(3)

TC | CU
ILT

Teachers College, Columbia University
525 West 120th Street
New York, New York 10027

Institute for Learning Technologies

The Cumulative Curriculum Project

1) The Cumulative Curriculum Project at Teachers College could be an appropriate experimental application for field-testing the ACORN network, starting late in 1992, continuing for five or more years. Teachers College is working with the Dalton School, selected public schools in the City, and IBM Research to develop a multi-media based system of education. Preliminary development work will begin September 1991 and last several years. Very limited field-testing will begin in 1992-93 with much more extensive field-testing planned for further stages of the project. We should be ready to begin work on interfacing to Teranet in September 1992.

2) Components of the project that will interface with the ACORN Project would consist of IBM PS/2 Model 95's or IBM RS6000's, acting as servers for multimedia workstations, located in 50 Thorndike between Broadway and Amsterdam and 120th and 121st streets. A conduit under 120th street to Teachers College exists near Amsterdam Avenue and fiber can then be run in the basements of the Teachers College buildings to 50 Thorndike with relative ease. The development installation will initially consist of 1 or 2 servers and about a dozen workstations. They will be running either DOS 5.0/Windows 3.0 or OS/2 2.0.

3) During its initial stages, the projects connectivity requirements would be largely contained within its development suite with traffic requirements normally being low except for periodic simulations of full-scale use of the target design. As we move into field-test stages, each site will be self-contained and as it grows to the scale of a full school, in will generate traffic requirements approaching, at peak, 1 Gbits/sec. While the interconnection of various field-test sites is not essential, it would be desirable and is a requirement if the project shifts from the R&D exploration of feasibility to full implementation.

   While the mandate of the Cumulative Curriculum Project concerns education K-12, intellectually the multi-media resources and pedagogy we will be developing should be useful in many components of undergraduate education. We will be seeking funding to explore these possibilities. If we get such funds, we will need to connect to classrooms on the main campus as well as locations in key Columbia libraries.

Explanation:

The Cumulative Curriculum Project is an effort to develop a curriculum for K-12 education that makes intensive use of networked multi-media resources. With these resources, all intellectual contents and pedagogical resources can be accessible to all students and teachers at all times. As a result, the existing sharp demarcations between subject-matter areas and between grade levels can be diminished significantly. Students will be able to study a curriculum of improved scope and quality, setting their own pace and following their interests. We embark on the project in the belief that such a curriculum is now becoming technically feasible and that it will prove substantially more effective than the traditional print-based curriculum has been.

Four distinct components will combine to make the Cumulative Curriculum:

1) an extensive multi-media ***library*** of intellectual resources describing the natural and cultural universes;
2) computer encapsulations of the major intellectual strategies for explaining and interpreting phenomena -- in essence, the major ***disciplines*** of inquiry;
3) a repertoire of ***assignments***, appropriate to different ages and centering on different domains, that students will work on, using the computer-based disciplines and materials from the multi-media library; and
4) orientation and ***assessment resources*** that will help students -- not to mention teachers, parents, employers, and the public -- evaluate what they have accomplished, diagnose significant difficulties, and plan ensuing stages of study.

During 1990-91, a prototype, ***Archaeotype***, exemplifying the first three components, has been introducing Dalton School sixth-graders to ancient history through group excavations of a hypothetical site near Corinth, Greece. The ***Library*** consists of the materials from the ***Perseus Project***, a videodisc and CD-ROM on ancient Greek culture developed at Harvard, as well as graphic and text materials digitized by Dalton faculty members, available through an appropriately equipped Mac II. The ***Discipline*** is archaeology, with its basic procedures, tools, and intellectual strategies for excavating and interpreting a site, encapsulated through a program written in ***Supercard*** running on four Mac SE's. The ***Assignment*** consists of a hypothetical ancient site, designed by archaeologists, that a class of sixteen students spend twelve weeks excavating and interpreting. The site spans the major periods of ancient Greek history and requires students to interpret the major confluence of forces that shaped Greek experience. Students work in four teams of four on separate quadrants of the site and they must pool their findings and interpretations to make

sense of the whole site. This format promotes cooperative learning among the students.

In moving beyond this prototype, the Cumulative Curriculum Project will

1) greatly expand the scope and variety of materials in the multi-media Library,
2) systematize and extend the disciplinary tools available to groups of students,
3) build a full repertoire of assignments that will draw students into constructive engagement with all aspects of their physical and cultural surroundings, and
4) develop appropriate tools of assessment, diagnosis, and orientation.

Development work on the Cumulative Curriculum will begin at the Dalton School and Teachers College over the next two years, supported through a $2,000,000 gift to Dalton from a private donor and with a major corporate grant of funds, equipment, and technical assistance. We are still negotiating for the corporate funding and when it becomes available will influence the pace at which initial development work proceeds. The start and direction of the effort, however, is not contingent on the corporate funding and it will last a minimum of two years. If the idea proves effective, we expect to be able to sustain the effort at the level of $1 to $3 million per year, as an ongoing program of curriculum development and teacher education.

Initially, the Cumulative Curriculum will have three systems components, which are illustrated in Diagrams 1 and 2 --

1) a highspeed library network with several multi-media servers;
2) small-group workstations and teacher workstations which will be the locus of multi-media work; and
3) individual notebook computers for each student which will be linked to the system by wireless LAN.

During 1991-92 we will begin work on all four intellectual components of the Cumulative Curriculum and the first two systems components. This work will take place in 50 Thorndike between Broadway and Amsterdam and 120th and 121st streets. A conduit under 120th street to Teachers College exists near Amsterdam Avenue and fiber can then be run in the basements of the Teachers College buildings to 50 Thorndike with relative ease. Development machines will be IBM PS/2 Model 95's and Model 80's, with 4 to 16 megs of memory and appropriate multi-media boards, possibly with RS6000's as servers.

We expect the small-group workstation to be a major focus of the pedagogy associated with the Cumulative Curriculum, enabling the ex-

ploratory, cooperative learning that should characterize a fully computer-based educational system. These small-group workstations will serve, on average, four students each. Thus, a school of 1200 students would need approximately 300 small-group workstations, roughly 60 teacher workstations assuming a student-teacher ratio of 20 to 1, and some 1200 notebook computers. The network servicing such an environment would usually be sending different streams of compressed video, text, graphics or audio to each small-group and teachers workstation at any time. At video quality approximating VHS and effective compression of about 40:1, the data flow for video and audio for each workstation would be 2 to 5 Mbits/sec., with the aggregate load on the network possibly exceeding 1 Gbits/sec. at those times when most users were simultaneously drawing heavily on video and audio. For many educational uses, HDTV quality, were it available, would be intellectually desirable, and it would increase the potential data flow per workstation to over 100 Mbits/sec.

With respect to the ACORN Project, work on the ***Library*** and the library network system will be most important component. Our idea with the ***Library*** is to avoid the expense of acquiring exclusive rights to the multi-media resources, but rather to buy discs -- videodisc, CD-ROM, CD-I, Compact-Audio, what-have-you -- on the market just as libraries buy books on the market. We will index, store, and retrieve materials on these discs in their native format. When a user calls for an item, the library system will digitize it as necessary, compress it in real time if necessary, and then send it to the caller whose system will decompress it. In order to provide multi-media materials to a substantial group of users, the library will need multiple retrieval channels. One text-retrieval channel can probably serve many, perhaps all, users at a time; each graphics-retrieval and audio-retrieval channel will probably serve several, but not all, users at a time; and each video-retrieval channel will probably serve only one user at a time. A major task will be to figure out how many retrieval channels we will need in what combination and then to engineer the indexing and control system for them. Diagram 3 gives a general schematic of the Library.

We estimate that design and initial implementation of the ***Library*** will take two years. At the end of this time, we would like to be able to attach the Library Manager and its Servers to Teranet, each through an NIU, and to connect a prototype Student Study Suite consisting of 10 to 20 PS/2's to Teranet through a concentrator and a single NIU. In 1992-93 we plan to set up two field-test sites, one at the Dalton School at 89th Street off Park and one at P.S. 92 at 135th Street off St. Nicholas. These installations will be self-contained and need not be connected to the one at Teachers College. They will start with about 30 machines and will grow at increments of 12 to 24 machines annually if ensuing stages of the project receive funding. The installation at Teachers College will add a

teacher education function starting in 1992-93 which would increase the number of machines there by 12 or more annually for several years, depending on the scale of field-testing we were servicing. The traffic requirements are difficult to predict as they will vary greatly on the mix of video, text, graphics, and audio that real users select. In general we are designing for relatively self-contained school-wide networks providing separate streams of multi-media data to about 350 workstations.

Need for Teranet: Strictly speaking, the Cumulative Curriculum Project is not dependent on Teranet as an enabling technology, at least until we start trying to implement HDTV quality multi-media. Nevertheless, Teranet would be a powerfully facilitating technology for this project. The fundamental goal is to adapt the technology to serve educational and intellectual activities, not to adapt the educational and intellectual activities to conform to technical constraints. Without Teranet, network limitations will be an intrusive consideration requiring from time to time that the educational context be distorted to account for the limits of other network technologies. Teranet will not make all technical limitations disappear, but those associated with network throughput capacity will cease to be significant. This would be a major advantage in an effort to make full use of networked multi-media as the basis for a new educational system.

Benefit to Teranet: The Cumulative Curriculum Project points the way to a major implementation of multi-media computing, providing a large-scale context for the implementation of Teranet. Against a time horizon of 4 or more generations, it is quite conceivable that the locus of education will migrate from the school back into the home and workplace. Against a time horizon of 1 to 2 generations, however, that is very unlikely as schools serve a complex of functions beyond the educational that will not quickly migrate to home "edutainment" centers or the like. Schools socialize, usually for better, sometimes for worse. Schools provide day care and help families cope with the constraints of work and managing mobile lives. Schools serve as community institutions, intermediate between large bureaucracies and isolated, inward-looking homes, providing civic shape, hope, and meaning. Schools should be restructured, not displaced. The Cumulative Curriculum Project aims at such restructuring of the schools and if successful, it would provide Teranet with a very substantial domain for implementation. There are some 100,000 schools nation-wide that spend some $150 billion annually, several times that many around the world, spending over $1 trillion annually. Schools are a domain through which we can develop and support technologies that enhance the quality of life.

Diagram 1

TC Cumulative Curriculum Project
Generalized schematic of **Student Study Suite**

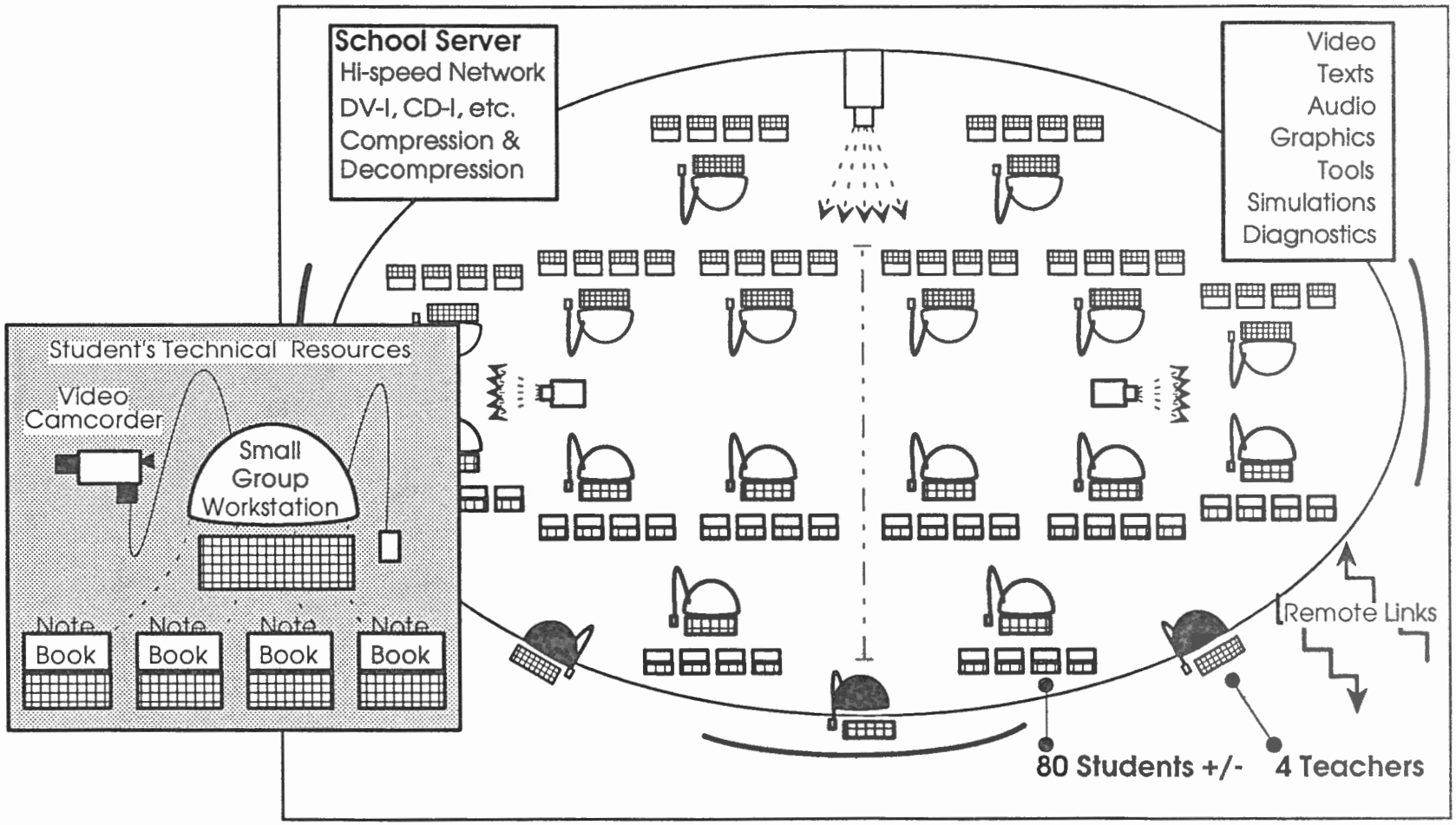
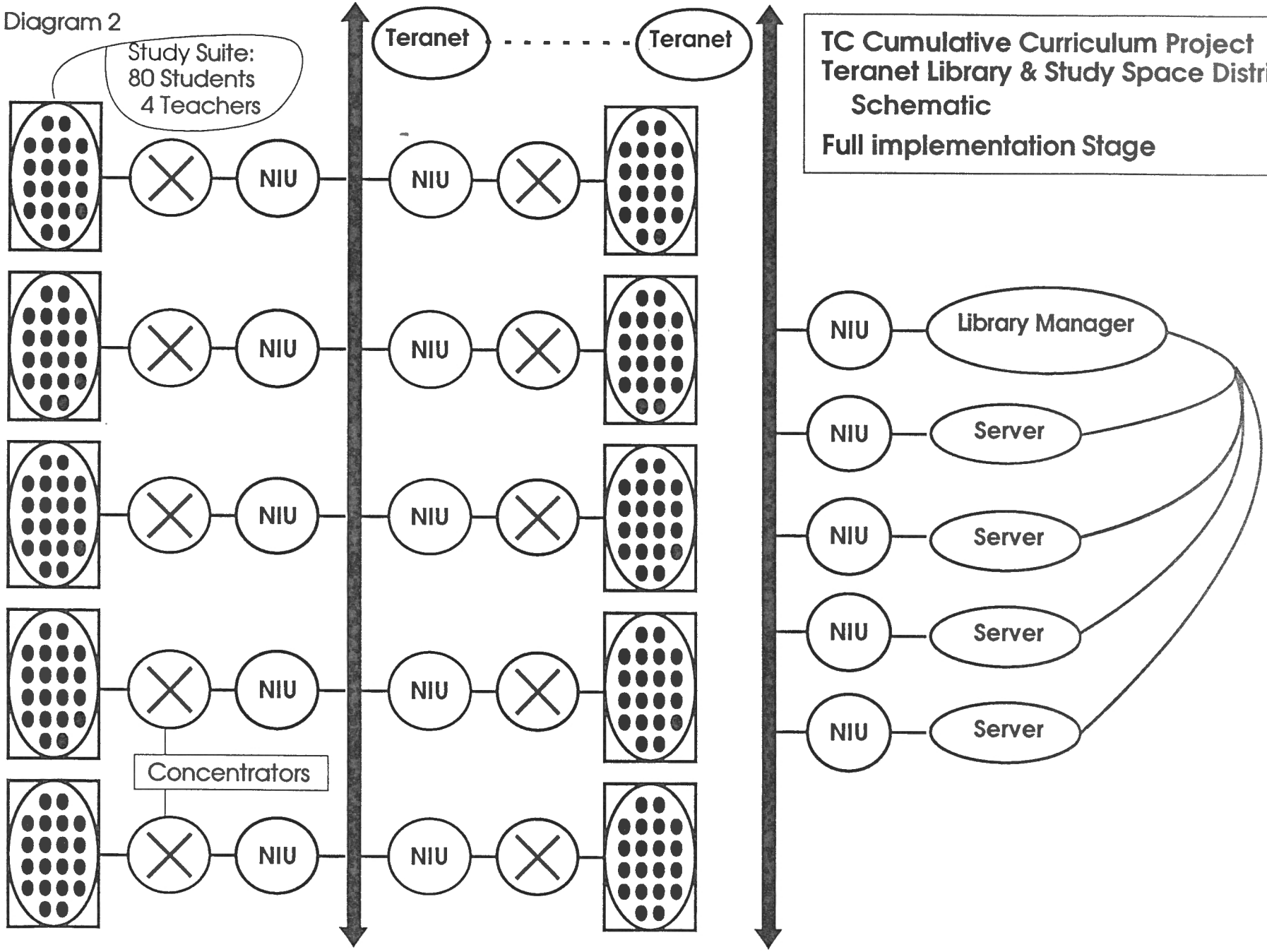


Diagram 2

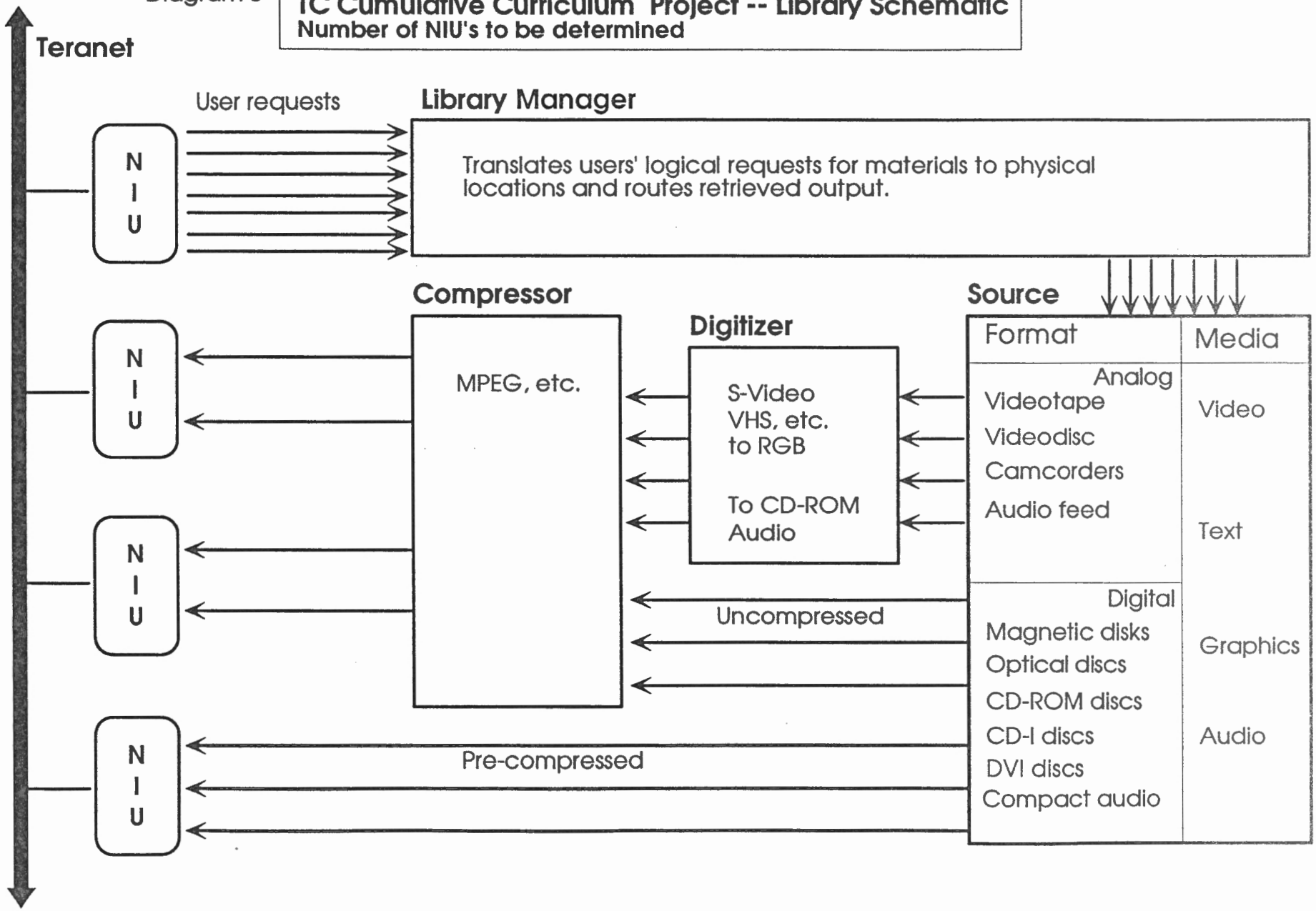


TC Cumulative Curriculum Project
Teranet Library & Study Space Distribution Schematic
Full implementation Stage

Diagram 3

TC Cumulative Curriculum Project -- Library Schematic

Number of NIU's to be determined



The Cumulative Curriculum:
Multimedia and the Making of a New Educational System

Robert McClintock and Frank Moretti

The Cumulative Curriculum project is a joint effort by
- the Institute for Learning Technologies at Teachers College, Columbia University
- the New Laboratory for Teaching and Learning at the Dalton School.

