

Advanced Technologies for Learning in the Department of Defense

**Forum on the Digital Promise
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Size and Scope of Defense Education and Training

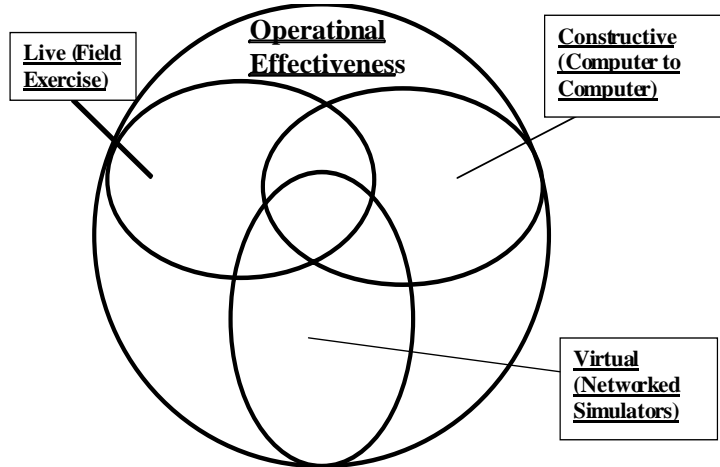
- **\$16 Billion per Year for Residential Instruction**
- **1,300,000 Uniformed Service Members**
- **750,000 DoD Civilians**
- **80,000 K-12 Dependents**

A Perspective on Education & Training

	Residential	Unit
Individual	I	II
Collective	III	IV



Simulation: Live, Virtual, & Constructive

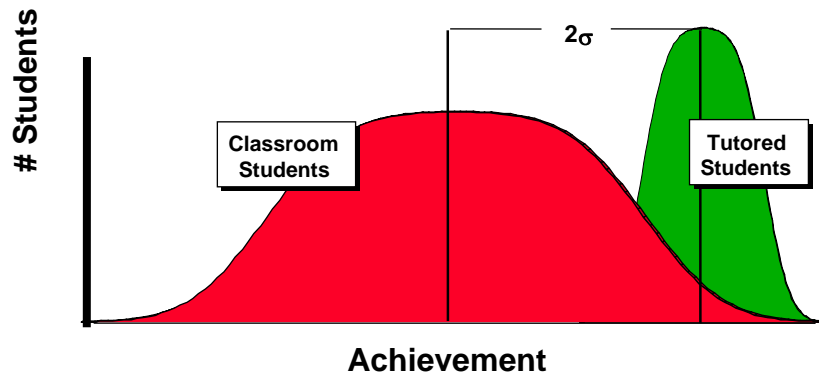


These approaches are complementary;
none is the final exam for the others.

Personnel and Costs for a Simulation and a Comparable Field Exercise(5-Day FTX)

	Simulation	FTX	Ratio
PERSONNEL			
Friendly	63	166	
Opposing	2	69	
O/CS/SMES	10	10	
Total	75	245	3.3
COSTS (\$ 000)			
Friendly			
Personnel	65	394	
Operating	103	1,283	
Opposing			
Personnel	4	83	
Operating	--	1,121	
Administration			
Personnel	17	17	
Operating	79	--	
TOTAL (\$000)			
Personnel	85	493	5.8
Operating	182	2,404	13.2
Total	267	2,897	10.8
COST PER PERSON TRAINED (\$ 000)	\$3.6	\$11.8	3.3

The Tutorial Imperative



Adapted From: Bloom, B.S. The Two Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring. *Educational Researcher*. 13, 4-16 (1984)

What Do Human Tutoring and Instructional Technologies Have in Common?

Individualization of

- Sequence,
- Content,
- Style,
- Difficulty,
- and Pace.

Intensified interactivity.

