Defense Acquisition University

Technology-Based Education and Training Plan

IMPLEMENTATION PLAN

VERSION 2.01

June 5, 1997

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1

OVERVIEW

SECTION 1: OVERVIEW

PURPOSE

The Defense Acquisition University (DAU) is committed to providing high-quality education and training to the members of the Department of Defense (DoD) acquisition community. Emerging technologies provide DAU with the ability to increase access to its courses while promoting effective learning experiences for individuals.

This document presents an overview of DAU's Plan for implementing the Technology-Based Education and Training Program.

VISION STATEMENT

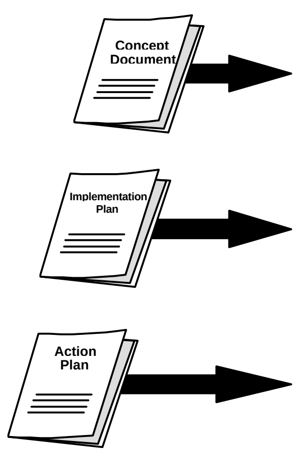
DAU's vision for technology-based education and training is as follows:

DAU Technology-Based Education and Training
Vision Statement

Provide an educational program that fully supports a culture of continuous learning and allows convenient, cost-effective access to education, training, performance support, and expert advice for all members of the acquisition community.

PLAN COMPONENTS

The Technology-Based Education and Training Plan includes the following three components:



The Concept Document includes the overall concept of operations.

This Implementation Plan provides a more detailed description and rationale for the concepts presented in this document.

The Action Plan presents the tasks and resources required to implement the Plan. The Action Plan is an internal use Document

SECTION 1:
OVERVIEW

CONTENTS

Overview

This document includes the following major sections:

Section	Description
Curriculum	This section describes the emerging trends in technology-based education and training and identifies DAU's future uses of these technologies. DAU's process of transitioning to and evaluating technology-based delivery methods is described.
Organizational and Human Resources	This section describes the organizational structure and new roles required to support the implementation of technology-based instruction. DAU's plan for supporting all participants during this transition is described.
Systems Infrastructure	This section describes the systems architecture required to support the implementation of technology-based instruction. DAU's plan for creating a centrally managed integrated systems infrastructure to support these requirements is described.

SECTION 2

CURRICULUM

Section 2: Curriculum

Purpose

This section focuses on the use of technology-based methods in the DAU curriculum materials and the processes used to select, design, develop, implement, and evaluate technology-based training.

Contents

This section includes the following topics:

- Target Audience Requirements
- Trends in Technology-Based Education and Training
- Current Uses of Technology-Based Methods
- Proposed Uses of Technology-Based Methods
  - ◊ By Course Levels
  - ◊ By Selected Courses
  - ◊ For Continuing Education
- DAU Curriculum Knowledge Base
- Technology-Based Development Process
  - ◊ Media Selection Stage
  - ◊ Design and Development Stages
  - ◊ Implementation and Maintenance Stages
  - ◊ Evaluation Stage
- Implementation Strategies

This section includes the following three attachments:

- Attachment 2-1: References
- Attachment 2-2: Effectiveness of Distance Learning
- Attachment 2-3: Sample Uses of Technology

SECTION 2: CURRICULUM

Target Audience Requirements

DESCRIPTION OF TARGET AUDIENCE

The target audience for DAU courses is the entire defense acquisition community and especially those acquisition specialists for whom career management was mandated by the Defense Acquisition Workforce Improvement Act (DAWIA). DoD 5000.52-M, "Career Development Program for Acquisition Personnel," established mandatory and desired training standards for the defense acquisition workforce. More than 100,000 personnel are required to complete such certification training, while the potential total audience requiring at least some acquisition education could be as high as a half million. These standards apply to education and training requirements for the following acquisition career fields:

Career Field	**Approx. Percent of Workforce**
Acquisition Logistics	9%
Auditing	4%
Business, Cost Estimating, and Financial Management	4%
Communication-Computer Systems	3%
Contracting	21%
Industrial Contract Property Management	1%
Manufacturing, Production, and Quality Assurance	11%
Program Management	10%
Purchasing	6%
Systems Planning, Research, Development, and Engineering	25%
Test and Evaluation	6%

Note: 22% of the DAWIA workforce attending DAU courses enroll for cross-career training and 15% enroll in courses to prepare for career advancement.

PROJECTED NUMBER OF LEARNERS

During FY 96, 32,980 students graduated from DAU courses. The FY 97 total quota for students is 36,571. It is anticipated that the numbers of students for certification courses will remain at a constant level for the next few years. During FY 96, gains to the acquisition workforce equaled 10,379. Each new member of the workforce requires an average of 2.4 courses for certification. New acquisition personnel represent a continuing demand for DAU courses.

Target Audience Requirements

PROJECTED NUMBER OF LEARNERS (CONTINUED)

Beginning FY 98, it is anticipated that DAU will assume increasing responsibility for providing continuing education to the acquisition community. While DAU may not provide all continuing education, the demand for DAU courses will continue to grow.

TARGET POPULATION LOCATIONS

The consortium schools and target populations are not well matched geographically. In addition, even when a school is located near a learner population center, that school may not currently offer the required courses. A high percentage of learners must travel to attend DAU courses.

CHANGING LEARNER CHARACTERISTICS

The following trends in learner characteristics impact the delivery of DAU courses:

- **Expanded Knowledge and Skills**

  Acquisition reform has expanded the knowledge and skills required of acquisition personnel. These changes save the Government time and money, but require acquisition personnel to consider more factors and make complex decisions. For example, Simplified Acquisition Procedures require that acquisition personnel be skilled decision makers and creative problem solvers. Integrated Product Teams require that personnel be able to work effectively with others representing different acquisition specialties. The skills required are broader than those required merely to apply acquisition regulations. Training needs to be redesigned to match these new requirements. Individuals who were trained previously may require additional training.

- **New Technology**

  Changes in the acquisition environment require that personnel use new technology-based tools to complete routine processes. For example, contracting personnel need to learn how to use the Federal Acquisition Computer Network (FACNET) and the proposed Standard Procurement System. Up-to-date acquisition references will be more readily available through the Internet and other Electronic Performance Support Systems (EPSSs). An EPSS is a computer-based system that improves worker productivity by providing on-the-job access to integrated information, advice, and learning experiences. EPSSs can improve productivity only if the workforce learns how to use these new tools.

Target Audience Requirements

CHANGING LEARNER CHARACTERISTICS (CONTINUED)

- **Increased Workloads**

  The total number of DAWIA personnel has decreased by approximately 6,000 personnel since September 1993. One implication of a decreasing workforce is that individual workloads are increasing. Also, temporary personnel may not be available to backfill positions while individuals are in training. After attending a training session, learners often return to a backlog of work. This backlog can interfere with the individual's ability to apply new learning.

  Base closures and other organizational centralization mean significant workforce relocation. Training replacements for those that choose not to relocate could be a significant additional training workload.

  Education and training need to be delivered in ways that minimize the negative impact on workplace productivity. Given the FY 97 DAU quota, more than 440,000 work days (approximately 250 work years) will be spent away from the job at classroom courses. (Note: This figure does not include the time spent traveling to and from the training location.) Even though DAU funds all travel and per diem for course participants, the DoD components' share of the total training is approximately 60% when salary and time-in-training is considered. The number of days spent by acquisition personnel in training and costs may increase when continuing education requirements are established.

  > Technology-based learning (often on-demand training) can decrease the total number of hours required for training. In addition, learning in the work setting allows learners to split their time between critical work tasks and learning. Another benefit is that new skills can be applied immediately.

- **Motivated To Learn**

  The certification process established in 5000.52-M, "Career Development Program for Acquisition Personnel," provides career advancement/retention incentives for completing courses. The fact that DAU courses are required courses increases the likelihood that learners will complete technology-based courses. Also, surveys conducted in conjunction with the 1996 Acquisition Day (May 1, 1996) indicate that the workforce is eager for more training.

SECTION 2: CURRICULUM

Trends in Technology-Based Education and Training

OVERVIEW

This section discusses how technology is being used in education and training. Section 4 presents more information on emerging systems technology.

TREND:

BLENDING LEARNING AND WORKING

Acquisition personnel are knowledge workers. Knowledge workers must continuously learn in order to perform job tasks successfully. The time spent learning is increasing each year. Training may include mastering new regulations, learning about new products and suppliers, or learning how to use the latest version of a software package. Projections indicate that every 18 months an individual may need to double his or her expert knowledge base (Tapscott, in press).

Implications:

- **Teaching Learning Strategies**

  Knowledge workers must know how to learn (metacognition) and how to access changing knowledge.

- **Changing Information**

  Courses need to be designed and delivered so that they are updated quickly and inexpensively and their shelf-life can be extended. Information updates should be supplied to DAU graduates using "push systems technologies." "Push systems technologies" allow relevant messages to be sent based on students' profiles and the courses they have completed.

