Distance Learning and the World-Wide Web: A Status Report

by

Professor Albert R. Meyer

Hitachi America Professor of Engineering

MIT Laboratory for Computer Science

November 9, 1998

Education spending U.S. 1995

Total:	$558 billion	(7% GDP)
University:	$198 billion	
Corporate:	$52 billion	5–6% growth

93% of U.S. organization spend on computer training

—Department of Commerce: Bureau of the Census, Int'l Trade Admin

Technology to enhance learning

Throughout history, presumably starting with charcoal. But *Computers* offer promise of *flexible*, *interactive*, *individualized*, *convenient* education.

Will the promise be fulfilled? — It was *not* fulfilled by “teaching machines” (B. F. Skinner in the 40’s–60’s).

Major Universities for two decades have supported "campus computing." But WWW in the last 5 years (less?) is now **pervasive**:

- **Course Websites** containing notes, problem sets, announcements, readings, personnel information, contact info, . . .
- **Online textbooks** — (some "free" versions of published books: Bill Mitchell, *Digital Cities*; Bruce Eckel, *Thinking in Java*, `www.cjug.org/download/javabook.html`)

Interactive Self-Instruction Units and Demos

- virtual mechanics experiments
- law course on evidence in court
- 3D "virtual reality" displays of mathematical figures
- visualization of algorithms
- interactive calculus/algebra using *Mathematica*
- math problems visualized: `http://www.cuttheknot.com/`

Next week: International Conference on Technology in Collegiate Math (New Orleans)

300 talks on

(1) setting up course web pages

(2) TI-calculators — { graphics / simulation

(3) interactive use of *Mathematica* (or *Maple*)

Notably missing: support for group learning and collaboration

Distance Learning

(1) "Correspondence" course over WWW:

Hundreds of **centers** studying learning technology

- `http://cee.indiana.edu/othercenters.html`

(2) **Broadcast** course over TV, microwave, phone

1995: 1/3 of post-secondary schools offer some distance education (Report of the National Center for Education Statistics, cited in *Syllabus*, June 1998)

Also, AOL, Microsoft "online institute"; IBM "global campus"

Distance Learning established at leading schools: Stanford, Harvard,

. . . and now MIT:

replace by Tech Talk slide

MIT/Singapore Distance Learning Project

Develop and teach three courses at National University of Singapore and Nanyang Technical University at a distance:

(1) Advanced Materials

(2) High Performance Computation for Engineered Systems

(3) Manufacturing Systems and Technology

$20 million/year for 5 years

12 hour time difference is one challenge.

Great temptation for instructors and researchers is to **develop curriculum**, (virtual labs, videos, texts, interactive demos and tests)

> **Me too**: Implementation of programming language (Scheme) model, rewriting (symbol manipulation/algebra), intermittently over 3 years, full time for 5 weeks this term.

This may be a **distraction** from the goal of *major educational gain from technology*.

Studies show computers in elementary schools have little impact.

A proven “Success for All” elementary education program in 1,100 inner city schools essentially ignores computers* in favor of teacher training, student groups, parent relations.

* Kenneth G. Wilson and Constance K. Barsky. Applied research and development: Support for continuing improvement in education. *Daedalus*, Fall 1998, p. 239.

What makes the great universities great?

Suppose a student working over the WWW

- read all the material,
- did all the exercises (and got them graded),
- saw video lectures,

of a course at MIT (or Stanford, Harvard, Berkeley, Oxford, . . .).

Do we believe the student would be as well-educated as if they took the course *at the university*?

Maybe.

It is arguable that “great” universities are great because they *select great* students, with little value added. *Education by filtering rather than improving.*

Widely held view: (my view :-))

> **Personal Interaction** with a great intellectual community — *instructors*, *teaching assistants*, *advanced students*, *fellow students*, *research staff*, *librarians*, *technical staff* — is what makes for a great education.

Students need to be there physically — in the community locale — to get educated.

Key issue: Can Computer Technology enhance personal interaction with members of an intellectual community?

I think so, though how much is a major uncertainty.

