbill files of the network. A fuller context should allow students to build a clearer sense of the intellectual, esthetic, and cultural situation which stimulated Dostoyevsky to write the novel, whether he was writing in accord with a given piece or in oppposition. It is not my idea that Dostoyevsky was fully conscious of his relationship to every item that will make up the data base: some are known influences; some provide a sense of the intellectual climate he breathed in; some are works whose propositions Dostoyevsky's novel anticipates; some are secondary—critical or biographical—materials; some items provide visual images of the world Dostoyevsky describes, intended less to give students a corroborating picture of that world than to reveal by contrast with actual images the shaping, interpretive, persuasive power of his narrative.

What I want to do is to put students in a position to recognize, feel, think through, identify with the individual and societal crisis of spirit Dostoyevsky reenacts in the novel. The idea developed over years of studying nineteenth and twentieth century literature and philosophy, but its application in a computer project occurred to me in the fall of 1991 when students in a Russian Fiction course were unable to respond to questions I was asking about philosophical implications in *Crime and Punishment:* "great questions," they said, "but we don't have the information to answer them." I began asking Robbie McClintock whether it was possible to tap into a data base such as the Library of Congress on-line. When he explained that potential was not yet available, I realized that I needed to build my own. In fact, even if the LOC data base were immediately available, it might strike students as a *Dada*-base with no starting-point, no means of navigating pathways and relationships, no gravity or weight. Something between a fixed curriculum and infinite resources was what I sought.

Since virtually all the material that is now on-line was not available during the first semester of 1992-93, it could not be used as this year's seniors studied *Crime and Punishment.* Unfortunate as the timing was, using this program during the second semester in connection with a reading of *Anna Karenina* revealed its flexibility and potential for broad application. The way I used the program this semester is as follows: instead of building a fixed pathway or directing all the students in the class to focus on a particular text at the same time, I decided to begin with only the broadest requirement that each student browse through the table of contents and find a passage that applied to his or her reading of the novel. From one assignment to the next, I talked with each student about the links they made and the way they applied them to passages of the novel; then we discussed further links that their arguments suggested. By the end of the semester, each student had read several pieces of philosophy and literary analogues; some had suggested additions to the files; and the class was unanimous in the opinion that having freedom to discover texts and apply them as they saw fit was vital to their forming a deep engagement with their own projects.

I want students to find their own routes into the novel, its backgrounds, analogues and descendants. To that end, I want to set up the data base in such a way that, as their reading,

writing and class discussion stimulate particular questions, they can see what is available to help them define issues, develop conceptual information, make surmises and working conclusions, seek connections to their own experience. For example, in the group I worked with on *Anna Karenina* during the second semester this year, in response to questions Noah Lehrman and Dana Evan asked about the famous scene in which Levin loses self-consciousness as he gives himself up to mowing, allowing a natural, pastoral rhythm of work and relaxation to take him over, I pointed out a tension between romantic and modern models of human consciousness. Dana spoke to me in the lab, saying she wanted to learn more about how a romantic paradigm would apply to Anna, and I suggested she read the selections from Hegel that are held in the computer files. One result was a stunning paper on Anna as a Hegelian "genius" caught in an antithetical society; another result was her commitment to a method of reading fiction that links esthetic patterns and philosophical concepts. She went on to read and apply other passages from Nietzsche and from Freud, and her experience is typical. Working with the selections from Freud's *Civilization and its Discontents,* Debbie Coen developed a related argument about the effect of social repression in Anna's psyche. Reacting strongly to Tolstoy's epigraph ("Vengeance is mine..."),Wei Li Tjong asked for help finding the full biblical passage, which is in Romans, then showed how Paul's full statement changes the tone from admonitory threat to wise advice.

I plan to set up certain links and prototypes of pathways for the work next fall on *Crime and Punishment.* For example, in Raskolnikov's dream about a peasant murdering his horse, another man asks, "ain't you got the fear of God in ye?"; a link to Nietzsche's "Death of God" should raise a vital awareness of the depth of the issue of faith, but further links to Darwin's *Origin of Species,* to Nietzsche's comments about origins of faith and guilt (*The Geneology of Morals*) on one hand and Freud's about the failure of human efforts to discover the purpose of life (*Civilization and Its Discontents*) will begin to reveal the general spiritual crisis that Dostoyevsky is reflecting on and placing in the center of his character's life. Again, to help students recognize the significance of a recurrent motif featuring half-open doorways, I will create a link to Keats's letter on the mansion of human thought, with its many doors and corridors, and his sense that thinkers and poets in his age advanced into dark passages but had not yet found the well-lit inner chamber. Yet again, I would certainly create a stack called "sources," to show the influence of texts such as "The Tell-Tale Heart," "The Queen of Spades," an excerpt from *Pere Goriot,* and the works by Stirner and Napoleon (if available), which we know Dostoyevsky was strongly influenced by.

But I feel sensitive to the problem of enforcing all the relationships that I can conceive among the texts or setting too many topics that students have to take up. This semester's class felt strongly that being free to browse allowed each to find rich connections, that having the sort of structured pathways that George Landow demonstrated for us might reduce their creativity and make a more shallow, purely thematic field of topics to explore. Last year, when I handed out printed copies of the material from Freud and Hegel, students balked at the reading and struggled through the discussions. This year all found materials that were specially helpful, read with alacrity, came to the lab and class eager to present their findings, complained only that there wasn't a complete version of each text in the computer files, but

became reconciled to the idea that they could move on to the library if they wanted to read further. Both the spirit and the productivity of that approach were great. How far I can go in creating links without blocking their perception that they have freedom and a deep field of associations to explore and be creative in, is a question that is active in my mind. I want to explore possibilities and discuss them with others here. So far, having categories of texts and pictures and being ready to suggest links for students to pursue on the basis of their comments and the interests that emerge in their writing, seems to work well. Adding criticism and biography should help make them more aware of routes others have followed, and I'm ready to give them such leads as long as there are enough possibilities to avoid tracking their moves too tightly. Categories like philosophy, literature, biography/criticism, sources, history, pictures will organize the material so that it isn't a completely wild field, and the particular links I set up will provide some models. Further, I could add annotations to focus their attention.

In class I plan to use the computer: first, to demonstrate what is available for students to browse through; second, to develop ways of "reading" or enhancing interpretation of passages in the text by (a) turning from scenes in the novel to passages in other texts that are echoed by Dostoyevsky or that provide analogues and (b) highlighting features of the text and pointing out its patterned effects; third, to motivate and focus students' writing and other forms of reaction to the novel throughout the unit; fourth, to put students in a position to lead discussions and demonstrate the pathways that they are finding for themselves; fifth, to continue a process of sharing students' thinking and writing beyond classroom discussions; and sixth, to teach techniques of writing and revision.

Students will need to learn how to drag the *HyperCard* stacks into their accounts and work with all the tools, including the notecards and notebooks and the linking tools to create pathways; to translate their writing into Mac files; they will need to learn how to read philosophical and psychological texts without losing sight of the esthetic patterns of the novel. I will assess their work almost every week through short explications I will ask them to write and share through the computer files, also through three-to-four longer projects which may be cumulative and will be spread evenly over the semester, and through their class presentations. I will be considering a special approach to or alternative to the traditional exam format as well, and will discuss ideas with Judy Sheridan and the department.

My project's relationship, through the Dalton Technology Plan, to the original Dalton Plan should now be self-evident: it is designed to draw students into a process of reflection on the deep background of a particular piece of literature; to investigate that work's relationship with texts of various disciplines; to find data that support their individual interpretations; to foster commitment to close reading and an extended process of thinking/research/writing over several weeks; to give students ownership of a project; to allow ready sharing of ideas; to build group skills. In this course classroom discussion still needs to be a vital norm of communication, but it should stimulate and intensify other modes of response that may take greater priority as the semester breeds independence.

* * *

The *Citizen Kane* Project—A Proposal: Steven Bender

Project Development

Introduction

This summer, I want to work on a project that has been kicked around verbally (among myself, Judith Sheridan, Frank Moretti, and Luyen Chou) for some time—the building of a hypertextual database revolving around Orson Welles's *Citizen Kane.* In my Film Theory and Criticism class, students are constantly asked for detailed close-readings of films. These readings tend to be overly formalist (solipsistic?) in nature, because the students do not have access to the wealth of materials (sources, influences, screenplays, biographies, critical essays) that accrue around the films we watch. *Kane is* a particularly rich film, both cinematically and sociohistorically, the most logical starting point for a multimedia cinema project—certainly more has been written about it than about any other American film. In many ways, *Kane* encapsulates the history of cinema up to the year of its release, 1941. It absorbs different genres (expressionism, realism, comedy, tragedy, the detective film, the "bio-pic") to create something original and new.

> I know that there will come a day when I do not offer this elective—when that time comes, I'd like to move this project into my 11th grade American Literature class. By that time, as a result of projects like *Playbill,* the *Bible* project, and *Kane,* I imagine that a student's sense of what a "text" is will have changed to the point where *Citizen Kane* can reside comfortably on the same shelf as Emerson, Faulkner or Hurston.

To enable students to understand Welles's film, the influences on it, and its enormous influence on subsequent films, I would like to develop a set of resources within a technological environment using the *Playbill* armature; I've spoken to Adam about this and I don't think we'll need many changes. These resources will allow students to function as genuine film scholars engaged in the task of interpretation/exploration of this great film. I'd like to create a "laboratory" setting for study of this film that both introduces students to the best scholarly and historical research that has been done on *Kane* and also encourages both independent scholarship as well as collaborative inquiry. A project of this kind can open the "text" to new and vital questions that don't get asked in a conventional class, where all we have to look at is the primary "text" and our own minds. These questions include (but are obviously not limited to) those of cinematic/historical influence, what goes on in the process of moving from screenplay to film, the validity of the *auteur* theory, the relationship of literature and history (including biographies of both Welles and William Randolph Hearst) to this film, etc.

Project origin

The idea for this project came to me as a result of my involvement with the *Playbill* project over the past two years. *Citizen Kane* seems a natural for hypertextual study. In many ways, I see the film itself as a precursor of deconstruction and the kind of theory George Landow discusses in his book, *Hypertext: The Convergence of Technology and Literary Theory.* Kane (as a character) is at the center of the film, but the movie is an attempt to get at that center from

multiple points of view. The film teaches us (I think) that there are only versions of the truth, not a single univocal one. The reporters tracking "Rosebud" can be seen as a metaphor for conventional students, diligently digging around for a meaning that might not exist. In this sense, *Citizen Kane* bears a close thematic resemblance to Kurosawa's *Rashomon,* a film I'd like this project to point my students to for comparison and contrast.

A project of this kind clearly fits into the context of a pedagogy that is more concerned with having students ask meaningful questions than it is with finding answers. I especially look forward to working with high school seniors in a technological environment—it seems to me that they will be more capable than my 10th graders of helping to create the database. I intend to spend time this summer creating assignments that will go well beyond asking students to respond to *my* questions—I intend to ask them to find articles, film clips, etc., that can better help all users of the database to understand *Kane,* as well as help them formulate their own questions about this film.

Existing software, etc.

In my browsing through various catalogues of CD-ROMs and HyperCard stacks, I have (surprisingly) not come across a great deal of material for film study. The CD-ROM of the Beatles *Hard Day's Night* provides an interesting model for organizing this sort of material, and there is a CD of Leonard Maltin giving a tour through clips from great films that I would like to see. Good secondary material on *Kane* exists on laserdisc as bonus material for special editions of the film. I have some of this, and plan to make use of it in this project. Apart from this, as far as I can tell, literature (and art) projects are generating more exciting software than are film studies.

Project Implementation

Development plan/educational objectives

I (along with Adam Seidman and Eileen Gumport) have taken the initiative and have already begun developing this project. As of this writing, the following materials have been scanned and proofread:

1. The complete script of *Citizen Kane* and notes on changes made in the actual shooting of the film.
2. The chapters dealing with *Kane* from the authorized biography of Welles by Barbara Leaming.
3. Several original reviews of *Kane* from 1941.

Over the summer, I would like to spend time (at least a month) researching and reading material about *Kane* in order to put together a package of material to be scanned during the late summer/early fall. This package would certainly include:

1. Material on *Kane* from the two other (Frank Brady and Charles Higham) major biographies of Welles.

2. Material from *Citizen Hearst,* a biography of the publisher who served as the source for much of Kane. This book also includes a good deal about Hearst (and his newspapers') response to the film.
3. Sections of *This is Orson Welles,* a recently published (and lengthy) book of conversations between Welles and director Peter Bogdonavich.
4. Storyboards, sketches and information from Robert Carringer's *The Making of Citizen Kane.* I'd also like to digitize information and images from his "Visual Essay" on *Kane* that is included with the Voyager anniversary edition of the laserdisc.
5. Selected text and pictures from Voyager's 50th Anniversary boxed (VHS) set edition of *Citizen Kane.* I have recently purchased this set—it includes promotional materials, stills, a comprehensive book about the making of the film, and a videotape of various film artists discussing the importance of the movie. (This set is a resource I especially look forward to spending time with this summer.)
6. Selected clips from films that influenced Welles, as well as clips from films that were influenced by him—I'd like to get the students started at tracing influence so that I can ask them to go out into the world and *find* influences that we can then incorporate into the database. I have compiled an extensive bibliography on this film, and am eager to spend time this summer discovering sources and materials with which I am not already familiar.
7. If we have a stable e-mail system for students by the Spring ("First Class" looks promising), I would like to set up a *Kane* bulletin board on which I can post questions, have "threaded" conversations with my students, etc. Since a course of this kind requires less reading than a conventional English class, I can create "homework" assignments that ask students to log in and post opinions as well as confront ideas of their peers about specific scenes or questions. Being in touch with my students and putting them in touch with each other through e-mail can certainly help me in the (noble) task of breaking down the barrier of the 45-minute period and conventional classroom.