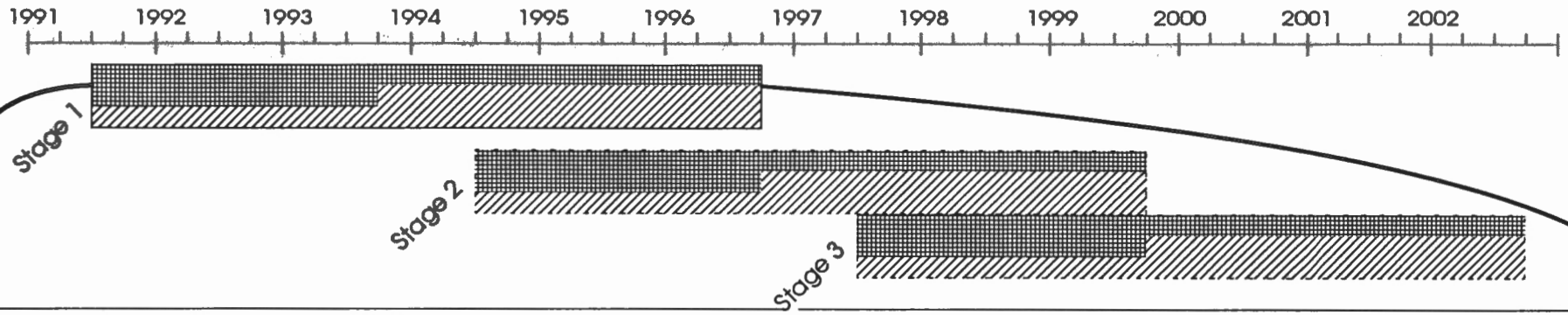
Co-Directors of the project are
- Robert McClintock, Professor of History and Education at Teachers College, and
- Frank Moretti, Associate Headmaster at Dalton

This talk will have two parts.
- Reflections that led us to formulate the project.
- Specific tasks and goals that we will address in the project.

A presentation at Teachers College, Columbia University
June 18, 1991

The Cumulative Curriculum: a three-stage design and development effort

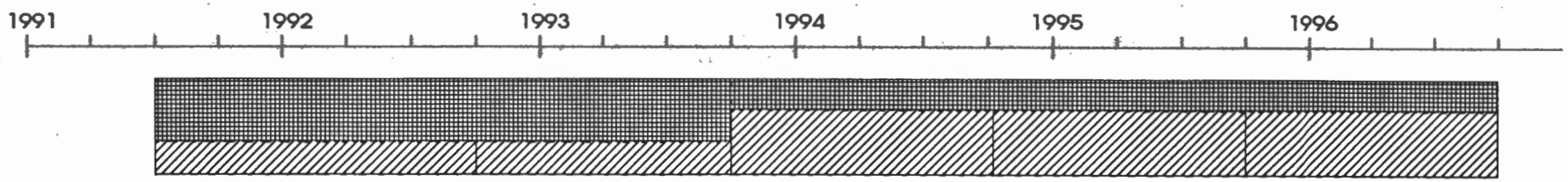
Purpose: To develop a Cumulative Curriculum and to test its effectiveness for children ages 6 through 18.
Stages: Differentiated by distinctive hardware-software platforms.



Current Proposal: Stage One of the Cumulative Curriculum

Objective: To provide proof of concept for the Cumulative Curriculum by building a prototype and field testing it with children ages 8 through 13 (grades 3-5 and grades 6-8).

Strategy: **Build** the prototype and **do** the field test **Build** **Do**



Build the prototype

1) Configure and validate the prototype platform.
2) Assemble the prototype curriculum: intellectual content.
3) Assemble the prototype curriculum: media of expression.
4) Develop curriculum applications.
5) Develop assessment applications.

Do the classrom field tests

6) Prepare field test sites.
7) Train teachers in the philosophy and practice of the cumulative curriculum.
8) Conduct the field test classes.
9) Evaluate and document the field test results.

Current Funding Situation

Requested:
5 million for 5 years

Recommended:
2.5 million for 2.5 years

Recommendors:
IBM's Grants for Innovation in Education
IBM Research
IBM Educational Systems

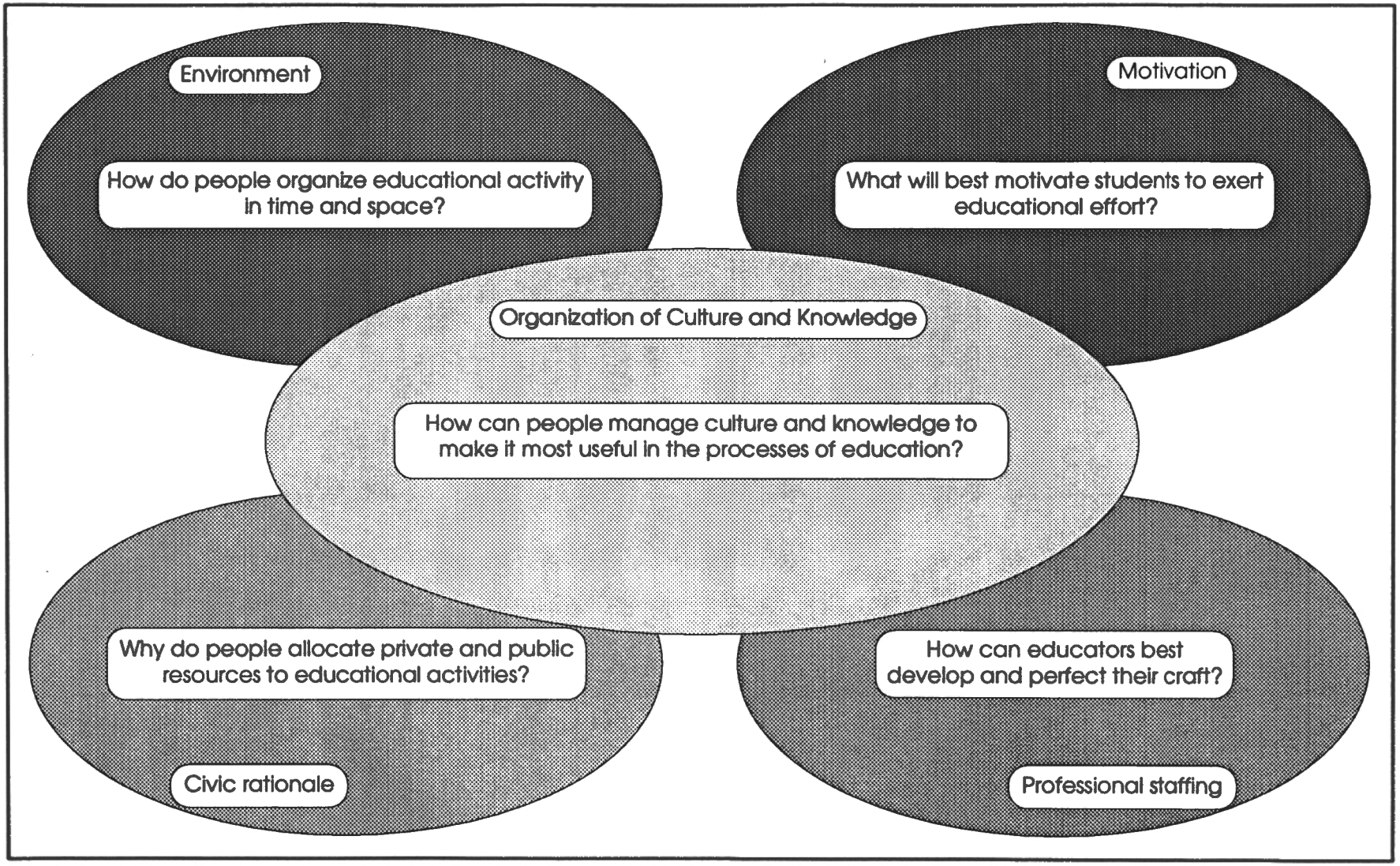
America 2000 proposal:
150 to 200 million for 3-7 Research & Development Centers

Problems:
Recession -- Commitments delayed by IBM
Complexity -- Slow policy formation in IBM

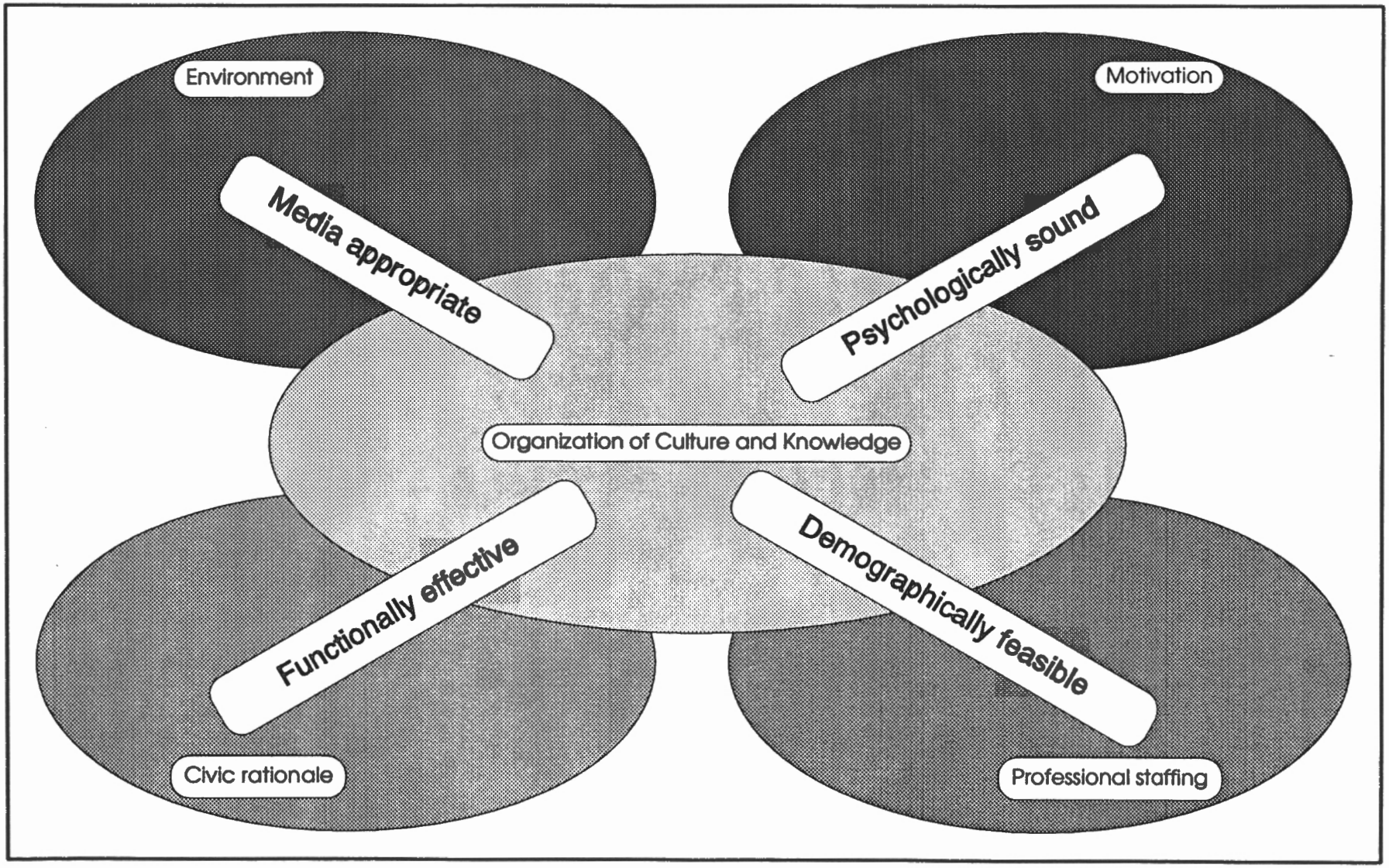
Assessment:
Chances of funding are high, but not sure
Official action between September 1991 and January 1992

Follow-through:
Individual Donors -- Dalton
Related Research Projects -- CTR's ACORN
Major Foundations -- Annenberg, Lilly, etc.
America 2000 Proposal

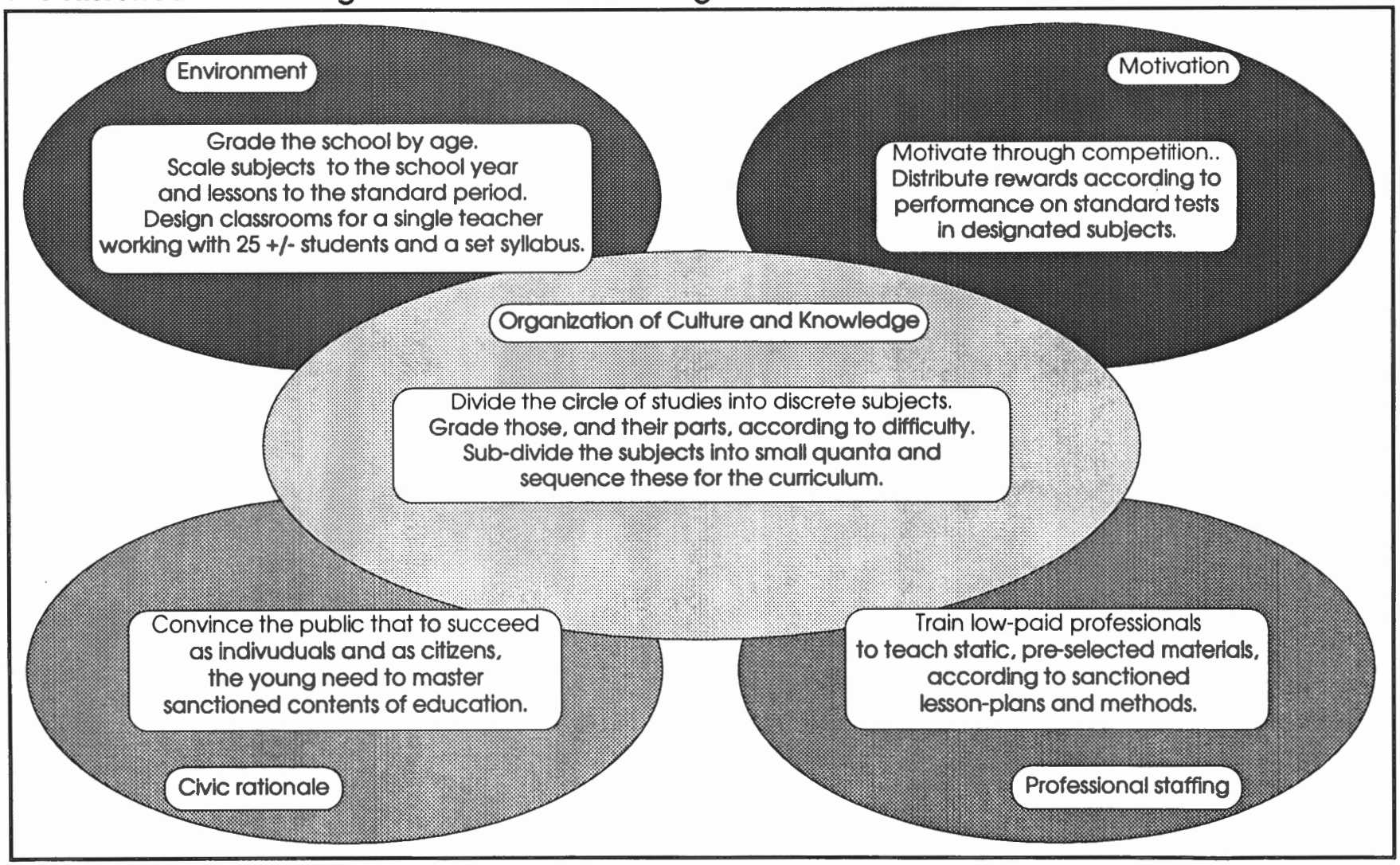
The domains of historical innovation in education