**Instructional Technologies Make
the 'Educational Imperative' Affordable**

Some 'Learning' Technologies

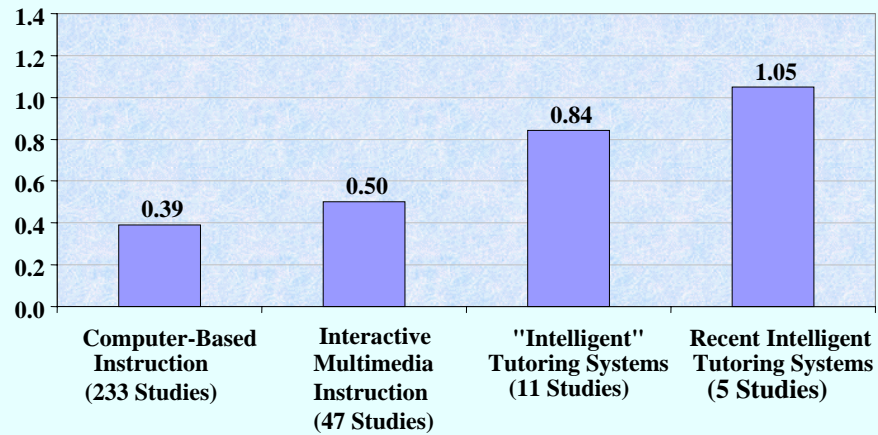
- Asynchronous, continually available instruction tailored for individuals
 - Computer-Based Instruction
 - Interactive Multimedia Instruction
 - Intelligent Tutoring Systems
 - Networked Tutorial Simulation
 - Instructional Games
 - Web-Based Instruction
 - Virtual Reality
- Performance aids, decision aids, electronic performance support systems

Interactivity: Classrooms, Tutorials, Computer-Based Instruction (CBI)

Number of Questions Asked Per Hour

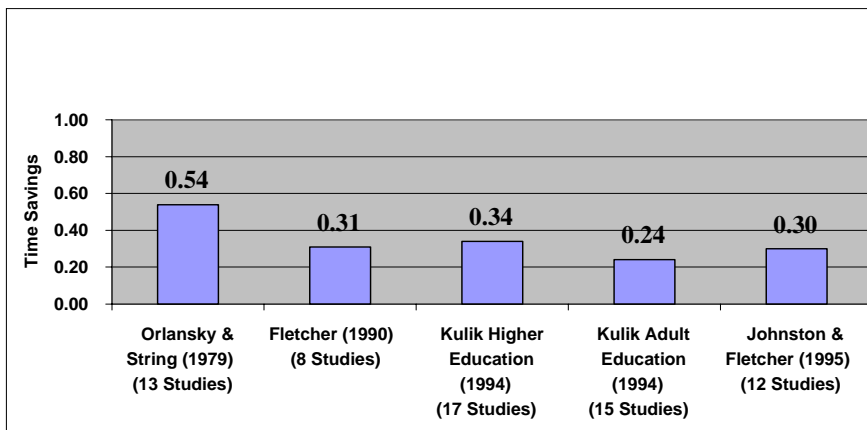
	<u>Traditional Class room /Hr</u>	<u>Tutored Session/H r</u>	<u>CBI/Hr</u>
Student	.1	20-30	??
Instructor	3	120 -150	180 -600

Technology Based Instruction: Effectiveness*



Time to Learn

Proportion Time Savings from Technology-based Instruction



Overall, “The Thirds”

Technology-based instruction reduces costs by about 1/3;

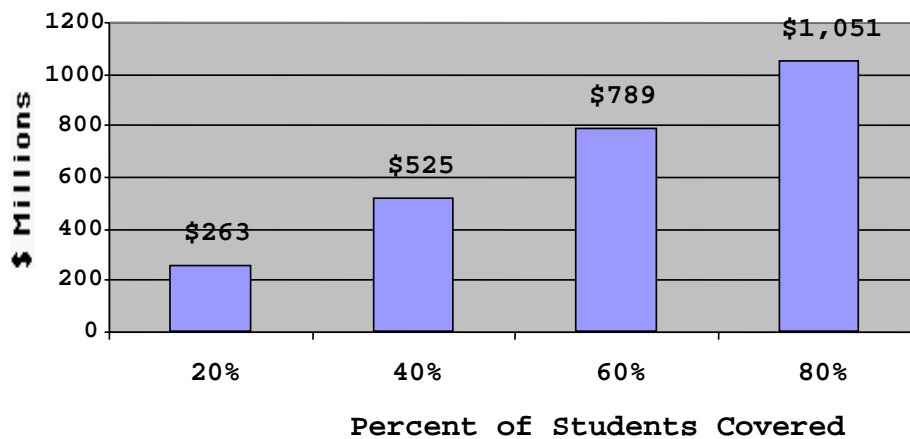
And ...