- **Electronic Performance Support Systems (EPSSs)**

  DAU courses (including Web-based/CD-ROM and teletraining) should teach how to use available EPSSs such as the Defense Acquisition Deskbook. Teaching how to use an EPSS allows personnel to update their own knowledge.

Trends in Technology-Based Education and Training

TREND:

BLENDING LEARNING AND WORKING (CONTINUED)

- **Just-In-Time Training**

  DAU should organize course content so that it can be accessed in a "just-in-time" mode after a learner completes the course. Just-in-time training is a networked instructional system that electronically provides modules of instruction, when needed, at a level and with materials best suited for the individual (Hudspeth, 1992). Individuals learn a new task just before they are about to perform it. Reducing the lag time between learning and task performance improves learning transfer and decreases the cognitive load of memorizing information that is not being used immediately in the workplace.

TREND:

RESEARCH IN DISTANCE EDUCATION EFFECTIVENESS

Moore and Kearsley (1996) reviewed more than 20 studies of the effectiveness of distance learning. Based on this analysis, the authors drew the following conclusions:

" . . . it seems unreasonable to continue to ask if distance learning courses can be as effective as conventional classroom instruction in terms of learner achievement measures. It seems more reasonable to conclude that (1) there is insufficient evidence to support the idea that classroom instruction is the optimum delivery method; (2) instruction at a distance can be as effective in bringing about learning as classroom instruction; (3) the absence of face-to-face contact is not in itself detrimental to the learning process; and (4) what makes any course good or poor is a consequence of how well it is designed, delivered, and conducted, not whether students are face-to-face or at a distance."

Thomas Russell from North Carolina State University reviewed more than 200 research reports, summaries, and papers on distance learning. This body of research shows that comparisons between classroom-based instruction and distance learning show either no difference in learning achievement or superior learning when delivered using technology. Attachment 2-2 at the end of this section presents a list of these studies.

Trends in Technology-Based Education and Training

TREND:

RESEARCH IN DISTANCE EDUCATION EFFECTIVENESS (CONTINUED)

Implications:

- **Systematic Design Process**

  A systematic design process must be used to ensure that performance outcomes are achieved through technology-based approaches. Experts in the design of technology-based training must be used to increase the probability of success.

- **Focus on Performance Outcomes**

  Media and methods used in classroom-based versions of courses will need to be modified for technology-based instruction. An instructor's favorite method for teaching a particular topic may not be the best approach to use in a technology-delivered course. During the design process, the focus must be on the achievement of the desired performance outcomes rather than on replicating the classroom-based delivery methods. In the end, this course may look very different from the classroom courses while still allowing learners to master the performance outcomes.

TREND:

ACTIVE LEARNING

There are different learning theories that emphasize an active approach to learning. One leading advocate for learning-by-doing is Roger Schank at Northwestern University's Institute for the Learning Sciences. The Institute is using Guided Social Simulations (GuSS), which allow learners to practice decision making in simulated situations while being guided by simulated expert characters. Emphasis is placed on complex situations where there may not be a single right answer. Learners access information as they need it to perform simulated job tasks. Schank stresses that learning should look and feel like the things the learner is going to do on the job.

Implications:

- **Interactivity**

  Most studies of distance learning effectiveness stress that interactive exercises that allow learners to participate fully in the learning process are crucial. DAU technology-based training courses will allow for interactive learning approaches.

Trends in Technology-Based Education and Training

TREND:

ACTIVE LEARNING (CONTINUED)

- **Linking Training to Job Performance**

  Overall course outcomes, terminal learning objectives, and learning activities must be linked to job-performance outcomes. Linking objectives and activities to the job context increases the likelihood that new skills will be retained and used in the workplace.

- **Job-Performance Simulations**

  When possible, job-performance simulations should be used for teaching and assessment purposes. Multiple levels of application exercises should be included in most courses.

- **Collaborative Learning**

  Collaborative learning is supported by Peter Senge's concept of a learning organization. In a learning organization, each individual strives for personal mastery while promoting team learning. In Web-based instruction, student-to-student collaborative learning can be fostered using discussion forums. In video teletraining, these types of interaction can be included through clear instructions and strong facilitation skills.

Trends in Technology-Based Education and Training

TREND:

EMERGING ONLINE TEACHING TECHNOLOGIES

More than 100 universities now offer Internet-based courses. Most offer electronic registration, hypermedia lecture materials, online assignments/testing, discussion forums, and electronic-facilitated faculty contact. Listed below is a summary of the emerging technologies being used by online universities:

Text-Based Communications	Educational Uses
Internet Relay Chat (IRC): A worldwide online text-based conferencing system that allows for multiparty discussions. Multiuser Dimensions (MUDs): Multiuser text-based virtual realities accessible via the Internet that allow people to access the same place at the same time. Mulituser Simulation Environments: Similar to MUDs. MUD-Object Oriented (MOO): MUDs that allow for the manipulation of and interaction with objects in addition to chatting with people. Virtual Reality Modeling Language: Allows multiparticipant interactive simulations via the Internet.	♦ Brainstorming ideas and exchange of information with other learners. ♦ Joint assignments. ♦ Interactive online simulation exercises. ♦ Synchronous text-based lectures. ♦ Online exams. ♦ "Real-time" instructor office hours. Implications: ♦ At this point in time, asynchronous forms of communication should be used widely in DAU courses. ♦ Pilot tests should be done to test the use of synchronous communications.
Synchronous Multimedia CU-SeeMe: Program providing real-time audio and video communication over the Internet, available from Cornell University. Multicast Backbone of the Internet (MBONE): A virtual network of host and routers connected to the Internet used for multimedia conferencing.	Educational Uses ♦ Presentation of information. ♦ Synchronous information exchange. Implications: This evolving technology should be monitored for use in the future.

Attachment 2-3 at the end of this section presents examples of how different organizations are using technology-based training.

Current Uses of Technology-Based Methods

CURRENT INITIATIVES

DAU has begun technology-based training initiatives in the following courses:

Course	Technology-Based Training
LOG 101 Acquisition Logistics Fundamentals	Offered by the Air Force Institute of Technology as a video teletraining course.
Simplified Acquisition Procedures (SAP) Course	Currently being developed as a Web-based course. This Web-based course is now being tested with learners. Video teletraining workshops may be offered following the implementation of the Web-based course.
SAM 101 Basic Software Acquisition Management	Currently being developed as a Web/CD-ROM hybrid course.
TST 101 Introduction to Acquisition Workforce Test and Evaluation	Currently being developed as a Web/CD-ROM hybrid course.
IRM 101 Basic Information Systems Acquisition	Currently being developed as a Web/CD-ROM hybrid course.
ACQ 101 Fundamentals of Systems Acquisition Management	Scheduled to begin production in spring of 1997.
ACQ 201 Intermediate Systems Acquisition	Scheduled to begin production in spring of 1997.

Current Uses of Technology-Based Methods

CURRENT INITIATIVES (CONTINUED)

In addition to these efforts, several of the schools are augmenting their classroom courses with CD-ROM hypertext materials and are supporting course exercises with the use of computers. As part of the redesign of core contracting courses, six schools are planning to add networked computers and Internet access in classrooms used to teach contracting courses. Computers will be used to teach FACNET and to access online references.

PRIORITIES

Additional course transitions are targeted to begin during FY 97. A complete listing of these priorities can be found in Attachment B of the Concept Document.

Proposed Uses of Technology-Based Methods—By Course Levels

WHAT-IF SCENARIOS

This section presents "what-if" scenarios for the use of technology-based training methods in each of the three certification levels:

- Level One: Courses at this level are designed to provide fundamental knowledge and establish primary qualifications and expertise in the individual's career field or functional area.
- Level Two: Courses at this level are designed to enhance the employee's capabilities in a primary specialty or functional area.
- Level Three: Courses at this level emphasize managing the acquisition process and learning the latest methods being implemented in the career field or functional area.

> These scenarios are not intended to be used for final decision making. Rather, the scenarios are presented to give DAU a basis for future planning and the development of cost profiles contained in the Action Plan. These analyses do not take the place of conducting systematic media selection studies.

The analysis process included the following steps:

ANALYSIS METHODS

Step 1: Review Documents

Listed below are the documents included in the analysis:

- Acquisition Career Management: Mandatory Course Fulfillment Program and Competency Standards, July 1995
- The DAU Education Media Selection Guide Summary Report, January 30, 1995
- Course Descriptions in the DAU Catalog for FY 97
- DAU Remote Learning Feasibility Assessment, Field Research Report, January 7, 1994
- Report on Distance Learning Technologies, March 1995
- Reports titled "Front-End Analysis of Six DAU Courses," June 1996

Proposed Uses of Technology-Based Methods—By Course Levels

ANALYSIS METHODS (CONTINUED)

Step 2: Interviews

The team conducted interviews with members of the DAU Academic Team. The characteristics of the target audience, course outcomes, current training approaches, and course development processes were discussed.