By having resources such as those discussed above at my disposal, as well as asking students to gather information to put on-line (I plan on this being a major factor distinguishing this project from *Playbill*—I think that discerning seniors have a better chance of succeeding at independently gathering historical, critical and cinematic information than do tenth graders), I hope that my students will be able to meet the following educational objectives:

1. *To move away from overly "formalist" reading of films.* Exposing students to the history, influences and critical theories that accrue around Kane should provide them with a rich interdisciplinary experience. They should begin to see all kinds of connections; the film should become a living, breathing organism, not a rarefied artifact.
2. *To empower students; to encourage them to become active, rather than passive scholars.* Students' personal areas of interest should govern their ownership of the project. Assignments should allow students to bring their own interdisciplinary passions to their work on *Kane*. For example, students who know music may want to work with Bernard

Hermann's score for the film and the influences on it. Strong English students may want to examine the influence of Shakespeare on the structures and themes of the film, etc. Asking students to go out into the world in order to bring materials back to the database should also help me meet these goals. For example, we could (and should) build a class "influence stack"—my students are constantly renting videos and telling me that they see things influenced by Welles. If each student digitizes one short clip that reveals an influence and writes an explanation of that influence, we will have the foundations of a very interesting resource.

3. *To encourage group work/collaboration/revision.* As were *Playbill* students, those in this project will be asked to work in teams, to solve problems together. I've learned that although the frustrations with this kind of work can be great, the rewards can be even greater. Students should begin to depend on themselves and each other (rather than the teacher/expert) to raise interesting questions and attempt interesting answers. Groups working on specific questions should be asked periodically to report their findings back to the group at large.

   My experience with *Playbill* has shown me that renewed attention to technical writing skills and revision is an interesting offshoot of required group work. This type of work leads to a kind of passionate debate about syntax and rhetoric that one too rarely sees at the high school level. In addition to groups inevitably wanting to revise their work, individuals within a group often wish to revise a paper on their own, to take it in a slightly different direction. Because group work provides the teacher with a base of fewer papers to assess, revision can be built in to virtually every assignment done in this manner.

4. *To encourage response to a text in a variety of modes.* Since this project will reveal a variety of entry points to *Citizen Kane,* students will be encouraged to express themselves in modes they feel most appropriate. While for some this may turn out to be the analytical essay (all students will certainly write in this mode at some point during the unit), for others it might not. For example, a group that has difficulty writing together may prefer to videotape a panel discussion/debate that gets at their disagreements better than written prose could. Some may create a hypertext document, some may make a film.

Assessment

Playbill has certainly taught me that assessment of projects of this kind (projects which depend largely on student-generated assignments and collaborations) can be especially problematic. Still, I've learned that it can be done meaningfully and fairly. Students will be assessed according to the work they produce: this will include group papers and presentations, as well as vehicles such as individual journals, in-class writing assignments, revisions, contributions to the data-base, and quizzes that will allow students to bring their uniquely personal voices to the project. Students will also be assessed in terms of participation and attitude. Although less easy to measure, labs with students and groups, coupled with observation of students at work (in and outside of class), will help me tell the story.

Internal evaluation

Obviously, it is important systematically to assess the project as a whole, as well as the student work that goes on during the unit. I plan on using the following vehicles for assessment of the project:

1. *Teacher journal.* I will keep a daily log of the successes, failures, joys and frustrations of working with the new technology in an English class, as I have in *Playbill* classes. This journal will be distributed to interested parties at the end of the unit.
2. *Student questionnaires.* I will distribute questionnaires to the students early on, so that I can, if necessary, adjust things to their demands. Another questionnaire will follow toward the end of the unit to help me glean student feelings and ideas about the whole thing.
3. *Outside evaluator.* In order to get a more objective point of view, I would like to invite an observer from outside of Dalton to look at and write an assessment of the *Kane* project.
4. *Input of the "Playbill Group".* Under the auspices of Judith Sheridan, this group has become a dynamic and helpful outfit. I think that it would be useful (and fun) for members of this group to experience each other's work and share their ideas about it.
5. *Teacher's formal report.* I will, of course, submit a formal report on the results of the project.

Budget (tentative) for summer project development

Although I am reluctant to be very specific about summer funding for this project, I can break things down into three areas that will require financing:

1. *My time.* Reading, researching, photocopying, watching films, compiling things to be scanned, creating assignments: 4-5 weeks (@ $350.00/week?)
2. *Materials.* Books, videotapes, etc.: $300.00
3. *Scanning.* I've talked to Adam Seidman about this, and he estimates that we are talking about a minimum of 100 hours (@ ???) of scanning time on this project.

Conclusion

I eagerly look forward to working on the *Citizen Kane* project this summer. I have no doubt that it will make an enormous contribution to my Film Theory and Criticism course, and I will not be surprised if, in some sense, it "reinvents" the entire course. I know that there will come a day when I do not offer this elective—when that time comes, I'd like to move this project into my 11th grade American Literature class. By that time, as a result of projects like *Playbill,* the *Bible* Project, and *Kane,* I imagine that a student's sense of what a "text" is will have changed to the point where *Citizen Kane* can reside comfortably on the same shelf as Emerson, Faulkner or Hurston.

Please know that I appreciate your invitation to submit a proposal of this kind, and that I am grateful for any support you can provide me in putting this project together.

* * *

Proposal for Enhancement of Project Galileo Through June 1994:
Malcolm H. Thompson

Phase I: Development prior to classroom use

Budget/Needs (Phase I and Phase II)

	Development Phase Summer '93	Implementation and Revision Phase Year '93-'94
Student Clerical/Secretarial Approx. 450 hrs. @ 6.50/hr.	$3000	$3000
Student Programming Approx. 150 hrs. @ 6.50/hr.	$1000	$1000
Payroll Taxes 10%	$ 400 $4400	$ 400 $4400
Materials etc.	$2000	$2000
Total	$6400	$6400

In addition there is a need for professional programming support, which I believe was funded at 25% of Bob Matsuoka's time. I don't believe that his time was used to that extent and in achieving the goals below will not be needed at that level. However, some network and data base needs (10% of Matsuoka's time) are anticipated. These relate to acquiring databases (CD-ROM, Internet) and making them accessible through data management software.

Explanation of Budget/Needs:

Personnel

- Summer and school-year student employees—clerical correspondence, ordering, filing, etc.
- Testing new activities
- Typing revised materials to accommodate Voyager II, general revisions and additions
- Cataloging of tasks by key word for sorting by fields

- Typing general descriptions of each unit
- Consolidating of student course evaluations for sorting by field
- Summer/School year student employees—programming
  - Assembly of new *HyperCard* data and instruction stacks
  - Instruction for project manager on programming in *HyperCard.*

Materials

- New programs and data for geology/life units and astronomy
  - E.g., Scotese, *Terra Mobilus*; U. of Col., *Evolution*
  - Data: global rock age data, fossil data, seafloor age and magnetic data, others.
- Additional Palomar Plates
- CCD camera for telescope
- Image and databases: spectra, binary materials, etc.
- Stellar evolution program (Pynzynsky)
- Set of high-resolution lunar photographs (Sky Pub)
- Outside emergency reproduction materials to maintain course flow.

Timetable

While the budget breaks the funding into two parts, experience has shown that the activity is seamless with regard to the summer and the school year. The summer activities, however, are more intense, so the division represents an enhanced rate of expenditure in the three months of summer compared to the nine months of the school year. The totals for each time period are the same.

July/August '93:

- Revision of first six assignments for third-round testing
- Completion of *HyperCard* stacks
- Revision and expansion of 8th grade assignment task flow
- Acquisition of additional resources—e.g., *Spectra*, *Stellar* and mass measurements of binary stars
- Coding of tasks and resources tested in database.
- Design, writing for first-round test of geology, origin and evolution of life materials at NYU, school year 1993-94 (see Phase II #3).

Space needs and alterations

The placement of computers on or above the worktables on swing arms in 305 seems much more conducive to group collaborative activity than the peripheral arrangements in 307. Modification by placement of four of the 307 machines with two on the periphery would greatly reduce crowding and enhance the general activity in 307. Also, one machine was taken from 307 to 305 and needs to be returned.

Phase II: Implementation in the classroom

Explanation of intended use of resources

The materials and labor described above are part of the natural development pathway of *Project Galileo* initiated in the summer of 1991. The project has created a Macintosh-based information landscape using a desktop planetarium program integrated with images and data from the professional astronomy community. To take full advantage of the resource, sequences of activities and excursions (tasks) have been designed with sufficient latitude to encourage students to query and plot their own pathways to answers or problem solutions. Two years of experience have indicated that the emerging information resource and the designed pedagogy form core elements for teaching under the pure Dalton Plan, an activity in progress in the astronomy course. These elements need expansion, refinement and general improvement and it is to that end that the proposal is submitted.

An overriding problem for the integration of the new technology in schools is that in the context of conventional classroom activity, computers can only make incremental additions. If the new technology is to fulfill its promise, new classroom scenarios must be created in a restructured workplace. The availability of digitized materials, first realized in 1991, strongly suggested that *Project Galileo* could be initiated to accomplish just that task with the pure Dalton Plan as the model. Over the past two years, the project has successfully created a Plan environment in three working astronomy classrooms. Continuing the development effort in this area is inherent in the philosophy and central mission of the New Lab.

Specific Skill and Content Assessment

Below is a list of the assignment sequence in advanced stages of development and testing, defined below:

1. Classical positional astronomy
2. The contents of the universe, the basic forces
3. Stars—the observational base of astrophysics
4. Stars—the theoretical base of astrophysics
5. Stars—stellar evolution
6. Galaxies, the large-scale structure, cosmology

For each of the above topics, a three-to-six-week assignment defines a task stream which the students pursue individually or in pairs using the computers and other "hands-on" materials. Each task in the stream requires submission of a brief written report or computer output of a spreadsheet, graph, or graphics. These are evaluated immediately by the instructor, returned to the students for revision if necessary, and appended to an assignment final report. At the conclusion of most assignments, an evaluation exercise is given. The task stream format has proved to be a good formula for structuring the pedagogy along the lines of the pure Dalton Plan.

These first six topic assignments have been designed and written, but all need more refinement; some holes need to be filled (spectra, mass by binaries, stellar evolution program,

etc.), and in two cases some reorganization is required. Assignment two will be expanded with the student-acquired images using the CCD camera and more Palomar Plates. For each, more work needs to be done on student evaluation mechanisms. In two assignments, the evaluation mechanisms seem very effective and work will be done by the Project Manager to generalize these and apply similar devices to other assignments.

The final two assignments, needed to complete the interdisciplinary course theme of cosmic evolution, are in a more primitive state. They are:

7. The solar system—Earth and planetary geology
8. The origin and evolution of life.

About half of the seventh assignment—the planet part—is well along, but in need of a set of lunar photographs (Sky Pub). TheEarth and the origin and evolution of life are in the design phase, and work is in progress on these with Michael Rampino, a geologist and chairman of the Applied Science Department at NYU. This work, begun about one month ago with the identified databases and simulation programs cited above, will require about a year to wind out through classroom testing in the Astronomy course in Spring 1994.

General assessment of the materials and their effectiveness will be accomplished in the following way:

1. All materials to be reviewed by Tom de Zengotita in June '93 and June '94.
2. All materials reviewed by George McCook, Chairman of Astronomy Department, Villanova University, Fall '93.
3. Assignment-by-assignment review by students.
4. Ongoing Project Manager review.
5. New Lab annual external evaluation.

Schedule for Achievement of Objectives

- Third-round test of revised assignments 1-6 (Sept.-March)
- Ongoing revision of each assignment as completed
- Second-round test of geology, origin and evolution of life materials in Dalton Geology class (December)
- Revision of *HyperCard* stacks (Sept .- March)
- Final revision of assignments 1-6 (Sept.-March)
- Third round test of geology/life materials in Astro. class (May)
- Final revision of assignments 7 & 8 (June).

It was not the technology, nor the dedicated space, nor the flexible schedule, nor even the teacher's constant presence - none of these things in and of themselves turned room 307 into "Astrocave" and brought *Project Galileo* to a level of maturity comparable to *Archaeotype* in just two years (see Professor Black's study in Volume II of this report). It was the attention to a constructivist pedagogy in a context of authentic information, the scrupulous working and reworking of calibrated Assignments, of what Malcolm Thompson calls "task streams," that made the difference. That is why the influence of this project has extended across all Divisions and disciplines in the school.

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Proposal for the Technological Enhancement of AP Chemistry, Chemistry A, and a New Chemistry Course: Margot Gumport

Development

1. *Resources immediately needed*

Hardware for Room 311

Four Mac SIs on platforms or movable arms:.....$10,000 (if not recycled internally)

Arms as in Room 305.....$100 each

Display monitor.....$2000

Software

3 CLP-700 Chemistry lab package @ 460.....$1380
1 ALI-650 Sensornet interface system.....$360
1 ALS-200 temp probe.....$40
4 ALS-211 colorimeter @ 110.....$440
$2220

Software is available from: Acculab Products Group
200 California Ave. Suite 217
Palo Alto, CA 94306

Tel: (415) 325-5898 FAX: (415) 325-5899 Applelink:Acculab

Some interactive simulations which look useful are available from *Serafim* listed at $15 each—but not for preview. Some have a source code available to modify them but we cannot know the cost or necessity of making modifications. However, the software can be installed at multiple stations at no extra cost. Estimate: $200 as a generous beginning.

Software from Serafim
Dept. of Chemistry
University of Wisconsin-Madison
1101 University Ave.
Madison, WI 5370

Some software from the American Chemical Society also looks interesting. Again, we are awaiting further information; we have requested the catalogue at $35.

Exploring Internet to see what is available in public domain or at moderate cost.

