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.

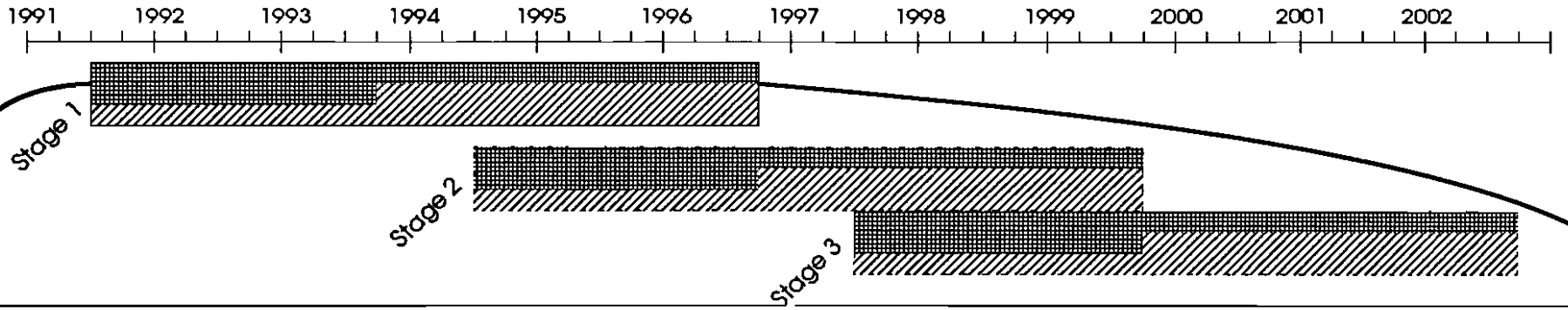
Co-Directors of the project are
- Robert McClintock, Professor of History and Education at Teachers College, and
- Frank Moretti, Associate Headmaster at Dalton

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

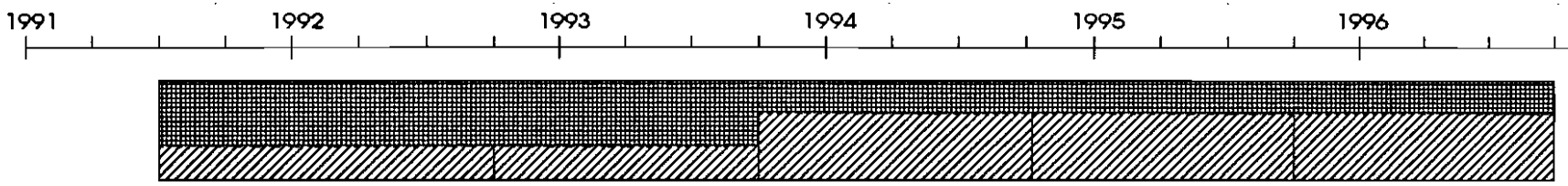
Purpose: To develop a Cumulative Curriculum and to test its effectiveness for children ages 6 through 18.
Stages: Differentiated by distinctive hardware-software platforms.



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

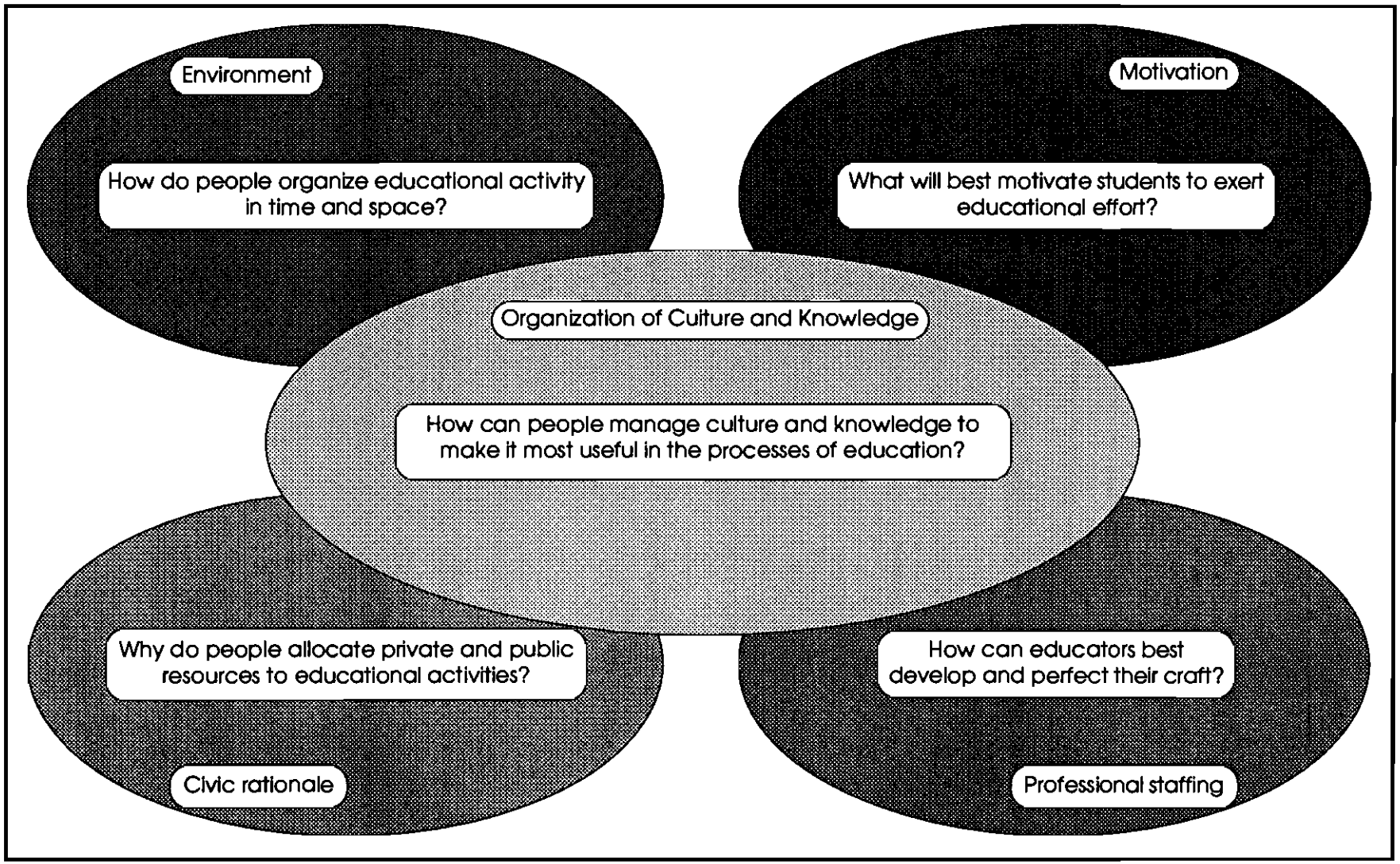
America 2000 proposal:
150 to 200 million for 3-7 Research & Development Centers