Step 3: Analysis

The next step was to review all the courses within each level and to make an overall judgment about the potential media mix. The following factors were considered in determining the potential media mix:

Media Selection Factors

- Types of Performance Outcomes: Performance outcomes were sorted into psychomotor, cognitive, or affective domains. This tentative analysis found that most outcomes fall into the cognitive domain. The affective outcomes included skills such as negotiation, alternative dispute resolution, and team decision making. Different domains lend themselves to different instructional media. For example, affective outcomes may be achieved more effectively through the use of video teletraining.
- Levels of Outcomes: Performance outcomes were analyzed to determine their potential levels within Bloom's Taxonomy. The types of training media and methods vary depending on the desired level of learning. For example, lower level outcomes may be taught using simple scenarios and multiple-choice item selection. Higher levels of outcomes may require the use of more complex simulations.

Proposed Uses of Technology-Based Methods—By Course Levels

ANALYSIS METHODS (CONTINUED)

Step 3: Analysis (Continued)

Media Selection Factors (Continued)

- Course Characteristics: Other characteristics of a course include: group versus individual task performance, level/type of instructor feedback needed, visual/auditory stimulus elements, and complexity of the content.
- Target Audience Characteristics: The target audience characteristics include the learning styles/preferences, motivation levels, and pre-training skill levels.
- Industry Standards for Efficiencies in Training Time: The following industry standards were used to determine the potential reduction in total training times:
  - ◊ Up to 35 percent reduction of classroom hours when content is converted to Web-based/CD-ROM training. Note: The estimated Web-based/CD-ROM training time is average contact times. Depending on the individual learning styles, individuals may spend more or less time working through the course materials.
  - ◊ Up to 25 percent reduction of classroom hours when content is converted to two-way video teletraining or one-way video/two-way audio teletraining.

  References: McNeil (1991), Nunan & Calvert (1992), Thurman (1992), and Xerox Document University (1994).

During the individual content analysis for each course, these factors will need to be re-evaluated in a systematic fashion.

Proposed Uses of Technology-Based Methods—By Course Levels

MEDIA OPTIONS

The following media options are proposed:

- Web-Based/CD-ROM Training: Design Strategies
  - ◊ Courses will be designed so that they can be delivered both on the Internet and using a stand-alone CD-ROM mode.
  - ◊ Courses will be scaleable to allow audio and video enhancements for those learners who have the equipment to accommodate these features. Learners can also combine Web-based delivery with CD-ROM delivery for those courses where video and audio components are essential for learning.
  - ◊ Computer conferencing through basic e-mail functions will be used with learners who lack Internet access.
  - ◊ At the present time, asynchronous communications will be used between faculty and other learners. More advanced multiparticipant interactive simulations/communications using evolving technologies such as Virtual Reality Modeling Language will be tried on an experimental basis.
  - ◊ All course administration functions will be incorporated into the Web-based training courses.
  - ◊ Web-based courses will be designed to generate personalized Electronic Performance Support Systems and “push system technology.” The course web site should be a resource to which DAU personnel can return to refresh their skills and support job performance.
- Video Teletraining
  - ◊ Courses will be designed to maximize interactivity among learners at a receive site and among the receive sites.
  - ◊ Courses will be designed so that they can be delivered using either two-way video teletraining or one-way video, two-way audio teletraining. For example, it may be optimal to teach negotiation or alternative dispute resolution skills using two-way video teletraining. However, if two-way video teletraining site availability is limited, the course could be conducted using one-way video, two-way audio teletraining. To accommodate the differences in technology, a more structured site facilitator’s guide would be created. In some cases, site facilitators may be needed to give feedback. This approach maximizes the number of learners per course offering.

Proposed Uses of Technology-Based Methods—By Course Levels

INSTRUCTOR-TO-LEARNER RATIOS

The resource data presented are based on assumptions concerning instructor-to-learner ratios. The ratios used in this plan for teletraining are based on industry standards.

Industry standards are currently being benchmarked for Web-based training. Interviews were conducted with faculty from the major universities using computer-mediated instruction. The faculty responding to the interviews reported wide ranges of faculty-to-student ratios depending on features included in the course design. It is important to note that most university and industry Web-based courses include limited interaction in the tutorial portions of the lessons. The majority of the training is provided in textual format with computerized testing. The DAU Web-based courses will be designed to allow for maximum interactivity within the tutorial portions of the lessons.

The following factors were used in determining the instructor-to-learner ratios for Web-based training:

- **Level One Courses**

  Most of the Level One performance outcomes could be accomplished using traditional computer-based instruction (CBI) delivered on CD-ROM. This form of instruction requires no instructor contact or contact that is limited to clarifying questions. In a traditional CBI lesson, interactions occur without instructor intervention. When these types of courses are delivered in a Web-based format, instructor interaction will include e-mail correspondence and asynchronous discussion groups.

  Following is the projected range of instructor-to-learner ratios for Level One courses:

Ratio	1:75	1:100	1:125
% of Courses	25%	25%	50%

Proposed Uses of Technology-Based Methods—By Course Levels

INSTRUCTOR-TO-LEARNER RATIOS (CONTINUED)

Note: The following ratios have been adjusted since the previous draft of the plan. The adjustment was made to accommodate mandates from the Board of Visitors and Under Secretary of Defense for Acquisition and Technology to transition all courses unless studies show technology cannot be used. Lowering the instructor-to-learner ratios will allow for a greater number of Level Two and Three courses to be transitioned to technology-based delivery. The lower ratio is more consistent with the performance outcomes being taught in these course levels.

- **Level Two Courses**

  Most of the Level Two performance outcomes could be accomplished using a combination of traditional computer-based instruction (CBI) delivered on CD-ROM and more dynamic instructor interaction through Web-based instruction. Courses with more Web-based instructor interaction will include less media-rich features in the tutorial portions of the lessons. In addition, some video teletraining will be used to increase interaction with instructors. As compared to Level One, more dynamic instructor interactions will be added including e-mail correspondence, asynchronous and synchronous discussion groups, audio conferencing, video teletraining, and collaborative learning assignments.

  Following is the projected range of instructor-to-learner ratios for Level Two courses:

Ratio	1:25	1:50	1:75
% of Courses	25%	50%	25%

- **Level Three Courses**

  Level Three performance outcomes require the highest level of dynamic instructor interaction. Level Three courses with more Web-based instructor interaction will include less media-rich features in the tutorial portions of the lessons. A higher percentage of Level Three courses will offer dynamic instructor interactions including e-mail correspondence, asynchronous and synchronous discussion groups, audio conferencing, and collaborative learning assignments.

Proposed Uses of Technology-Based Methods—By Course Levels

INSTRUCTOR-TO-LEARNER RATIOS (CONTINUED)

Following is the projected range of instructor-to-learner ratios for Level Three courses:

Ratio	1:25	1:50	1:75
% of Courses	50%	25%	25%

Final decisions about the degree of instructor interaction in Web-based courses must be considered during the content analyses. The content analysis process will balance the desired performance outcomes and the nature of the content with the economics and feasibility of different levels of instructor interaction.

Proposed Uses of Technology-Based Methods—By Course Levels

LEVEL ONE COURSES:

BACKGROUND INFORMATION

Level One Courses

Types of Performance Outcomes:

- Learning of Facts, Concepts, and Principles (Cognitive Tasks; Bloom's Levels 1 and 2)
- Learning of Computer Skills (ACEIT software, FACNET) (Psychomotor and Cognitive Tasks; Bloom's Levels 1 and 2)
- Application of Regulations in Planning and Decision Making Scenarios (Cognitive Tasks; Bloom's Level 3)
- Application of Math and Statistical Skills in Case Studies (Cognitive Tasks; Bloom's Level 3)
- Application of Negotiation Skills (Cognitive and Affective Tasks; Bloom's Level 3)

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING

Level One Courses

The following table summarizes the potential mix of technology-based methods for delivering Level One courses. The percentage refers to the total number of Level One training contact hours. Based on the completed content analyses, a mix of training technologies may be used to meet the requirements of a single course.

Technology	Description	Percent of Training
Web-Based/ CD-ROM Training	• Online lessons. • Virtual office simulations. • Limited asynchronous communication with instructors and other college support personnel. • Limited asynchronous discussions with other learners. • Use of the web as an electronic performance support tool. • Testing. • Remediation and refresher training. • Limited audio conferencing (telephone or Web-based). (Future: Desktop video conferencing.) • Pre-course learning activities for video teletraining.	90%
Video Teletraining	• Presentations and demonstrations of "softer" skills. • Presentation of more complex math/statistical concepts. • Interactive exercises (e.g., mock negotiations).	10%

Note: This potential mix of training technologies is for planning and resource management purposes only. The mix has been adjusted since the previous draft to accommodate mandates to increase the number of courses transitioned to technology-based delivery.