2. *Technical Assistance*

- Six weeks of computer-wise student assistance for the summer of 1993.
- The same assistance will be needed during the course of the academic year 1993-94, at an estimated rate of 3-5 hours a week.

Since the New Chemistry course materials will be essentially derived from the traditional curriculum —to be enhanced by the technology, like the other chemistry courses—we have applied for our own stipends through Mike Sturm's committee.

Additional resources anticipated

Hardware

•A dedicated VCR

•Laserdisk player

•CD-ROM Drive

3. *Timetable*

Immediately needed resources must be deployed in Room 311 by August 25, 1993, so as to be ready for classroom use at the beginning of the school year.

Development of new course materials will continue during the school year on a part-time basis in preparation for consolidation in the summer of 1994. I anticipate intensive though spasmodic need for technical assistance at that time.

Deployment schedules for anticipated resources must depend on our success in course material development. It should certainly be completed by the end of the summer of 1994.

Resources must be connected to the network, with a power strip at each station. The connections to the network must be from overhead—safe and quick exit from the room is essential! All the machinery must be elevated above the tables. Two computers should go on the back desk, one on each of the other two benches at the south end of the room and a *fifth one* on the teacher's desk with a display monitor mounted above the blackboard. Costs cannot be estimated by me.

4. *Space and Scheduling Needs*

For reasons given below, we are convinced that a dedicated space is essential to success. Since Room 311 will be scheduled for 38 periods per week, 35 of which will be for chemistry courses, such a space is already in virtual existence. However, with this heavy scheduling of the room we also expect increased usage of other machines in the school by our students for more independent research and simulations. Ideally, these machines would be near where a chemistry teacher is always available to interact as needed (see Geller proposal for enhancement of the Science Lab). We are also planning to have one chemistry teacher available in 311 on three afternoons after school to maximize teacher support when machines are free.

Classroom Implementation

1. *Educational Rationale*

For all chemistry courses

The requested resources will be used to enhance AP Chemistry, Chemistry A, and the

New Chemistry course. Essentially, it will provide a sophisticated and flexible tool which will extend the capacity of our senses to record and measure in the laboratory, and permit simulation of experiments which cannot be conducted in a High School environment. Just as electronic balances have replaced beam balances and digital thermometers have replaced the old-fashioned mercury thermometer, so have indicator papers and visual color matches been replaced by electronic probes. Graphic displays and simulations provide instantly what used to involve hours of tedious manual work for students, as for professional chemists. Educationally, what this means is quite simple: more time for real analysis of experimental data. The emphasis shifts from mechanical procedure to genuine inquiry. The wet labs we are planning, in all three courses, will utilize the technology in this way.

The original Dalton plan was a contract between teacher and student organized around specific assignments. These assignments were essentially study guides with specific steps laid out to help the student achieve his/her goals. Formal classes were few, but small group discussions and individual conferences were plentiful. The success of this method depended on the teacher's almost constant availability in a dedicated classroom with lots of materials.

For the New Chemistry course

The New Chemistry course will involve over 70% of the tenth grade. We expect it to be challenging to the strongest students and to provide support and challenges for the weaker students. The students entering this course may have interests and strengths in fields other than science, and it is our intention to teach them how scientists solve problems so that we can provide them with the tools to be intelligent consumers and critical citizens in our increasingly complex world. Defining problems, amassing information, testing and analyzing data involve techniques which can be learned over problems of varying complexity, and we hope to identify interesting and suitable ones.

We will capitalize on what we know of the original Dalton Plan and on the work going on in the school at present in planning this course. The original Dalton Plan was a contract between teacher and student organized around specific assignments, which were essentially study guides with specific steps laid out to help the student achieve his/her goals. Formal classes were few, but small group discussions and individual conferences were plentiful. The success of this method depended on the teacher's almost constant availability in a dedicated classroom with lots of materials.

Today, the astronomy course comes closest to realizing this approach. We have discussed the reasons for the success of this course with Malcolm Thompson. His task-oriented study guide is almost the original Dalton contracted Assignment. The independent study and work groups replacing formal classes and supported by Malcolm's almost constant charismatic presence in a dedicated room with technological access to a world of materials is an ideal adaptation of the original model of the Lab. This course will be adapting portions of his methodology. Since we are working with topics which are accessible to direct experimentation our thrust will necessarily be different, but we have a successful working model which we can adopt in the chemistry program. We believe that this model depends in large part on

the dedicated room and the technologically enriched environment such a room allows. Aware that the new science center is on hold, we do not feel that we can postpone our requests for the technological enrichment of that environment until such time as ideal space becomes available.

2. *Educational Objectives*

The Acculab interfaces will be integrated into the curriculum as follows:

- AP Chemistry: approximately 15 basic wet experiments and 1-2 research projects per year
- Chemistry A: approximately 10 basic wet experiments
- The New Chemistry course will involve basic wet experiments, but their number and precise nature will be determined over the summer.

Representative wet labs:

- Temperature changes during phase changes
- Temperature changes during chemical reactions
- Temperature changes in measuring colligative properties
- pH as properties of various ions and compounds
- pH changes in titration
- pH measurements to find equilibrium states
- pH changes during redox titrations
- Colorimetric changes to follow rate of reaction
- Colorimetric measurements of solution concentrations in equilibria

The resources requested (the pH, temperature, and colorimetric probes in the Acculab package and tools) will permit precise and immediate measurements, recording, and data manipulation for these experiments, and others as well. The computers and the display monitor will also support natural extensions of traditional chemistry experiments into related areas.

A possible scenario for the New Chemistry

First student exposure to the compound ammonia is a sniff. This might be followed by a video clip of the industrial preparation and uses of this substance. The next round, the student might be asked to modify the procedure on the basis of chemical principles to get a greater yield, then to get a cheaper product and still later to recycle the by-products and to follow the eventual uses of the material by way of networked software which allows the construction of flowcharts. More sociopolitically oriented students might look for data on world impact of ammonia usage and agricultural and health problems associated with this usage. The data could be developed into a research project on the economic consequences of nitrogen use in developed and developing countries. Students might be asked questions about possible as well as actual uses of ammonia, applying their knowledge to extending the uses, to considering the thermodynamics of the processes involved in making fertilizers, etc. There

is, in principle, no limit to the interdisciplinary possibilities for a technologically enhanced New Chemistry course.

In general, then, we intend to teach chemistry in much more open-ended and flexible situations which the new technology makes possible by allowing simulations of processes and experiments which cannot be performed wet. The task-oriented problems we will design, under varying conditions of experimentation and calibrated to each level of student competence in chemistry, will provide parameters within which student inquiry can proceed meaningfully. Such tasks, undertaken within class time with continuing dialogue between the instructor and the students as in Malcolm's approach, will give students the opportunity to apply theory to practice in ways essentially similar to real research chemistry.

Assessment

In addition to standard testing of student skill and knowledge development as each study unit is completed, I plan to have AP Chemistry students assist in implementing the work in the course and in comparing the effectiveness of the learning experience to their own of the previous year. From this process, I expect to develop assessment devices which are more specifically adapted to the new environment and the learning process within it. I see this very much as an evolving process and so would expect to make progress reports several times during the year.

3. *Schedule for achievement of educational objectives*

The AP Chemistry and Chemistry A assignments are a matter of record, and the schedule of topics and skills involved will not fundamentally change—at least to begin with. The New Chemistry course schedule cannot be given until it has been developed.

Concluding Note

The laptops were not a satisfactory solution. The paraphernalia is too unwieldy and they are only suitable for two students working together. But the new Mac interfaces are excellent. The laptops should be permanently moved to physics, where there is programming going on and no wet experimentation. They should be upgraded with co-processors for this purpose.

Our request calls for resources which will allow 5 groups of 4 students to work simultaneously—plus a generally accessible display capacity. This is the minimum workable arrangement and the maximum which can be incorporated into the present work space.

* * *

Proposal for Interdisciplinary Cultural Studies on Nature and Progress in American Culture: Jean Gardner and Warren Johnson

Time: Summer

Warren Johnson—Five Weeks and Jean Gardner—Three Weeks

Academic Year:

Warren and Jean continue to develop project.

Result:

One month unit within American Literature course, leading eventually to full semester senior elective on Nature and Progress in American Culture.

Project development

1. Relationship to Dalton Plan

We developed this project for interdisciplinary cultural study because it is an area of inquiry in which we both are deeply involved. Its subject—Nature and Progress in American Culture—is currently a contentious area of discourse that is central to understanding the modern history of the West. We hope to recreate for others our excitement about this discussion, which we first took together into the classroom two years ago. Our intention is to create an instructional environment using the new technologies that allows students to participate fully in the debate. We are proposing two strategies for doing this:

a) A hypermedia environment for inquiry
b) Inquirer Investigations

Both strategies fulfill the educational aspirations of the Dalton Technology Plan to provide students with learning that is "inquiry-driven", "student-centered," and exploratory.

The proposed ***Hypermedia Environment*** provides anyone entering it with a multipathed approach to the interdisciplinary study of cultural artifacts such as text, painting, music, dance, architecture, development, storytelling. The individual entering the program must construct and then explore her/his own pathway through the environment. S/he becomes an *inquirer* within a living debate, rather than a student in the traditional academic sense, who is intended to explore a subject along a single, linear path. Previously in the classroom, we, of necessity, have been in complete control of the presentation of materials; in a *HyperCard* environment, the participants will be able to assume the control and explore in their own way. This project therefore transforms students, as well as teachers, into constructors.

In the initial stages of the program a participant can select a button entitled Inquiry. It opens a stack that will contain representative assignments ***(Inquirer Investigations)*** that show strategies for an interdisciplinary study of "Nature and Progress" (see attached *HyperCard* Plan). These assignments are examples of actual studies made by Warren and

Jean. Inquirers can open other assignments that indicate unexplored areas of study. These may be based on preestablished links between cultural artifacts or links that the inquirer constructs.

Besides depending upon inquirer initiative, the assignments call for collaborative work between a number of participants. The results of group investigations can then be incorporated into the program so that future participants will have the benefit of their ideas.

...the project is a comparison of artworks and critical writing: initially, a 19th century novel, paintings, music, dance, and critical writings. We hope later to add photography, architecture, park design, and storytelling.... We know of no existing software that explores American art forms together in the way we propose.

In addition, the cumulative and constructivist principles of the New Dalton Plan are reflected in the areas of course development we anticipate. These allow for the creation of a full interdisciplinary ***elective***. The themes of the current project, such as immigration, expansion, and American Romanticism, lead to fascinating areas of further study under the rubric of "Nature and Progress". For instance, the development of New York City involves studying environmentalism, modernism, and the modern city; in particular, the emergence of the public park, with Central Park as a primary example, illustrates in a surprising way, some of the animating conflicts in *My Antonia.* Hence, other subjects, such as city planning and photography, which document these modern developments, will also be of interest as this project is expanded and developed.

Our experiences with the new multimedia technologies encourage us to believe that our project will help institutionalize the educational aspirations of the Dalton Technology Plan.

2. Origin of Project

This proposal is based on collaborative work that Warren Johnson and Jean Gardner began in the Fall of 1991. We were both interested in creating an interdisciplinary study of American Literature and Painting with particular emphasis on what they reveal about ideas of Nature and Progress in the United States. In connection with Willa Cather's *My Antonia,* which Warren currently teaches in 11th grade, we worked with the catalogue from the Smithsonian Institution exhibit, *The West as America,* to create an interdisciplinary study of the portrayal of immigration and American expansion. The students and Warren treated *My Antonia* as a critique of immigration and Jean presented slides she made from the catalogue. In addition, Warren brought in slides of paintings by Winslow Homer and François Millet. The assignment was a big success. Students very much enjoy *My Antonia* as something unlike what they have encountered in American Literature; and the response to the paintings was vigorous and full of stimulating controversy and contradiction.

3. Related Research and Pedagogy

The focus of the project is a comparison of art works and critical writing: initially, a 19th century novel, paintings, music, dance, and critical writings. We hope later to add photog-

raphy, architecture, park design, and storytelling along with appropriate criticism. We know of no existing software that explores American art forms together in the way we propose.

4. Minimum Start-Up—Development Plan for Multimedia Instructional Environment Linking Text, Painting, Music, and Dance

A. Technological Implementation

Sections 1 and 2 are immediate priorities to be accomplished this summer; Sections 3 through 7 will begin in September.

1. Text scan:
   a) *My Antonia*—238 pages/Eileen is scanning
2. Create card catalogue:

   (Since this is one of the primary organizational tools, this needs to be in place at the beginning so that other aspects of the instructional system can be created.)

   a) For 200 paintings
   b) Modify existing card catalogue to organize by subject headings
   c) Modify existing card catalogue to search/sort/merge
3. Build instructional environment
   a) Based on current capabilities of Hypermedia Navigator—see attached plan
4. Text scan
   a) Critical writings
      i. Spelling check and other corrections
5. Music: one/two examples put into instructional environment
6. Linking text to videodiscs of ballet/National Gallery
7. Modifying Notebook

B. Subject Matter Implementation

Beginning June 28, Warren and Jean will work together for two weeks. Warren will do two more weeks in July from July 12-30. Warren and Jean will work together one week in August, between Aug 2 and 13.

1. Detailed overall organization of p roject, including subject areas for paintings, thematic categories for assignments/Warren and Jean: 2-3 weeks during summer
2. *Photoshop* Enhancement of paintings/Jean: 3 days (Jean has already made slides of needed paintings: 1 week; Warren: 1/2 day)
3. Research and enter IDs for paintings/Jean and Warren 2 days
4. Analyses of two text passages and two paintings/Warren and Jean: 1 week
5. Development of Assignments Stack linked to text passages and paintings/Warren and Jean:1 week
6. Linking of additional paintings and passages—based on current capabilities of *Hypermedia Navigator*/Warren and Jean: 2 days

7. Research/selection of critical writings to be scanned:
   a) Passages from West as America/Jean and Warren:1-2 days
   b) Biographical and critical essays on Cather's life/Warren: 3 days
   c) Music criticism to complement one/two examples/Warren: 1-2 days
   d) Dance criticism: 1-2 days

C. Materials To Be Bought

These materials need to be found and acquired this summer—1 or 2 days.

