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

by

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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

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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).

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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 — $\begin{cases}\text{graphics}\\\text{simulation}\end{cases}$

(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.

Asynchronous 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.