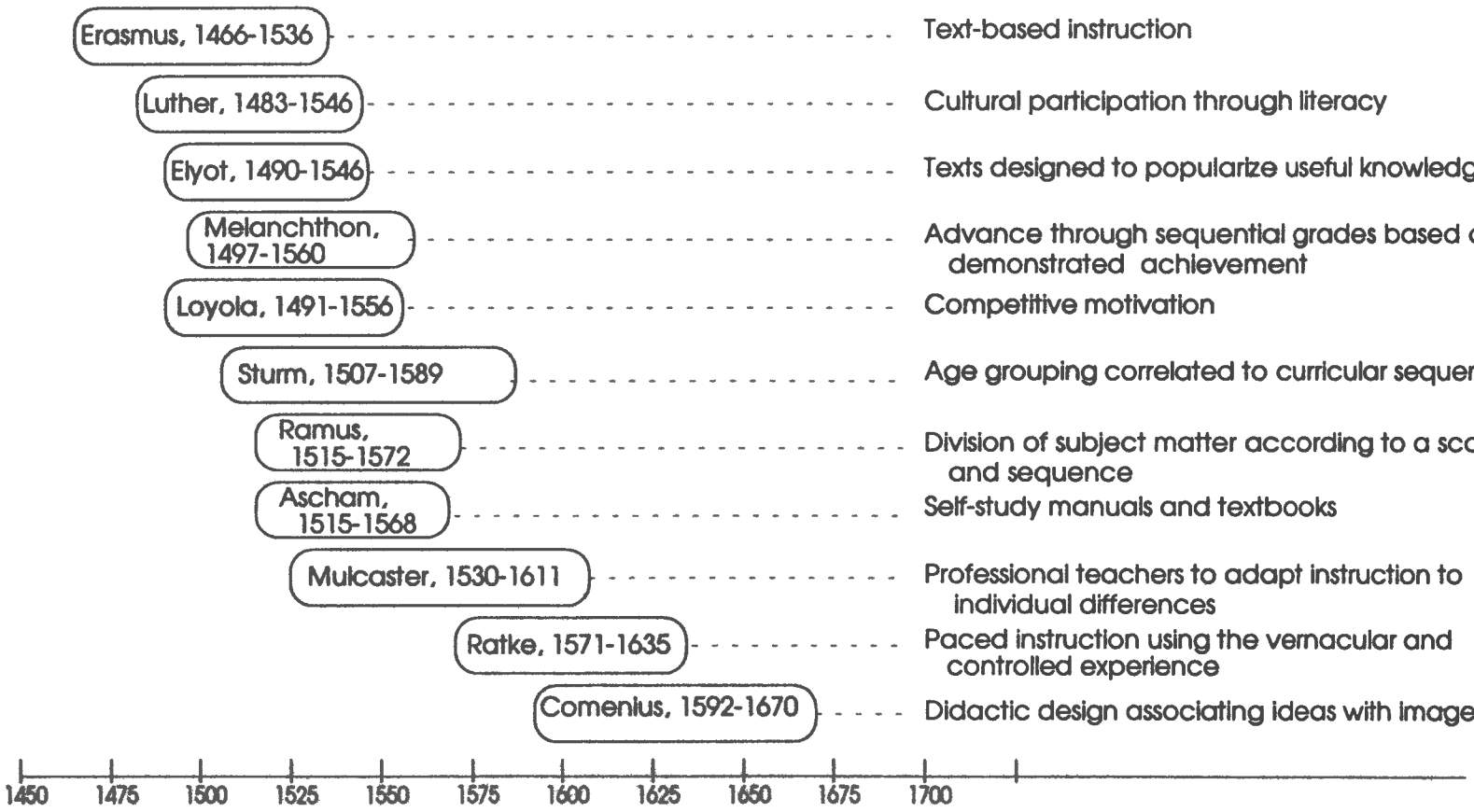
Structural limitations on historical innovation in education



The Historical Grounding of Print-Based Schooling

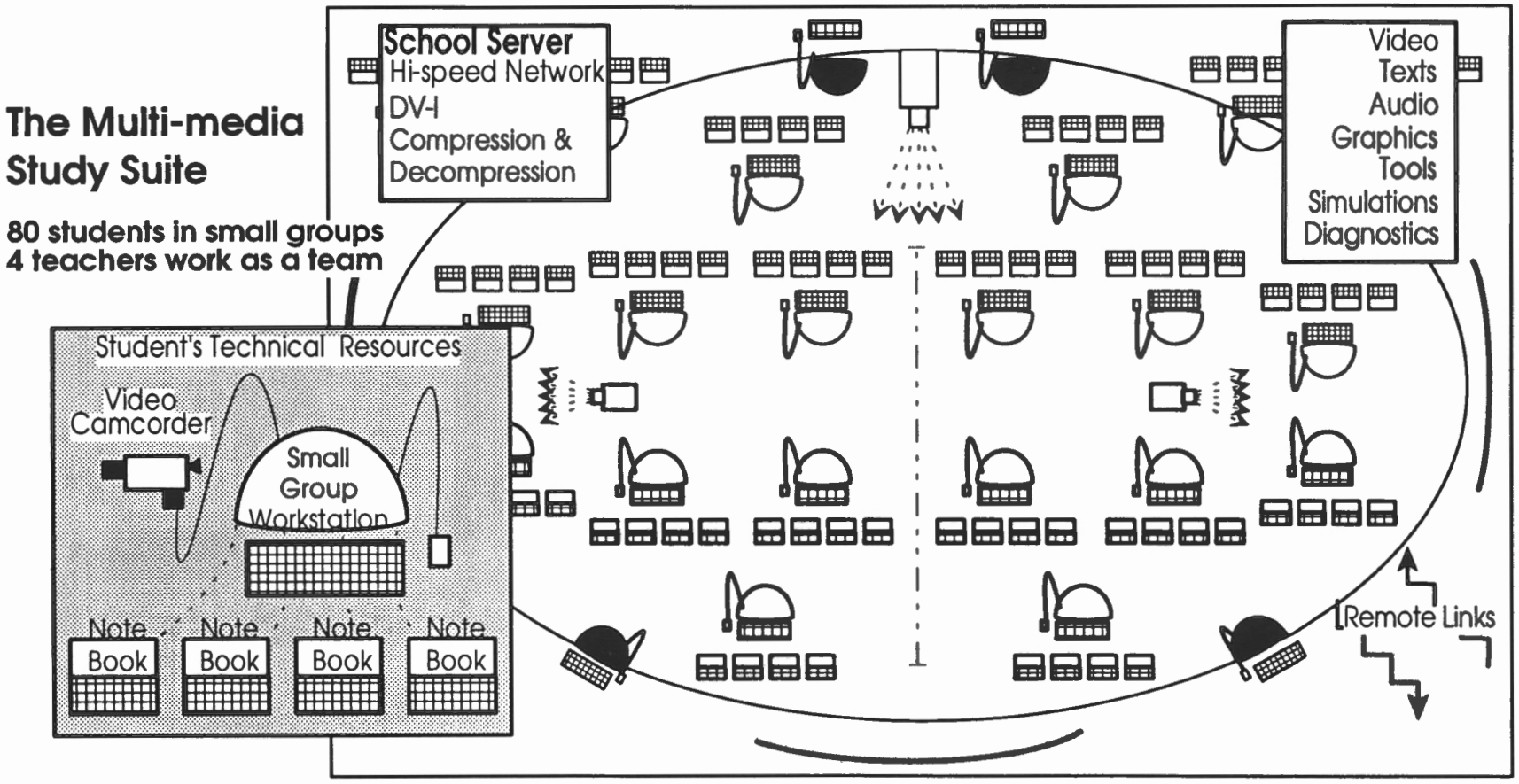


Printing and Early-Modern Educational Reform



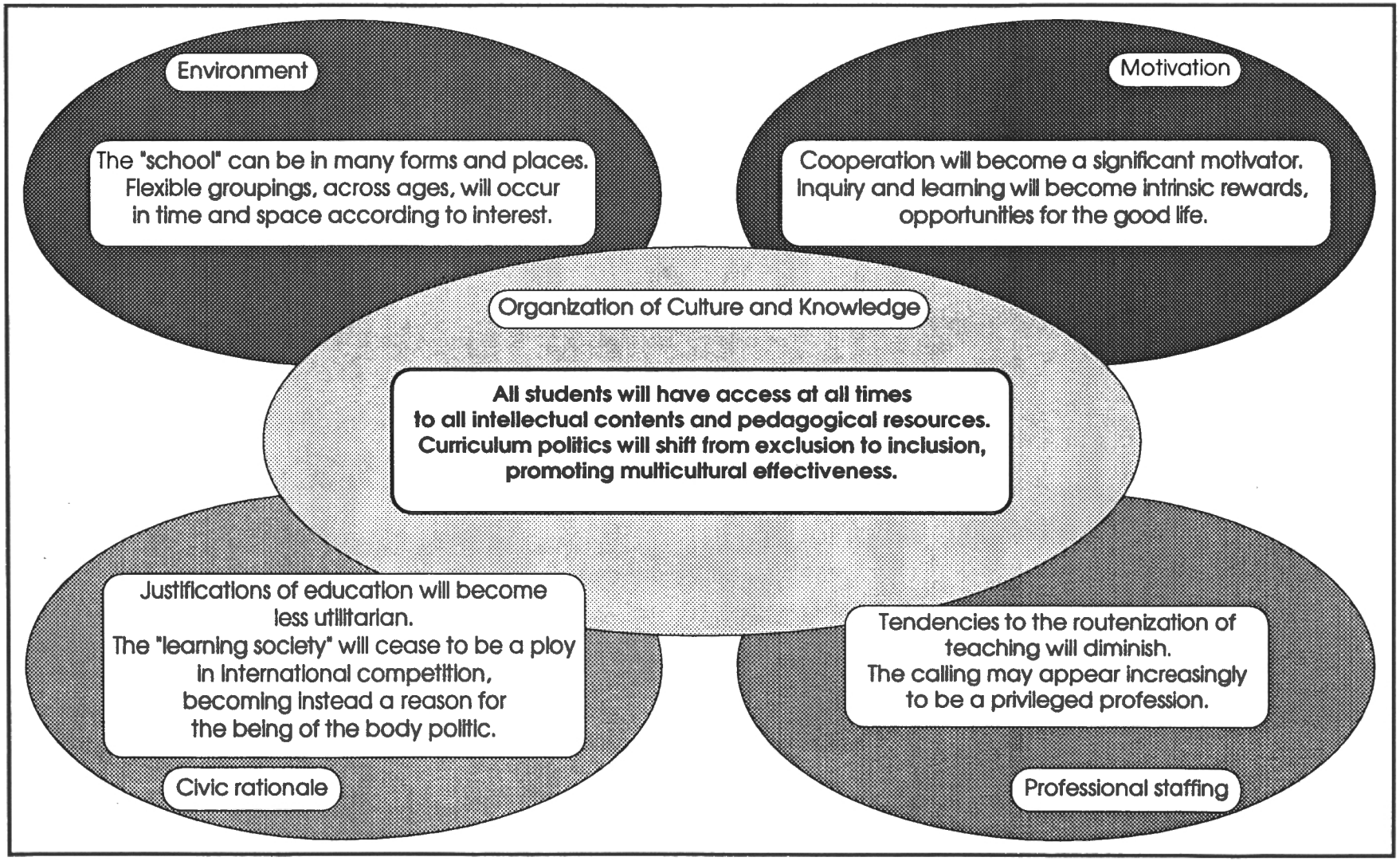
Most of the main techniques of schooling were developed between 1500 and 1650, and printing was an essential means by which the reformers implemented their ideas.

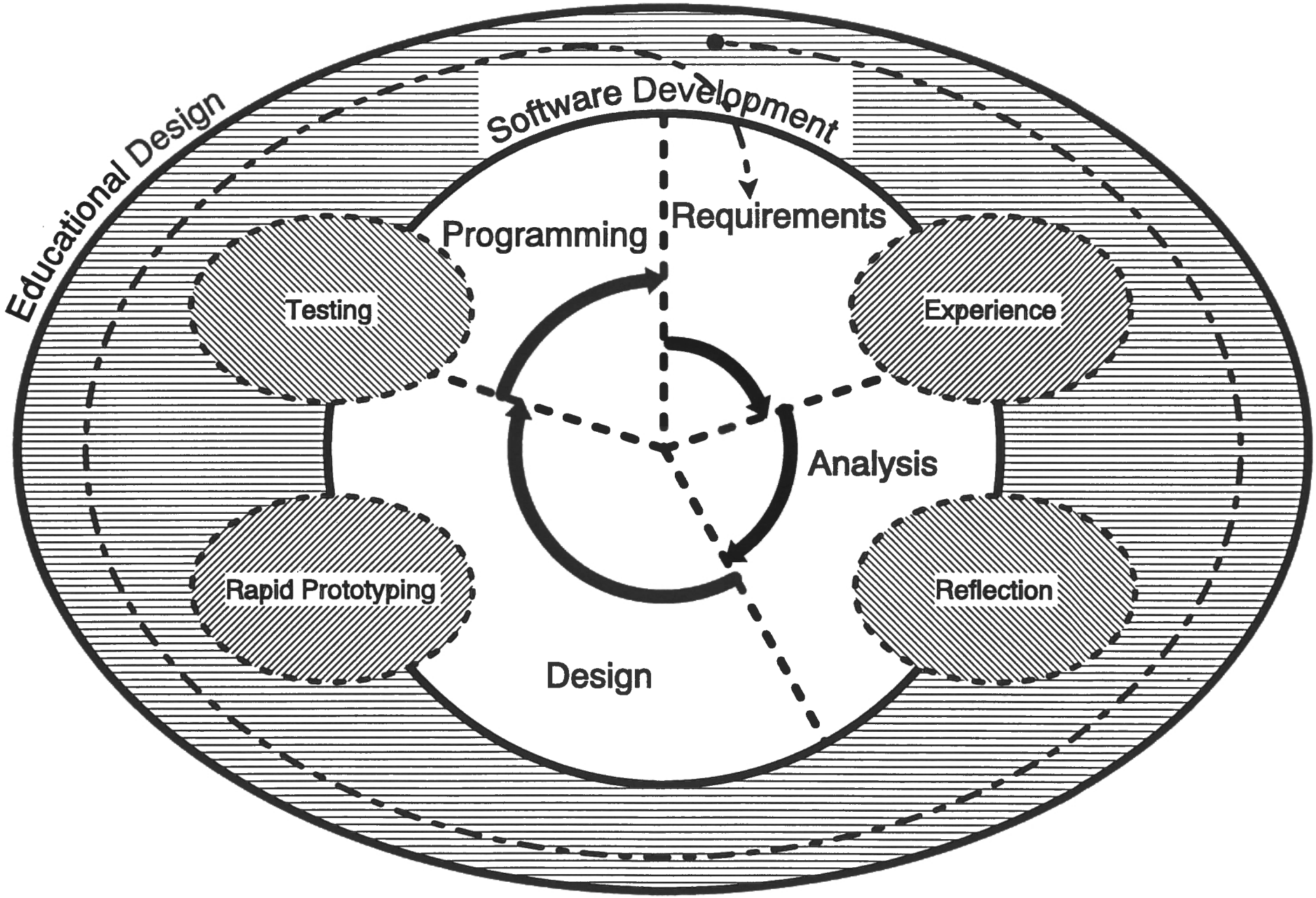
How might the educational experience be changed through a full use of information technology?



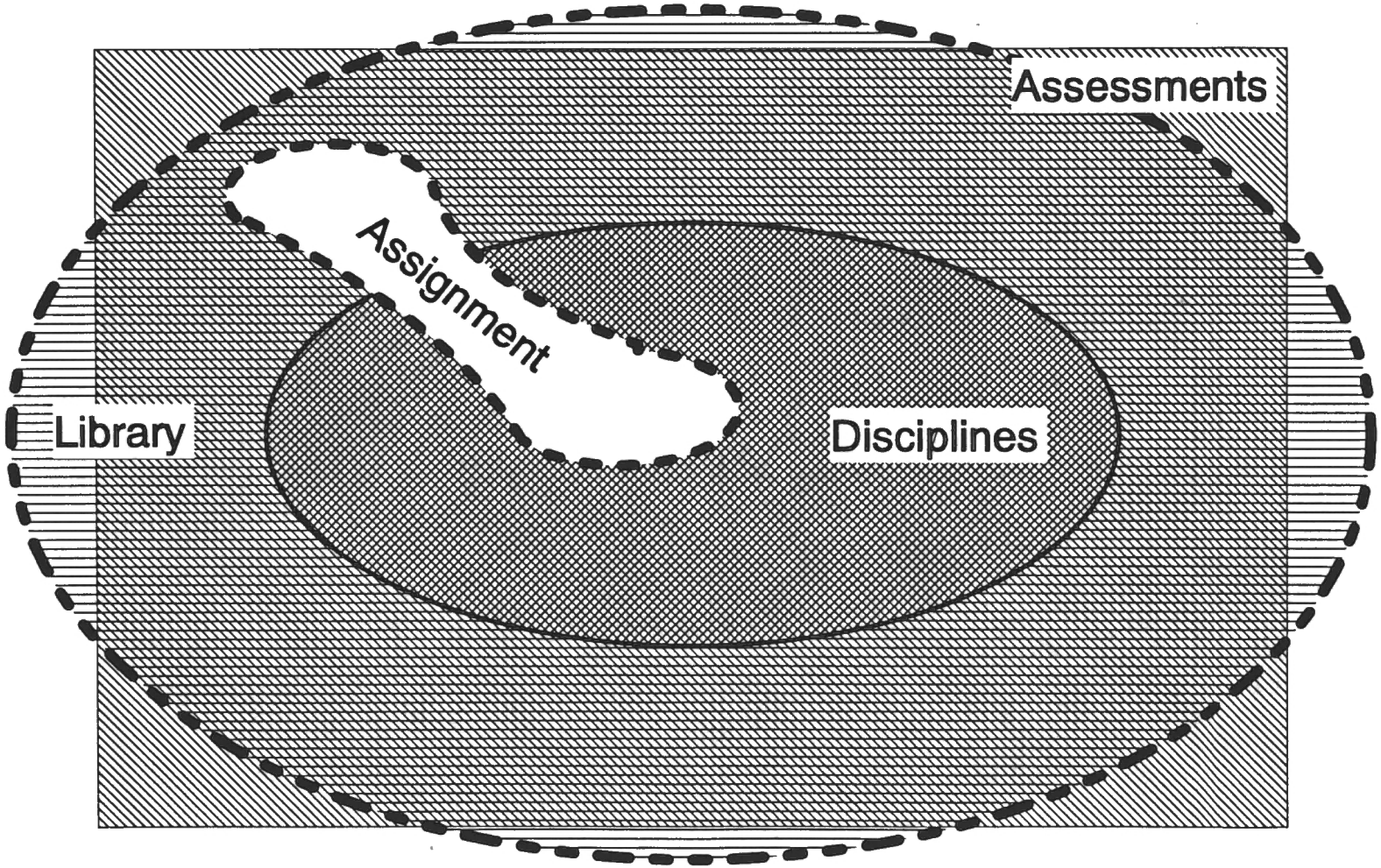
Significant changes will occur throughout the domains of historical innovation in education.