1. Aaron Copland, "Theme for the Common Man"
2. Dvorak, "New World Symphony"; "Violin Concerto"
3. National Gallery of Art Videodisc—American Art/ca. $100
4. Video of "Rodeo"/American Ballet Theatre Production
5. Consensus Program/Paul Ryan

Project Implementation

1. *Educational Objectives*

Willa Cather's novel, *My Antonia,* provides a perfect occasion for the study of American culture. Written in 1918, *My Antonia* looks back at the period of immigration and expansion in the 1870s, and tells the life story of an immigrant farm girl from the point of view of Jim Burden. The railway brings Jim to Nebraska from Virginia when he is a young boy; again when he is a grown man, the railway is the vehicle which brings him back to the world of his youth, now a world that has been lost to him. *My Antonia* juxtaposes the world of the eastern seaboard, associated with values of both education and industrialism, and the almost purely agrarian, nonindustrial world of Nebraska. Seen in this way, Cather's novel develops and explores a central contradiction in American ideology, the conflicting claims of nature and progress which were present from the time of the Puritan invasion.

> When resources of such variety are made so fluidly available, the possibilities for stimulating genuine inquiry increase as a function of that accessibility. Educators cannot predict what idea or character, what historical setting or style of speech, what song or painting will capture a particular student's imagination, and initiate a process of study over which the student will have ownership. But now educators can create circumstances so enriched that each student's chances of experiencing that defining educational moment are immeasurably enhanced.

The various ways in which this contradiction is expressed in the lives of Americans as well as in pictorial art and music—as for example in the tension between "romanticism" and "realism"—provide the basis for the interdisciplinary study.

The study of nineteenth century painting and photography can focus on how these media represent pastoralism in conflict with industrial expansion. Paintings for the initial stages of the project might be divided into two groups. The pastoral tradition is represented by the American painter, Winslow Homer, and his adaptation of the

work of François Millet. Particularly suitable for study in connection with Cather are paintings by these artists representing a single figure or small group, working with scythes or pitchforks, and standing against a single background of sky and field. (Homer's paintings, "Farmer Wetting His Scythe," "Veteran in a New Field," or "Girl with Pitchfork" are particularly moving examples.) This kind of image is a recurrent one in *My Antonia.*

Hypermedia can provide the means of linking the Homer paintings to specific scenes in Cather's novel; the linking would then provide the means for the students to consider some crucial questions in the study of pictorial and verbal art. The study of the relation between Americans and the land allows a questioning of the values of pastoralism. The students will develop their skills in questioning by looking at: the character and situation of the protagonists; the role of place, not so much what it is but what it means, especially the moral values that are associated with it; and the interaction of protagonists and place (in literature), or people and place (in painting); and the way, in both paintings and novels, this interaction generates a story or narrative.

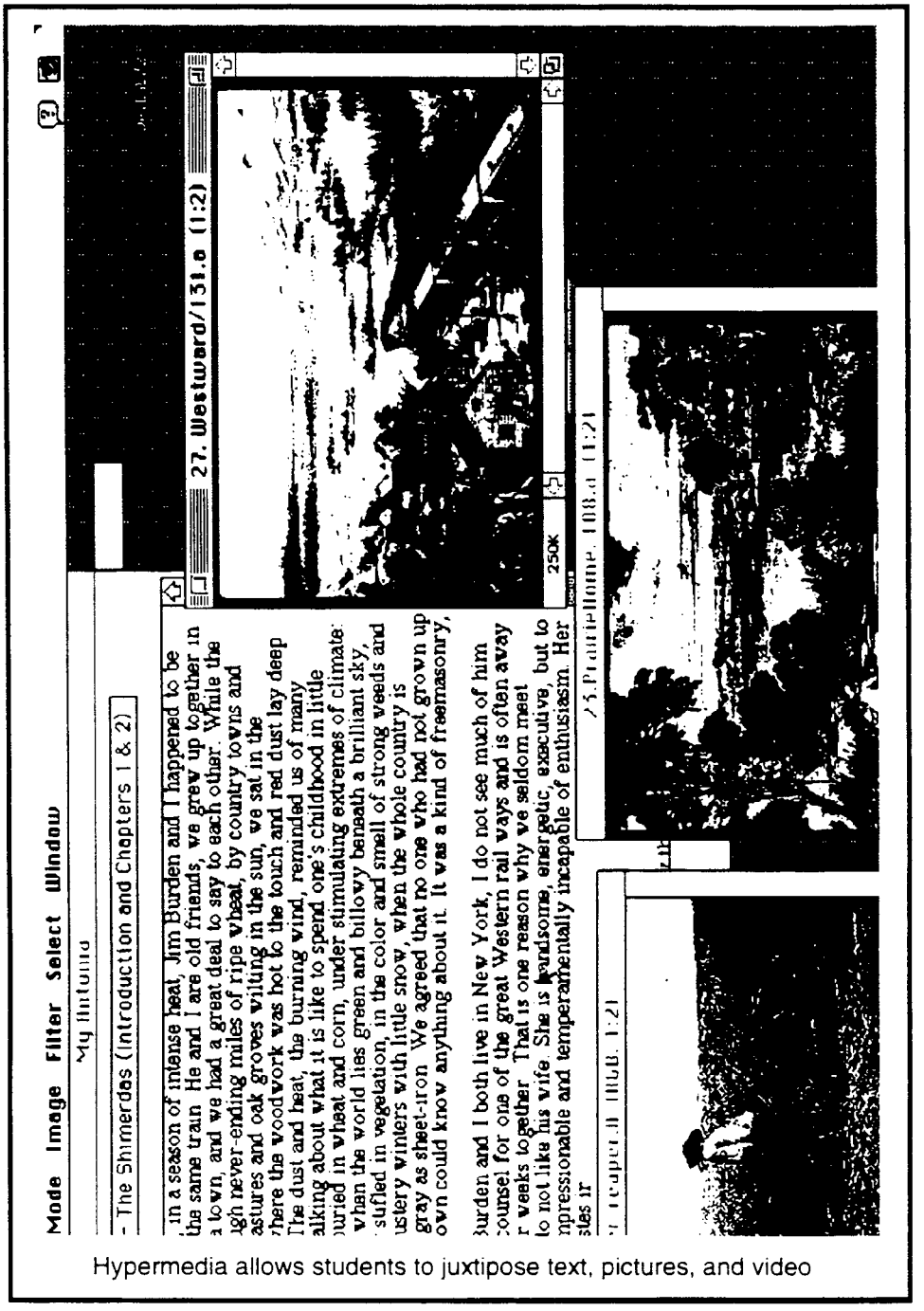
As with these pastoral paintings, there is a startlingly direct connection between Cather's novel and the second group of artworks in this projects: paintings and photographs representing the experience of expansion in the later nineteenth century. The railway, a dominant image in *My Antonia,* is also a major image in American painting during the period after 1845, when Manifest Destiny and expansionism extended the frontier—and the wilderness—westward. (Paintings such as Thomas Otter's "On the Road" and Andrew Melrose's "Westward the Star of Empire" are two vivid examples.) As with the paintings of Homer, the presence of the image of the railroad (and the idea of it) in Cather's novel makes it possible to use *Hypermedia Navigator* to make direct links between painting and novel. A work like "On the Road," which juxtaposes images of a wagon train and the railroad, provides a kind of icon for the tension between Humanity and the Machine that animates Cather's novel.

Just as *HyperMedia Navigator* can be used to make links between visual and verbal media, an important component of this project is commentary on the art and artists. The catalogue from the 1991 Smithsonian Exhibition, *The West as America: Images of the Frontier,* ed. by William H. Truettner, provides an invaluable source for a critique of the ideology of expansion. Similarly, commentary explaining the meaning of "romanticism" and "realism" in Winslow Homer's work and exploring how values are expressed in painting in terms of the use of light and color could help develop the students' skills in art criticism.

The ideas and questions raised by the issue of "What is American in the American experience?" also point to how all the arts in the United States developed in response to this question in the 20th century in the important collaborations that went on in the worlds of music and dance. Aaron Copland, Agnes de Mille, Leonard Bernstein, Lincoln Kirstein, Igor Stravinsky, George Balanchine and Martha Graham: the stunning collaborative work of these variously combined talents is a perfect paradigm for the idea of collaboration underlying hypermedia studies.

Agnes de Mille's ballet "Rodeo," to music by Aaron Copland, would be a good beginning for this aspect of a project in American culture. (Copland also wrote the music to "Billy the Kidd".) The dance and the music represent the western theme and raise questions about what is American. Copland himself is an important figure for this question. The possibility of linking his "Theme for the Common Man" to a painting by Homer and a scene in Cather's novel illustrates *HyperCard*'s potential for interdisciplinary study. Similarly, Dvorak's

"Violin Concerto" and his "New World Symphony" could be linked to commentary on his stay in America and musical criticism on his use of the American folk idiom; and then linked again to American landscape painting and a scene from Cather's novel. Having established this basis for the study of music and dance, it wouldthen be possible to move on to others, such as the collaboration between Stravinsky and Balanchine, two artists whose lives are exemplary in a special way, as representative of the experience of the immigrants who then went on to define and create America.



Hypermedia allows students to juxtipose text, pictures, and video

Finally, the themes of this project point directly to a concern that is currently part of our mandate as Daltonians: the environment. The conflict which animates and links all the materials in this proposal is a conflict between a pastoral view of life that asserts the superior moral integrity of those who live close to the land, as opposed to the typical citizens of a commercial, manufacturing, and urban society dedicated to expansion and progress.

2. Assessment of Student Work

Evaluation of the students' work can be roughly divided into two areas: the development of skills which will allow the writing of hypermedia essays, and the development of personal skills related to collaborative study.

The Hypermedia Essay

Students will develop the ability to construct essays which explore a more-or-less "three-dimensional" sense of the relation of the sources they use, rather than the currently more established mode of the written essay, which incorporates all sources in a more linear fashion. The creation of these hypermedia essays involves the development of particular skills which grow out of the computer technology, which can be used to enhance research, organization, writing and revision:

i. Use of the search/sort/merge feature in the notecards for organizing data and ideas that evolve in group discussion.
ii. Use of the linking tools, which will allow the students to explore new ways of organizing data and evidence, and make the various media a part of their explorations.

Evaluation of this area of endeavor will be accomplished by various means. Most importantly, we have found that some time needs to be spent with each student individually in the lab, where their familiarity with the resources and technology can be readily seen. It must be noted that this new form of "writing" will require the evolution of new forms of "evaluation," since the conventional modes of argument, which we are more familiar with and used to assessing, will of necessity evolve.

Development of Collaborative Skills

The "evaluation" of our humanity is of course a problematic issue, but collaborative work is a fundamental part of this endeavor. Our experience has shown that collaborative skills can be encouraged when we convey to the students that these skills are something to be valued. By working closely with the various groups, we can build the students' ability to work with each other at each step of the way.

Plan for Internal Evaluation

We intend to keep a daybook containing significant events and observations on the problems, developments, and successes of the project. Our final report will be based on these notations and the quality/level of completed participant work.

* * *

"Cante Jondo" Enhancement Proposal for Advanced Placement Spanish Literature: Sol B. Gaitan

The work of Spanish poet and playwright Federico Garcia Lorca presents a challenge to both teacher and student because it is embedded in one of the oldest European cultures, known today as the Andalusian.

Garcia Lorca's interest in the traditions brought into Spain by the gypsies, who entered south of the Iberian peninsula with the last immigration of North African moors in the 15th century, is reflected in his poetry and drama. Most of these traditions reached the 20th century through the "cante jondo".

"Cante jondo" is the result of the confluence of Byzantine liturgical chants that Andalusians had maintained since the 11th. century, with the music brought by the gypsies from their native India and which was enriched by their Arab experience.

> At Dalton, the English Department happens to be physically located next to the Language Department. That is perhaps coincidence. But it follows necessarily that what digital technologies can bring to the study of Shakespeare, they can bring as well to any literature—indeed, to any humanistic study whatsoever.

"Cante jondo" is a vital element in Lorca's work. His poetry is profoundly influenced by the rhythm and emotion of "cante jondo". One of his major collections of poetry is called *Poema del cante jondo* (1921). In this collection, Garcia Lorca takes the different types of songs that compound "cante jondo" and constructs poems that come near the essence of poetry and, more importantly, reflect the intimate character of the Andalusian people.

Garcia Lorca's work evokes the complexity of a group whose oral expression combines the antiquity of the Byzantine civilization and the "voice" of natural phenomena (bird songs, animal calls, sounds of water, wind, etc.) brought upon the primitive oriental songs.

In 1924 Garcia Lorca published another of his seminal works, *El romancero gitano*, an homage to his native Andalusia and its people.

Talking about "la siguiriya gitana" (a type of song that maintains in all its purity the qualities of primitive oriental songs) Garcia Lorca says that it is "the scream of generations bygone, elegy to centuries that have disappeared, pathetic evocation of love under other moons. The mystery of tones brings out the sob, sonorous tear over the river of the voice".

Considering such correlation between music and text, and the complexity of expression of that music, the possibilities that hypertextual links offer are extraordinary.

For Phase I of this proposal, my programming needs are minimal. All parts of this project can be developed with the existing software at Dalton (*Playbill*). An alternative to this could be George Landow's Hypertext, given the obvious connections between the nature of my project (as an enrichment or "enhancement" of the student's literary scholarship) and his work.

Phase I

Materials

The following is a list of the basic books needed for the development of the project prior to classroom use. Foreign book prices in New York, whenever the books can be found, are extremely high. I will do my best to get prices from Spanish publishing houses. As of this moment it is not easy for me to provide "real" book prices, but I will be pursuing this as soon as possible.