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

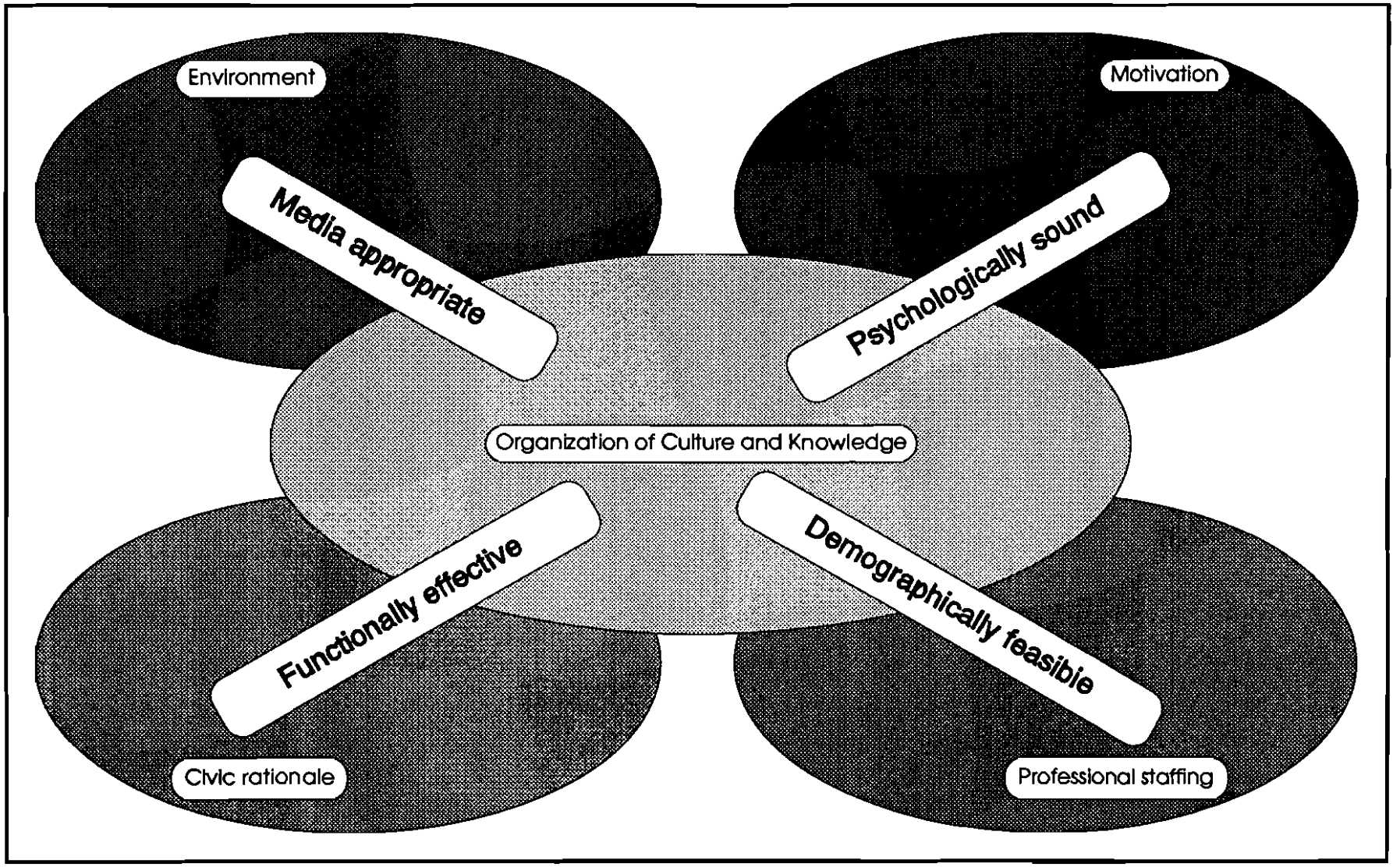
Assessment:
Chances of funding are high, but not sure
Official action between September 1991 and January 1992

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

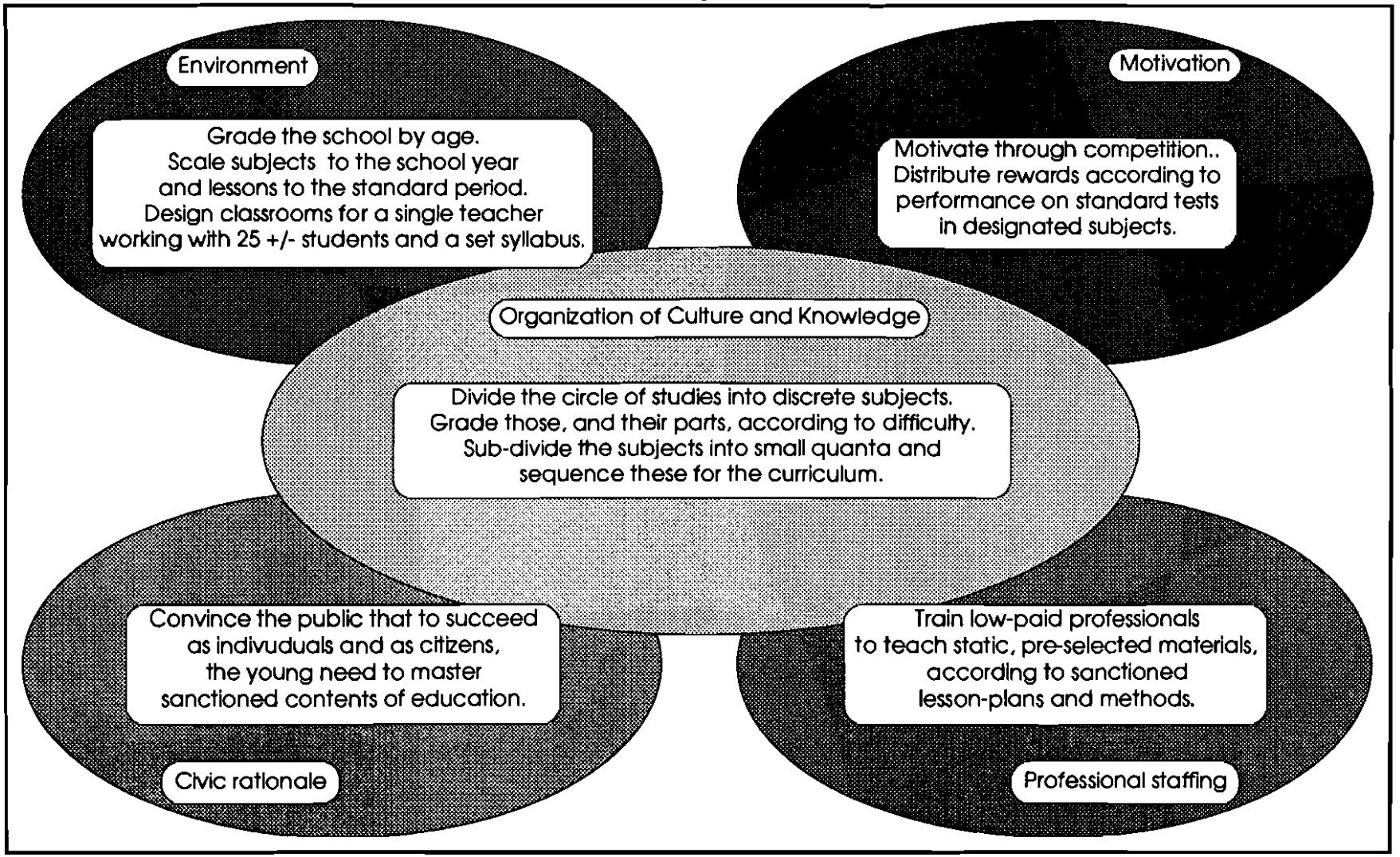
The domains of historical innovation in education