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING METHODS (CONTINUED)

Level One Courses

Rationale:

- Web-Based/CD-ROM Training: The majority of the Level One training is geared to learning facts and concepts. Web-based/CD-ROM training will be used to deliver this type of training.
- Video Teletraining: A smaller number of Level One performance outcomes involve application exercises that require a high degree of interaction among the learners and "real-time" coaching/ feedback from instructors (e.g., negotiating, complex case-study exercises, etc.). Video teletraining will be used to deliver training of these performance outcomes.

> During the content analyses, the performance outcomes will be reviewed closely to determine which type of instructional methods is optimal.

Proposed Uses of Technology-Based Methods—By Course Levels

LEVEL TWO COURSES:

BACKGROUND INFORMATION

Level Two Courses

Types of Performance Outcomes:

- Review of Concepts and Principles (Cognitive Tasks; Bloom’s Level 1)
- Learning of Complex Concepts and Principles (Cognitive Tasks; Bloom’s Levels 2 and 3)
- Application of Information/Research Skills (Cognitive Tasks; Bloom’s Levels 2 and 3)
- Application of Computer Skills (Cognitive Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Principles in Planning and Decision Making Scenarios (Cognitive Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Math and Statistical Skills in Case Studies (Cognitive Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Planning and Modeling Skills (Cognitive Tasks; Bloom’s Levels 4 and 5)
- Application of Negotiation Skills (Cognitive and Affective Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Ethical Principles to Case-Study Situations (Cognitive and Affective Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Interpersonal Skills to Team Problem Solving (Affective Tasks; Bloom’s Levels 3, 4, and 5)
- Application of Presentation Skills to Case Briefings (Cognitive and Affective Tasks; Bloom’s Levels 3, 4, and 5)

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING METHODS

Level Two Courses

The following table summarizes the potential mix of technology-based methods for delivering Level Two courses. The percentage refers to the total number of Level Two training contact hours.

Technology	Description	Percent of Training
Web-Based/ CD-ROM Training	• Online lessons. • Virtual office simulations. • Demonstrations of complex processes (e.g., modeling). • Asynchronous communication with faculty and other college support personnel. • Asynchronous discussions with other learners. • Use of electronic performance support tools. • Testing. • Remediation and refresher training. • Audio conferencing (telephone or Web-based). (Future: Desktop video conferencing.) • Pre-course activities for video teletraining.	80%
Video Teletraining	• Presentations and demonstrations of "softer" skills. • Discussions to promote Integrated Product Teams. • Interactive exercises (e.g., team decision making).	20%

Note: This potential mix of training technologies is for planning and resource management purposes only. The mix has been adjusted since the previous draft to accommodate mandates to increase the number of courses transitioned to technology-based delivery.

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING METHODS (CONTINUED)

Level Two Courses

Rationale:

- Web-Based/CD-ROM Training: Within the Level Two courses there are performance outcomes that relate to learning facts and concepts. Web-based/CD-ROM training will be used to deliver this type of training. In addition, this technology can be used to demonstrate and practice planning and modeling techniques. The Web-based technology can also be used to establish virtual Integrated Product Teams. For example, in a cross-cutting course such as ACQ 201, each learner would be assigned to a virtual project team based on his or her profile information. Each team would have a cross-section of specialties. The team would then be required to complete joint assignments.
- Video Teletraining: Many Level Two performance outcomes involve application exercises that require a high degree of interaction among the learners and "real-time" coaching/ feedback from instructors (e.g., negotiating, complex case-study exercises, etc.). Level Two outcomes require that learners solve problems in the context of an Integrated Product Team. Video teletraining will be used to deliver training on these performance outcomes.

Proposed Uses of Technology-Based Methods—By Course Levels

LEVEL THREE COURSES:

BACKGROUND INFORMATION

Level Three Courses

Types of Performance Outcomes:

- Learning of Facts, Concepts, and Principles Related to Recent Policies and Issues (Cognitive Tasks; Bloom's Levels 2 and 3)
- Learning of Skills Related to the Use of Statistical Tools and Interpretation of Information (Cognitive Tasks; Bloom's Levels 3, 4, and 5)
- Application of Analytical Skills to Identifying Interrelationships, Interactions, and Ethical Implications in Case Studies (Cognitive Tasks; Bloom's Levels 4 and 5)
- Application of Forecasting and Strategic Planning Skills in Integrated Simulation Exercises (Cognitive Tasks; Bloom's Levels 5 and 6)
- Application of Leadership Skills in Integrated Simulation Exercises (Affective Tasks; Bloom's Levels 3, 4, and 5)

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING METHODS

Level Three Courses

The following table summarizes the potential mix of technology-based methods for delivering Level Three courses. The percentage refers to the total number of Level Three training contact hours.

Technology	Description	Percent of Training
Web-Based/ CD-ROM Training	• Online lessons. • Virtual office simulations. • Modeling simulations. • Asynchronous communication with faculty and other college support personnel. • Asynchronous discussions with other learners. • Use of electronic performance support tools. • Testing. • Remediation and refresher training. • Audio conferencing (telephone or Web-based). (Future: Desktop video conferencing.) • Pre-course learning activities for video teletraining and classroom.	55%
Video Teletraining	• Discussions of new policies and issues. • Presentations and demonstrations of “softer” skills. • Seminars/discussions on identifying interrelationships, and ethical implications of situations.	45%

Note: This potential mix of training technologies is for planning and resource management. The mix has been adjusted since the previous draft to increase the number of courses transitioned to technology-based delivery.

Proposed Uses of Technology-Based Methods—By Course Levels

USE OF TECHNOLOGY-BASED TRAINING METHODS (CONTINUED)

Level Three Courses

Rationale:

- Web-Based/CD-ROM Training: Within the Level Three courses Web-based/CD-ROM training will be used to ensure that learners have the knowledge required to enter into advanced simulation exercises conducted using two-way video teletraining and classroom training.
- Video Teletraining: Many Level Three performance outcomes involve application exercises that require a high degree of interaction among the learners and "real-time" coaching/feedback from instructors. Complex case-study and teletraining will be used to deliver training on these performance outcomes.

Proposed Uses of Technology-Based Methods—By Selected Courses

ACQ 101:
WHAT-IF SCENARIOS

USE OF TECHNOLOGY-BASED TRAINING METHODS

The purpose of this section is to present "what-if" scenarios for the use of technology-based training methods in the following seven courses:

- ♦ ACQ 101: Fundamentals of Systems Acquisition Management
- ♦ ACQ 201: Intermediate Systems Acquisition
- ♦ BFM 201: Systems Acquisition Funds Management (currently being revised as BFM 103)
- ♦ CON 104: Contract Pricing
- ♦ CON 223: Intermediate Facilities Contracting (currently being revised)
- ♦ PQM 101: Production and Quality Management Fundamentals
- ♦ TST 202: Intermediate Test and Evaluation

> These scenarios are not intended to be used for final decision making. Rather, the scenarios are presented to give DAU a basis for future planning and the development of cost profiles contained in the Action Plan. DAU decisions will be based on results of more detailed content analyses on each of these courses.

ACQ 101:

BACKGROUND INFORMATION

ACQ 101: Fundamentals of Systems Acquisition Management

Number of Training Contact Days: 9 (based on current course design)

Types of Performance Outcomes:

- Learning of Facts, Concepts, and Principles Related to the Systems Acquisition Program Management (Cognitive Tasks; Bloom's Level 1 and 2)

  Note: Most outcomes fall into this category.
- Application of Regulations to the Development of an Acquisition Strategy (Cognitive Tasks; Bloom's Level 3)

Other Course Characteristics:

- Entry-Level With No Prerequisites
- Certification Requirement in Most Career Fields
- New Integrated Product Team Approach

Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods—By Selected Courses

ACQ 101: Technology-Based Training Recommendations

Recommended Delivery Method: Web-based/CD-ROM training.

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, and audio).
- Interaction through course exercises.
- Virtual office simulations to demonstrate Integrated Product Team concepts.
- Limited asynchronous communication with instructors and other school support personnel.
- Limited asynchronous discussions with other students. The emphasis of these discussions will be to promote the Integrated Product Team concept.
- Use of hypertext references.
- Testing.
- Audio conferencing.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet.

Average Training Contact Time: 40 hours Web-based/CD-ROM training

Instructor-to-Learner Ratio: 1:125

ACQ 101: Technology-Based Training Recommendations

Notes:

1. The use of Web-based/CD-ROM training methods is consistent with the DAU Education Media Selection Guide Summary Report, January 30, 1995, and the ACQ 101 Front-End Analysis Report, June 14, 1996.
2. Five hours have been added to the recommended time as stated in the Front-End Analysis Report. This report recommended that application-level objectives be shifted to ACQ 201. It is recommended that some application-level outcomes be included in this course. These learning outcomes are critical for engaging adult learners and for fostering the development of Integrated Product Teams. Adding these hours will allow for a reduction in the total time required for ACQ 201.