Books:

- Federico Garcia Lorca. *Obras completas.* Aguilar, Madrid.
  - ———*Poema del cante jondo.*
  - ———*Romancero gitano.*
  - ———*Autografos I. Facsimiles de ochenta y siete poemas y tres Prosas.* Prologo, transcr. y notas de Rafael Martinez Nadal. The Dolphin Book, Oxford.
  - ———*Poeta en Nueva York. Fotografias MasPons-Ubina.* Lumen, Barcelona.
  - ———*Antologia poetica.* (1918-1936). Sel. Rafael Alberti y Guillermo de Torre. Pleamar, Bs. As.
- ———*El Publico.* The Dolphin Book, Oxford.
- ———*Cartas, Postales, Poemas v dibujos.* Ed. Antonio
- Ana Maria Dali. *Salvador Dali visto por su hermana.* Juventud, Barcelona.
- Damaso Alonso. *Poetas espanoles contemporaneos.* Gredos, Madrid.
- A. Alvarez Miranda. *La metafora y el mito.* Taurus, Madrid.
- George Steiner. *The Death of Tragedy.* Knopf, NY
- Allen Josephs. *White Wall of Spain: The Mysteries of Andalusian Culture.* Iowa State Univ. Press. Antonina Rodrigo. *Margarita Xirgu y su teatro.* Planeta, Barcelona.
- Ildefonso Manuel Gil. *Federico Garcia Lorca: El escritor y la critica.* Taurus, Madrid.
- E. T. Kirby. *Ur-Drama: The Origins of Theater.* NYU Press.
- Rupert C. Allen. *Psyche and Symbol in the Theater of Garcia Lorca.* Univ. of New Mexico Press, Albuquerque, NM.
- Pablo Neruda. "Federico Garcia Lorca: Poema del cante jondo", *Obras completas.*
- Guillermo de Torre. *Triptico del sacrificio: Unamuno, Garcia Lorca,* Machado. Losada, Bs. As.
- William Carlos Williams "Federico Garcia Lorca", in Manuel Duran *Lorca, a Collection of Critical Essays.* Prentice Hall, NJ
- Eduardo Molina Fajardo: *Manuel de Falla y "el cante jondo".* Univ. de Granada, Granada.
- *Canciones espanolas antiguas. Recogidas y armonizadas por Federico Garcia Lorca.* Union Musical Espanola, Madrid.

- Edward F. Stanton: *The Tragic Myth: Lorca and Cante Jondo*. Univ. of Kentucky Press, Lexington, KY.

Xerox copies of articles from the following journals:

•*Hispania.*

•*Revista hispanica moderna.* NY

•*Insula.* Madrid.

•*Revista de Indias.* Bogota.

•*Trece de nieve.* Madrid (1976)

Slides, CDs, tapes and videotapes:

- 17 slides taken from drawings of Garcia Lorca.
- Videotape of TV Espanola on Garcia Lorca's life and works. (fragments)
- Videotape made in Granada by Bernice Laporta, TV Production professor at The William Paterson College of New Jersey. Prof. Laporta will be in Granada this summer and is very interested in this project. She has offered me to make a videotape of gypsies in Granada. (fragments)
- *Blood Wedding,* dir. by Carlos Saura. Based on Garcia Lorca's *Bodas de Sangre.* Choreographer Antonio Gades. (fragments)
- There are also an opera by Paul Bowles, *Yerma*, from Garcia Lorca's tragedy; and a ballet, *Las hermanas*, based on Garcia Lorca's*La casa de Bernarda Alba*, choreographedby Kenneth MacMillan and performed by the American Ballet Theatre in 1967. I will try to get a copy of them, if possible.
- I will use about 20 minutes extracted from the works mentioned above. Given the network space and technical needs involved in creating video links, I will try to get the Granada videotape pressed into a laser disk if Mrs. Laporta has the capability to do so. This way I may be able to include more material.
- I anticipate using about 3 hours of music including "cante jondo" performed by classic singers such as "La nina de los peines", "El chocolate", "Angelillo", etc.
- Also, music of great composers on which "cante jondo" had a direct influence, such as:
  - Debussy
  - Manuel de Falla
  - Albeniz
  - Granados
  - Rimsky-Korsakov
  - Glinka

Time for acquisition and deployment

- For acquisition of materials I will need one month.
- For scanning, according to my conversations with New Lab staff, it takes about 10 minutes per page of very clear text; and about 20 minutes per page of video image.

- Scanning (60 hours) includes:
  - 17 slides, most of them black and white ink drawings.
  - 20 minutes videotape (more time if using laser disk). (7 hours)
  - 21 pages of Garcia Lorca's letters.
  - 30 pages of interviews.
  - 19 pages of Garcia Lorca on nursery songs and lullabies.
  - 66 pages of Garcia Lorca on music and "cante jondo".
  - 23 pages of Garcia Lorca on poetry.
  - 89 poems (most of them one page or less).
  - Critical works will be mostly included as notes, and background information.

Space and scheduling

I will need a room with computers and a display monitor. The students must have access to the network in order to develop their part of this project. I expect it will take about two and a half months. Depending upon the New Lab's allocation of professional staff, my editorial needs, etc., I would like to implement "Cante jondo" in the classroom by mid-January 1993.

Phase II

Why?

Viewing Warren Johnson's *Bible* project and reading and attending George P. Landow's presentation at Dalton, I realized the extraordinary potential that computer links offer the teacher and the learner (and the teacher as a learner) of literature. Much has been said about the inspiration we as teachers receive from our students in the intimacy of the classroom. But when that inspiration can be stored, expanded, enriched, shared, and it will still be "intimate", the possibilities of learning are enormous. Warren Johnson's project brought to my mind provocative Borges' essays on the translations of the *Arabian Nights*. In fact, I thought of Borges as the perfect author to be studied through computer links. This led me to establish the Lorca works as the first of several projects I hope to complete for the Literature class.

Considering the time limitations of a Dalton student and the immediacy of the information to which young people are accustomed through media, I find a great value in the possibility of offering the student the opportunity to access and create massive amounts of information. This information, that in the past was the patrimony of the literary "initiated", becomes a possession of every student, literally "at one's finger tips".

> ...I plan to go to Granada to try to collect "cante jondo" from its only source, the gypsies living in the caves in the outskirts of the city.

What I find most exciting is that the student is not a passive receiver but a participant in the creation of the network. (S)he can create, add, change, enrich. And (s)he can do it

according to his/her inclinations and expertise.

Teaching Garcia Lorca's plays this year, especially his tragedies, has been a challenge in the sense that the students (on the eve of the 21st century) look for a rational explanation for everything. This tendency destroys the essential mystery that lays in the heart of tragedy and, in the case of Garcia Lorca, the true understanding of his works. If a student has access to the sources that make up the core of those works, he or she will have an easier time grasping the intangible, the vibration of the spirit that gave rise to Garcia Lorca's search.

Garcia Lorca's plays, especially his tragedies, have roots in "cante jondo" since it is the testimony of the antiquity of a race for whom the elements that make up classical tragedy are still alive.

Garcia Lorca's profound love and respect for the Andalusian people reflect his historic moment, when Spain was trying to find a collective destiny as an answer to the accumulation of facts that took her to her final defeat in 1898 (year of Lorca's birth).

The difference between Spain, especially Andalusia, and the rest of the Western world is the prevalence there, until today, of ancient forms of ritual (in the Dionysian sense), such as the bullfight. Conveying the real meaning of those rituals and helping the student understand that the old Mediterranean sensibility is still alive in the Andalusian mind is not an easy task. Hypertextual links from music, text, images, and other literary works open a vast realm of possibilities for the student.

How different students can profit from "Cante Jondo"

Garcia Lorca's multiplicity of talents combined with the technological capability of hypertextual links, offers the student opportunities to work on his/her personal interests. The student interested in history, for example, has an exciting world to explore, from the expulsion of the Moors and Jews which contributed to the "secret" way of life of the gypsies, to the Spanish Civil War and its prosecution of artists and intellectuals.

Garcia Lorca was an accomplished pianist and studied guitar with gypsy masters of his native Granada. With the support of Manuel de Falla, Lorca investigated and rescued old songs and melodies for which he wrote the scores in order to preserve them. He also found a decisive influence of "cante jondo" in the music of Glinka, Rimski-Korsakov, Debussy, and of course in Albeniz, Granados and Falla. There is also music in Algeria, Tunisia and Morocco called "music of the Moors of Granada".

This aspect of Lorca offers the student interested in music the possibility to investigate one of the oldest forms of music surviving in Europe to this day. Thanks to Lorca's transcriptions, those songs have survived. A comparative study between "cante jondo" and the music of Debussy, for instance, will enrich all of those who have access to this project. Since music language is universal, it could be used by other departments.

Garcia Lorca was a talented artist. His friendship with Dali and Bunuel, founders of the surrealistic movement, influenced his life, making him a complete artist. His work as

director of "La barraca", a traveling troupe of actors who performed masterpieces of the Spanish classics, created an intimate connection with the visual in a literary sense. He used his surrealistic drawings to illustrate poems and to create stage designs. Garcia Lorca's visual interpretation of his written works gives the students a chance to compare performances and adaptations of his works.

I foresee this project as being a prototype of additional literary projects in my Department. I also find it has great interdisciplinary potential.

From the technological point of view, it can use the armature of *Playbill.*

During the summer I would like to start selecting and scanning text and music. I would like to work from the end of the school year to the end of July, 4 or 5 weeks.

After this, I plan to go to Granada to try to collect "cante jondo" from its only source, the gypsies living in the caves in the outskirts of the city.

Resources, texts, and materials obtained during the research trip to Granada will be employed in the long-term development and application of this project.

* * *

Architecture Curriculum Development/Enhancement Proposal: Robert Meredith

I could have hardly predicted a year ago, when I first entered into conversations about this idea of a multimedia/architecture studio with Frank Moretti and Luyen Chou, that today we would have a facility that is unsurpassed by any high school and challenges many university facilities.

Overview

The use of computers this year has excited and energized my commitment to teaching while complicating and adding immensely to my workload at the school. By and large, I predict that this approach to learning will shape the pedagogy of the future at Dalton and elsewhere. I am encouraged by the level of dedication from the students and the high quality of work that has come out of the studio in this first experimental year. I am also personally proud of two of this year's senior students who will be matriculating into five-year architecture programs next year, partly due to their expanding knowledge and work with the new technology. I am honored to be a participant in this program.

I could have hardly predicted a year ago, when I first entered into conversations about this idea of a multimedia/architecture studio with Frank Moretti and Luyen Chou, that today we would have a facility that is unsurpassed by any high school and challenges many university facilities. We have moved swiftly, wisely in most cases, and with untethered enthusiasm. At this juncture I find it necessary to take what I have learned about this specific technology and find a way to evaluate what the students have learned and assess how to proceed from our present state. This requires a close investigation of our present modeling software (an excellent package for our students) and how to best couple it with other programs in order to further enhance the design work. This involves substantial research into a number of sophisticated programs already purchased by the school but as yet untested. When some of these packages are coupled with the basic modeling software, students will be able to render buildings with photo-realistic accuracy with specific materials, as well as provide a "walk-through" capability, replicating a journey through any envisioned building. The possibilities are thrilling to contemplate.

I wish to apply for curriculum development money to allow my research to continue during this summer and to help me apply that research to reshaping my existing curriculum for future classes. I am proposing to work at Dalton and at home on a steady basis during the last two weeks in June and during the month of July. I plan to refurbish some of my time-proven assignments but to expand them in ways that until now seemed impossible. I would also like to create two new long-range assignments for the advanced-level class which are more appropriately designed to educate individuals who use the technology. I know that the results will be rewarding.

I would also like to request that some New Lab money be used for the purchase of a magneto-optical drive and discs so that we can store and transport large files, something which is currently hard to do. The present Syquest drives are limited in size (44 MB) and have presented us with problems relating to architectural and presentation documents. A magneto-optical drive would allow students and faculty to take memory-intensive PICT images out to computer/photo dealers to have work printed with a high-quality printer. I would also like to use this drive to take images home for long-term renderings. Currently it can take up to 12 hours to render one architectural image using the best quality rendering option on form•Z, and I need the undisturbed time to set up and run these renderings. If there were a magneto-optical drive available, I could run these presentation images and transport them back and forth to school.