The Historical Grounding of the Cumulative Curriculum




Educational Design
Software Development
Requirements
Programming
Testing
Experience
Analysis
Rapid Prototyping
Reflection
Design

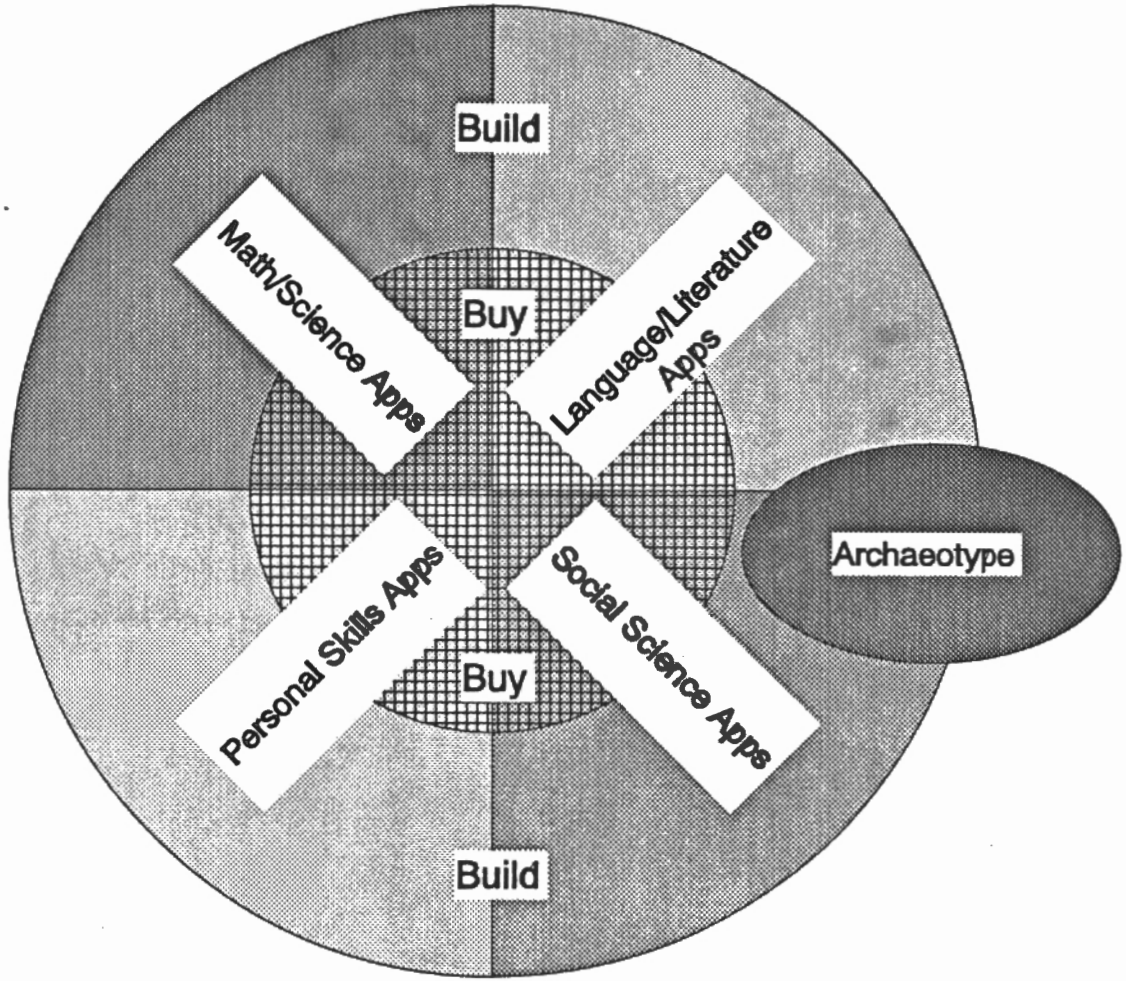
Components of the Cumulative Curriculum



• What are the objectives of the project?

Develop the curriculum applications

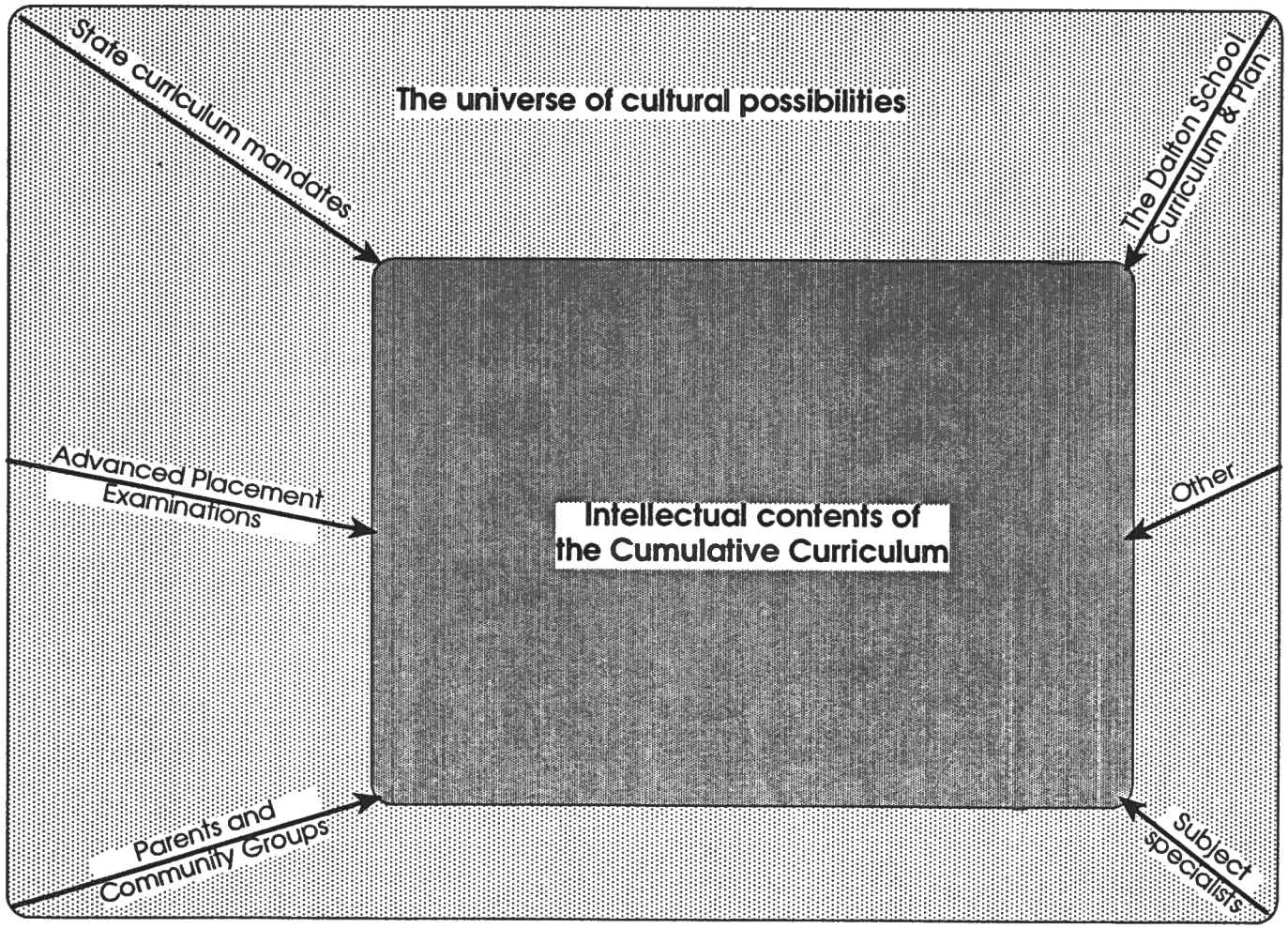
- Make an inventory of curriculum applications on the market.
- Establish criteria for deciding what apps to build and what to buy.
- Select curriculum apps and schedule the "builds" and "buys".
- Map potential "builds" and "buys" to the selected intellectual contents and media of expression.
- Design and code the "builds" and acquire the "buys".



- What are the objectives of the project?

Select intellectual content for the cumulative curriculum

- Map current curricular contents
- Establish inclusion criteria for choosing material
- Make selections



The Library

A formal definition:

The library will comprise a comprehensive, selective representation, in multiple formats, of the key phenomena of the world and of humanity. It will include a full repertoire of the cultural constructions that people use to interpret these phenomena, in examples that range from the most simplified to the highly sophisticated.

Implications:

The library = a museum. " . . . the key phenomena of the world and of humanity. . . ."

The library = an exploratorium. " . . . a comprehensive, selective representation, in multiple formats. . . ."

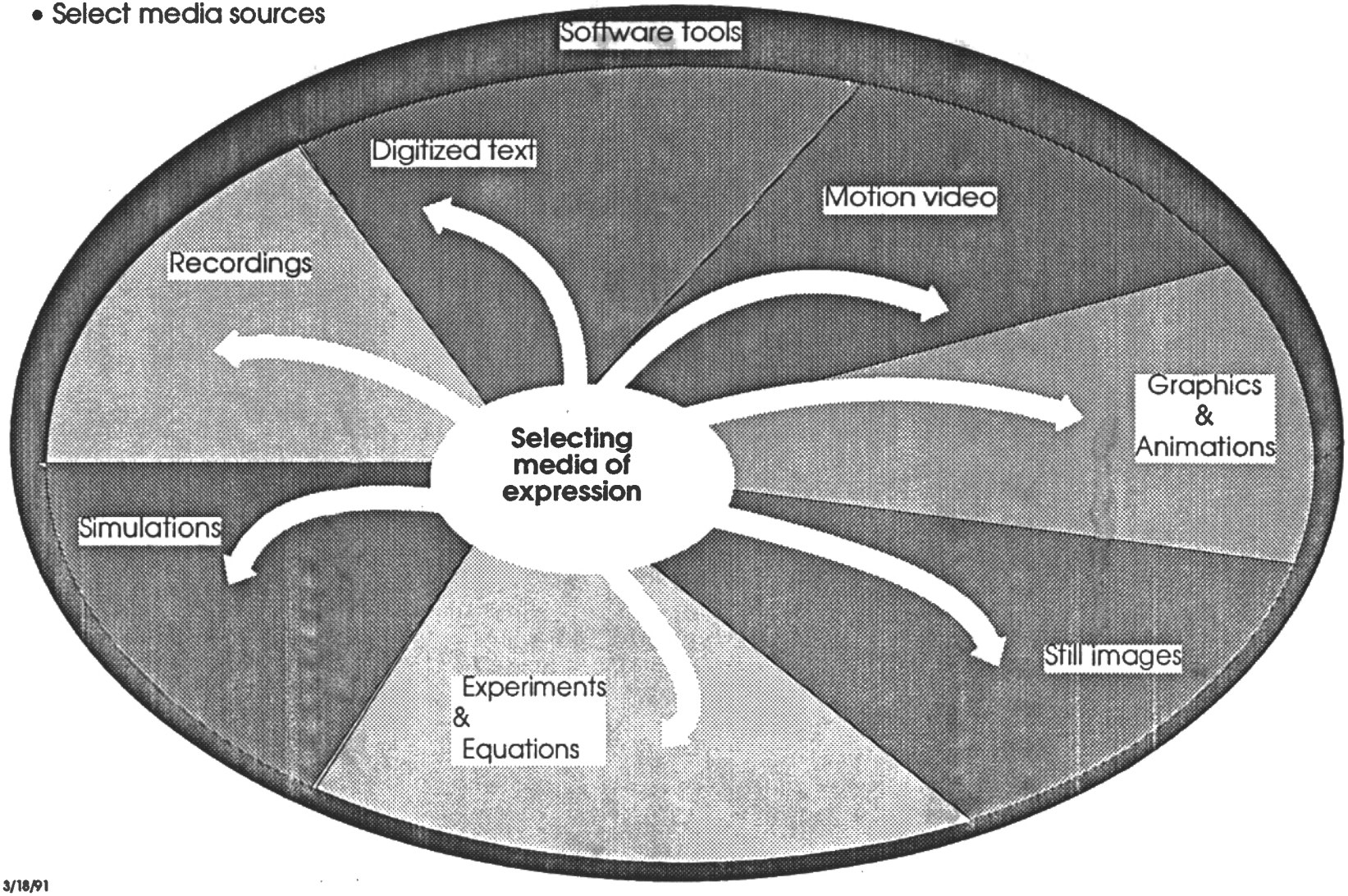
The library should serve all ages. " . . . examples that range from the most simplified to the highly sophisticated."

The library should be active and expansive. " . . . a full repertoire of the cultural constructions that people use to interpret . . . ."

- What are the objectives of the project?

Choose media of expression for the content

- Establish media criteria for choosing materials
- Inventory available media for topics included among intellectual contents
- Select media sources



The Disciplines

A formal definition:
The disciplines will provide students with computer-based resources that enable people to explain and interpret subjects of inquiry. Disciplines will avail to students the tools, questions, procedures, methods, and standards, at appropriate levels of complexity, for making different realms of experience intelligible, manageable, and valuable.

Echoing Bruner:

"We start with the hypothesis that any subject can be (studied) effectively in some intellectually honest form (by) any child at any stage of development." *The Process of Education*, p. 33.

" . . . Intellectual activity anywhere is the same, whether at the frontier of knowledge or in a third-grade classroom. What a scientist does at his desk or in his laboratory, what a literary critic does in reading a poem, are of the same order as what anybody else does when he is engaged in like activities . . . . The difference is in degree, not in kind. The schoolboy learning physics *is* a physicist, and it is easier for him to learn physics behaving like a physicist than doing something else." *The Process of Education*, p. 14.

"Motives for learning must be kept from going passive in an age of spectatorship, they must be based as much as possible upon the arousal of interest in what there is to be learned, and they must be kept broad and diverse in expression." *The Process of Education*, p. 80.

Assignments

A formal definition:
Assignments will put to students significant problems that draw them into constructing solutions, by using the resources of one or more discipline, along with materials in the library and in their daily environs. Assignments should challenge students to work together, extending their use of resources and materials, to question, observe, reason, estimate, measure, demonstrate, doubt, criticize, and affirm -- across the range of things at stake in the conduct of life.

.

Echoing Dewey:

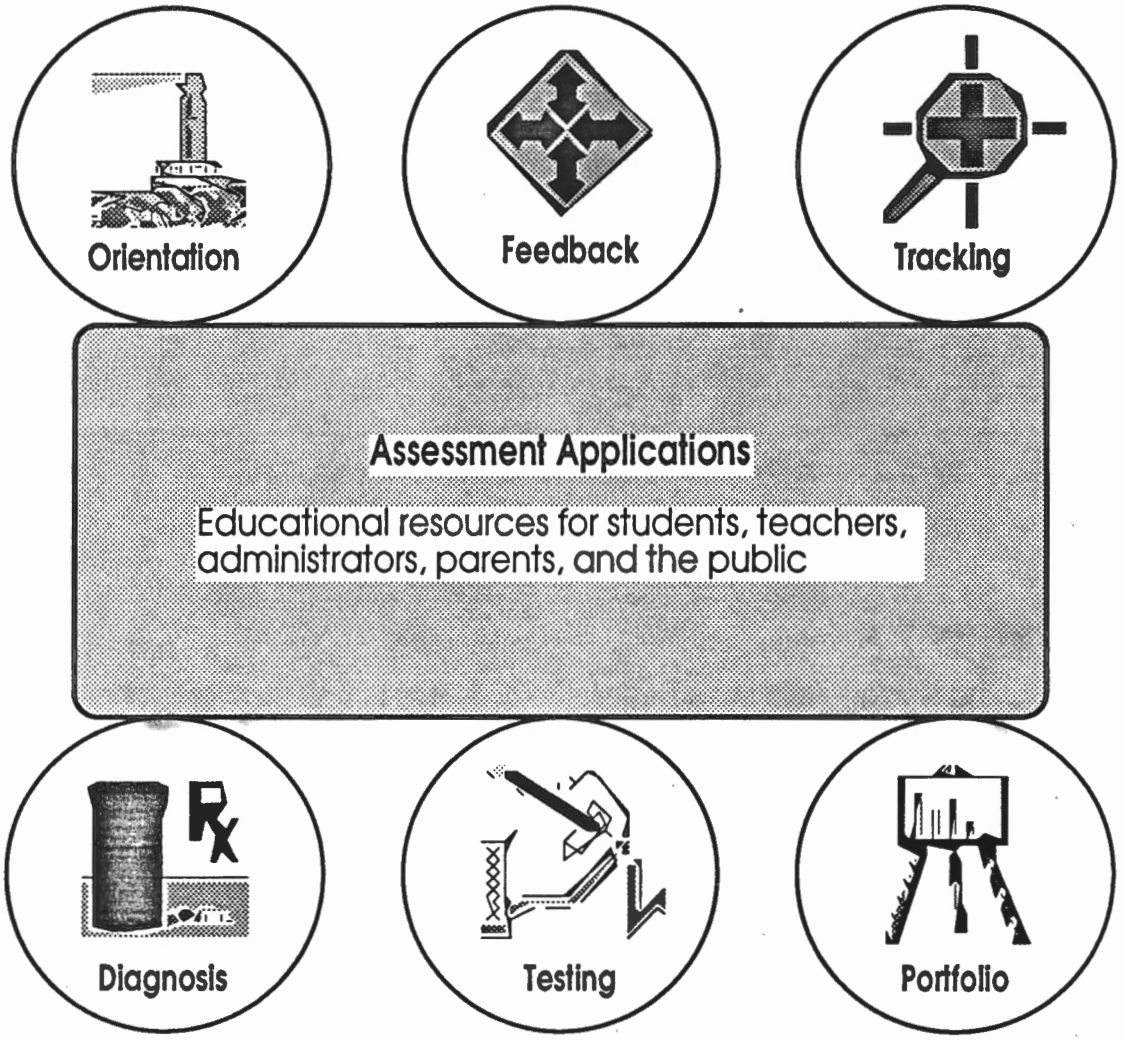
"The obvious pedagogical starting point of scientific instruction is not to teach things labeled science, but to utilize the familiar occupations and appliances to direct observation and experiment, until pupils have arrived at a knowledge of some fundamental principles by understanding them in their familiar practical workings." *Democracy and Education*, p. 287.

"The individual who has a question which being really a question to him instigates his curiosity, which feeds his eagerness for information that will help him cope with it, and who has at command an equipment which will permit these interests to take effect, is intellectually free. Whatever initiative and imaginative vision he possesses will be called into play and control his impulses and habits. His own purposes will direct his actions." *Democracy and Education*, pp. 304-5.

"The criterion of the value of school education is the extent in which it creates a desire for continued growth and supplies means for making the desire effective in fact." *Democracy and Education*, pp. 53.

- What are the objectives of the project?

Develop the assessment applications



- Make an inventory of the forms of feedback that would be useful.
- Set criteria for choosing assessment applications to develop.
- Select the assessment applications to be developed.
- Design and code the assessment applications and integrate them into the cumulative curriculum prototype.

Assessments

A formal definition:

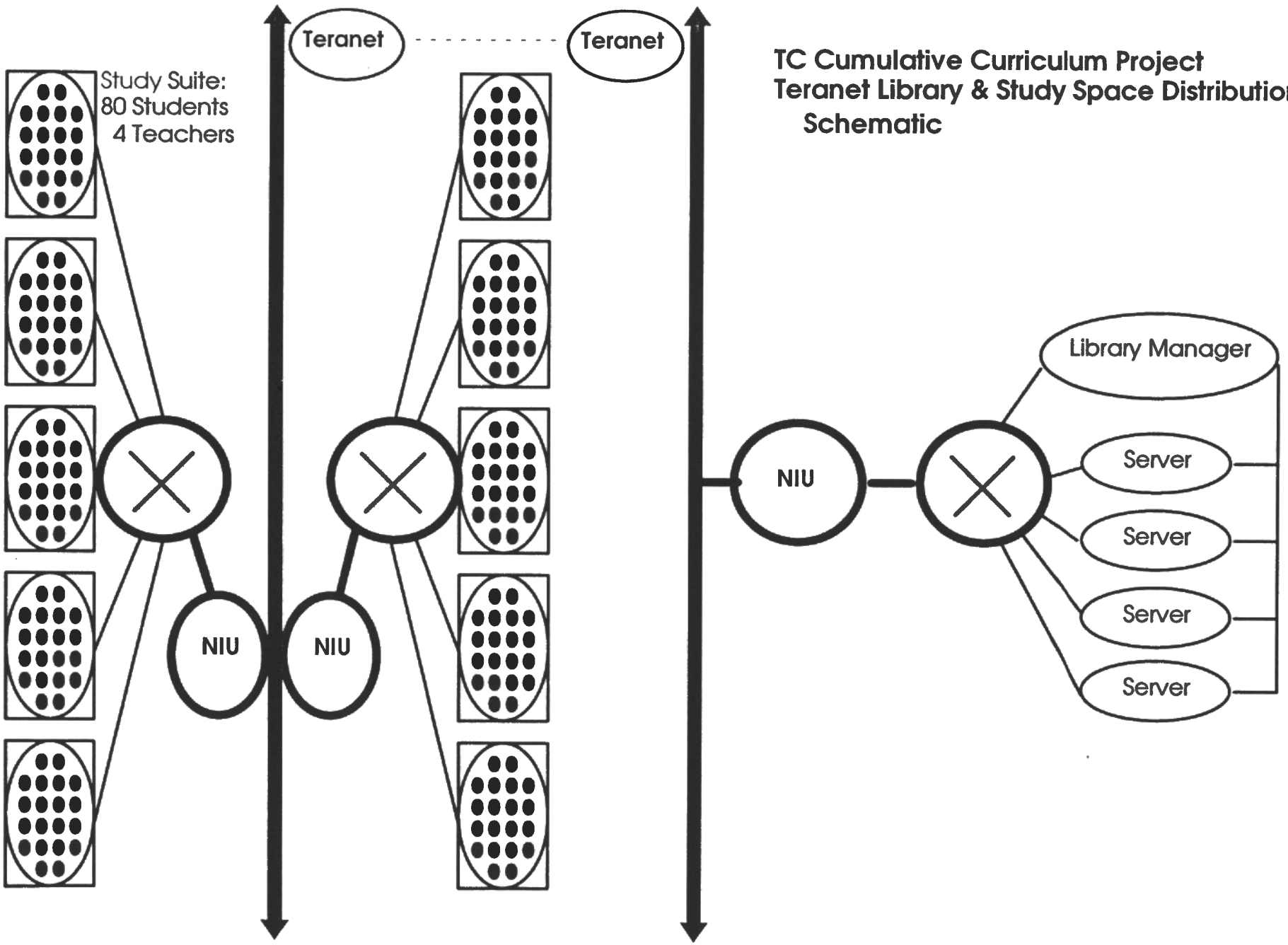
Assessments will help students and teachers perceive what they have and have not essayed within the resources of the program, providing information relevant to the diagnosis of difficulties, suggesting possibilities for further assignments, and keeping a portfolio of accomplishments. So far as possible, assessments should take into account the needs, interests, and capacities of individuals and groups, allowing people to understand where they stand relative to the possibilities of the whole.