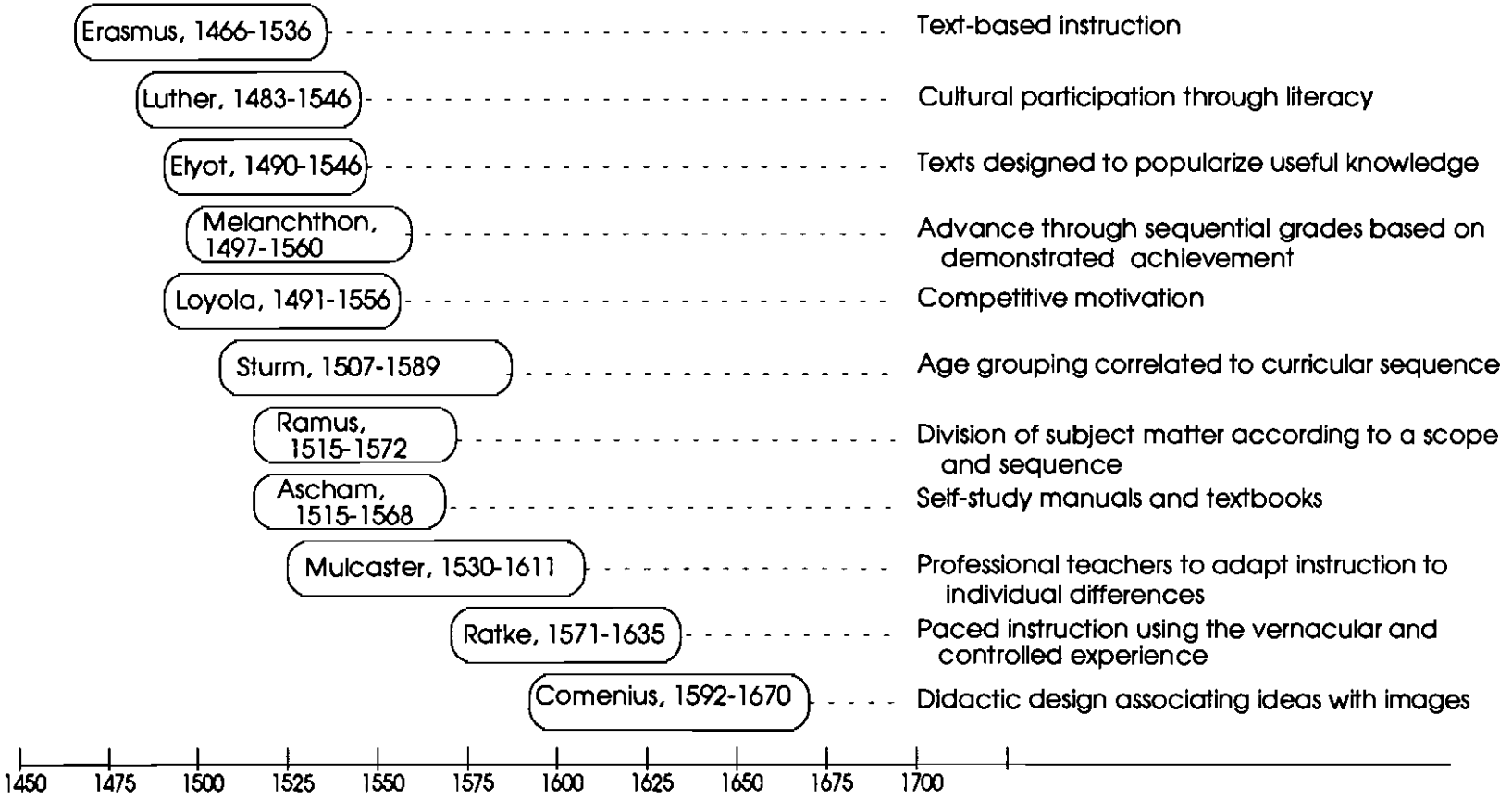
Structural limitations on historical innovation in education



The Historical Grounding of Print-Based Schooling

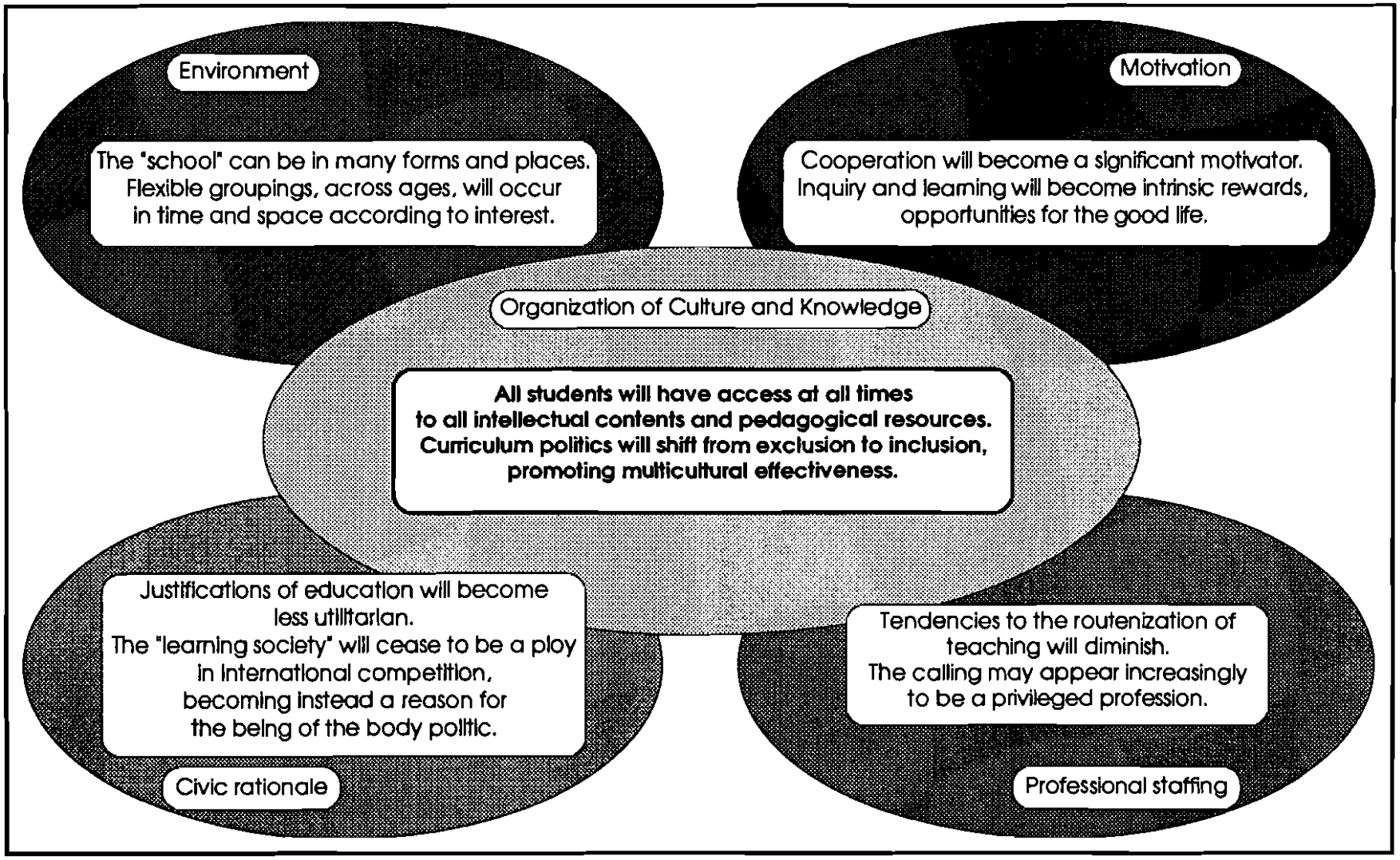


Printing and Early-Modern Educational Reform



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.