Proposed Uses of Technology-Based Methods—By Selected Courses

ACQ 201:

BACKGROUND INFORMATION

ACQ 201: Intermediate Systems Acquisition

Number of Training Contact Days: 20 (based on current course designs)

Types of Performance Outcomes:

- Review of Facts and Concepts (Cognitive Tasks; Bloom's Level 1)
- Learning of Complex Concepts and Principles (Cognitive Tasks; Bloom's Levels 2 and 3)
- Application of Information/Research Skills (Cognitive Tasks; Bloom's Levels 2 and 3)
- Application of Principles in Decision-Making Scenarios (Cognitive Tasks; Bloom's Levels 3 and 4)
- Application of Negotiation Skills (Cognitive and Affective Tasks; Bloom's Level 3)
- Application of Ethical Principles to Case-Study Situations (Cognitive and Affective Tasks; Bloom's Levels 3, 4, and 5)
- Application of Interpersonal Skills to Team Problem Solving (Affective Tasks; Bloom's Levels 3, 4, and 5)

Other Course Characteristics:

- Level Two Certification Requirement in Most Career Fields
- New Integrated Product Team Approach

Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods—By Selected Courses

ACQ 201:

USE OF TECHNOLOGY-BASED TRAINING METHODS

ACQ 201: Technology-Based Training Recommendations

Recommended Delivery Method: Web-based/CD-ROM training for acquisition and application for cognitive performance outcomes. Two-way video teletraining for affective performance outcomes and for an integrated application exercise.

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, and audio).
- Virtual office simulations to demonstrate Integrated Product Team concepts.
- Asynchronous communication with instructors and other college support personnel.
- Asynchronous discussions with other learners.
- Use of hypertext references.
- Testing.
- Remediation/review training.
- Two-way video teletraining.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet to replace video teletraining component.

Average Training Contact Time: 55 hours Web-based/CD-ROM training and 20 hours two-way video teletraining. (Alternatives: If two-way video teletraining sites are limited, one-way video/two-way audio with onsite facilitators could be used.)

Instructor-to-Learner Ratio: 1:75

Notes:

1. The use of Web-based/CD-ROM training methods combined with two-way video teletraining is consistent with the ACQ 201 Front-End Analysis Report, June 13, 1996. The proposed mixture of training hours has been adjusted slightly to allow for more group interactive time.
2. The DAU Education Media Selection Guide Summary Report, January 30, 1995, favored classroom instruction, followed by video conferencing and synchronous computer-based discussion groups.

Proposed Uses of Technology-Based Methods—By Selected Courses

BFM 201:

BACKGROUND INFORMATION

BFM 201: Systems Acquisition Funds Management
Number of Training Contact Days: 5 (based on current course design) Types of Performance Outcomes: • Learning of Facts, Concepts, and Principles Related to the Formulation of Program Office Budget (Cognitive Tasks; Bloom's Levels 1 and 2) • Application of Problem-Solving Skills to the Development of an Acquisition Strategy (Cognitive Tasks; Bloom's Level 3) • Application of Principles to Decision Making in a Simulation of the Fiscal Budget Cycle (Cognitive Tasks; Bloom's Levels 3 and 4) Other Course Characteristics: • Work is in progress to redesign this course as a Level One course titled "BFM 103 Fundamentals of Business Management." • The number and levels of performance outcomes may change. Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods—By Selected Courses

BFM 201:

USE OF TECHNOLOGY-BASED TRAINING METHODS

BFM 201: Technology-Based Training Recommendations

Recommended Delivery Method: Web-based/CD-ROM training.

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, and audio).
- Virtual office simulations to demonstrate the DoD planning/programming/budgeting system.
- Asynchronous communication with instructors and other college support personnel.
- Asynchronous discussions with other learners.
- Use of hypertext references.
- Testing.
- Remediation training.
- Audio conferencing.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet.

Average Training Contact Time: 25 hours Web-based/CD-ROM training

Instructor-to-Learner Ratio: 1:100

Notes:

1. The use of Web-based/CD-ROM training methods is consistent with the DAU Education Media Selection Guide Summary Report, January 30, 1995.
2. That report recommended the use of Intelligent Tutoring Systems. It is recommended that more emphasis be placed on simulating the fiscal cycle so that the learner can identify the different roles played by the various organizational entities and the impact of decisions made by these entities on the acquisition manager.

Proposed Uses of Technology-Based Methods—By Selected Courses

CON 104:

BACKGROUND INFORMATION

CON 104: Contract Pricing

Number of Training Contact Days: 14 (based on current course design)

Types of Performance Outcomes:

- Learning of Facts, Concepts, and Principles Related to Cost and Price Data (Cognitive Tasks; Bloom's Levels 1 and 2) Note: Most outcomes fall into this category.
- Application of Math Skills to the Analysis of Cost and Pricing Data and Estimating Techniques (Cognitive Tasks; Bloom's Levels 3 and 4)
- Application of Negotiation Skills to Cost and Pricing Discussions (Affective and Cognitive Tasks; Bloom's Levels 3 and 4)

Other Course Characteristics:

- Work is in progress to redesign the Level One Contracting course that is a prerequisite to this course.
- The number and levels of performance outcomes may change due to the redesign effort.
- Negotiation skills may be taught in a separate lesson.

Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods—By Selected Courses

CON 104:

USE OF TECHNOLOGY-BASED TRAINING METHODS

CON 104: Technology-Based Training Recommendations

Recommended Delivery Method: Web-based/CD-ROM training for acquisition and application for cognitive performance outcomes (assuming that the negotiation skills will not be taught as part of this course).

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, audio, and video).
- Interactive exercises within the lessons.
- Demonstrations of estimating techniques.
- Simulations to apply cost and pricing analysis to negotiations.
- Limited asynchronous communication with instructors and other college support personnel.
- Limited asynchronous discussions with other learners.
- Use of hypertext references.
- Testing.
- Remediation training for algebra skills.
- Audio conferencing.
- Two-way video teletraining.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet.

Average Training Contact Time: 40 hours Web-based/CD-ROM training

Instructor-to-Learner Ratio: 1:125

Notes:

1. The use of Web-based/CD-ROM training methods is consistent with the DAU Education Media Selection Guide Summary Report, January 30, 1995. This report recommended the use of computer-based case studies.
2. A commercial off-the-shelf (COTS) package or the George Mason University math tutorial should be used in conjunction with this course to address any math skill deficiencies.

Proposed Uses of Technology-Based Methods—By Selected Courses

CON 223:

BACKGROUND INFORMATION

CON 223: Intermediate Facilities Contracting*

Number of Training Contact Days: 10 (based on current course design)

Types of Performance Outcomes:

- Application of Previously Learned Facts, Concepts, and Principles to Architect-Engineering, Construction, and Facilities Contracting (Cognitive Tasks; Bloom's Levels 2 and 3)
- Application of Analytical Skills to the Evaluation of Alternative Strategies for Handling Contracting Challenges (Cognitive Tasks; Bloom's Levels 4, 5, and 6)

Other Course Characteristics:

- Work is in progress to redesign the core Contracting courses that are prerequisites to this course.
- The number and levels of performance outcomes will change due to the redesign effort.
- Portions of this course will be incorporated into assignment-specific courses focusing on construction contracting issues.

<u>Note</u>: Training days do not include travel time.

* This course was analyzed before a final decision was made about changes to the overall contracting curriculum. The primary purpose of this analysis is to test the proposed reinvestment model.

CON 223:

USE OF
TECHNOLOGY-BASED
TRAINING METHODS

Proposed Uses of Technology-Based Methods—By Selected Courses

CON 223: Technology-Based Training Recommendations

Recommended Delivery Method: Two-way video teletraining.

Recommended Course Features:

- Instructor and Guest Lecturer Presentations
- Discussions of Construction Contracting Issues
- Interactive Exercises Applying Analytical Skills to the Evaluation of Alternative Strategies for Handling Construction Contracting Challenges

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet to replace teletraining.

Average Training Contact Time: 15 hours two-way video teletraining. (Alternatives: If two-way video teletraining sites are limited, one-way video/two-way audio with onsite facilitators could be used.)

Instructor-to-Learner Ratio: 1:75

Notes:

1. No previous distance learning analyses have been conducted.
2. Only portions of the current course will remain in the new version of this course.