Either increases effectiveness by about 1/3

Or reduces time to learn by about 1/3

The real payoff is increased operational effectiveness

Savings in DoD Specialized Skill Training With 30 Percent Reduction in Training Time



Performance Aiding: IMIS Case Study

- **F-16 Avionics Maintenance: Three Subsystems**
 - Fire Control Radar
 - Heads-up Display
 - Inertial Guidance

- **IMIS = Integrated Maintenance Information System**
 - (Hand-Held) Portable Maintenance Aiding System

- **IMIS Capabilities**
 - Connected to Maintenance and Spares Data Systems
 - Dynamic Diagnostics

Performance Aiding: Some IMIS Data

	Correct Solutions		Time to Solve		Time to Order Parts	
	TOs ^a	IMIS ^b	TOs	IMIS	TOs	IMIS
Avionics Specialists	82%	100%	149 min	124 min	19 min	1 min
APG Technicians	69%	98%	176 min	124 min	25 min	1 min

^a Technical Orders (Paper Manuals)

^b Integrated Maintenance Information System (Electronic)

Some IMIS Data (Annual Cost Savings)

IMIS* Cost Savings	IMIS Develo- -ment	IMIS Mainte- -nance	Net Cost Savings
\$38M	-\$12M	+\$6M	= \$20M

* IMIS cost savings here are in O-Level Maintenance, D-Level Maintenance, Transportation of Parts, Reduction in MSRP, and Pipeline Spares. Only for 3 subsystems of F-16 Avionics.

Hence: DoD Training Transformation

Provide dynamic, capabilities-based training for the Department of Defense in support of national security requirements across the full spectrum of service, joint, interagency, intergovernmental, and multinational operations.