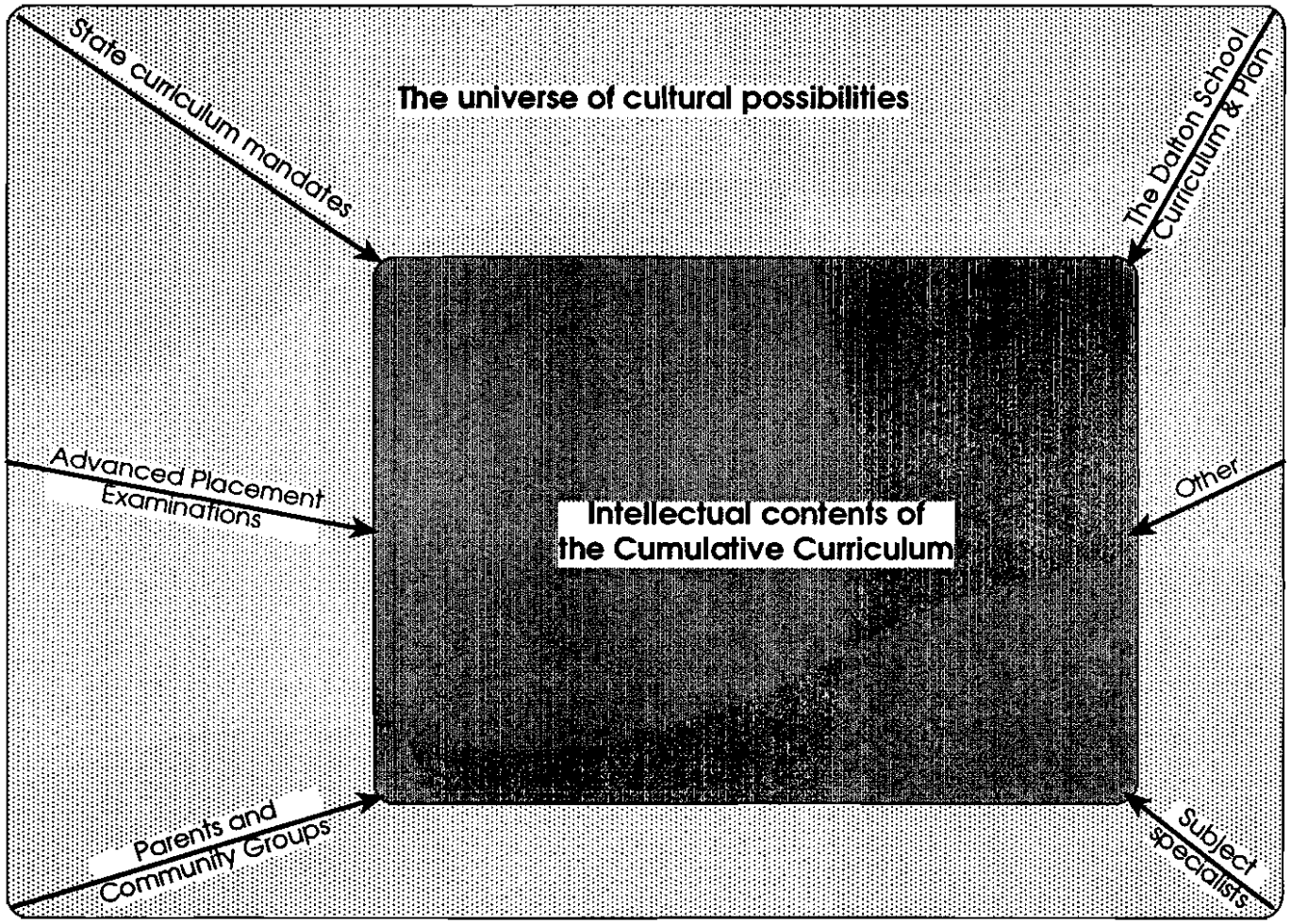
The Historical Grounding of the Cumulative Curriculum



- What are the objectives of the project?

Select intellectual content for the cumulative curriculum

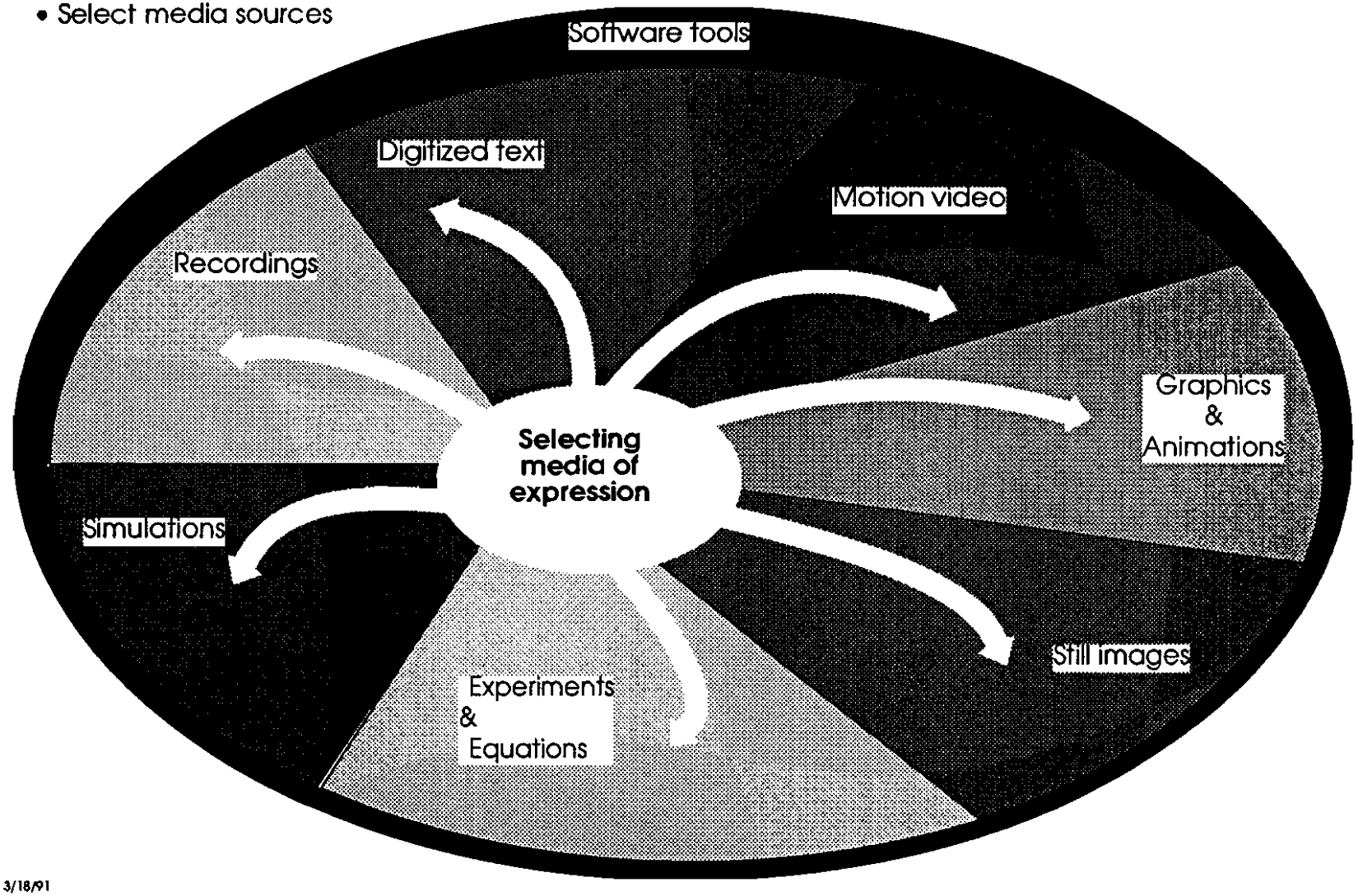
- Map current curricular contents
- Establish inclusion criteria for choosing material
- Make selections