Implications:

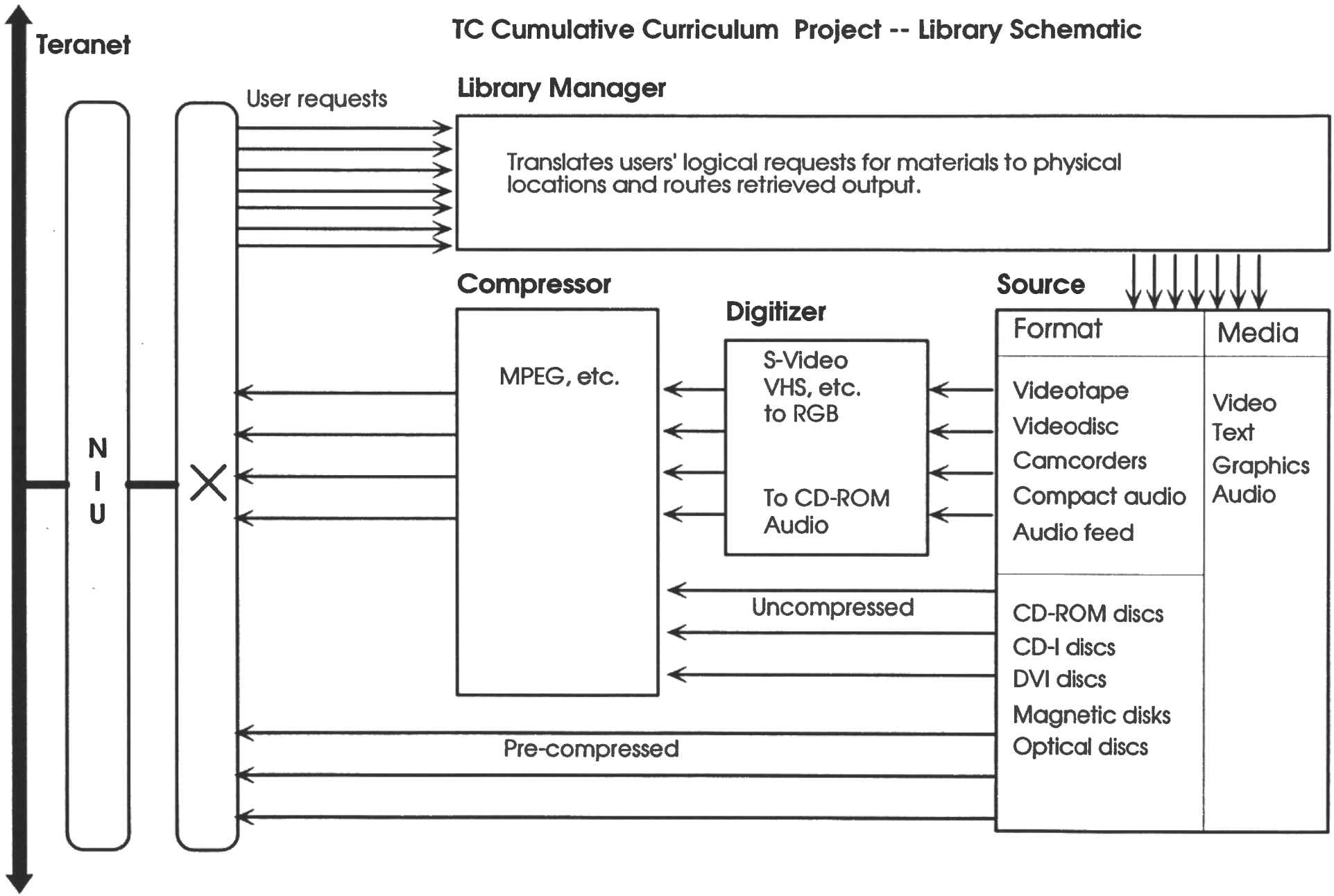
Assessments should serve students.

Assessments should engender cooperation among peers -- when other students do well, it should benefit all.

Assessments should culminate in enduring expressions of thought, feeling, perception, and insight.



TC Cumulative Curriculum Project
Teranet Library & Study Space Distribution
Schematic


TC Cumulative Curriculum Project -- Library Schematic
Teranet
User requests
Library Manager
Translates users' logical requests for materials to physical locations and routes retrieved output.
Compressor
MPEG, etc.
Digitizer
S-Video
VHS, etc.
to RGB
To CD-ROM
Audio
Source
Format
Media
Videotape
Videodisc
Camcorders
Compact audio
Audio feed
Video
Text
Graphics
Audio
Uncompressed
CD-ROM discs
CD-I discs
DVI discs
Magnetic disks
Optical discs
Pre-compressed
N
I
U

Library --

The ***library*** will comprise a comprehensive, selective representation, in multiple formats, of the key phenomena of the world and of humanity. It will include a full repertoire of the cultural constructions that people use to interpret these phenomena, in examples that range from the most simplified to the highly sophisticated.

Disciplines --

The ***disciplines*** will provide students with computer-based resources that enable people to explain and interpret subjects of inquiry. ***Disciplines*** will avail to students the tools, questions, procedures, methods, and standards, at appropriate levels of complexity, for making different realms of experience intelligible, manageable, and valuable.

Assignments --

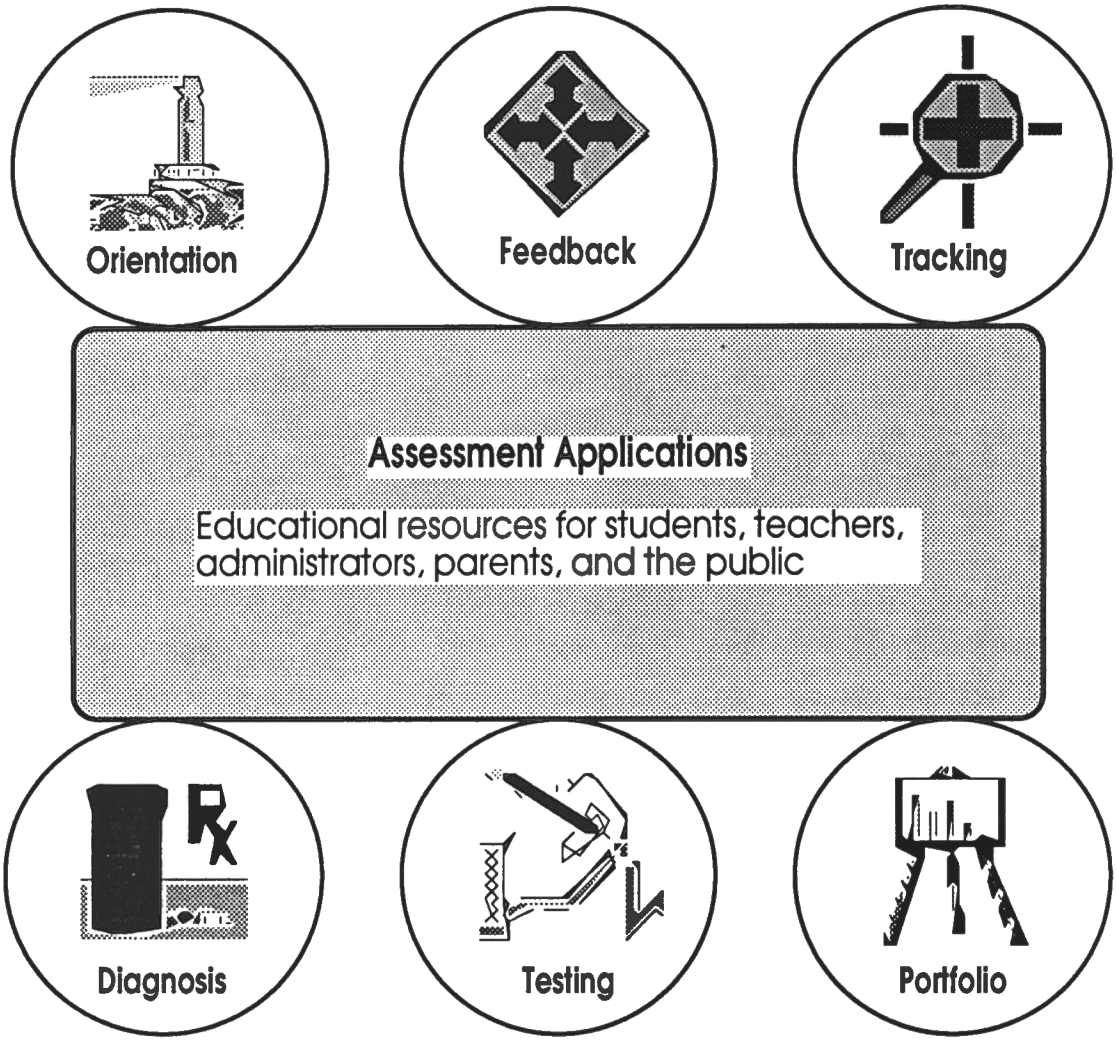
Assignments will put to students significant problems that draw them into constructing solutions, by using the resources of one or more ***discipline***, along with materials in the ***library*** and in their daily environs. ***Assignments*** should challenge students to work together, extending their use of resources and materials, to question, observe, reason, estimate, measure, demonstrate, doubt, criticize, and affirm -- across the range of things at stake in the conduct of life.

Feedbacks --

Feedbacks will help students and teachers assess what they have and have not essayed within the resources of the program, providing information relevant to the diagnosis of difficulties, suggesting possibilities for further assignments, and keeping a portfolio of accomplishments. So far as possible, ***feedbacks*** should take into account the needs, interests, and capacities of individuals and groups, allowing people to understand where they stand relative to the possibilities of the whole.

- What are the objectives of the project?

Develop the assessment applications



- Make an inventory of the forms of feedback that would be useful.
- Set criteria for choosing assessment applications to develop.
- Select the assessment applications to be developed.
- Design and code the assessment applications and integrate them into the cumulative curriculum prototype.

"Technology and the Pedagogy of Intelligence"

Robbie McClintock
Institute for Learning Technologies
Columbia University

http://www.ilt.columbia.edu/mcclintock/intelligence/

A methodological reflection

Two main points:
1) Augmenting intelligence
2) Nourishing intelligence

A concluding expectation

"Technology and the Pedagogy of Intelligence"

A methodological reflection

Technology in the context of cultural history

Observation, not prediction

Describing what is happening in the present of long duration

"Technology and the Pedagogy of Intelligence"

Augmenting intelligence

Basic principle:
externalizing intellectual actions into tools
in ways that enhance human capacities

The verbs of intellection

Some thoughts on pedagogical implications:
1) The dilemma of simplicity and complexity
2) "What knowledge is of most worth?"

"Technology and the Pedagogy of Intelligence"

Students learn, but they also criticize, think, probe, scrutinize, judge, question, hypothesize, and disagree.

Students inquire, observe, theorize, map, reason, assume, examine, inventory, seek, challenge, dispute, hope, quote, speculate, infer, conjecture, suppose, list, investigate, notice, recognize, contest, and tinker.

They converse, create, wonder, reflect, travel, doubt, solve, understand, and write.

Students also predict, perceive, inspect, comment, read, conform, honor, refute, debate, compose, oppose, discuss, invent, copy, search, picture, measure, compare, record, estimate, and consult.

And finally they analyze, deduce, guess, memorize, listen, evaluate, formulate, simulate, meditate, admire, muse, emulate, aspire, waver, synthesize, weigh, contrast, associate, catalog, compute, assert,
and so on through all the verbs that describe the human capacities for cultural activity.

"Technology and the Pedagogy of Intelligence"

Nourishing intelligence

The graves of medieval settlements in Greenland

The structural elitism of traditional education

The challenge of ubiquitous access

"Technology and the Pedagogy of Intelligence"

A concluding expectation

Technology as an investment in the power of students:

Pose powerful generative questions in cooperative settings
End limitations on the intellectual resources available to students
Enable teachers and students to communicate beyond the classroom
Provide advanced tools of analysis, synthesis, and simulation

Towards an intellectually rigorous, progressive education, accessible to all.

(5)

The Cumulative Curriculum:
Multi-Media and the Making of a New Educational System

A Project Proposal by

The Institute for Learning Technologies
Teachers College, Columbia University

and

The New Laboratory for Teaching and Learning
The Dalton School

Proposal Submitted for
IBM Educational Innovation Grant
September 8, 1990

Presentation to IBM Research
March 5, 1991

The Cumulative Curriculum
Presentation Overview

• What are the objectives of the project?

Basic Objective for the Cumulative Curriculum Project
Configure and validate the prototype platform
Select intellectual content for the cumulative curriculum
Choose media of expression for the content
Develop the curriculum applications
Develop the assessment applications
Field-test the prototype

• Who will manage the project?

Project Directors
Management Structure
Types of Participants

• How much will it cost?

Project Sequencing and Break Point
Revised Budget Summary
Equipment Needs

• Timelines of activity

Details by objective
(10 supplementary foils)

• What are the objectives of the project?

The Cumulative Curriculum

- A comprehensive, integrated curriculum using networked multi-media.
- All intellectual contents & pedagogical resources are available to any student at any time.
- Promotes a multicultural awareness through cooperative learning.
- Each student develops a portfolio reflecting her cumulative learning.

Project Objective

- To provide proof of concept for the Cumulative Curriculum by building a prototype and field testing it with children ages 8 through 13 (grades 3-5 and grades 6-8).
- Strategy: Build the prototype and do the field-test.
- Duration: June 1991 through September 1996.
- Cost: approximately $1,000,000 anually plus equipment.

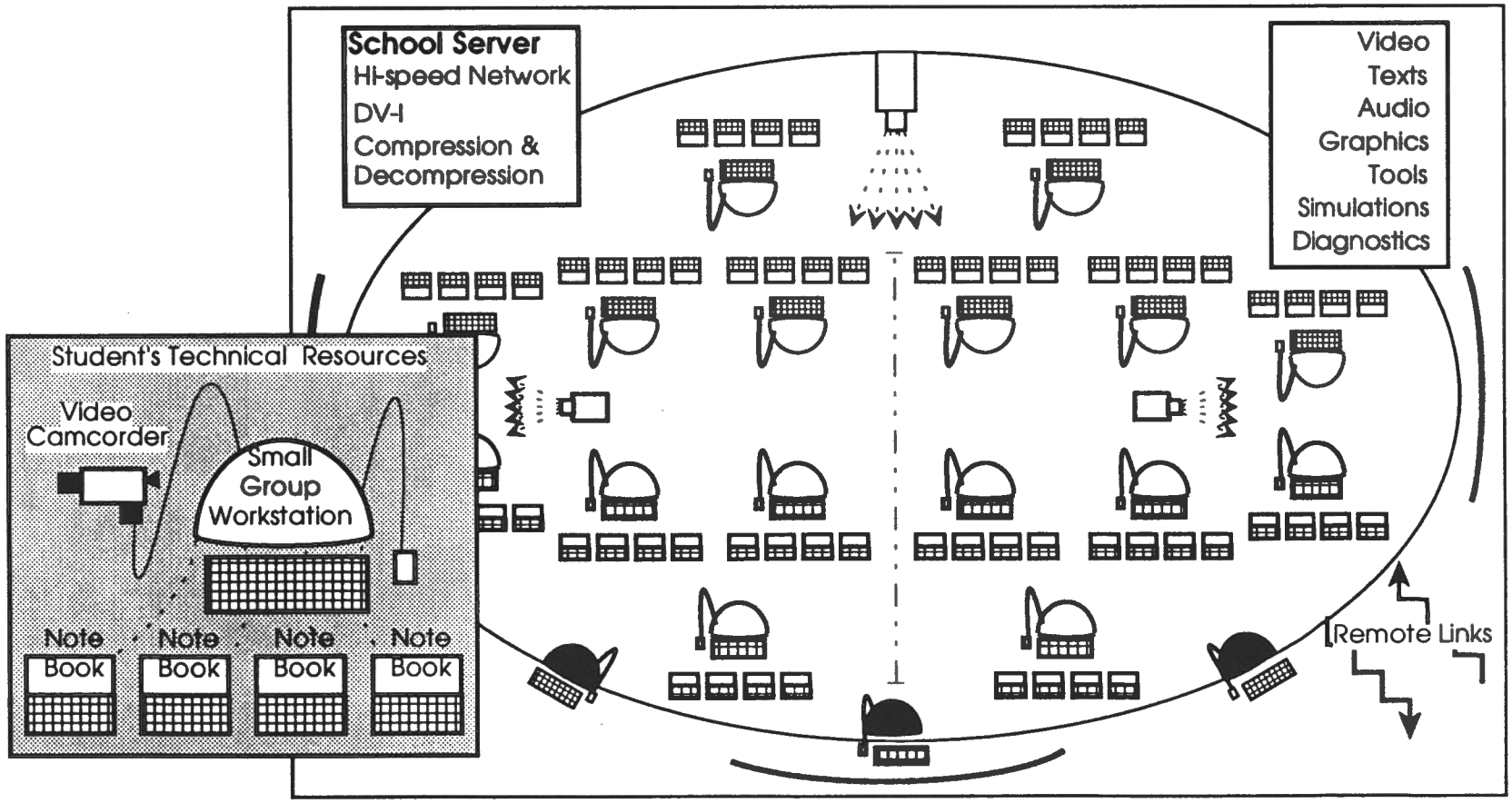
- What are the objectives of the project?

Configure and validate the prototype platform

Set validation criteria.

Define and install software development environment (hardware and software development tools.