Proposed Uses of Technology-Based Methods—By Selected Courses

PQM 101:

BACKGROUND INFORMATION

PQM 101: Production and Quality Management Fundamentals

Number of Training Contact Days: 10 (based on current course design)

Types of Performance Outcomes:

- Learning of Basic Facts, Concepts, and Principles Related to Production and Quality Management (Cognitive Tasks; Bloom's Levels 1 and 2)
- Application of Facts, Concepts, and Principles to Problems Encountered in Case-Study Exercises (Cognitive Tasks; Bloom's Level 3)

Other Course Characteristics:

- The target audience for this course is diverse in their education, background, and work assignments.
- The primary intent of the course is the acquisition of basic knowledge.

Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods—By Selected Courses

PQM 101:

USE OF TECHNOLOGY-BASED TRAINING METHODS

PQM 101: Technology-Based Training Recommendations

Recommended Delivery Method: Web-based/CD-ROM training.

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, and audio).
- Interactive exercises within the lessons.
- Demonstrations of statistical and other automation tools that could be used to accomplish job tasks.
- Limited asynchronous communication with instructors and other college support personnel.
- Limited asynchronous discussions with other learners.
- Use of hypertext references.
- Testing.
- Remediation training.
- Audio conferencing.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet.

Average Training Contact Time: 42 hours Web-based/CD-ROM training

Instructor-to-Learner Ratio: 1:125

Notes:

1. The DAU Education Media Selection Guide Summary Report, January 30, 1995, favored the use of classroom training followed by computer-based case studies and intelligent tutoring systems.
2. Web-based/CD-ROM training has been recommended due to the emphasis on the basic knowledge acquisition.
3. The more formalized content analysis should explore the reasons why the previous report favored classroom-based instruction.

Proposed Uses of Technology-Based Methods—By Selected Courses

TST 202:

BACKGROUND INFORMATION

TST 202: Intermediate Test and Evaluation

Number of Training Contact Days: 9 (based on current course designs)

Types of Performance Outcomes:

- Learning of Concepts and Principles Related to Test Planning, Design, Conduct, Instrumentation, Analysis/ Evaluation, and Reporting (Cognitive Tasks; Bloom's Level 2)
- Learning of Skills Needed To Use Software, Modeling, and Simulation Tools (Cognitive Tasks; Bloom's Level 2)
- Application of New Test and Evaluation Policies and Tools to Developing Strategies To Avoid Pitfalls (Cognitive Tasks; Bloom's Levels 3 and 4)
- Application of Principles in Integrated Decision-Making Scenarios (Cognitive Tasks; Bloom's Levels 3 and 4)
- Application of Interpersonal Skills to Team Problem Solving (Affective Tasks; Bloom's Levels 3, 4, and 5)

Other Course Characteristics:

- Current design includes a team exercise that applies the major principles and skills related to developing a complete test plan for a major weapons system.

Note: Training days do not include travel time.

Proposed Uses of Technology-Based Methods— By Selected Courses

TST 202:

USE OF TECHNOLOGY-BASED TRAINING METHODS

TST 202: Intermediate Test and Evaluation

Recommended Delivery Method: Web-based/CD-ROM training for acquisition and application for cognitive performance outcomes. Two-way video teletraining for affective performance outcomes and for an integrated application exercise.

Recommended Course Features:

- Online/CD-ROM lessons (text, graphics, and audio).
- Virtual office simulations to demonstrate modeling and use of other software tools.
- Asynchronous communication with instructors and other college support personnel.
- Asynchronous discussions with other learners.
- Use of hypertext references.
- Testing.
- Remediation/review training.
- Two-way video teletraining.

Recommended Features for the Future:

- Collaborative learning experiences through mulituser simulated environments.
- Real-time video communication over the Internet to replace video teletraining component.

Average Training Contact Time: 25 hours Web-based/CD-ROM training and 12 hours two-way video teletraining. (Alternatives: If two-way video teletraining sites are limited, one-way video/two-way audio with onsite facilitators could be used.)

Instructor-to-Learner Ratio: 1:75

Notes:

1. The use of Web-based/CD-ROM training methods combined with two-way video teletraining is consistent with the DAU Education Media Selection Guide Summary Report, January 30, 1995. This report favored computer-based case studies followed by classroom and intelligent tutor systems.
2. The more formalized content analysis should explore the importance of the team aspects of the integrative final exercise. This analysis may find that Web-based/CD-ROM training may be sufficient to meet the training goals.

Proposed Uses of Technology-Based Methods—By Selected Courses

SUMMARY

The following table summarizes the recommended conversions for the course-by-course “what-if” scenarios:

	Number of Hours	
Course Title	Web-Based/ CD-ROM	Video Teletraining
ACQ 101: Fundamentals of Systems Acquisition Management	40	0
ACQ 201: Intermediate Systems Acquisition	55	20
BFM 201: Systems Acquisition Funds Management	25	0
CON 104: Contract Pricing	40	0
CON 223: Intermediate Facilities Contracting	0	15
PQM 101: Production and Quality Management Fundamentals	42	0
TST 202: Intermediate Test and Evaluation	25	12

Proposed Uses of Technology-Based Methods—Continuing Education

CONTINUING EDUCATION TRAINING:

BACKGROUND INFORMATION

Continuing Education Training

Target Audience: Defense Acquisition Community

Types of Performance Outcomes:

- Learning of Facts, Concepts, and Principles Related to Recent Policies and Issues (Cognitive Tasks; Bloom's Levels 2 and 3)
- Application of Changing Policies to Decision-Making Situations (Cognitive Tasks; Bloom's Levels 4, 5, and 6)

USE OF TECHNOLOGY-BASED TRAINING METHODS

The following table summarizes the potential mix of technology-based methods for delivering continuing education training. The percentage refers to the total number of continuing education training contact hours.

Technology	Description	Percent of Training
Web-Based/ CD-ROM Training	• Online lessons. • Virtual office simulations. • Asynchronous communication with instructors and other college support personnel. • Asynchronous discussions with other learners. • Use of electronic performance support tools. • Audio conferencing. (Future: Video conferencing.)	50%
One-Way Audio/Two-Way Video Teletraining	• Presentation/discussions of new policies and issues.	50%

Proposed Uses of Technology-Based Methods—Continuing Education

USE OF TECHNOLOGY-BASED TRAINING METHODS (CONTINUED)

Continuing Education Training

Rationale:

- Web-Based/CD-ROM Training: Web-based/CD-ROM training can be used to provide continuing education. It may be possible to repackage portions of Web-based/CD-ROM certification for re-use as continuing education training.
- One-Way Video, Two-Way Audio Teletraining: One-way video, two-way audio teletraining can be used to provide the policy update portion of the continuing education training. The training should be designed to take advantage of two-way video capability at selected sites.

SECTION 2: CURRICULUM

DAU Curriculum Knowledge Base

DAU KNOWLEDGE BASE: THE NEED

ACQ 101 and ACQ 201 are core courses for most of the career fields. These courses are designed to provide the cross-cutting knowledge and skills. The courses also help to bring together acquisition staff from different career areas.

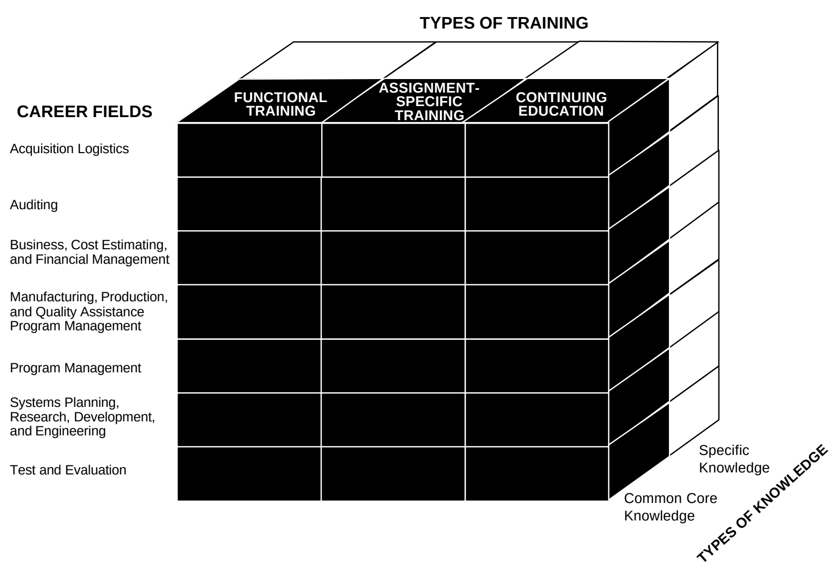
There are additional content areas beyond those taught in ACQ 101 and ACQ 201 that appear in several DAU courses. The application of these content areas may vary among the courses but the core body of knowledge is the same. An example of a content area that appeared in several courses is life-cycle management practices.

> Conversion to technology-based training methods will be more cost-effective if common elements of key content areas can be reused across certification and continuing-education courses. In addition, course maintenance costs will be reduced if common content areas are developed and maintained centrally.