- What are the objectives of the project?

Choose media of expression for the content

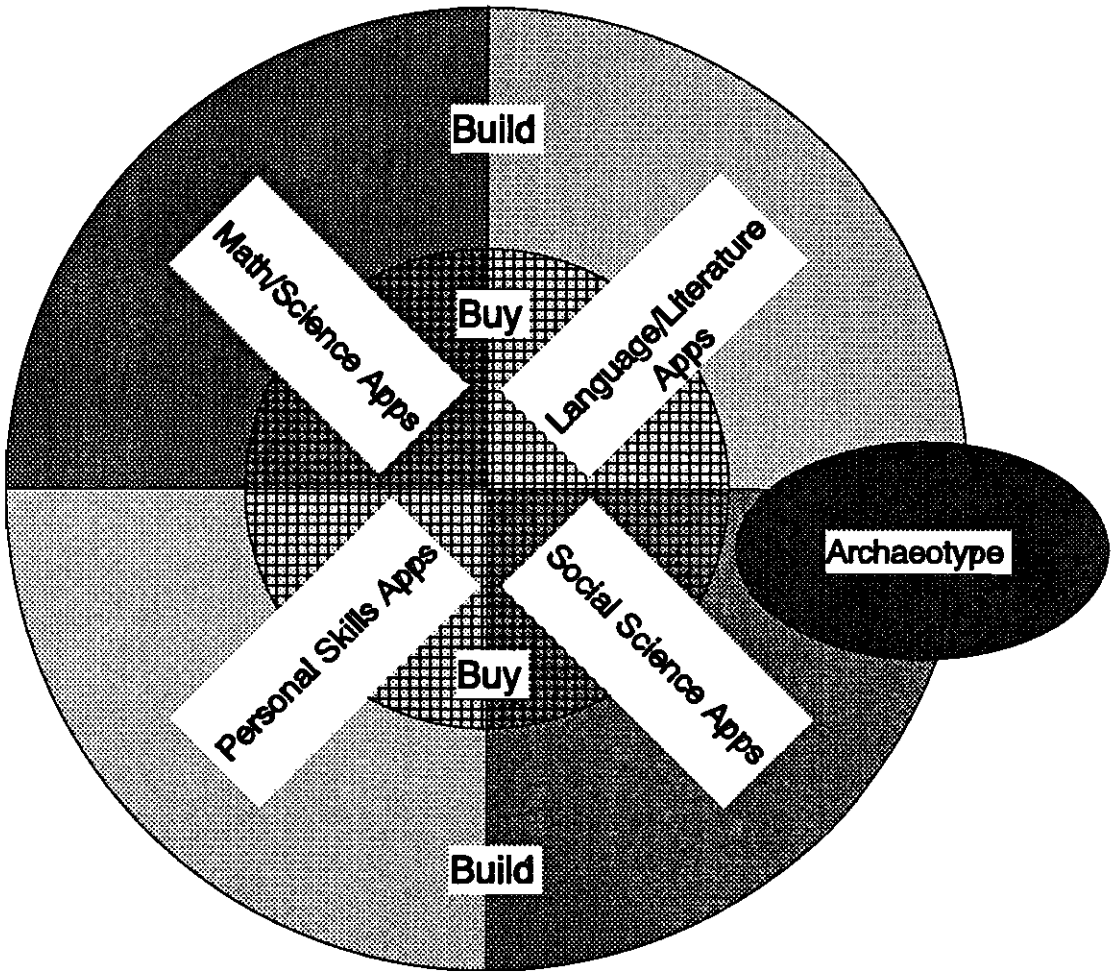
- Establish media criteria for choosing materials
- Inventory available media for topics included among intellectual contents
- Select media sources



- What are the objectives of the project?