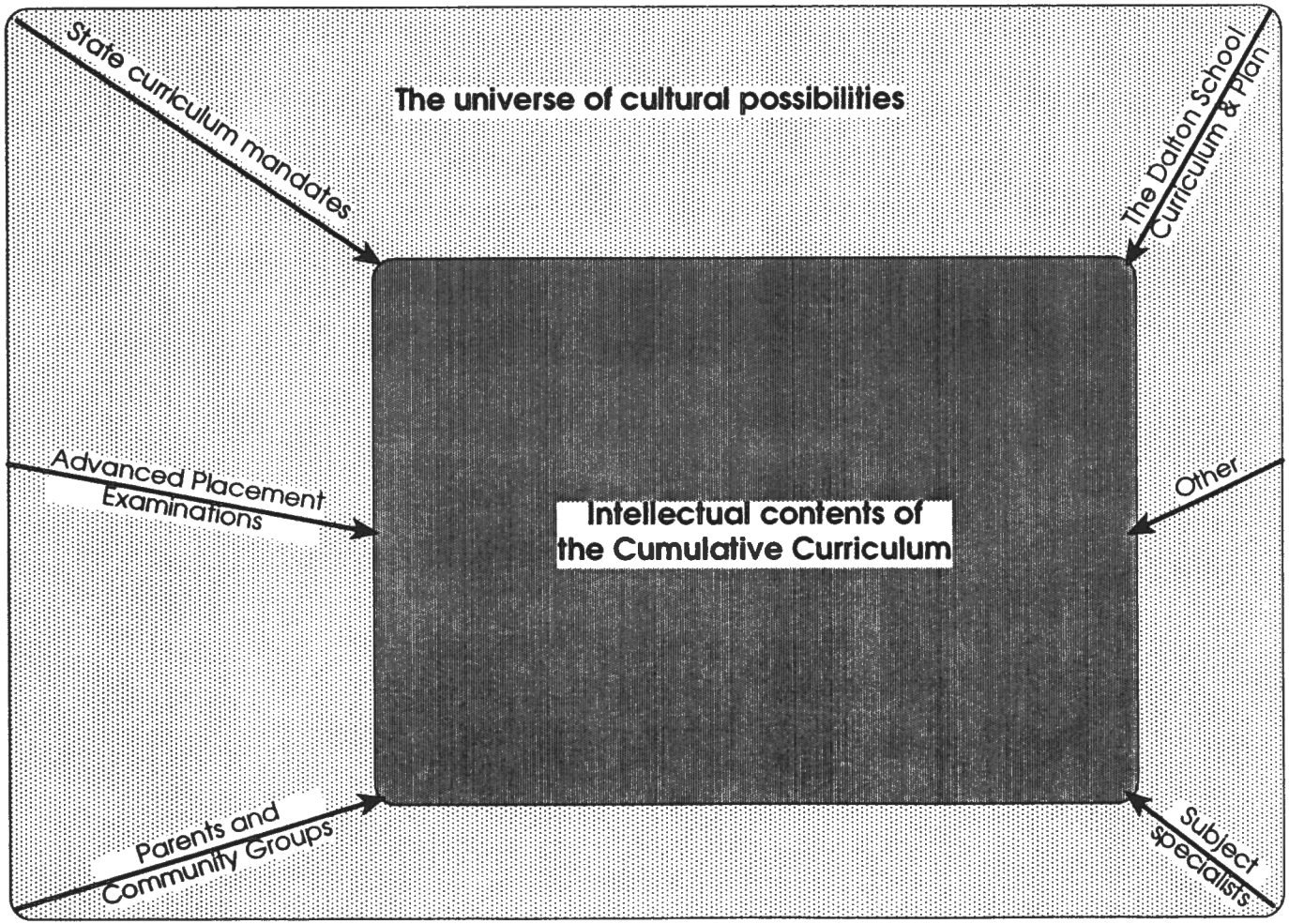
Validate prototype platform.



- What are the objectives of the project?

Select intellectual content for the cumulative curriculum

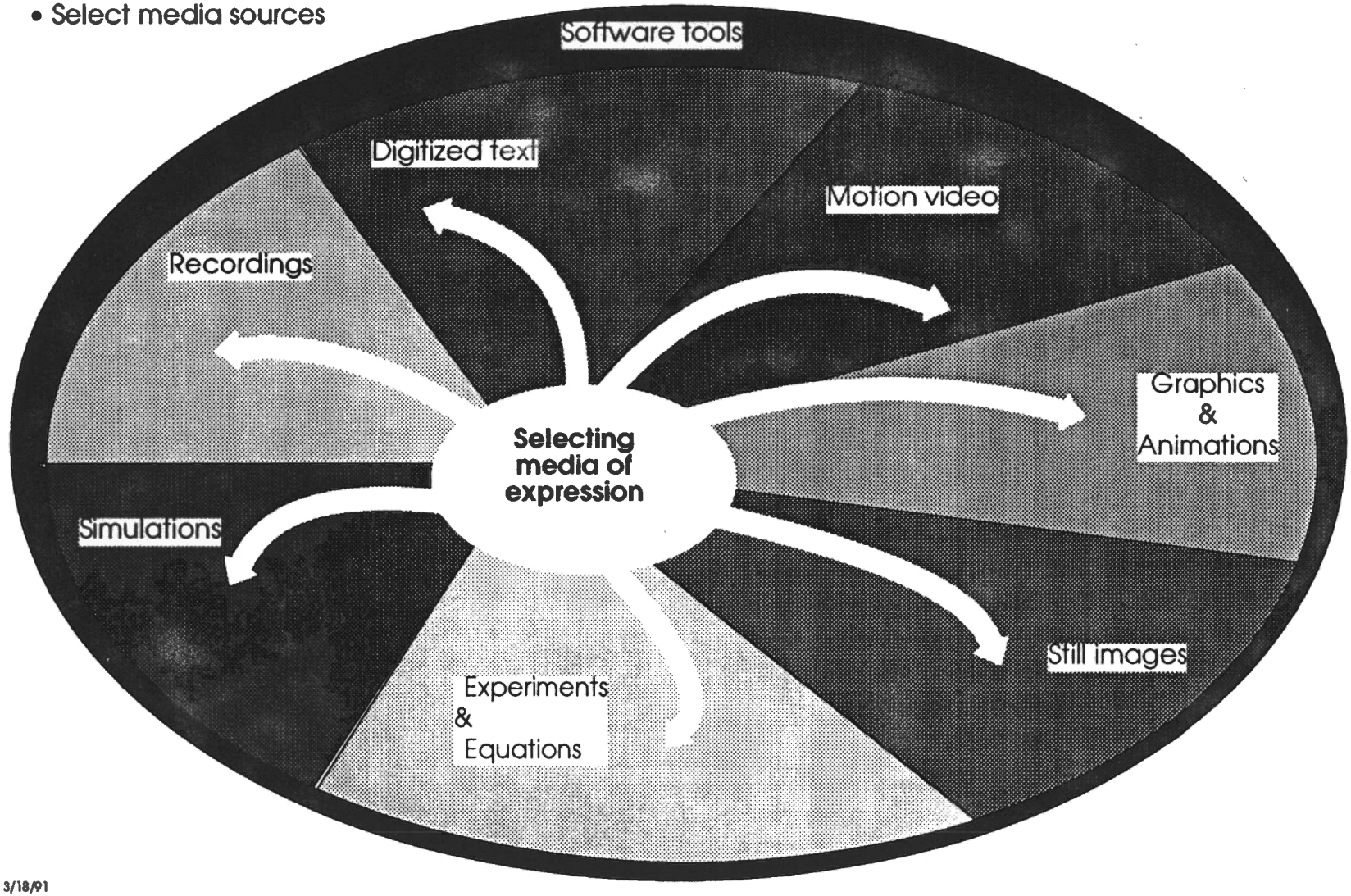
- Map current curricular contents
- Establish inclusion criteria for choosing material
- Make selections



- What are the objectives of the project?

Choose media of expression for the content

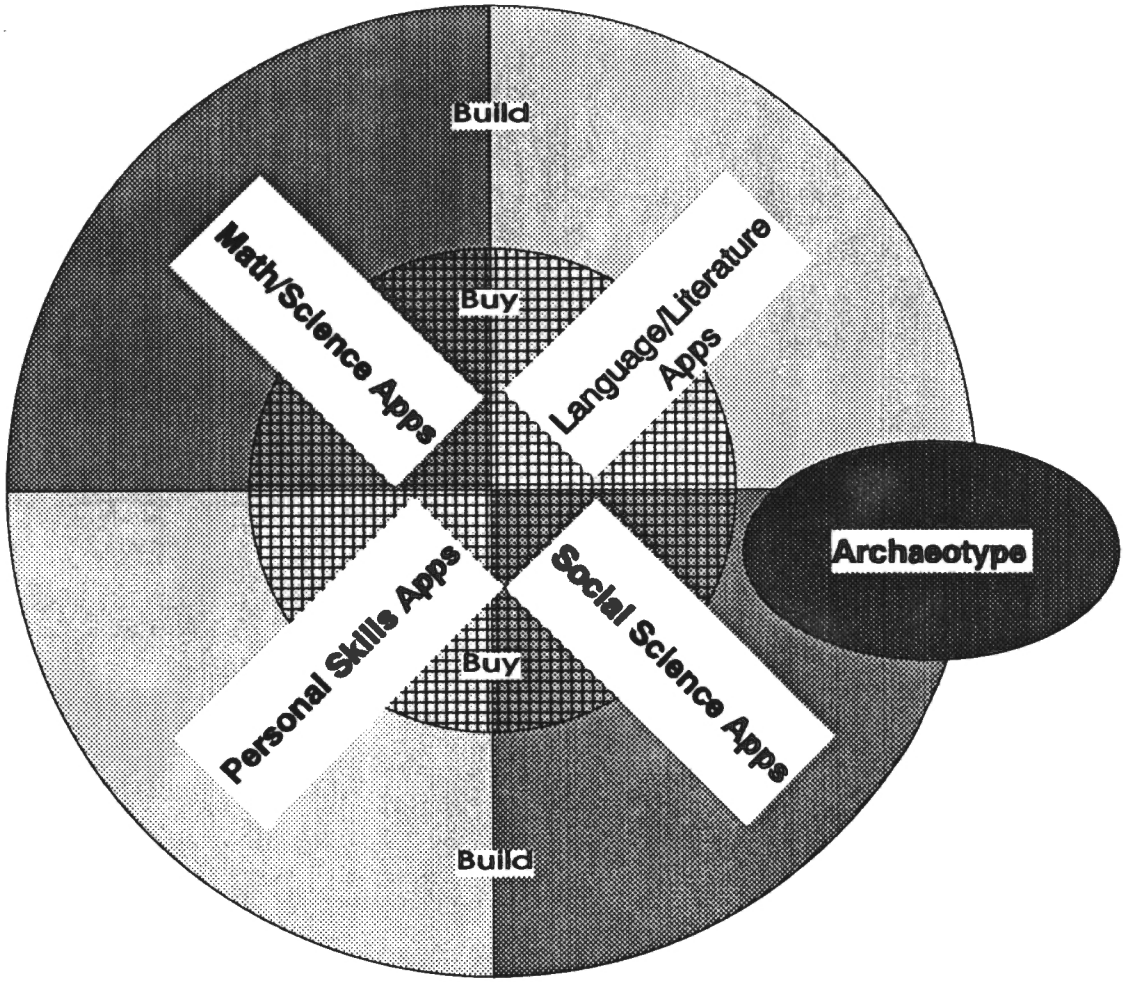
- Establish media criteria for choosing materials
- Inventory available media for topics included among intellectual contents
- Select media sources



- What are the objectives of the project?

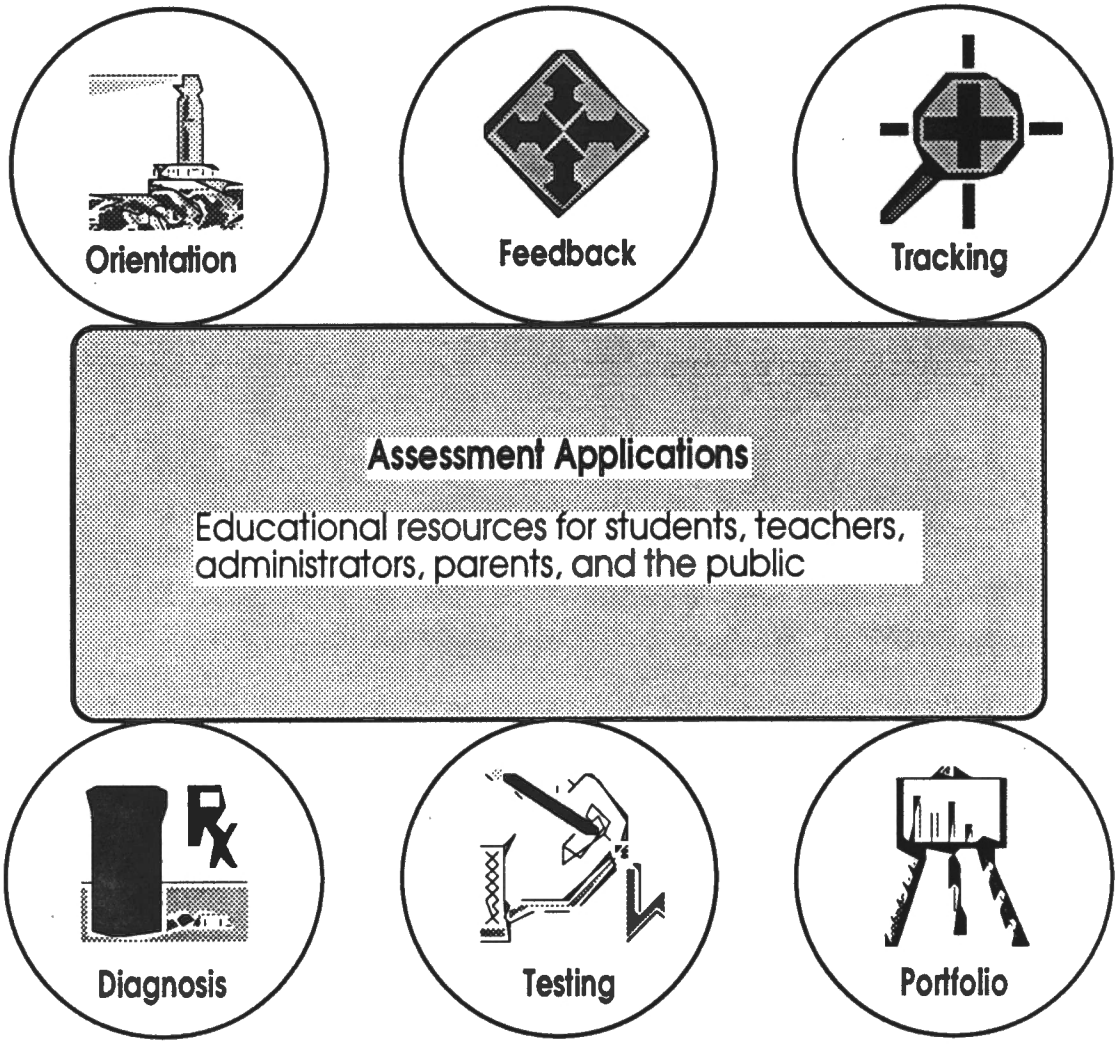
Develop the curriculum applications

- Make an inventory of curriculum applications on the market.
- Establish criteria for deciding what apps to build and what to buy.
- Select curriculum apps and schedule the "builds" and "buys".
- Map potential "builds" and "buys" to the selected intellectual contents and media of expression.
- Design and code the "builds" and acquire the "buys".



- What are the objectives of the project?

Develop the assessment applications



- Make an inventory of the forms of feedback that would be useful.
- Set criteria for choosing assessment applications to develop.
- Select the assessment applications to be developed.
- Design and code the assessment applications and integrate them into the cumulative curriculum prototype.

• What are the objectives of the project?

Field-test the cumulative curriculum prototype

At each site, for each of three years, a cohort of 20 to 25 of students, who would normally start the 3rd grade (8 year-olds) or the 6th grade (11 year-olds), will enter the field test program. With each cohort, 2 to 3 teachers will start working full time with the field test.

Recommended Sites

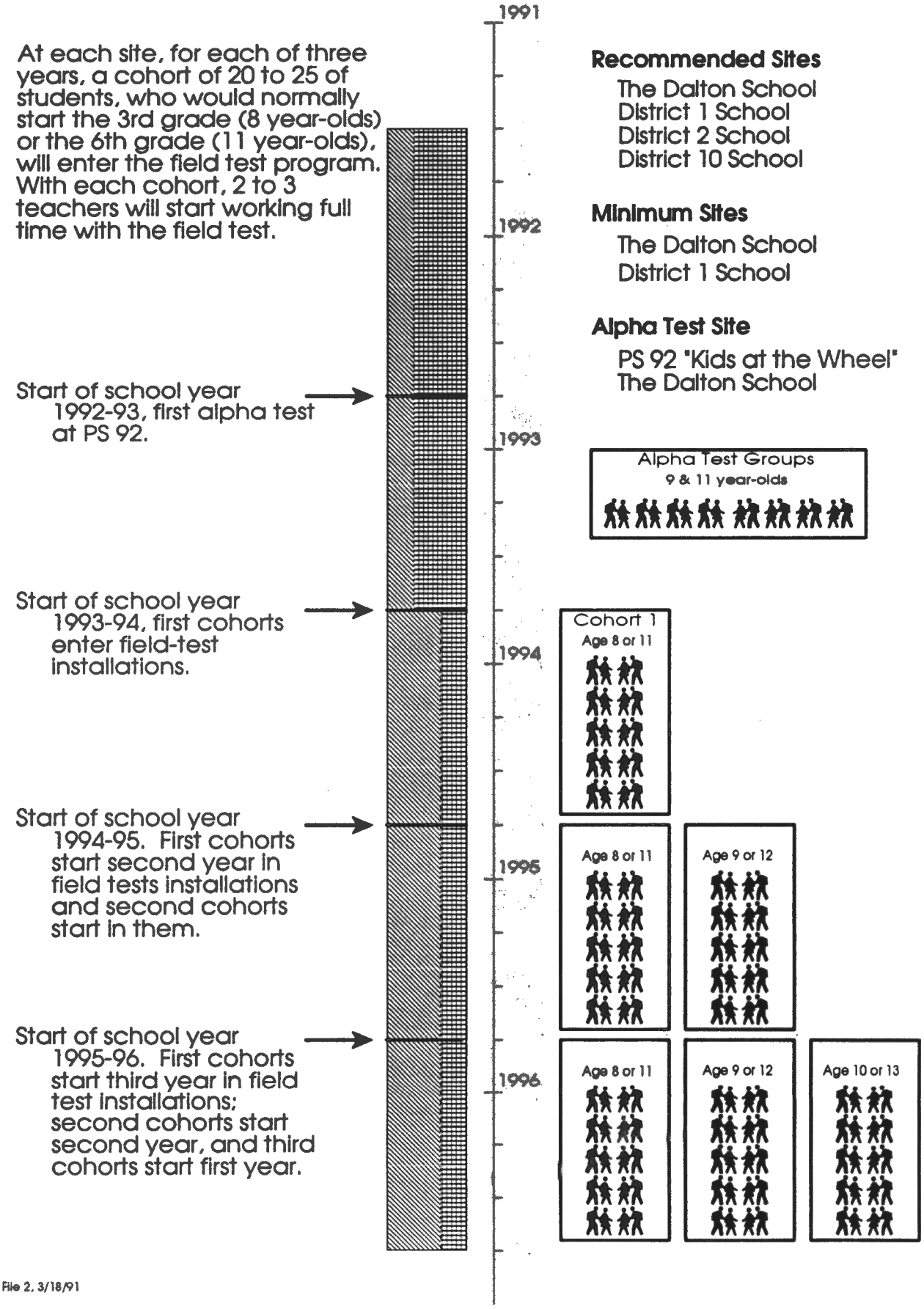
The Dalton School
District 1 School
District 2 School
District 10 School

Minimum Sites

The Dalton School
District 1 School

Alpha Test Site

PS 92 "Kids at the Wheel"
The Dalton School



File 2, 3/18/91

Who will manage the project?

