Transforming the Way We Learn

President's Information Technology Advisory Committee
Subcommittee on Transforming the Way We Learn

Final Report

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Presentation Outline

- **Background**

Report

- **Introduction**
- **Scope and Focus**
- **Findings**
- **Recommendations**

Panel Members

- **Co-Chairs**
  - **Susan Graham**
  - **Andrew Viterbi**
- **PITAC Members**
  - **Eric Benhamou**
  - **Ching-chih Chen**
  - **Steven Dorfman**
  - **Joe Thompson**
- **Outside Members**
  - **Andries Van Dam**
  - **Bruce Lincoln**
  - **Roy Pea**
  - **Marshall Smith**
  - **David Shaw**

Panel Charter

Study and recommend information technology R&D activities that can transform education, training, teaching, and learning for the benefit of all citizens.

Process

- **February, May, September Meetings**
- **Reviewed previous reports**
- **July Workshop, site visits, and meeting in San Diego**
- **Drafted report of Findings and Recommendations**

Participants in July 2000 Workshop

Alice Agogino
Nick Aguilar
Barbara Allen
Doris Alvarez
Terri Bergman
Bruce Braciszewski
Al Corbett
Dexter Fletcher
Janet Deanda
John Eger
Noah Finkelstein
Larry Fitch
Phillip Harman
Randy Hinrichs
Paul Horwitz
Chip Johnstone
Ted Kahn
David Katz
Henry Kelly
Darryl LaGace
Anthony Maddox
Joy Marquez
Michael Moe
Jeff Munks
Susan Myrland
Don Norman
Roy Pea
Lori Perine
Robert Pozos
Ann Redelfs
Larry Rosenstock
Michael Schudson
David Sharpe
Jane Signaigo-Cox
Kris Stewart
Andy Van Dam
Olga Vasquez

Eric Benhamou
Ching-Chih Chen
Susan L. Graham
Joe Thompson
Andrew Viterbi
Yolanda L. Comedy
Kay Howell
Robert I. Winner

Affiliations of July 2000 Workshop Participants

UC Berkley	UCSD	Lemon Link
Preuss Charter School	Workforce Partnership	SD County Education Office
CMU	Inst. For Defense Analyses	HP
Merrill-Lynch Knowledge Web	SD Regional Econ. Development Council	Concord Learning Consortium
Western Governors U.	Design Worlds for Learning	3Com
Fed. Of American Scientists	Lemon Grove Schools	NSF
Edmin.com	SDSU	Digital Think
Interactive Media Management	Unext.com	SRI International
OSTP	High Tech High	Microsoft
Brown U.	Simmons C.	Miss. State U.
Viterbi Associates	Noesis	NCO
R. Winner & Associates		

Introduction

- **Lifelong education and training are foundations of the modern democratic state and the 21st century economy.**
- **Our best is great, but the median is too low and the low end is far too low.**
- **Leveraging Information technology is our most promising path to significant progress.**
- **Widespread access to information technology is essential, including not only computers and networking, but also software, training, and support.**

Scope and Focus

- **Cover all of education and training**
  - **Pre-K, K-12, university, adult, community, professional, military, government, industrial, …**
  - **Learning styles and objectives determine the blend of information technology solutions**
- **Focus on technological aspects of education and training**

Overarching Finding

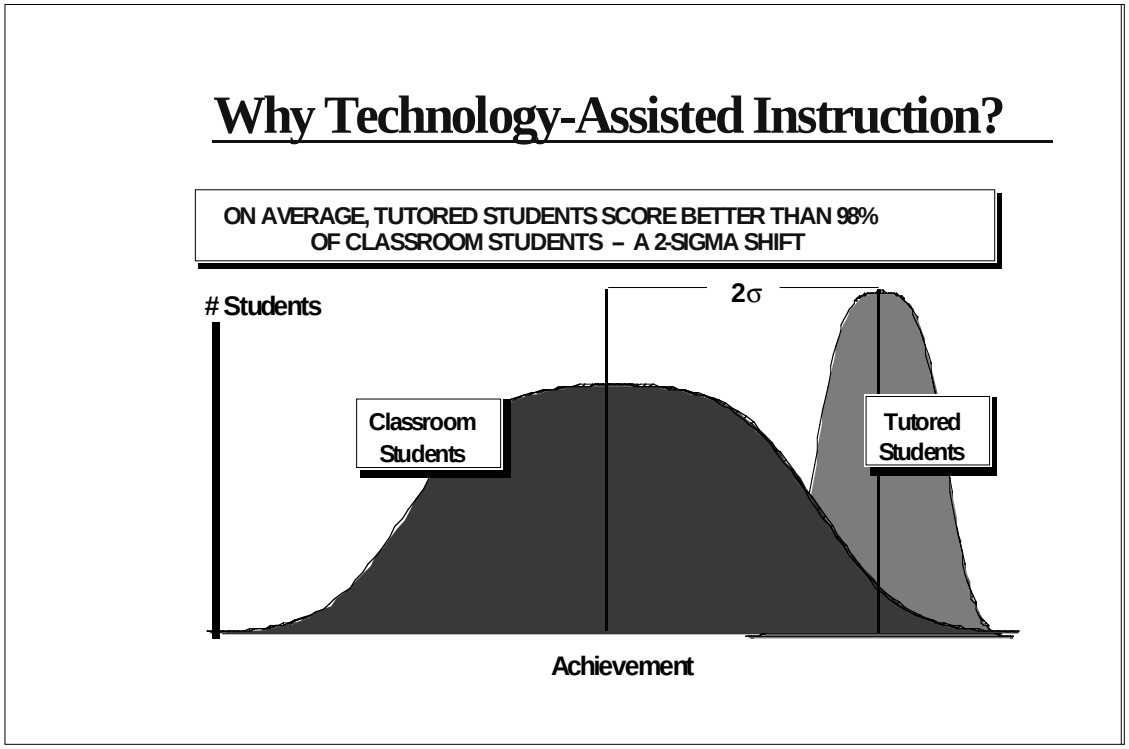
In an information-based society, education and training of all citizens throughout their lives is one of our most important national goals.