DAU KNOWLEDGE BASE: CONCEPT

As illustrated below in Figure 2-1, a DAU knowledge base will be established. Course content will be organized into a database structure. The structure will allow courses to share common content areas if appropriate (see the shaded cells below). The core knowledge could be combined with unique application exercises that are specific to the course being completed. An example of a content area that may appear in the shaded cells is acquisition ethics because this topic is taught in all career fields and in all types of training courses.

Figure 2-1. DAU Knowledge Base



SECTION 2: CURRICULUM

DAU Curriculum Knowledge Base

DAU KNOWLEDGE BASE: BENEFITS

At Apple University, training has been shortened from 3-day sessions into a series of 3-hour modular sessions (Keegan & Jacobson, 1995). Apple Corporation reports that modular training provides a break from the daily work routine and allows the learner to apply what he or she learns immediately to the job setting. Trainers reported a one-third reduction in development time of course materials.

> Modularization of training materials allows for the delivery of Just-in-Time Training. Just-in-Time Training allows learners to access training when they need it in order to perform a job task. In the DAU environment, Just-in-Time Training could be used for certification or as credit toward the continuing education requirement.

DAU KNOWLEDGE BASE: DEVELOPMENT

The following three-phased process could be used to develop the DAU knowledge base:

Phase 1: Complete Course Objective Database

DAU is in the process of creating a database of course objectives. The database will help identify common objectives among the courses. This database is critical to helping identify the common content areas. In addition, overlapping content areas should be identified during all content analyses.

Phase 2: Develop Knowledge Modules

DAU is currently redesigning the Contracting Level One and Two courses using a more modularized approach. The model being used in this redesign effort should be considered for other career fields.

Phase 3: Design Knowledge-Base Structure and Formats

The next phase is to design the structure and formats to be used in creating the modular units that will comprise the knowledge base.

Technology-Based Development Process

INSTRUCTIONAL SYSTEMS DESIGN

The use of systematic Instructional Systems Design (ISD) processes helps ensure the effectiveness of education and training. However, the ISD processes have not focused on the efficiency of the process (Tripp & Bichelmeyer, 1990). According to Hannafin (1992), the ISD field has failed to evolve at the same pace as advances in technology and cognitive sciences.

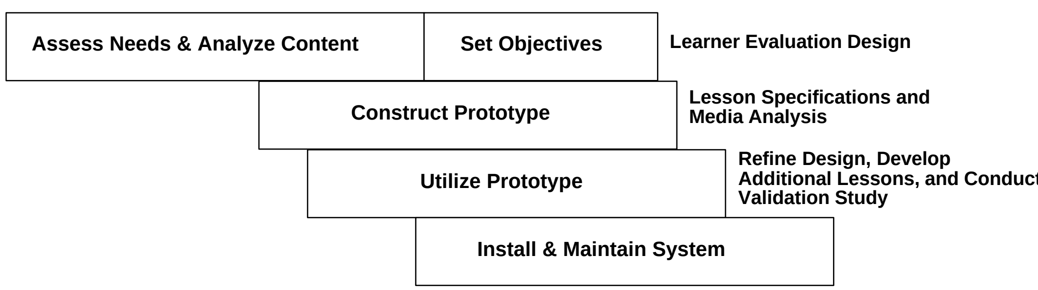
RAPID PROTOTYPING

In today's environment of rapid change, there is a need for ISD processes that are quicker and more efficient while still maintaining the focus on effectiveness. In the commercial arena, software developers have turned to rapid prototyping models to balance the challenges of maintaining high quality while decreasing cycle time.

According to Tripp and Bichelmeyer (1990), rapid prototyping is a viable model for instructional design, especially computer-based forms of instruction. DAU is currently testing the use of rapid prototype approaches in the development of the Simplified Acquisition Procedures (SAP) Course. The total development cycle for the course has been reduced from 6 to 3 months.

Figure 2-2 shows how Tripp and Bichelmeyer arranged the ISD steps in the rapid prototyping model. The overlapping boxes are meant to represent the fact that the processes do not occur in a linear fashion. In other words, the completion of the analysis of the content is dependent on the knowledge gained from creating a prototype lesson.

Figure 2-2. Rapid Prototyping Model

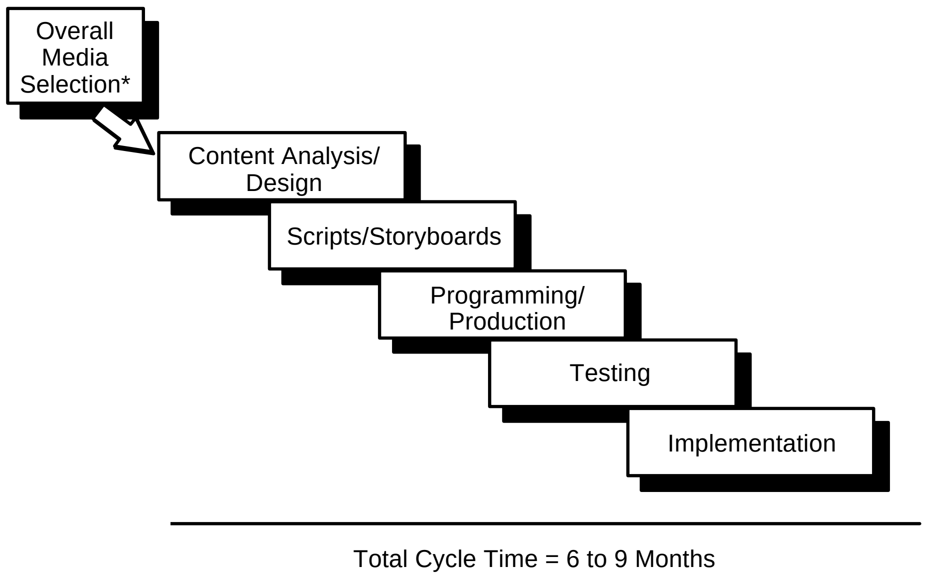


Technology-Based Development Process

DAU'S APPROACH

To meet the mandate for a rapid transition to technology-based course delivery, DAU will balance sound instructional design with innovative technologies that allow for rapid prototyping. The Tripp and Bichelmeyer model will be adapted as shown in Figure 2-3.

Figure 2-3. Rapid Prototyping Model



* Note: The DAU President makes final decisions about media selection based on the performance outcomes, course objectives, and input from the Implementation Team.

The total time cycle is 6 to 9 months depending on the length of the course. This timeframe includes 60 days of operational testing. In addition, portions of larger courses will be completed in phases. For some efforts online course materials will be available in as little as 3 months. A detailed plan will be developed for each course transition effort.

In addition, rapid prototyping reduces potential risks by having stakeholders review materials early in the process when changes can be made more cost effectively. Early reviews of completed course materials can reduce the development cycle by at least one third.

Technology-Based Development Process: Media Analysis Stage

PURPOSE

The current mandate is to transition as many DAU courses as possible. The media analysis is used primarily to make a sound decision about which technology-based delivery methods should be employed. If a course is selected for technology-based conversion, then a more thorough analysis of the performance outcomes must occur. Therefore, the media analysis process should be as efficient as possible. For new or changing courses, this process should occur immediately after the Functional Board finalizes the performance outcomes.

APPROACH

The following approach will be used in the media analysis process:

	Description	Key Players
Preparation	• All relevant materials are collected by the DAU team leader. • Read-ahead materials are sent to the panel.	DAU Academic Curriculum Coordinator DAU Education Specialist
Panel Session	• An analysis of the course is conducted by the panel using a facilitated group process. • Selection criteria are applied to the course using a series of structured rating processes. • Any differences in ratings are discussed and final ratings are made by the group.	DAU Academic Curriculum Coordinator DAU Education Specialist Representatives From Sponsoring and Offering School Other Subject-Matter Experts Contracted Facilitator/Distance Learning Advisor
Decision Making	• Recommendation is considered by the DAU President. • DAU President makes the final decision.	DAU President DAU Distance Learning Program Director DAU Academic Director

Technology-Based Development Process: Media Analysis Stage

MODEL ORIGIN

This model is similar to the Multi-Attribute Matrix (MAUM) used at the United States Air University. This model was developed by Hannafin and Peck (1988).

SAMPLE CRITERIA

Listed below are sample criteria that will be used in the panel process:

- Target Audience Characteristics: The target audience characteristics include the learning styles/preferences, motivation levels, and pretraining skill levels.
- Types of Performance Outcomes: A series of questions will be used to help panelists sort performance outcomes into psychomotor, cognitive, or affective domains.
- Levels of Outcomes: Performance outcomes will be rated on the levels of learning required. A modified version of Bloom's Taxonomy will be used. The modifications to Bloom's Taxonomy are necessary to include job performance dimensions.
- Levels of Job Performance Expected: Performance outcomes will be rated as novice, journey, and expert levels. This rating will tell the designers the depth of instruction required.
- Learning Difficulty: The level of difficulty of the content will be rated.
- Types of Stimulus: The types of visual and auditory stimulus elements needed both to learn the content and perform the job tasks will be identified.
- Group Versus Individual Performance: Each outcome will be identified as requiring group versus individual task performance.
- Instructor Feedback: The levels and types of instructor feedback needed for learning the content will be rated.