The Project Directors

Robert McClintock

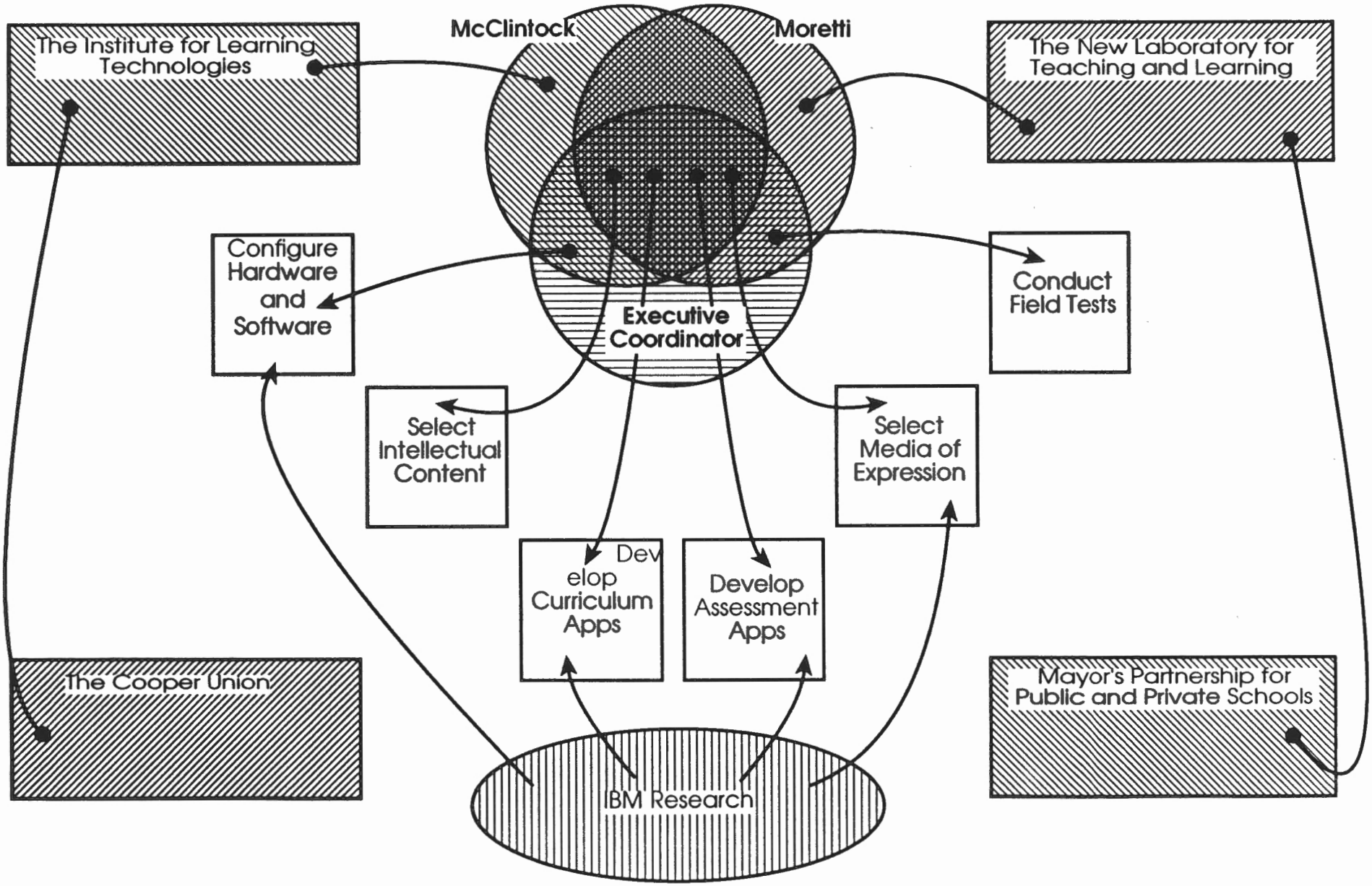
- Ph.D. Columbia University, History and Education
- Director, Institute for Learning Technologies, and Professor of History and Education, Teachers College, Columbia University
- Chaired the Department of Communication, Computing, and Technology in Education at Teachers College from 1985 through 1988.
- Directed initial work on "The Freedom Project," a technology-delivered social-studies project, for the JHM Corporation from 1988 to 1990.
- Helped secure and administer a $1.15 million grant of funds and equipment from the IBM Corporation to Teachers College.
- Oversaw the installation of an extensive LAN for academic microcomputers at Teachers College.
- Published extensively on the history of educational and political theory and on the import of computers for education.
- Managed diverse systems and software development projects for the non-profit sector and funded research projects through the Institute.

Frank Moretti

- Ph.D. Columbia University, History and Education
- Associate Headmaster, The Dalton School
- Has taught Classics, History, and Philosophy at both the university and the school levels.
- Designed and administered general education curricula at both Bloomfield College and New York University.
- Designed a variety of school level curricular projects, including philosophy and anthropology for high school, and an archeology program for elementary and middle school using both physical and computer simulations.
- Conceived and administered a teacher training program in math and science for public and private school teachers and secured $400,000 in grants to support it.
- Organized with colleagues the Mayor's Partnership for Public and Private Schools.

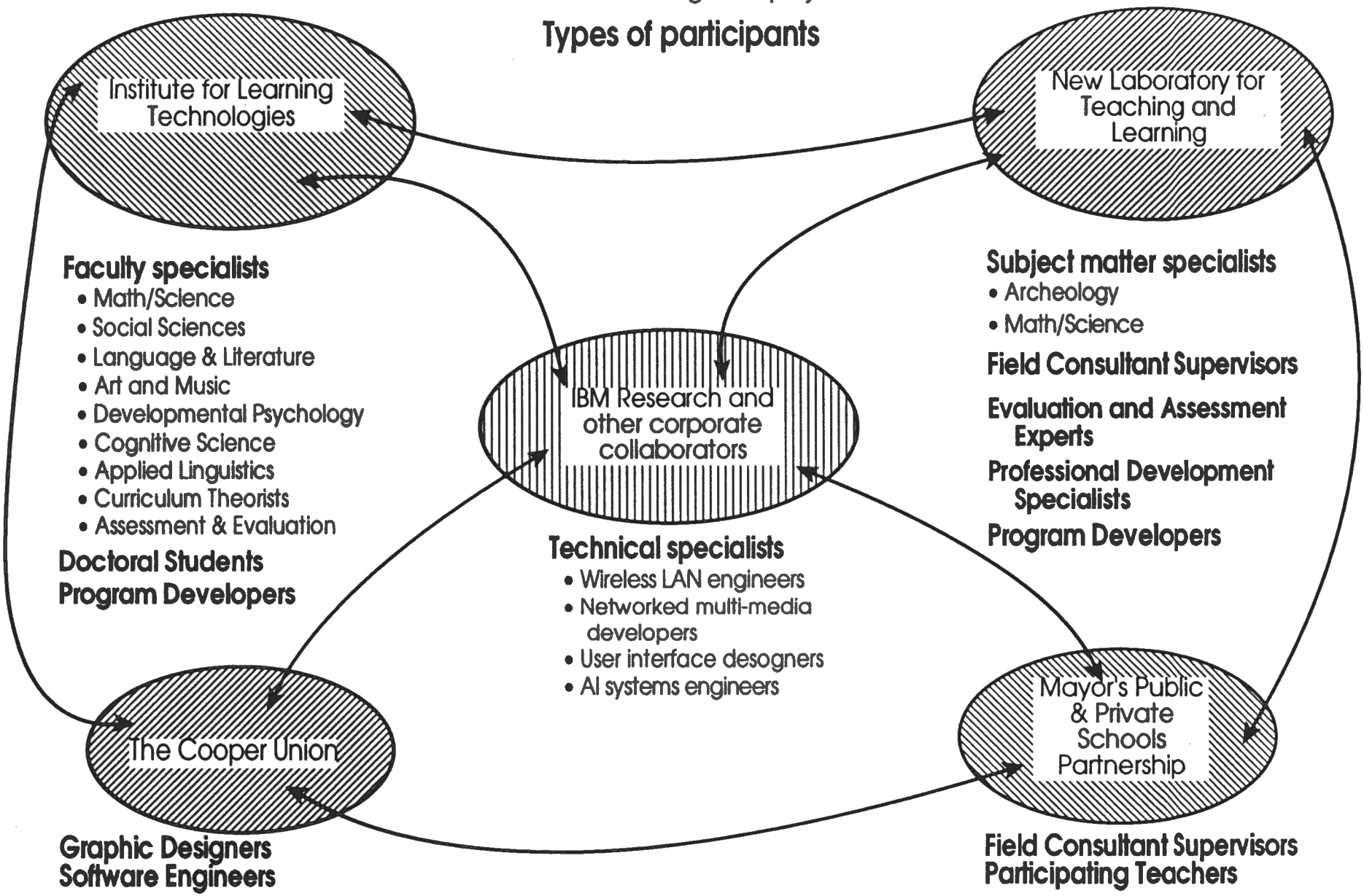
Who will manage the project?

Management Structure



Who will manage the project?

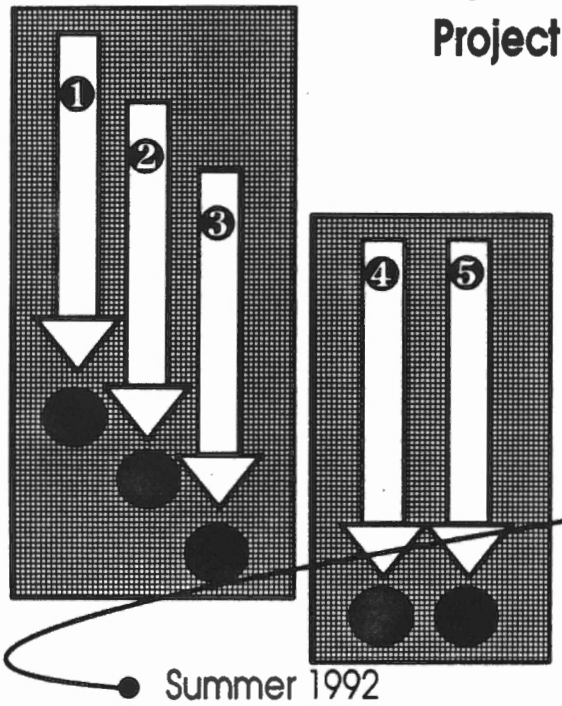
Types of participants



File 7, 3/18/91

How much will it cost?

Project sequencing and break point

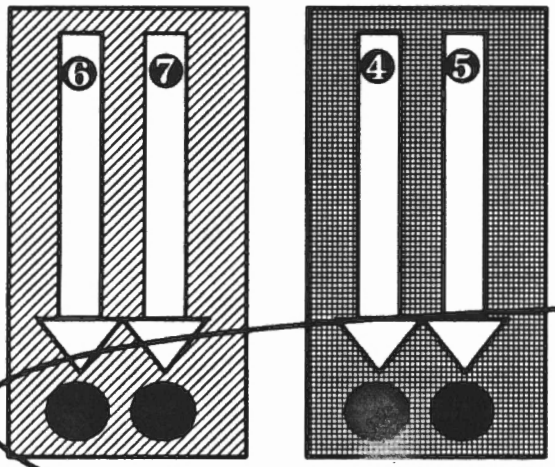


Build the prototype

1) Configure and validate the prototype platform.
2) Assemble the prototype curriculum: intellectual content.
3) Assemble the prototype curriculum: media of expression.
4) Develop curriculum applications.
5) Develop assessment applications.

Evaluation point -- Summer 1992

Summer 1992



4) Develop curriculum applications.
5) Develop assessment applications.

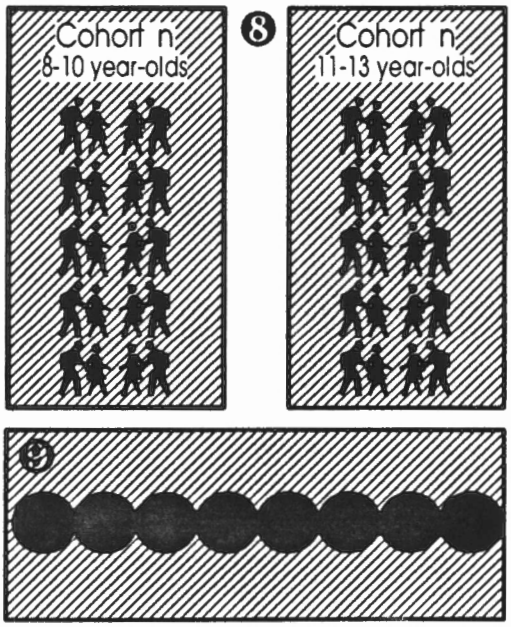
Do the classrom field tests

6) Prepare field-test sites.

7) Train teachers in the philosophy and practice of the cumulative curriculum.

Decision point on conducting the field-test -- Summer 1993

Summer 1993



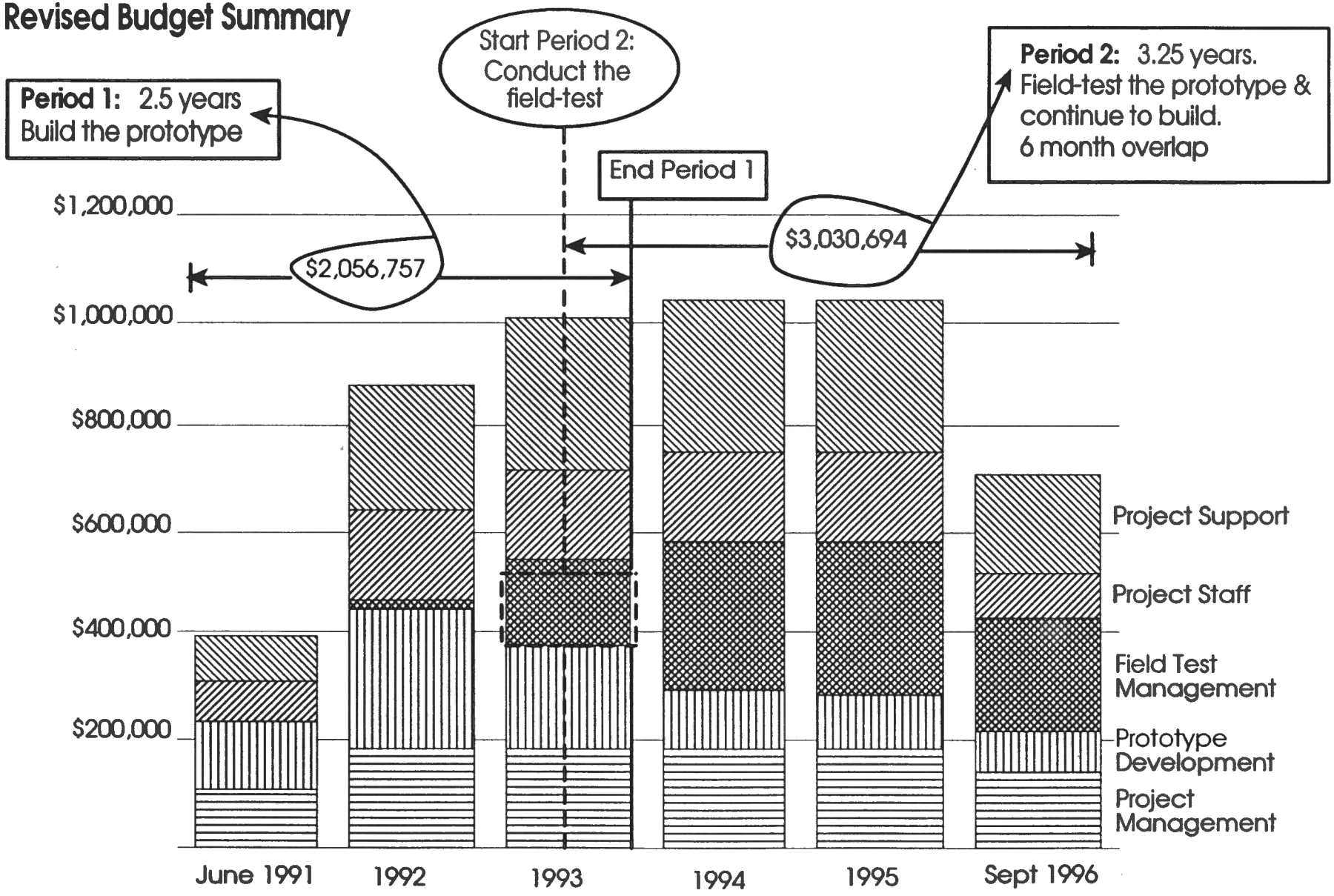
8) Conduct the field-test classes.

9) Evaluate and document the field-test results.

File 3, 3/18/91

How much will it cost?

Revised Budget Summary



File 7, 3/18/91

• How much will it cost?