Specifics of the proposal

Phase I: Development prior to classroom use

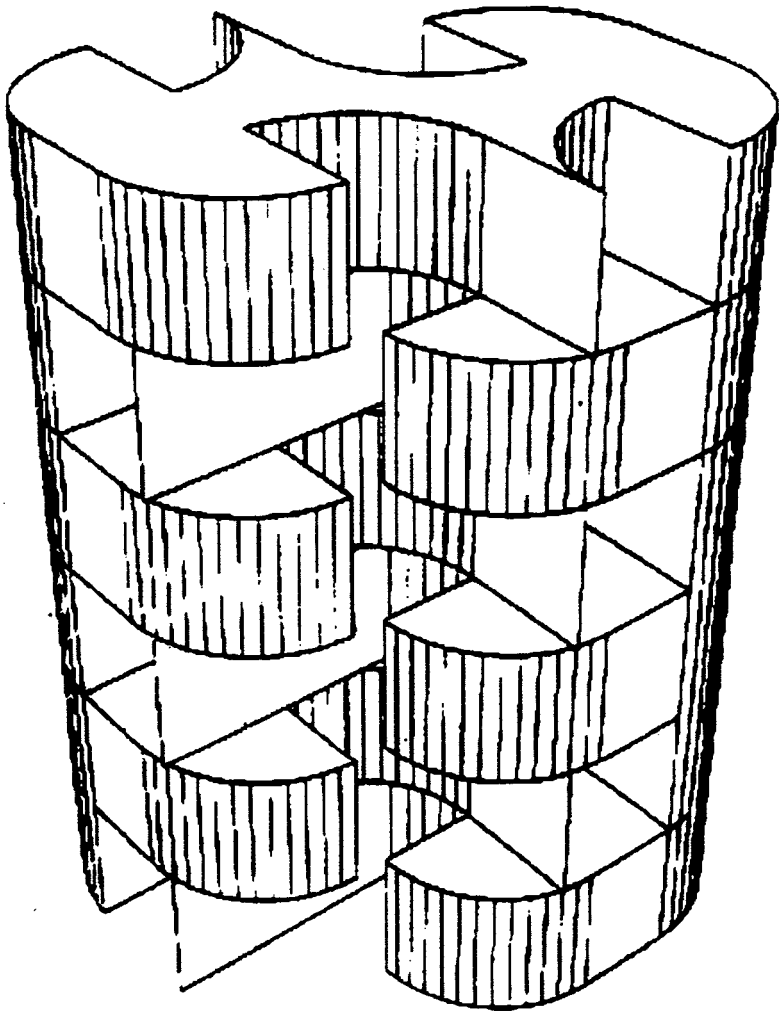
1. Hardware requests: To purchase one magneto-optical drive (128 MB storage)
2. Software requests: none at this time

The school has all the software available that I wish to explore. Some of it still needs to be installed on the network and placed in working condition. The programs I would like to spend time learning are *Stratavision*, for three dimensional rendering, and *Macromind Director* for rendering and animation. This will allow students to take the basic designs from the form•Z framework and add to the visual articulation of the final product.

I would also like to become better aquainted with *Photoshop*, *Persuasion*, and *Virtus WalkThrough*. These software packages have allowed students to shape their individual projects into a professional presentation format. Up to this time we have only used these on a limited basis. But as the scope of the computer-generated projects grows, it will be increasingly more important to place work into a presentation framework. Knowledge of these projects will make a big difference in the final results and the way viewers understand the work done by students.

I would like to have all the software accessible and placed on the network by the end of the academic year. I will be working the last two weeks in June and the first three weeks in July (both at school and at home). These programs have direct application to the work that we will be doing in architecture next year, but I have not had any extra time to explore their potential during this overly busy year.

There will not be any need for additional space, scheduling or facilities outside of the current structure established for the present architecture curriculum.



An example of the Modular System Assignment for Beginning Architecture

Phase II: Implementation in the classroom

I wish to build and alter a number of assignments for next year. Currently, I am working on expanding a community design project whereby I will be dividing the advanced class into small work teams and introducing them to a site upstate where they will need to develop and build a model community for a fixed number of residents. I would like to generate a number of computer models of the existing terrain and have the students generate ideal residential, commercial, civic, transportation, and recreation areas. I propose to work with an outside architectural firm, which has already shown interest in the project, and Jean Gardner, who will focus on the environmental issues. I have given this assignment before in a simplified version, but the computer will enhance design ideas, abilities, and results. By introducing the assignment with a computer-generated model of the site and its terrain, students will for the first time be able to "see" the land, and respond to it in a direct way.

By strengthening the assignments, and building on software knowledge that students learned this year, individuals will be able to produce near professional results with a new focus on the final presentation format. Students will be able to branch out from projects using the form•Z software to include more sophisticated renderings, animated walk-through, and final sequential presentation displays of their work.

I plan to begin the Advanced Architecture class with an assignment related to creating a personal museum for three artworks. The development of this assignment should take three months (September through November). Students will then take the month of December to render final presentations of the nature described above. For the second semester, students will work on the community design project which will again follow a design phase, as well as a final presentation format.

* * *

Conclusion—Intersection and Convergence in a New Educational Culture

Two common threads are woven through the tapestry of diverse accomplishments, aspirations, and concerns expressed in the faculty reports and proposals to the New Laboratory. First: the pressure on resources of technology, space, time, and technical expertise has mounted inexorably as interest and activity have increased. Second: strategies, tools, and databases for teaching in the new environment are beginning to overlap significantly.

If the supply of resources available to the Dalton Technology Plan cannot rise to meet the demand, then a phase of consolidation is inevitably upon us. The New Laboratory must take advantage of the overlap just noted to relieve as much pressure as possible, to ensure that this burgeoning educational culture can sustain the creative energies it fostered and informed.

One area of response, already mentioned, has to do with what we have called "deployment." Issues of deployment range from how what kinds of tables and chairs should be arranged in what kinds of spaces for what age groups and subjects; to how networked rooms, time-slots, and teachers can best be cross-correlated; to more radical possibilities of rescheduling, such as those undertaken systematically in the Middle School and improvisationally in *Project Galileo* and *New York in the Civil War*. These issues have little to do with technological or pedagogical innovation, and possible responses are sharply limited by built-in structural factors as stubborn as gravity, but what slack there might be must be found.

A second area of response offers more opportunity because it does involve innovative use of the new technologies—and is therefore more open to qualitatively transforming initiatives. This area is not so much physical, or even topical, as it is informational and conceptual. It is, to begin with, the digital space, the electronic universe hovering in the ether behind the computer's screen. It is also the way that universe is organized and accessed, the structures and procedures that determine what in that universe will be, at any given time, displayed on the screen—and how. Finally, this area does have a physical aspect: the screens and chips and keyboards and servers and CD-ROM drives and printers and cables and so on. These artifacts live in the shadow of perpetual obsolescence, almost as ephemeral as bytes. But they will not be denied, no matter how tiny or replaceable; meaning still needs a body.

The reports to follow are by staff of the New Laboratory with particular responsibilities in the area just outlined. Maintaining distinctions of this type is notoriously difficult—after all, the overriding issue is overlap, intersection, and convergence—but for purposes of introductory exposition, we can present the matter this way. The universe of information is the special focus of the Multimedia Library, problems of organization and access are to be addressed by a Navigator, and the whole system must be arranged and maintained on the network.

* * *

The Multimedia Library: Thomas de Zengotita, Robert McClintock

> *When people speak about interactive, multimedia systems, they are speaking about a process by which the full gamut of human expression will integrate into one complex system, with all components, regardless of form, being generally, efficiently, and enduringly accessible.*—Robert McClintock, p.121, NLTL First Annual Report.

Because the concept of the Multimedia Library is so inclusive and expansive, our attempt to realize it in practice, and from the ground up, must call upon a broad constituency within the school from the very beginning. Membership on the Multimedia Library Steering Committee (MML-SC), charged with starting that process, is accordingly both large and porous. As of the end of the last academic year, members included:

Evaluation Subcommittee Members

High School: Marilyn Moss, Warren Johnson, Adam Seidman

Middle School: Audrey Zucker, Peter Khouri, Toby Sanders

First Program: Karen Bass, Susan Seitner, Cynthia Millman

Faculty Attendees

Joseph Akus, David Diggs, Carol Farber, Mary Feldtmose, Cameron Hendershot, Daniel Kramarsky, Robert Meredith, E. Jay Sims, Michele Viard-Andre

Other New Lab Staff

Thomas de Zengotita, Robert McClintock, Robert Matsuoka, Lou Miele

A general invitation was also extended to all departments in the three Divisions to send representatives on an occasional basis, and to contribute to the evaluation of materials, where appropriate.

As for the substance of the issues to be faced by such a committee, the only general observation one could justifiably make would be this: when the concept of the Multimedia Library meets the exigencies of practice, all the opportunities and dangers provided by the new media in an educational setting are simultaneously engaged. From the classic issue of "it's neat to have all this stuff but what do we do with it?" to completely unexpected issues of setting behavioral standards in digitized public spaces; every contingency seemed to present itself in relation to any particular decision. Here are some examples of the issues with which the committee dealt and the principles, criteria, and decisions that emerged:

Internet

Professor McClintock provided dial-out capacities to Internet for those on the Committee who signed up to experiment with it. Robert Matsuoka gave members a tour of this enormously powerful resource, a resource that provides users with access to workstations all over the world: to libraries, museums, universities, government agencies, and to "bulletin boards," public colloquia of user groups with special interests in just about anything one can think of, unfortunately including entirely inappropriate topics—ergo, an issue of access, a whole new species of disciplinary and supervisory problem.

On a more predictable note we found that, to those members of the committee without technical backgrounds, the Internet interface seemed forbidding and the imprecision of the search protocols frustrating. What makes a complex digital environment exciting and challenging to the regular user can be inhibiting, even frightening, to the novice (some people like to wander around in the woods; others don't). The general issue here, repeated in somewhat different terms across the whole transforming culture of information, is this: how do we create an environment which will be nurturing enough to interest and reward beginners and at the same time powerful and progressive enough to engage the best creative energies of more experienced users? On our committee, as in other venues, there was an inevitable tendency for experienced users to warn against "spoiling" the technically inept and for the technically inept to warn against alienating everyone but the already competent. Another issue, then: How, and how hard, can institutions in transition push people to adapt? Within a decade or two, computer competency will presumably be taken for granted—like reading and writing today—but, until then....

Cameron Hendershot agreed to do some research over the summer into patterns of use (and regulation of use) on Internet in other institutions. He will be reporting back to us at our first meeting in the Fall.

CD-ROMs:

We set a goal for each evaluating subcommittee of a minimum of 5 CD-ROMs a month. That meant they had to be acquired and reviewed by appropriate parties in that time period. That is no mean feat, and why? Again, there is so much out there, so much that no one can really tell you beforehand what you are getting— including the vendors. A single CD-ROM can contain 650 MBs worth of information, more than all the volumes of an encyclopedia. There is only one way to know if a given CD-ROM has real educational value in a particular setting—first, guesswork and then hard work. What follows is a list of the criteria that were developed over the course of the Spring semester, and are now stored on the network as an expandable *HyperCard* stack, a permanent record of the MML evaluation process.

Pedagogical

1. Age appropriateness
2. Is there a rationale for the collection? Are there identifiable educational reasons for it and, if so, what are they?

3. Intellectual quality of primary materials. Are they well chosen, if not according to a rationale, then at least with respect to inherent value?
4. Do secondary resources—commentary, analysis—meet scholarly standards? Are they reliable, informed, up-to-date?

Notice that criteria 2 and 4 must be balanced against 3. A CD might have poor commentary or no rationale, but the content might be extremely valuable and we might filter out the commentary, provide a curricular rationale, etc.

Technical

5. Ease of installation in the case of a CD not intended for network use; and is it networkable at all, or easily?
6. Downloading (also legal)
7. Printing (also legal)

Financial and Legal

8. Cost: for network use vs. single user

Interface

9. Ease of access, clarity of directions and format. Can you understand what you are looking at and what you can do with it? How does this interface compare with others already in regular use?
10. Search capacities and orientation. What *can* you do with it, and can you keep track of what you are doing? Are links provided? Can they be followed? Can links be created? And, if yes, how transparently?
11. Quality of graphics, text, etc.

Criteria 9 and 10 are vitally important; 11 is more an aesthetic than educational issue.

The Role of the Librarian

There can be no question that the Multimedia Library will take root in the culture of the school as an extension and enhancement of services the Library has always provided. The coordinate roles of the librarians, technology coordinators, and faculty on the evaluation subcommittees embody that necessity. We decided to work towards a system in which all the multimedia resources at the 89th St. facility which are not actually on the network will be catalogued, stored, and made available for use in local drives in the libraries on the tenth floor. The Committee also decided that our short-term problem was not so much what to put on the network or alongside the workstations, but rather to ensure that the entire Dalton community explores the resources we already have.

At the beginning of the Fall semester, Marilyn Moss will post an announcement in the library concerning the availability of CDs—in terms of the distinction between those on the network and those catalogued. She will also be announcing (with the technology coordinator's support) this policy at the next High School meeting—as will Audrey Zucker for the Middle School. She will also solicit community service credit for expert student help in accessing

CD-ROMs, and set up a sign-out system for catalogued CDs so we can identify steady and skilled users and monitor what gets used. That iterative process of reflection and adaptation will be essential to success as more and more resources become available through more and more powerful tools.

* * *

The Network Navigator: Lou Miele, Associate Professor of Interdisciplinary Studies, New York University

The Dalton network has collected and developed a veritable sea of source information — six *gigabytes* at the last reckoning — and the pace of its growth is accelerating. As the network backbone is continually expanded and extended, the sheer volume of user access to this material will grow exponentially. Both the conventional wisdom of network building and the experience of Dalton staff, students, and consultants suggest that a mechanism be developed for "navigating" the system. The requirements for the Navigator must, however, go beyond industry conventions and reflect the actual circumstances of the Dalton educational philosophy and practice.

Since Dalton students are accustomed to accessing the network for a wide array of services, and also to using the traditional library resources, this catalog dimension must be consistent with the library's actual card files. This is only one of several areas in which close collaboration between organizers of digitized and text-based resources is essential to developmental success.

The following discussion will consider the objectives of a Navigator for the Dalton environment and suggest a model for the implementation.

Objectives

1. *Cataloging the network*

The first and most obvious requirement for a Navigator is to catalog and reference the mass of network material. At the least, such a mechanism would provide the interested user with a service which will parallel that of a library card system, an avenue for browsing and locating multimedia files. Since Dalton students are accustomed to accessing the network for a wide array of services, and also to using the traditional library resources, this catalog dimension must be consistent with the library's actual card files. This is only one of several areas in which close collaboration between organizers of digitized and text-based resources is essential to developmental success.

2. *Extending the flexibility of existing curricula*

At present, the various curricula developed within Dalton for use on the network—*Archaeotype*, for example—are programmed with an explicit map of the network artifacts that they reference. Each program relieves the user of the responsibility of having to locate a picture of, let us say, the Aphrodite of Melos. These curricula, however, represent an exceptionally narrow and restricted view of the data on the network. As currently configured, they assume (1) that the artifacts will necessarily reside at given network addresses, (2) that no *other* artifacts will ever need to be accessed in this (curricular) context, and (3) that no one would ever need to access a given artifact from *outside* the curriculum.