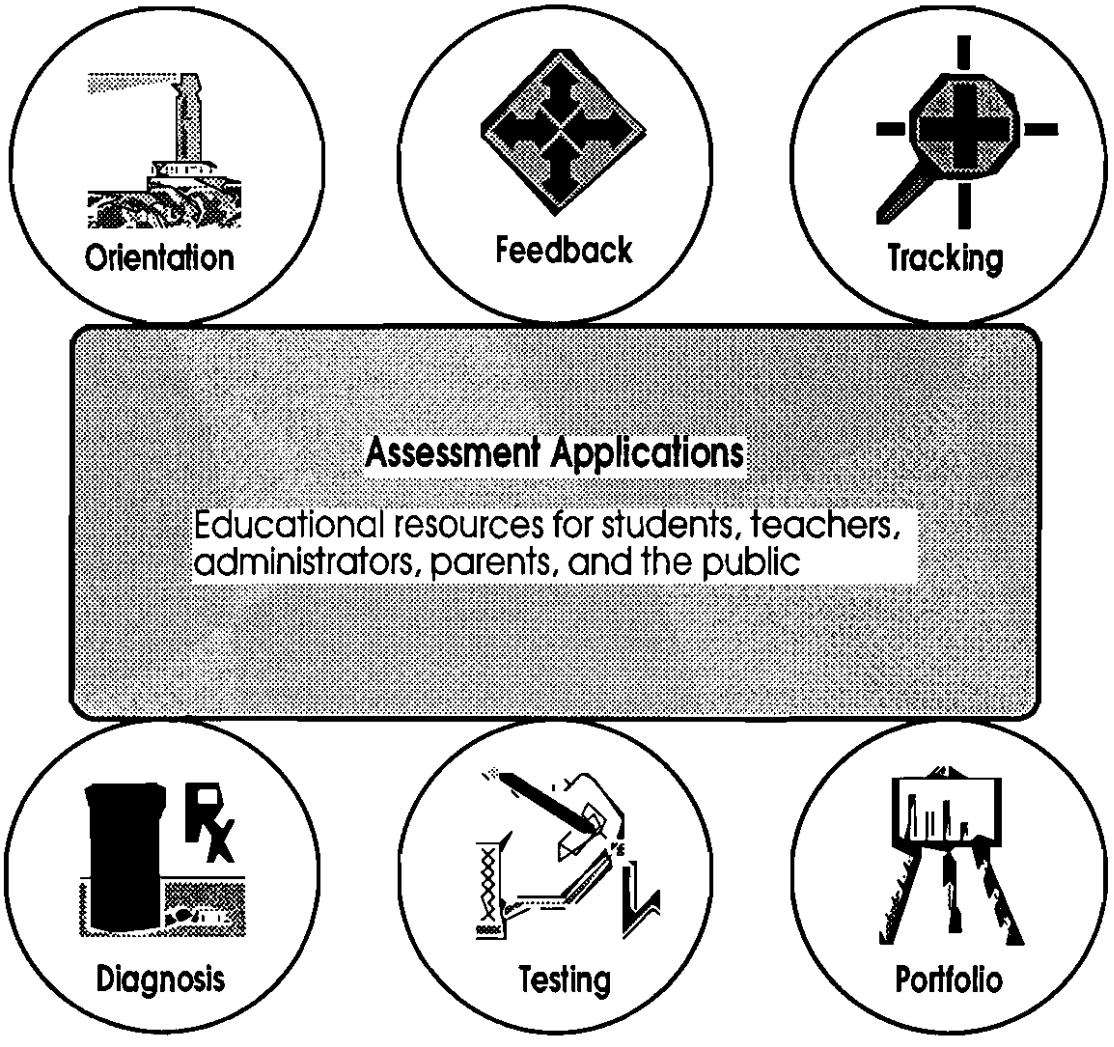
Develop the curriculum applications

- 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".

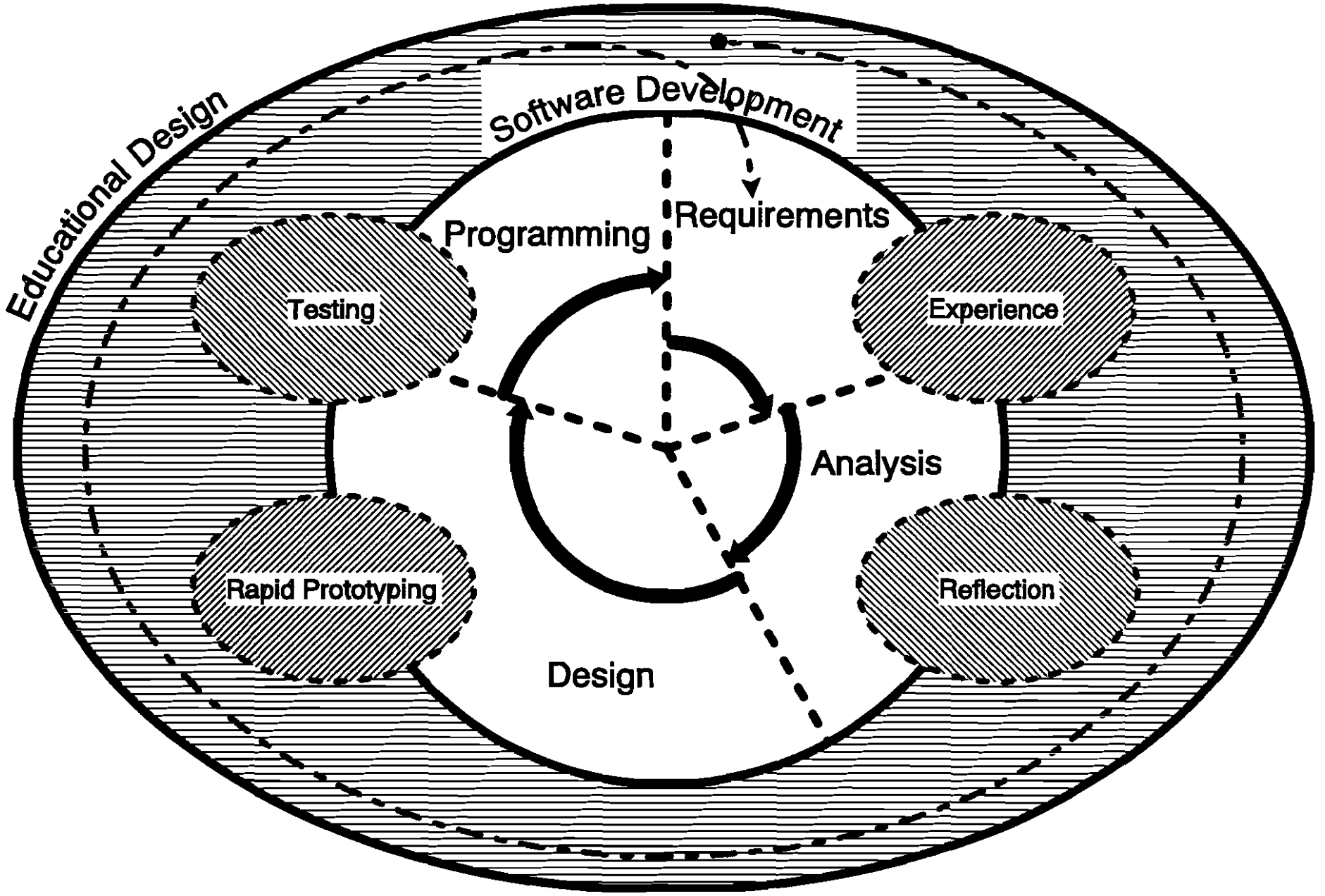


- What are the objectives of the project?