Equipment needs

Development Site @ $125,000

Required development sites:
- Teachers College, Columbia University
- The Dalton School

Recommended development site:
- The Cooper Union

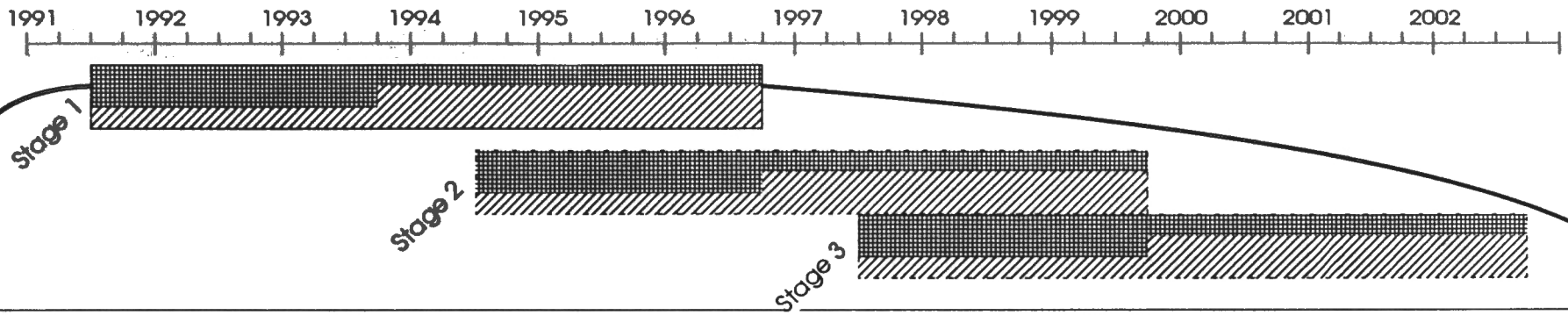
Field-test Site @ $260,000 new
@ $220,000 additional

Field-tests sites:
- Summer 1992 -- 2 new
- Summer 1993 -- 1 to 3 new
- Summer 1994 -- 2 to 4 additional
- Summer 1995 -- 2 to 4 additional

System server:			
High-capacity 486 server, 16 meg ram, good caching ($15,000)	1	1	
System storage:			
Multi-gigabyte, high-speed magnetic disks ($9,000)	1	1	
Multiple CD-ROM players, network compatible ($6,000)	1	1	
Industrial videotape decks ($1,250 ea.)	2	2	
Industrial videodisc players ($1,250 ea.)	2	2	
DV-I (or better) compression & decompression cards (2,500 + 750 ea.)	1	1	
Networking resources:			
Cabeling ($1,000)	1	1	1
Network cards ($400 ea.)	10	36	36
Teacher workstations:			
33 MZ 386, 8 meg. ram, 300 meg fixed-disk, XGA video + 8514-type monitor, DV-I type comp. & decomp. ($7,500)	1	3	3
Video camcorder ($1,250)	1	3	3
Desktop scanner ($1,250)	1	3	3
Laser printer, with Postscript ($1,750)	1	3	3
Small group worstations			
33 MZ 386, 8 meg. ram, 120 meg fixed-disk, XGA video + 8514-type monitor, DV-I type comp. & decomp. ($6,500)	1	6	6
Video camcorder ($1,250)	1	6	6
Notebook computers:			
20 MZ 386SX, 5 meg ram, 640x480 VGA, 32 gray-scale, 40 meg disk, network-link (wireless when available) ($3,500)	6	24	24
Classroom peripherals:			
Projection monitor, ceiling mounted ($12,000)		1	1
Desktop scanner ($1,250)		1	1
High-capacity laser printer, with Postscript ($5,000)		1	1
Development peripherals:			
High-capacity laser printer, with Postscript ($5,000)	1		
High-capacity scanner ($12,500)	1		
Operating software: (app. $8,000 in licenses)			
DOS 5.0, Windows 3.0, Novell 386, E-mail and network tools, utilities	1	1	1
Productivity software: (app. $8,000 in licenses)			
Word for Windows, Excel, PageMaker, Current, CorelDraw, Scrapbook +, Spinnaker Plus 2, Bridge Development Kit, DV-I Authoring, OmniPage Professional	1	1	1
Development tools: (app. $5,000 in licenses)			
Smalltalk for Windows, Borland C++ Professional, other needed tools	1		

The Cumulative Curriculum: a three-stage design and development effort

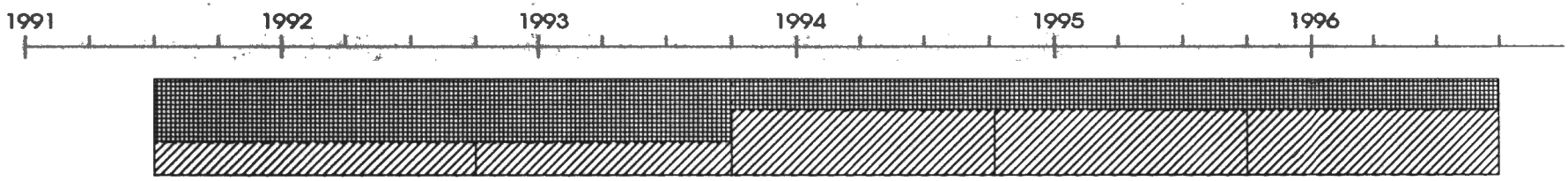
Purpose: To develop a Cumulative Curriculum and to test its effectiveness for children ages 6 through 18.
Stages: Differentiated by distinctive hardware-software platforms.



Current Proposal: Stage One of the Cumulative Curriculum

Objective: To provide proof of concept for the Cumulative Curriculum by building a prototype and field testing it with children ages 8 through 13 (grades 3-5 and grades 6-8).

Strategy: **Build** the prototype and **do** the field test **Build** **Do**



Build the prototype

1) Configure and validate the prototype platform.
2) Assemble the prototype curriculum: intellectual content.
3) Assemble the prototype curriculum: media of expression.
4) Develop curriculum applications.
5) Develop assessment applications.

Do the classrom field tests

6) Prepare field test sites.
7) Train teachers in the philosophy and practice of the cumulative curriculum.
8) Conduct the field test classes.
9) Evaluate and document the field test results.

Build the cumulative curriculum prototype

1) Configure and validate the prototype platform.
Select and install the system hardware and software and test it to see that it can perform the functions needed by the cumulative curriculum.

A) Set validation criteria.

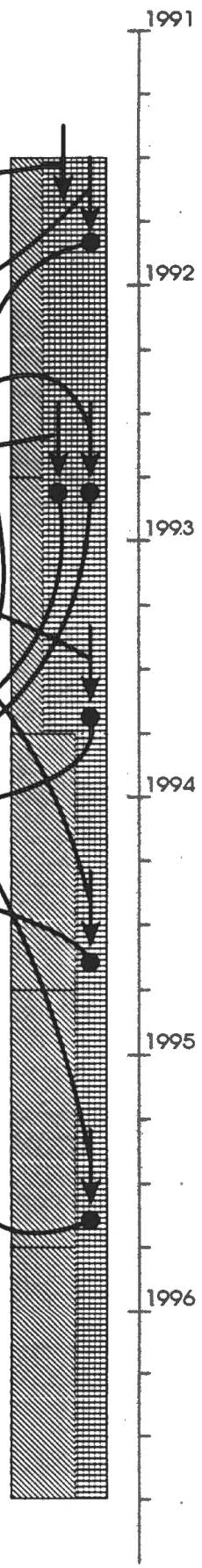
B) Define and install software development environment (hardware and software development tools).

(Teachers College – ILT)

Define and install start-up hardware

Alpha test system -- (PS 92)
Teacher demonstration system -- (Dalton)
First year installations -- (District 1 & Dalton)
Second year installations -- (District 1 & Dalton)
Third year installations -- (District 1 & Dalton)

C) Validate prototype platform
Perform validation tests.



Build the cumulative curriculum prototype

2) Assemble prototype curriculum: intellectual content.

Intellectual content consists of an extensive selection of topics from our cultural heritages, study of which will enable diverse students to acquire the knowledge, skills, understanding, and values associated with quality general education.

A) Map the current curriculum contents and the desired learning outcomes, grades 1-12 (ages 6-18).

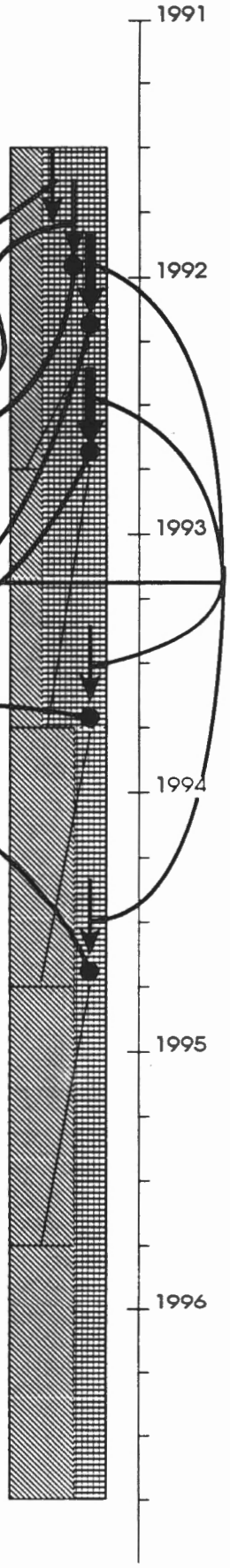
B) Set intellectual inclusion criteria for for choosing materials for the cumulative curriculum.

Review and formalize criteria.

C) Make intellectual selection of materials to include in the cumulative curriculum.

Review and formalize for the Alpha Test
Review and formalize for the First Year
Review and formalize for the Second Year
Review and formalize for the Third Year

The scale and scope of the intellectual content will be determined early in the selection sequence, but the process will continue throughout the life of the project as a result of feedback from students, teachers, and applications developers.



Build the cumulative curriculum prototype

3) Assemble prototype curriculum: media of expression.
Media of expression consist of specific works in the cultural heritages as represented for an audience. Media of expression thus comprise numerous texts, pictures, scores, films and videos, recordings, experiments, graphs, equations, buildings, artifacts, and so on.

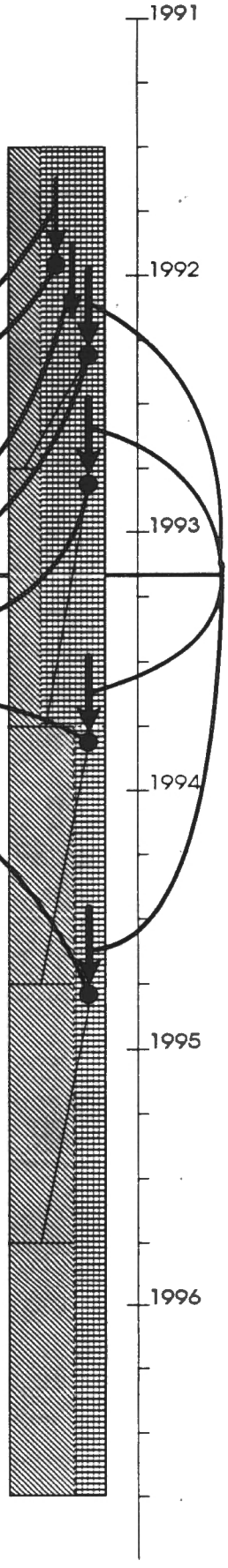
A) Set media of expression criteria for choosing materials for the cumulative curriculum.

Review and formalize criteria.

B) Inventory the media of expression available for topics included among intellectual contents.

C) Select media sources.

Review and formalize for the Alpha Test
Review and formalize for the First Year
Review and formalize for the Second Year
Review and formalize for the Third Year



Build the cumulative curriculum prototype

4) Develop curriculum applications.
Curriculum applications combine intellectual content with pedagogical resources in ways that will help students acquire knowledge, understanding, skills, and values.

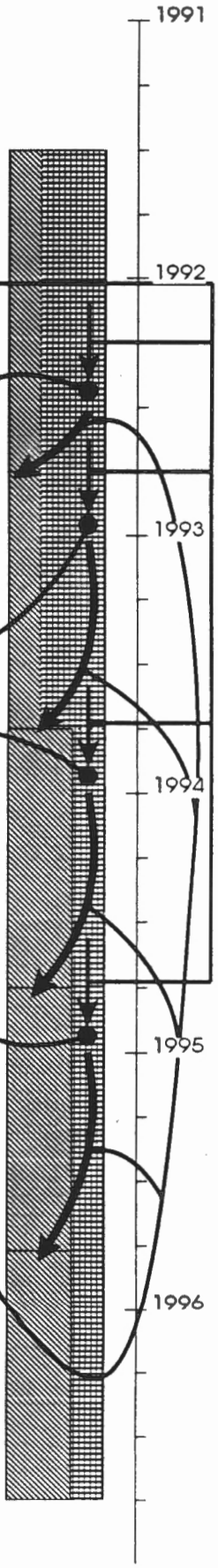
A) Make an inventory of curriculum applications available on the market.

B) Set criteria for choosing curriculum applications to be built (we code or substantially modify application) and to be bought (we buy and use as is).

C) Map potential "builds" and "buys" to the selected intellectual contents and media of expression.

D) Select curriculum applications and schedule the "builds" and the "buys."
- Review and formalize for the Alpha Test
- Review and formalize for the First Year
- Review and formalize for the Second Year
- Review and formalize for the Third Year

E) Design and code the "builds" and acquire the "buys." Integrate into the curriculum prototype and debug.



Build the cumulative curriculum prototype

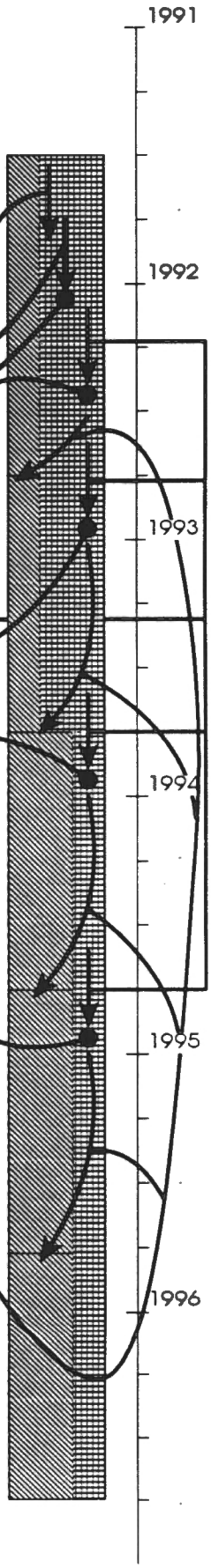
5) Develop assessment applications.
Assessment applications provide feedback to students, teachers, administrators, and parents about students' work with the cumulative curriculum, indicating what a student has done, supporting the diagnosis of interests and difficulties, keeping a permanent portfolio of his or her accomplishments, and helping guide and stimulate his or her further work.

A) Make an inventory of the forms of feedback it would be useful to provide.

B) Set criteria for choosing assessment applications to develop.
Review and formalize the criteria.

C) Select the assessment applications to be developed.
Review and formalize for the Alpha Test
Review and formalize for the First Year
Review and formalize for the Second Year
Review and formalize for the Third Year

D) Design and code the assessment applications and integrate them into the curriculum prototype.



Field test the cumulative curriculum prototype

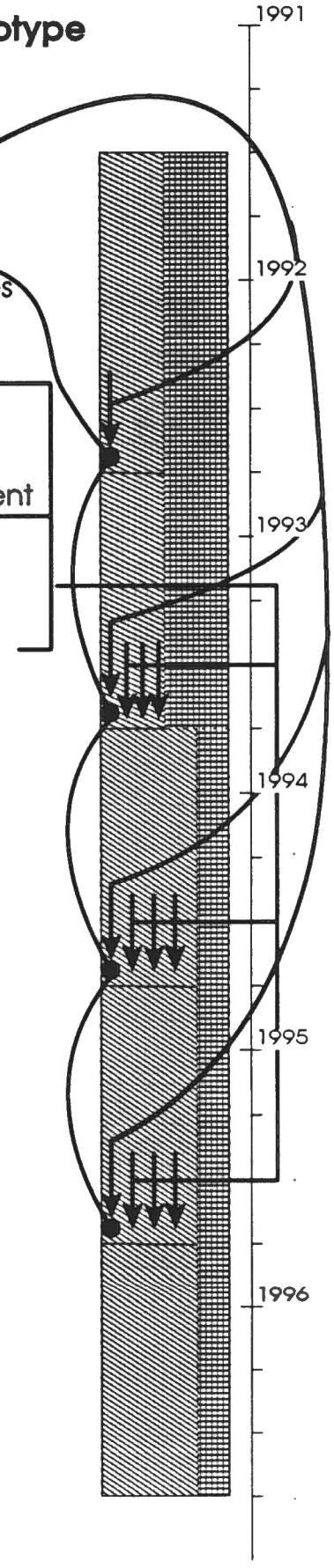
6) Prepare field-test sites.

A) Design and set-up spaces and install technical environment.
Validate system.

B) Work out how cumulative curriculum sites will interface with the program of the host schools (physical education, assemblies, extra-curricular activities, etc.).

C) Introduce project to parents of the student participants.

D) Establish project bulletin board for teachers, partents, and student use (homework, conferencing, etc.).



Field test the cumulative curriculum prototype

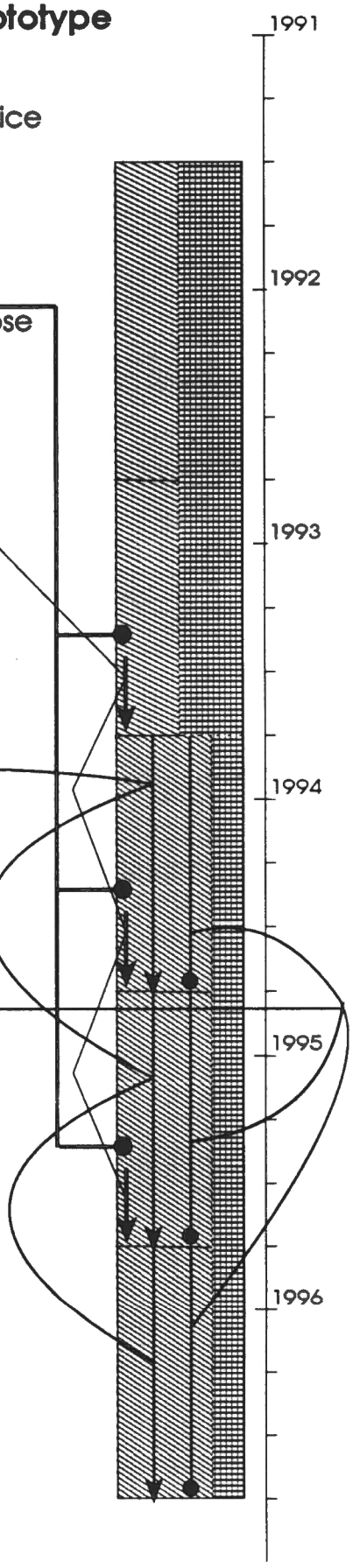
7) Train teachers in the philosophy and practice of the cumulative curriculum.

A) Set criteria for selecting teachers and recruit participants according to those criteria.

B) Run summer taining program for participating teachers.

C) Conduct support program on-line and through workshop during the school year.

D) Engage participating teachers in the assessment and feedback process.



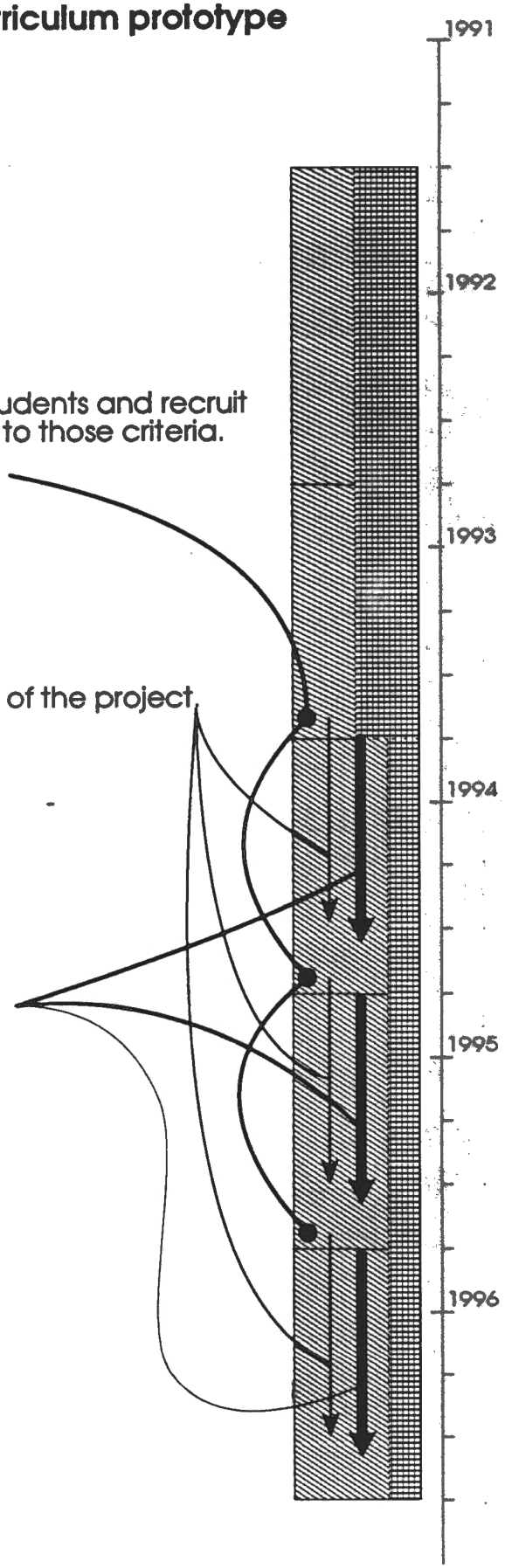
Field test the cumulative curriculum prototype

8) Conduct the field-test classes.

A) Set criteria for selecting students and recruit participants according to those criteria.

B) Involve parents in support of the project.

C) Hold the field-test classes.



Field test the cumulative curriculum prototype

9) Evaluate and document the field-test results.