Rest of talk:

- Review computer supported collaboration: ideas; some actual systems.
- Sketch MIT LCS Fuse N (fusion) education project.

Collaboration/Group Learning/CSCW Concepts and Ideas

- white board
- group enabling
- chat and buddy lists
- asynchronous sharing of data and “objects”
- real-time synchronous sharing, “same time”
- sharing “environment” or “state”

white board

— a “draw” program built to be shared

— (e.g., `http://rendezvous.visualtek.com`)

- key strokes from different people
- multiple cursors controlled by different users
- ownership and “locking” of graphical objects
- parallel audio (often obviates the need for locking)

E.g., Intel’s “Pro share” shipped with Lotus Notes (also had video).

Microsoft “Net Meeting” has white board (and much more).

group enabling

- access control: system understands that there are different users
  - builtin “roles”: editor or author; student or TA
  - owner-defined roles
- versioning related to roles — who made which changes or annotations
- alternate versions maintained and coordinated

“chat” and “buddy lists”

chat rooms — real-time *interleaved text* from participants. Publicly available: anyone can come and go. Maybe can scroll some prior messages. Just a text channel, minimal support.

buddy-list — AOL, ICQ, Ubique. Tracks when your “friends” come online. Send messages to specific ones.

May include ability to form “private” chat groups dynamically.

*A*synchronous collaboration

Shared documents in flexible database. Dynamically addattribute “fields” to documents to define groups of documents (called “views”). Access control.

Lotus Notes is leading example of group-enabled asynchronous sytem. Includes specification and template for defining format for document display. Underlying distributed network architecture scales to thousands (but not tens of thousands?).

“Synchronous” “real-time” collaboration

- **Awareness** of other users:
  - avatars for individuals
  - visualization of who’s where, available, where they’ve been
- **Flexible communication with collaborators**:
  - private channels (audio, video, text-chat) with collaborator
- **Shared objects**:
  - white board
  - document
  - cursor on screen
  - video player

Sharing environment (“state”)

Environment is bigger than “object”

Example: student in programming session has

- definitions of programs (classes, methods, etc.)
- files
- windows on screen accessing
  - editor
  - development kit
  - Scheme system

Sharing involves collaborators linking to user machine, watching “over the shoulder.” Ubique has “follow me” feature for leader to guide a WWW tour.

Commercial efforts: Distributed Classroom

- ILINC (`www.ilinc.com`): distributed classroom:
  - audio and video of instructor
  - student-to-student messages
  - "over the shoulder" by instructor
  - student "raises hands" electronically

  Used by Office Depot, Chrysler Financial Management
- Socrates (`www.esocrates.com`) online material plus chat

- Microsoft Net Meeting
  - claims all features “Windows multimedia collaboration tool”
  - runs on Windows and Macs
  - white board
  - chat
  - file-sharing
  - shared real-time applications
  - “over the shoulder”
  - owner can allow remote interaction — cut and paste into shared documents.

`www.microsoft.com/netmeeting/features/`

- Lotus Learning Space with Databeam Learning Server – claims comparably rich environment

`www.lotus.com/products/learningspace.nsf`

MIT LCS Fusion Project

Seth Teller, John Chapin, Saman Amarisingh

`http://edufuse.lcs.mit.edu/fusion/`

- Real time system for students and instructor/teaching assistant.
- Tailored for teaching programming and algorithms
- Using WWW, TA can freely interact with full student programming environment on student machine.
- *Platform independent* — written in Java; will run on *any* operating system with a Web browser application (in contrast with Windows/Mac based commercial products).

Summary

- University educational activity is pervasively involved with the World Wide Web (like corporate world, publishing, libraries, and most developed institutions).
- Impact of these changes is generally *expected* to be enormous, but *how and when* is subject to intense debate and *speculation*.
- I believe *greatest impact* on education will come *from computer*/web support for *enhanced collaborative learning*.
- Can't predict degree of such impact, but definitely believe worthwhile improvements achievable with present technology. Efforts such as Fusion worth pursuing.