The Navigator would provide a range of network services that share the educational assumptions of the curricula.

The Navigator would extend to each homegrown curriculum the portability generally associated with commercial software. The practical objective would be to have each curriculum call the Navigator to learn the location of an artifact. Since the "address" of each object would be stored in the Navigator's internal database, the curriculum would not have to be preprogrammed with a map of its particular setting. Moving a curriculum to another site or indeed changing the location of artifacts on this site (let us say, for the purpose of rationalizing disk space) would be *transparent* to the curriculum.

As of now, each curriculum "sees" only those objects which it is programmed to see. The Navigator would allow the possibility of having a curriculum reference a *class* of artifacts — a "collection" of Greek statuary, for instance—which could grow dynamically. Over the course of time, additional artifacts could be inserted into the Navigator's internal database and coded as belonging to the "collection" in question. The curriculum would immediately and without a change in its programming be able to access this expanded set.

3. *Turning the network into an extended, interactive curriculum*

The remarkable success of the curricula developed on the Dalton network is in large part due to the fact that while the source material is not prepackaged—it does not have the usual textbook-enforced contextual framework—it is also not chaotic. Each curriculum presents an open field for self-directed learning but places the educational enterprise entirely within a larger, guided context of meaning. *Once students have returned to the network, however, the services and friendly context provided by the curriculum no longer exist.* They no longer are in an environment in which sources may be browsed at whim, in which linkages among the sources are apparent, and in which they themselves may create new linkages.

The Navigator would provide a range of network services that share the educational assumptions of the curricula. Students could search, browse, write and share comments, and link objects (that is, create collections of artifacts) in ways that are already familiar. The line between curriculum and open network would blur.

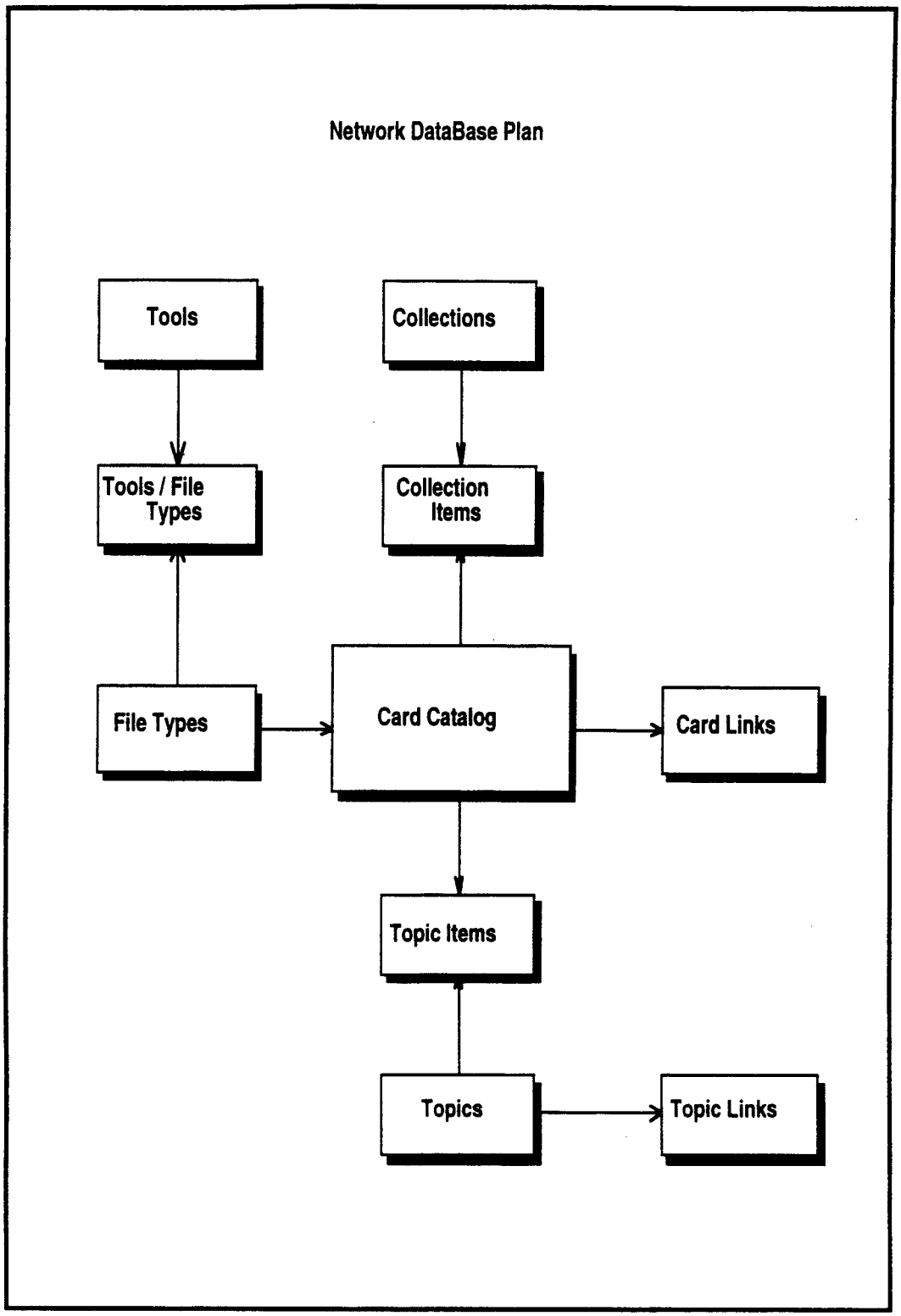
4. *Providing students with a familiar interface*

The existing Dalton-generated curricula are created in the *HyperCard* environment and have, in consequence, a similar "look and feel" and a similar range of functionality. By simply extending that model, the Navigator would be as easy to master as a host network environment.

Suggested Model

Navigator Database

The storage of artifacts (documents, graphics, films, etc.) on the network must remain unstructured—that is, they should not be stored *within* a database. Rather a structured database should be created to *map* the network and to retain the data needed to support the various Navigator functions.


Network DataBase Plan
Tools
Collections
Tools / File Types
Collection Items
File Types
Card Catalog
Card Links
Topic Items
Topics
Topic Links

The network at the Dalton School is really central to all of our projects. The idea is to create an environment in which there is this ubiquity of access to the resources that we're developing, and so stand-alone workstations won't do the trick, and you really need a kid at the moment when an idea comes into her mind to be able to access those resources, wherever she happens to be. With tools like remote access, we'll be able to extend that experience to places that are offsite.—Luyen Chou, Apple's *Imagine.*

The database, a minimal model for which is detailed at the end of this section (see Network Database Plan and Navigator Table Layouts), should be written in the industry standard Structured Query Language (SQL), using a product that supports "client-server" network technology. A prototype is currently being developed with Oracle.

When it is fully developed, the database model will contain an expanded card catalog structure that is consistent with that of the Library of Congress (not yet reflected in the included model). This would allow the database to support the Dalton library's card catalog and open the possibility, at some later date, of electronically loading standardized library card references. The model proposed at this time, however, has a much smaller scale and is based on the following core structure:

- A *card catalog* table that would contain a series of descriptive and standardized code fields. Users would be able to search for sources that are coded as, for example, "picture format" and that have the word "Renaissance" in their description.
- A *collection* table that would designate various user-and school generated virtual groupings of sources. This data structure would support a teacher's designating a group of 20 picture files out on the network as "Flemish Portraits". Each artifact could be included in several collections and each collection could be dynamically expanded or contracted.
- A *topics* table would allow a network "librarian" (one of the Navigator's executive functions) to dynamically build a topic or subject hierarchy and classify each object within as many of the topics as desired.
- A *tools* table would maintain references for the many programs, commercial and otherwise, that may be used to access files of particular types. For instance, a scanned photograph may be viewed or manipulated using any of several commercial products. The database would show the user the optional "tools".

Navigator Functions

- Executing Searches

  The Navigator would support a variety of search techniques:

  1. Key word or phrase searches of the card catalog text fields (e.g., "Mona")
  2. Code searches of the card catalog (e.g., file type = "Picture")
  3. Subject/topic searches (e.g., everything under the "Civil War")
  4. Collection searches (e.g., everything grouped in a student-created "pictures of weapons of the Civil War collection)"

- Cataloging Artifacts

The network is constantly having objects added to it by students, faculty, and staff. Every user would be able to create a card catalog reference for an object. Before the entry was made permanent, it would be reviewed by a "librarian".

- Creating Collections

  Any user would be able to create a "collection" and designate objects that were to be included. A student might be interested in creating a group of references for a term paper project. The collection would initially be private and temporary (so as not to clutter the network). To make the collection permanent or public, a user designated with a librarian clearance would have to "approve" it.

- Creating Topics

  The topics or subject hierarchy is conceptually very similar to that of a collection. The essential difference is that while collections have an informal and ad hoc dimension, the topics hierarchy is to be viewed as a more formal, conceptual entity. For this reason, the mechanism for changing the topics index would require a formal request submitted to the Navigator librarian.

- The Librarian

  The Navigator librarian role would essentially be that of a supervisor. It would oversee card catalog entries, the maintenance of collections, and the structure of the topics index. Since other users—students, faculty, etc.—would do most of the work involved in creating network database entries, the librarian function could be largely limited to review and approval.

HyperCard Interface

The programs that constitute the Navigator's user interface or "front end" should be written in the language used by the existing Dalton-generated curricula—*HyperCard*. Beyond the issue of look and feel, *HyperCard*'s facilities for dynamically "linking" objects allow for quick and inexpensive software development. To code the Navigator in another language would tax the resources of the project.

Design Protocols

The development of new curricula at Dalton will take the Navigator into account. For this reason, the Navigator will include a series of design protocols that may be used by programmers who wish to utilize the Navigator's services (looking up network addresses, browsing collections, etc.).

Programming Library

A library of standardized programming functions will be developed for inclusion in any software designed for use on the Dalton network (that is, on any network utilizing the services of the Navigator).

Ideally, the Navigator's programs and database — as well as the Dalton curricula — will be designed and implemented in such a way that they could be readily ported to other venues.

Navigator Table Layouts

Card Catalogue

Field	*Data Type*	*Length*	*Index*
Card ID	Integer	Sequential Counter	Index
Path	Text	255	
Leaf	Text	32	
Title	Text	80	Index
Description	Text	255	Index
Type Code	Text	5	Index
Creator ID	Text	30	
Creation Date	Date		
Source	Text	80	
Source Description	Text	80	
Location Code	Text	5	Index
Location Desc.	Text	80	
Group Access Code	Text	5	Index
Security Level	Text	5	Index
Collection Status	Text	5	Index
Librarian ID	Text	30	

Card Links

Field	*Data Type*	*Length*	*Index*
Parent Card ID	Integer		Index
Child Card ID	Integer		Index
Parent Bookmark	Text	50	
Child Bookmark	Text	50	
Date	Date		
Comment	Text	255	

Collections

Field	*Data Type*	*Length*	*Index*
Collection ID	Integer	Sequential Counter	Index
Collection Name	Text	30	Index
Description	Text	255	Index
Creator ID	Text	30	
Creation Date	Date		
Type Code	Text	5	
Security Level	Text	5	

Collection Items

Field	*Data Type*	*Length*	*Index*
Collection ID	Integer		Index
Card ID	Integer		Index
Creation Date	Date		

Topics

Field	*Data Type*	*Length*	*Index*
Topic ID	Integer	Sequential Counter	Index
Topic	Text	80	Index
Description	Text	255	Index
Creator ID	Text	30	
Creation Date	Date		

Topic Items

Field	*Data Type*	*Length*	*Index*
Topic ID	Integer		Index
Card ID	Integer		Index
Creation Date	Date		

Topic Links

Field	*Data Type*	*Length*	*Index*
Parent Topic ID	Integer		Index
Child Topic ID	Integer		Index
Creator ID	Text	30	
Creation Date	Date		

File Types

Field	*Data Type*	*Length*	*Index*
File Type ID	Text	5	Index
Description	Text	50	Index

Tools

Field	*Data Type*	*Length*	*Index*
Tool ID	Text	5	Index
Description	Integer	50	Index
Vendor	Text	50	
Version	Text		

Tools / File Types

Field	*Data Type*	*Length*	*Index*
File Type ID	Text	5	Index
Tool ID	Text	5	Index

* * *

Growth and Consolidation—NLTL/Dalton Technological Infrastructure:

Robert Matsuoka

1. Introduction

In its second year, the Dalton Technology Plan has seen a dramatic increase in the scope and capability of its technological infrastructure. From a handful of black-and-white computers, the project has grown to a metropolitan-area network connecting nearly two hundred high-performance Macintosh™ II, DOS™/Windows™, OS/2™, and Unix workstations. These machines share common resources of over 20 gigabytes of file storage, sitewide electronic mail, and a large pool of commercial software in addition to the programs developed by the New Laboratory for Teaching and Learning.

2. The Year in Review

The Dalton/NLTL network began its first year of full-time operation last year. The system consisted of 4 16-Mbps token-ring and 1 localtalk networks routed by a primary file server, "Helen", and a secondary file server, "Parky". About 100 Macintosh Quadra, IIci, IIsi, SE/30 and 486 DOS/Windows machines were connected to the network. Peripherals included a number of flat-bed scanners, video digitizers, CD-ROM drives, SyQuest 44-megabyte removable hard drive systems, and laser and inkjet printers.

The network provided a wide range of services including electronic mail, limited E-mail and remote access capabilities, file serving, high performance printers, a plotter, and shared CD-ROMs. Over 950 students and faculty signed up for network accounts, giving them access to roughly 8 gigabytes of file storage space, hundreds of applications, and many megabytes of multimedia computer productions and data files. In addition, a new space, dubbed the Multimedia Art and Architecture Lab was added to the 11th floor, virtually doubling the amount of space available where students could use these tools.