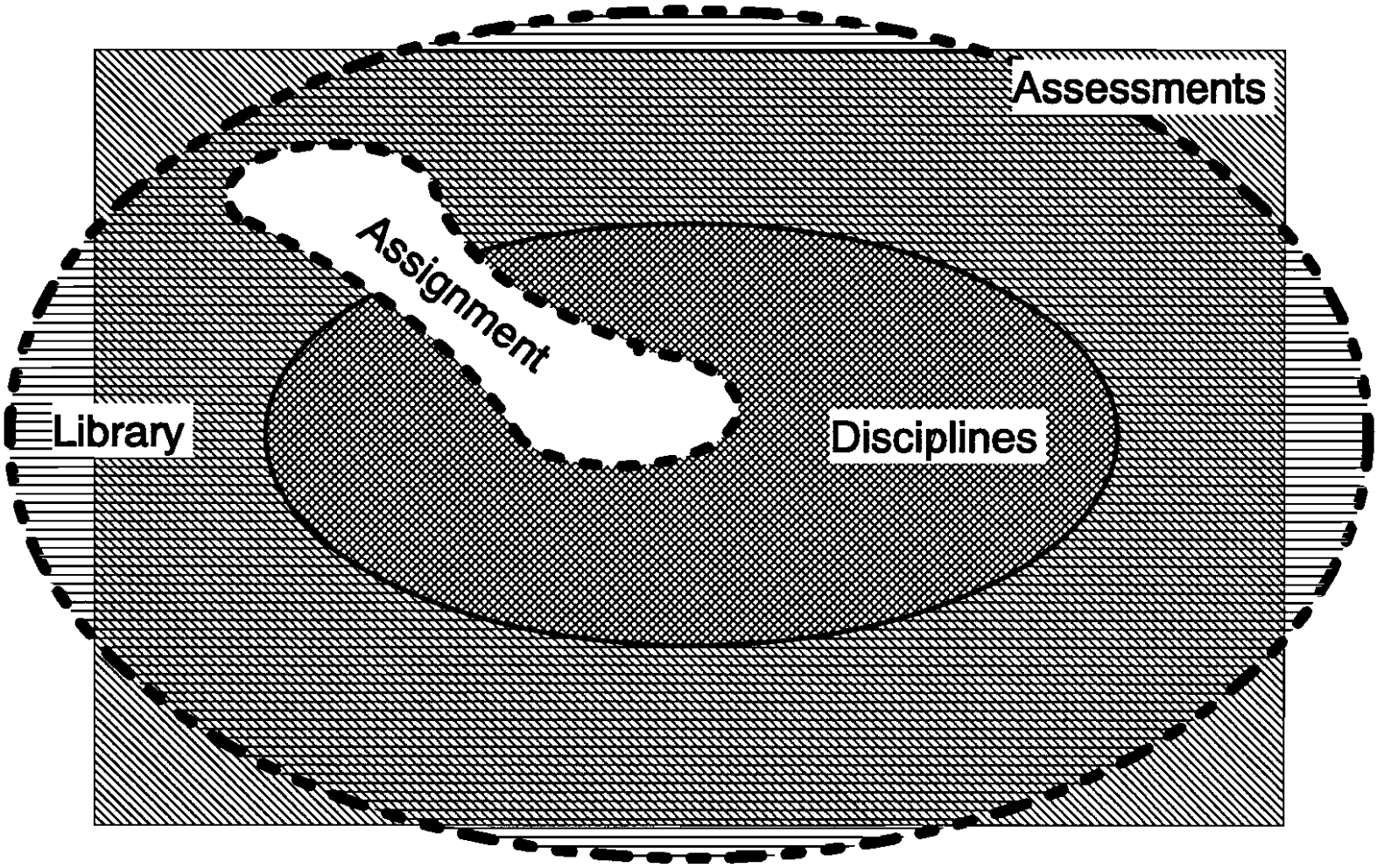
Develop the assessment applications



- 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.


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

Components of the Cumulative Curriculum



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.

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 . . . ."

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.

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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.

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.

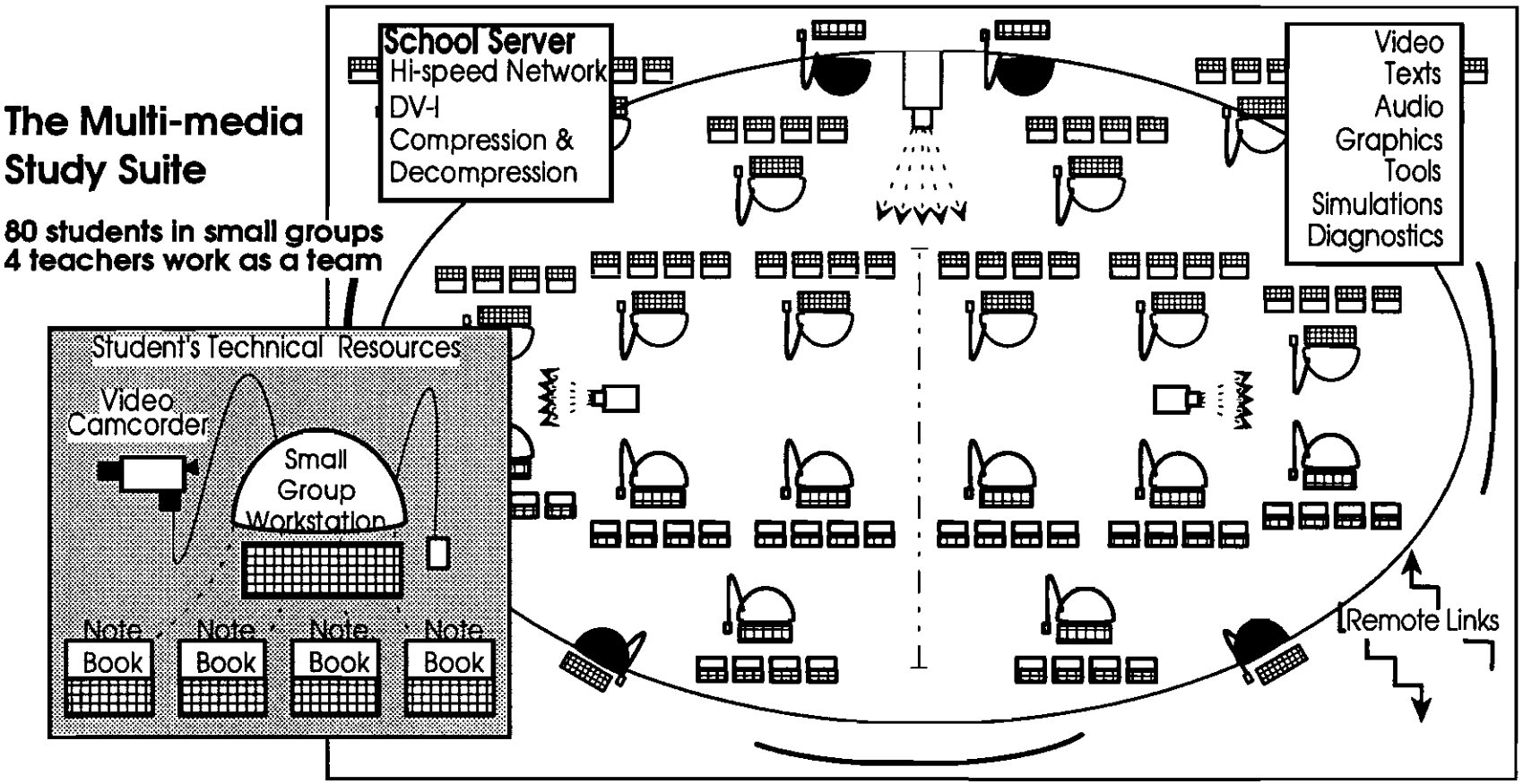
Implications:

Assessments should serve students.