Create Dynamic,
Global
Knowledge
Network



Build Live, Virtual,
Constructive (LVC)
Training
Environment



Establish
Performance
Assessment
Architecture

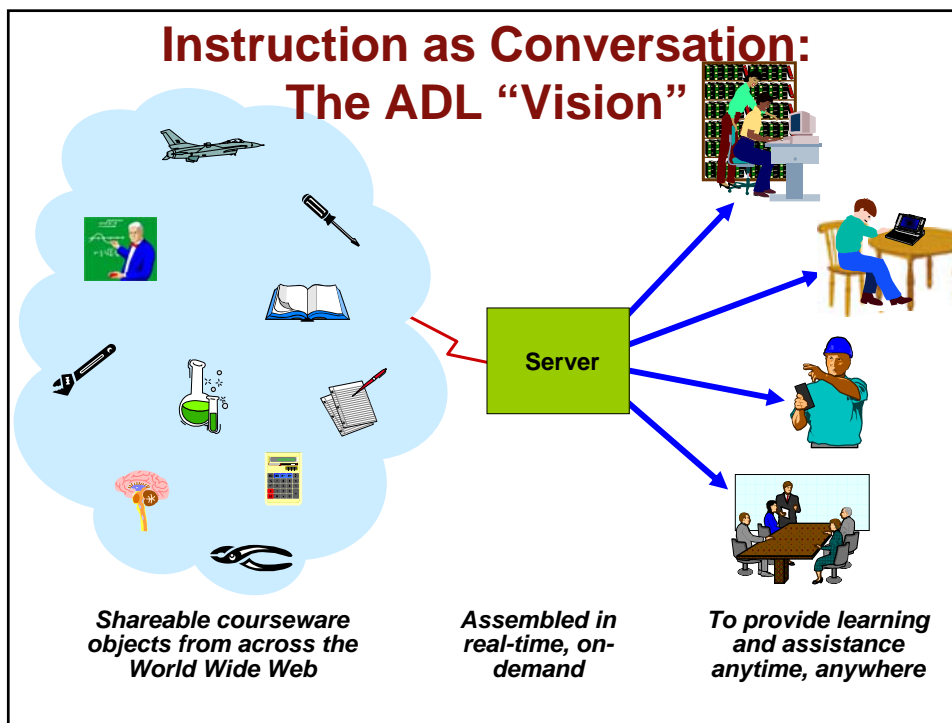


A Key Element of T2: Advanced Distributed Learning (ADL)

The goal of the Advanced Distributed Learning (ADL) initiative is:

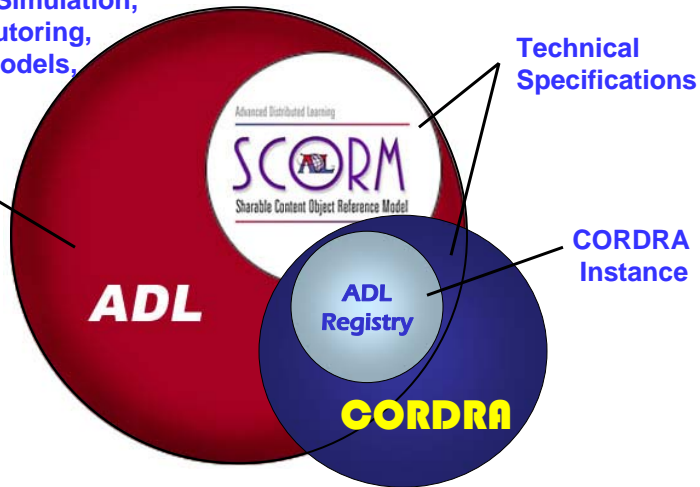
To ensure access to high quality education, training, and performance aiding tailored to individual needs, developed and delivered cost-effectively, available anytime and anywhere.

The goal is an instructional capability that can only be achieved with technology.



ADL, SCORM, & CORDRA

Instructional Capability,
Modeling & Simulation,
Intelligent Tutoring,
Economic Models,
Policy,
R&D, etc.



To Make Objects Sharable, We Have Developed a Reference Model

Sharable Courseware Object Reference Model (SCORM)

A software model that defines the interrelationship of course components, data models, and protocols such that courseware “objects” are sharable across systems that conform with the same model.

**SCORM 2004 is now available at
www.adlnet.org**

To Ensure Objects Can Be Identified and Then Located ...

Content Object Repository
Discovery and Resolution Architecture

“CORDRA”

A system of registries to allow global visibility
but local control over access to objects.

Where (Eventually) We Are Headed ...

- Fewer Lessons, More Learning
- Fewer Tests -- More Assessment (Continuous, Unobtrusive)
- Personal Learning Associates (In classrooms and out – anytime, anywhere)
- Less Authoring, More Material (“Meta-authoring”?)

**Instruction (and Performance/Decision Aiding)
as Conversation**

In Sum: The Digital Opportunity

40 Years of DoD investment in technology-based instruction have shown that it:

- **Reduces cost**
- **Increases learning (or reduces time to learn)**
- **Can combine training, education, and performance aiding in one package**
- **Can be delivered anytime, anywhere**

We now have the pieces, but we need to learn how best to assemble them into learning environments

Two additional Slides

Enterprise Exemplars

Org	Users	Learning Content*	Standards	Usage
Oracle	600k	450,000 objects	SCORM, QTI, EP	6k/day
UFI	900k	900 courses	SCORM, LOM, CMI, QTI, LIP	50k/day
Cisco	100k	1,400,000 objects	SCORM, LOM	
MSFT	80k	1,000,000 objects	SCORM, LOM, QTI, CP	50k/day
HP	160k	5,000 courses	SCORM, QTI, AICC	5k/day
Sun	30k		SCORM, AICC	

* courses/objects – cataloged, tagged and searchable

Costs to Increase Mathematics Achievement by One Standard Deviation