Information technology promises to play a significant role in empowering both teachers and learners.

- **Gap between potential and accomplishments is greater than in any other information technology application area.**
- **Barriers must be addressed by large-scale, aggressive methodological and technological R&D**
- **Information technology will enable both incremental improvements and revolutionary change**

Findings

Information Technology, used both within classroom settings with well-educated and motivated teachers and by individuals, has the potential for simultaneously providing many of the benefits of one-on-one tutoring, group interactions, and access to world-class facilities and experiences.



Findings

The role of the teacher is changing and will continue to change, but current teacher education and training in the methods of using technology and its potential is insufficient.

Education and learning R&D is dramatically under-funded as compared with other domains.

Findings

Information Technology that has been successfully applied in industrial and military training contexts has been effective and has reduced costs.

In the military context alone, cost, effectiveness, and productivity improvements due to increased use of IT in training could save hundreds of millions of dollars per year.

Findings

Current Web-based technologies are beginning to be applied in a grass-roots way in many educational and training contexts, but there are key barriers to more rapid diffusion of existing beneficial technologies and materials

- **teacher preparedness to adopt information technology**
- **absence of adequate educational performance metrics**
- **expense of developing materials**
- **lack of standard, application-level infrastructures**

Findings

Current research demonstrates the potential for fundamental transformation in education and training.

The breadth and scale of the needed research effort and the necessity for technology diffusion require unprecedented partnerships among governments, industry, foundations, universities, and schools.

Overarching Recommendation

Make the effective integration of information technology in education and training a national priority

Recommendations

Establish and coordinate a major research initiative for IT in education and training. This initiative should include

- Learning technologies and sciences
  - Effective IT-enhanced learning strategies and methods
  - Learning how to learn using IT--using the infrastructure
  - Improving student performance assessment using IT
  - Assessing the effectiveness of IT in education and training
  - Socioeconomic factors in using IT in education and training
  - Search, discovery, and selection of appropriate content
  - Learning for cognitively-disabled students

Recommendations

- **Information technology research for education and training**
  - **Advanced computational technologies for education and training**
  - **Content development tools and technologies**
  - **Application-specific human/computer interfaces**
  - **Online safety and protection**
  - **Discernment, archiving, search and navigation, organization of electronic information**
  - **Low-cost scalable ubiquitous information infrastructure**
  - **Access for disabled students and teachers**
- **Requirements for Learning and Teaching Information Fluency**

Recommendations

Establish focused government-university-industry-foundation partnerships to aggressively pursue the information technology research program required to advance education and training in the United States.

- **Spans theory, experiment, assessment and application**
- **Does not pursue generic information technology research, e.g. NGI or displays**
- **Requires aggressive, activist program managers**
- **Funds Exploration-scale projects**
  - **5-10 years**
  - **Millions of dollars per year each**
- **Funding on the order of $500 million per year from all sources**

Recommendations

Enable educators and related professionals to use information technology effectively.

- Disseminate new and existing teaching methods that use information technology effectively in education and training settings.
- Create and evaluate new programs to train developers of educational materials based on existing and emerging technologies. Developers will include teachers.
- Develop and deploy incentives to attract and retain IT-fluent teachers.

Recommendations

Define and promote a set of standard representations, languages, protocols, and interfaces to be used for evolvable, component-based infrastructures for on-line education and training software and materials.

- **Create a clearinghouse of small, medium, and large educational components that can be incorporated in courses and curricula.**
  - **Enables culturally appropriate examples to be substituted into an existing course.**
  - **Facilitates easy updates to maintain relevance.**
- **Requires participation by interested Federal agencies and industry.**