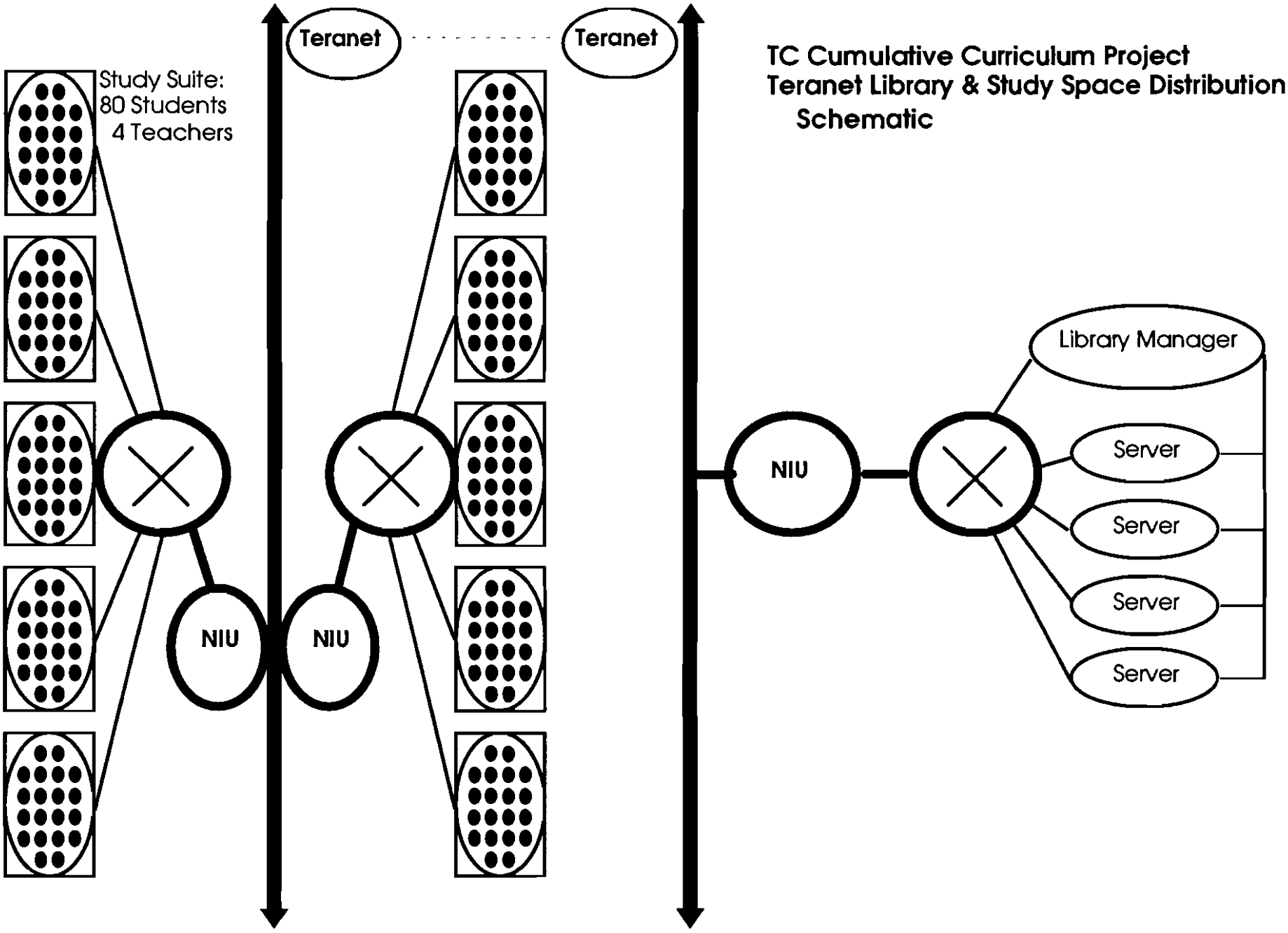
Assessments should engender cooperation among peers -- when other students do well, it should benefit all.

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

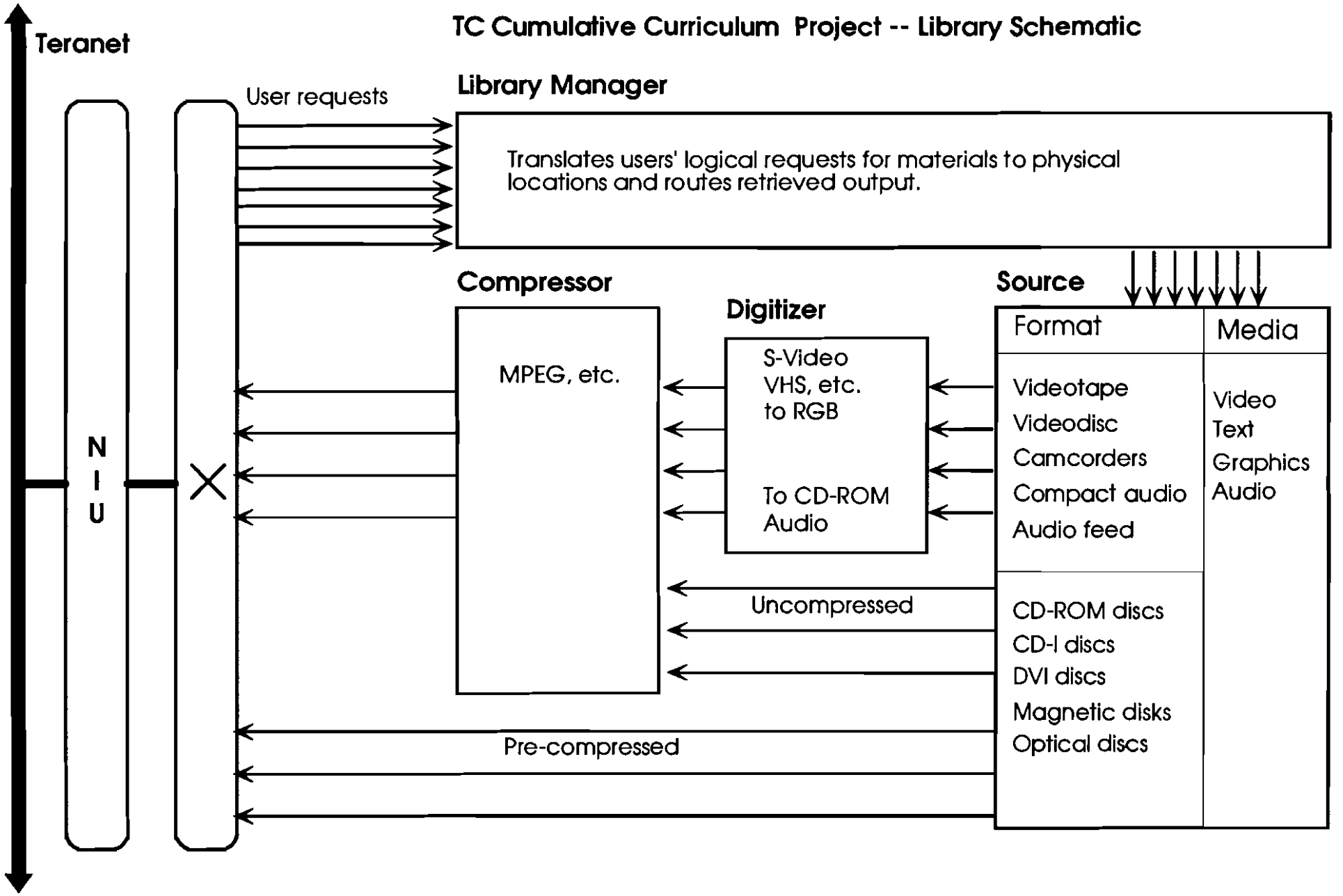
How might the educational experience be changed through a full use of information technology?



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



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
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