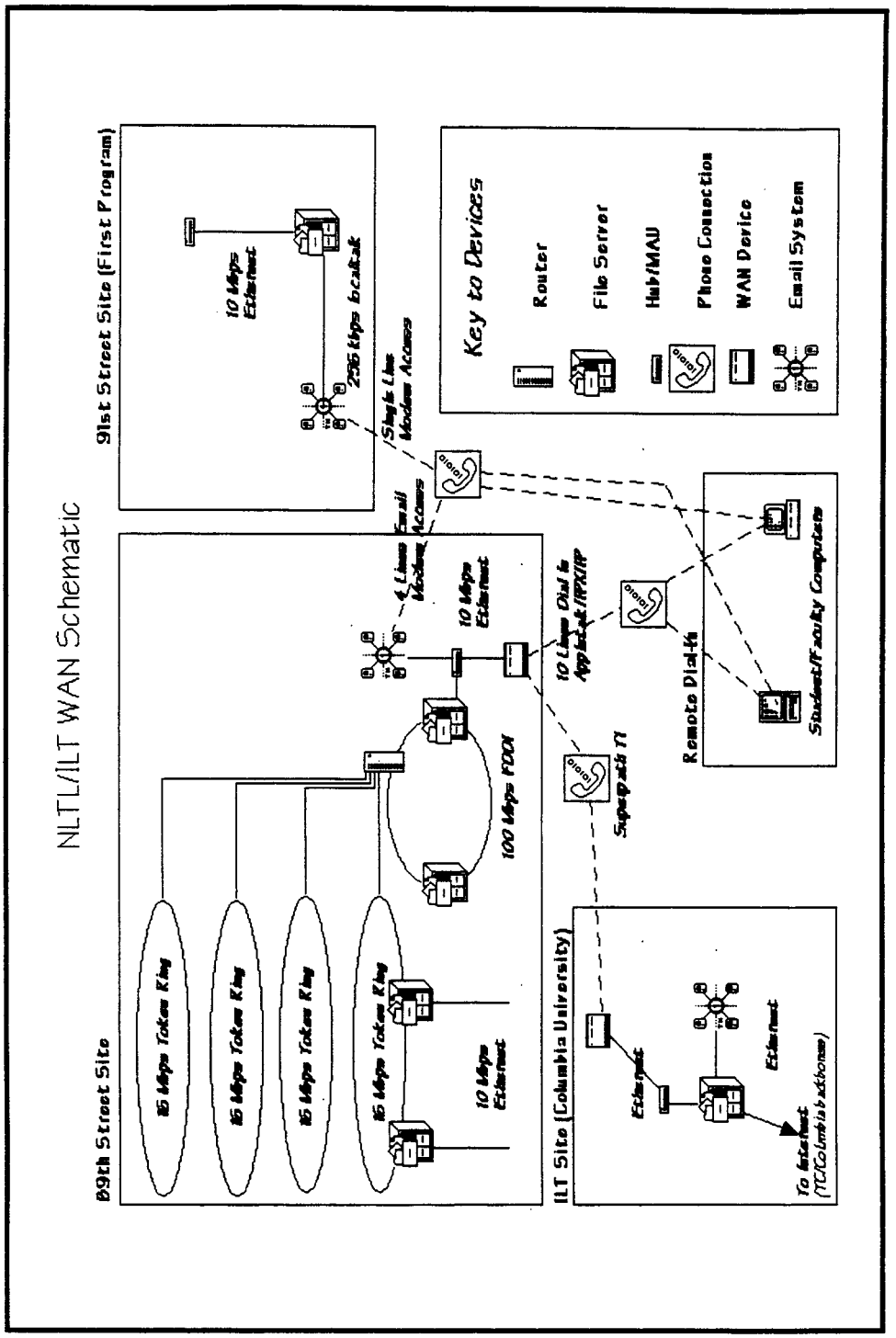
Since the start of regular service, the network has operated on a 24-hour/day 7-day/week schedule. In approximately 2,500 hours of service during school hours, the network suffered approximately a dozen serious disruptions, interrupting service for less than 6 hours, about 0.24% total downtime. This represents a 99.76% operation rate.

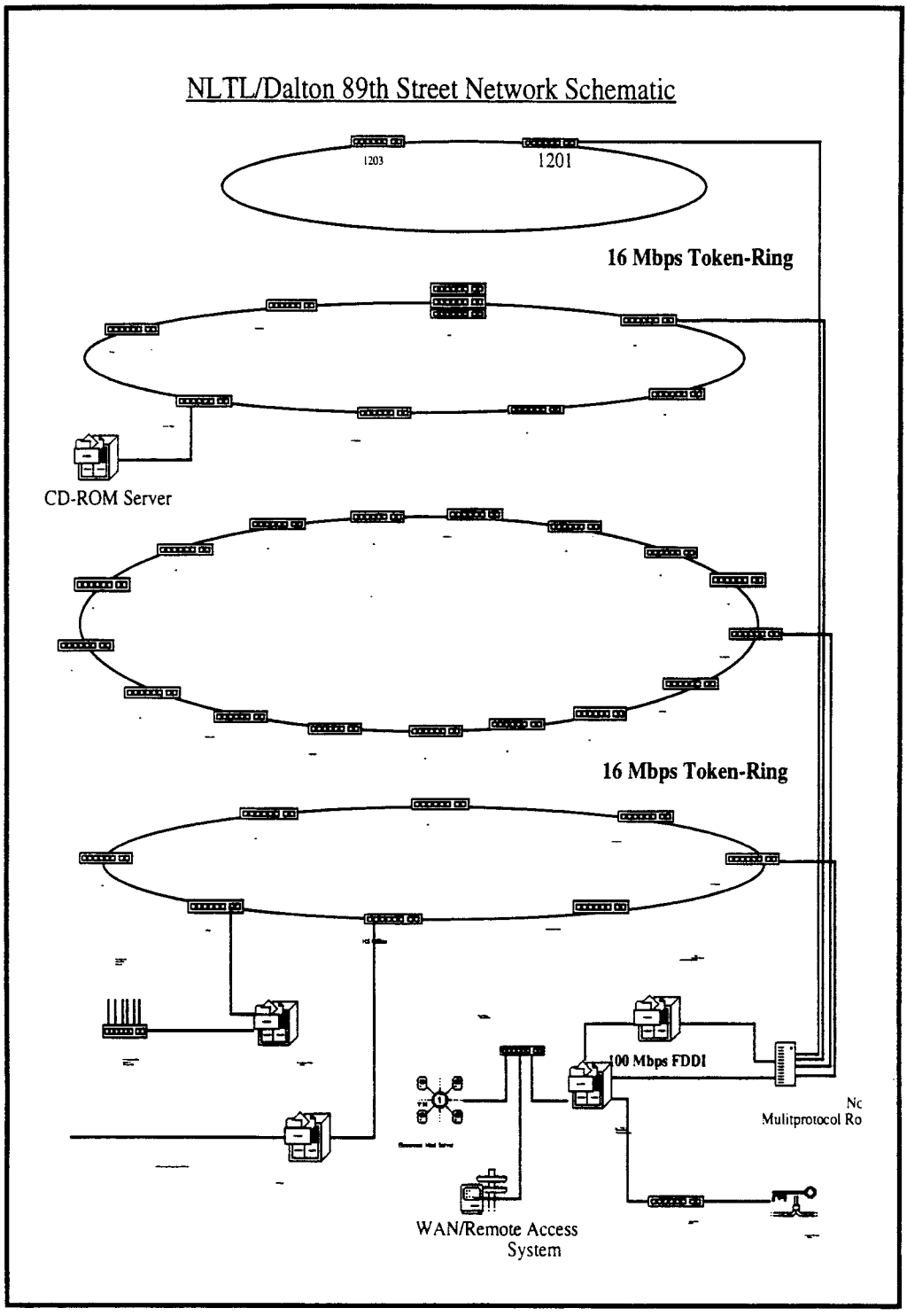
3. The Coming Year

Introduction

Despite the success of our first year, continued expansion of the programs supported by the Dalton Technology Plan has necessitated that we continue to expand and further stabilize the infrastructure supporting these programs. We will attempt to meet these needs through the following activities:

- Investing in a "superserver" for primary storage
- Increasing the amount of storage space available
- Providing a corresponding increase in back-up capability


NLTL/ILT WAN Schematic
89th Street Site
91st Street Site (First Program)
ILT Site (Columbia University)
Remote Dial-In
Student/Faculty Computers
Key to Devices
Router
File Server
Hub/MAU
Phone Connection
WAN Device
Email System
16 Mbps Token Ring
10 Mbps Ethernet
100 Mbps FDDI
256 kbps leased
Single Line Modem Access
Ethernet


NLTL/Dalton 89th Street Network Schematic
1203
1201
16 Mbps Token-Ring
CD-ROM Server
16 Mbps Token-Ring
100 Mbps FDDI
Nc
Mulitprotocol Ro
WAN/Remote Access
System

- Increasing the robustness of the network topology
- Greatly increasing the scope of dial-in and WAN (wide-area network) services
- Providing CD-ROM pressing services for portfolio creation and archiving
- Providing electronic mail for the bulk of the school community
- Adding additional high performance workstations, digitizers, and printers
- Adding Internet connectivity to the network and E-mail system
- Networking the computer lab at the First Program.

Adding a Superserver

The main limitation in network performance at the 89th street facility this year was the limited hard drive access speed of the primary file server, 'Helen'. To address this limitation, we have purchased a Tricord™ Superserver. This machine uses a dedicated high performance disk channel to increase access time to hard drives. In combination with the 12 gigabytes of storage we are purchasing for it, this superserver will support the various ongoing multimedia computer projects and the increased loads due to the expanding base of networked workstations.

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The planned purchase of a CD-ROM pressing unit will allow us to create portfolios of student work on the computer as well as a permanent set of archives of work done throughout the year. This is an important part of our strategy to provide a comprehensive solution to the organization of the tremendous amount of information created and collected by faculty and students.

After experimenting with a number of electronic mail packages this past year, Dalton will this year become one of the first secondary schools in the world to make E-mail generally available to all faculty and students.

Network Topology

As a means of further increasing the stability of the network, we will offload routing services from the primary server this year. Instead of having one machine do both file serving and routing, we will have the Tricord provide the bulk of file serving capability and use an IBM PS/2 model 95 (with a 486 dx2 upgrade) running Novell's *Multiprotocol Router* software as a router. This will not only reduce processing requirements of the file server, increasing its efficiency but in case of a file server crash, other network services (such as electronic mail, scheduling, and software metering) can proceed uninterrupted. Both the

superserver and the secondary server will sit on a separate 100 Mbps FDDI ring. The FDDI medium can pass data at up to 100 Mbps and was chosen to maximize data throughput between the servers and router. 32-bit busmastering, intelligent token-ring network interface cards will also be used in the router to maximize inter-network throughput.

A number of rooms have been added to the network this year, including a new computer lab space on the ninth floor, two rooms on the eighth floor, a room on the sixth floor, a room on the third floor, and a new server room on the first floor. The new Dalton Communications Center will house the superserver, secondary server, router, WAN and dial-in unit, back-up system, and servers for electronic mail, scheduling, and software metering.

This year, the high school/counseling network will be routed to the main academic network through use of a Novell server which will house administrative programs used by the High School. The development/admissions network will also be routed to the academic network via their Novell server. This will allow staff members from both groups to share the electronic mail system.

Sitewide E-mail

After experimenting with a number of electronic mail packages this past year, Dalton will this year become one of the first secondary schools in the world to make e-mail generally available to all faculty and students. In addition, this electronic mail system will have a gateway to the Internet, which will potentially allow any student to send electronic mail to any of the over a million computers worldwide connected to the Internet. The Dalton electronic mail system will be based on *FirstClass*, a commercial e-mail system that employs a simple-to-use graphical interface similar to the Macintosh Finder™ desktop.

WAN Connections

Connection to the Internet will be provided by the Institute for Learning Technologies (ILT) at Columbia University's Teachers College. The ILT collaborates closely with the New Lab on a number of projects, including a M.Ed. program that includes Dalton/NLTL internships. Connectivity will be via a dedicated T1 connection from the Dalton Communications Center to the ILT studio at Columbia, and to the Internet through the Columbia University fiberoptic Ethernet backbone. Initially, electronic mail and newsgroup services will be offered via the FirstClass electronic mail system and an Internet gateway. Eventually FTP, Telenet, Gopher, and Wais service may be made available using the many graphical utilities available for Macintosh computers connected to the Internet.

Additional Workstations and Peripherals

In order to support the increased number of requests for computers that have resulted from the success of our first year, we are adding approximately 30 high-performance Macintosh II Quadra™ and Centris™ workstations with 16" monitors to the network this summer. As well, additional scanners, video digitizers, CD-ROM drives, laserdisk players, inkjet printers, laboratory sensors, and a variety of software have been purchased. The microcomputer lab in Room 509 has been renovated to accommodate the increased need for space

brought about by the larger computers and monitors.

In addition to the standard suite of workstations and software, more specialized equipment has been made available for use by certain projects. These include Windows™/ laserdisk setups for use by the Foreign Language Department, large-screen display systems on carts for use by the school in general, a projection system for presentations, a large-capacity (600 Mb) magneto-optical drive for archiving purposes, and an IBM PS/2 Ultimedia™ Workstation running the OS/2 version of *Illuminated Books and Manuscripts*™ and *Columbus*™, multimedia history and literature programs.

First Program Additions

Although plans to network the whole First Program facility have been postponed, the First Program computer lab will receive a Novell file server with 4 gigabytes of storage and a DAT back-up unit. Lab workstations will be connected to the file server via an Ethernet network. In addition, the First Program will also receive its own electronic mail server and a phone gateway to 89th Street.

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