Technology-Based Development Process: Media Analysis Stage

PANEL PROCESS

After an orientation process and demonstrations of the potential uses of technology, each panelist will rate a series of statements about the course. Next, the facilitator will lead a discussion on the ratings. The panel will review the comments and make final ratings.

FACILITATOR ROLE

It is recommended that DAU Functional Boards and Consortium members complete all the steps in the media analysis process except for the role of the facilitator. The facilitator should be an independent third party with no investment in the outcome. The facilitator should also have expertise in the use of technology-based instruction.

ACTIONS

The recommended next steps are as follows:

Task Title
Refine the front-end analysis format and methodology.
Implement the refined process on a selected course.
Conduct all remaining media analyses.

Technology-Based Development Process: Design and Development Stages

PURPOSES

The purposes of the design and development stages are to:

- Produce the courses.
- Validate the courses.

STREAMLINING THE PROCESS

The design and development process can be streamlined by:

- Design Process: Combining the lesson specification document and the media analysis document into a one-step process. Storyboards, scripts, outlines, or other documentation would follow the approval of the course design guide. The Federal Aviation Administration (FAA) uses this one-step development process for its distance learning training.
- Standardized Templates: Providing standardized templates for the design of Web-based/CD-ROM lesson and teletraining materials.
- Standardized Virtual Classroom Interface: Developing the code and documentation for a standardized virtual classroom interface. The interface will register learners, manage the number of individuals enrolled in any one course offering, collect learner data, allow for interaction among learners, provide access to instructors and other experts, provide links to other relevant Internet resources, etc.
- Standardized Course Validation: Developing a standardized course validation process. (See the subsection on the evaluation stage for additional information.)
- Team Approach: Using integrated teams to work on the development efforts. According to Moore and Kearsley (1996), producing technology-based courses involves many kinds of expertise. Design teams should include team members who have expertise in the content area, instructional design, graphics design, media design, programming, and evaluation. The team should blend the expertise of DAU staff, Consortium instructors, Functional experts, and contracted personnel. **Teams must stay intact for the duration of the design/development process.**

Technology-Based Development Process: Design and Development Stages

The following team design/development process will be used:

Stage	Description	Key Players
Identify Performance Outcomes	• Specific performance outcomes are established for the course. • Certification criteria and testing strategy are identified.	Functional Board Members and Experts DAU Academic Program Coordinator Distance Learning Program Director
Develop Course Design Guide	• Terminal objectives are established. • Content is divided into units. • Enabling objectives are added. • Methods and media are selected. • Validation plan is developed.	DAU Academic Program Coordinator Representative From Sponsoring/ Offering School Functional Experts Contracted Instructional Designer Distance Learning Program Director
Create Scripts/ Prototypes	• Content is developed into lesson scripts/ storyboards. • Exercises/interactions are developed. • Test items are finalized. • Prototypes of lessons, graphics, and interactions are created.	DAU Academic Program Coordinator Representative From Sponsoring/Offering School Functional Experts Contracted Instructional Designer, Media Specialist, Programmer, etc. Distance Learning Program Director DAU Operations Representatives
Develop Course Materials	• Materials are readied for pilot testing.	DAU Academic Program Coordinator Representative From Sponsoring/Offering School Functional Experts Contracted Instructional Designer, Media Specialist, Programmer, etc. Distance Learning Program Director

The following table shows the approval responsibilities of the key players.

Approval of . . .	DAU Personnel			
	D/L Prgm. Dir.	Aca. Curr. Coordi.	Ops. Rep.	Instructors, Functional Board, & Experts
Content		✓		✓
Instructional Approach	✓	✓		
Validation Plan	✓	✓		
Programming/Technical Aspects	✓		✓	
Contractual Matters	✓			

Technology-Based Development Process: Design and Development Stages

TEAM DESIGN/ DEVELOPMENT (CONTINUED)

Note: Team members may have input into areas for which they do not have approval responsibility. Each instructor and Functional expert working on a development team will be required to assist throughout the process.

DESIGN STANDARDS

Standards can help ensure that the design and development process is both effective and efficient. Using industry standards and best practices, DAU will develop standards for the areas listed below.

Categories of Design Standards: Web-Based/CD-ROM

- Writing Style, Grammar, and Spelling
- Reading Level
- Screen/Graphic Formats/Type
- Use of Video/Audio Files
- Use of Colors
- Numbering of Screens
- Menu Organization/Navigation
- Lengths of Segments
- Copyright Guidelines
- Content Accuracy
- Learner Control/Test Out Options
- Levels and Types of Interactivity
  - Immediacy of Responses
  - Frequency of Practice
  - Feedback
- Testing Options/Test Security/ Test Mastery Criteria
- Technical Functionality
  - HTML Formats
  - Download Timing
  - Data Files Structures
  - Scaleability of Media Features
- Support Resources (online and 1-800 help desk)

Technology-Based Development Process: Design and Development Stages

DESIGN STANDARDS (CONTINUED)

Categories of Design Standards: Teletraining

- Writing Style, Grammar, and Spelling of Text
- Graphic Formats/Type
- Use of Video/Audio
- Lengths of Segments
- Selection of Presenters
- Roles of Site Coordinators/ Technicians
- Copyright Guidelines
- Content Accuracy
- Scheduling Procedures
- Checklists for Session Logistics
- Formats of Site Materials
- Site Groundrules
- Formats of Instructor Materials
- Levels and Types of Interactivity
  - ◊ Immediacy of Responses
  - ◊ Frequency of Practice
  - ◊ Feedback
- Testing Options/Test Security

ACTIONS

The recommended next steps are as follows:

Task Title
Complete development of the Web-based/CD-ROM templates.
Complete development on the virtual classroom interface.
Complete Web-based learner registration and data collection systems.
Select and acquire COTS software to support the computer conferencing aspects of the virtual classroom.
Develop Web-based/CD-ROM design standards documentation.
Develop teletraining design standards documentation.
Convert courses based on the results of the media analyses.
Complete the objectives database effort.
Design the structure of the DAU Knowledge Base.
Enter modules in the DAU Knowledge Base as courses are completed.

.

Technology-Based Development Process: Implementation and Maintenance Stages

PURPOSE

The purpose of the implementation and maintenance stages is to field and support the training products.

SUPPORT REQUIREMENTS

Providing support includes:

- Technical Support: Technical support for ensuring that servers are operating correctly or that teletraining transmissions/ equipment function properly is critical to DAU's program. A technical support plan will be developed for each course.
- Help-Desk Support: After a few Web-based/CD-ROM courses are fielded, DAU will offer 800-number help-desk support services from 7 a.m. EST to 8 p.m. EST. The help-desk staff will answer online technical questions and maintain a library of answers to frequently asked technical questions.
- Administration Support: Administration support means that systems are in place for scheduling, registering, and collecting learner data. For Web-based courses these functions will be automated as part of the virtual classroom interface. For CD-ROM delivered and teletraining courses, an automated system via e-mail will be established. The system will be centralized and administered by DAU and include the following features:
    - Ability to ensure that learners have completed prerequisites prior to enrolling in a course.
    - Ability to limit the number of learners enrolled in a specific course offering to an established upper limit. This feature will ensure that instructor-to-learner ratios stay within the course design guidelines.

Technology-Based Development Process: Implementation and Maintenance Stages

SUPPORT REQUIREMENTS (CONTINUED)

- Site Facilitation: Site facilitation is needed both at the teletraining receive sites and in the work setting. A teletraining site facilitator's primary function is to ensure that the equipment is operating and learners know how to use it. A site facilitator may also help manage exercises and ensure that learners follow the scheduled events. Supervisors assume the role of site facilitator in the work setting. DAU will develop a standard package that is sent to supervisors when a staff member is enrolled in a distance learning course. The package could be sent to the supervisor via e-mail, fax, or other means.
- Instructor Support: Systems must be in place to support instructors who are teaching learners at a distance. To assist instructors:
  - ◊ Administrative staff will be assigned to complete tasks that do not require instructor/content expertise.
  - ◊ Routine data management and tracking functions will be automated for the instructors. For example, sample correspondence to learners and discussion room issues will be delivered as part of the course design efforts.
  - ◊ Instructors should not be asked to carry a full classroom teaching load while trying to instruct at a distance. An instructor's routine workload should be reduced to allow for the new tasks being assumed. These new tasks include responding to e-mail inquiries, managing on-line discussion groups, and tracking learner progress.
  - ◊ Instructor training and resources must be provided. (See Section 3 for additional information on instructor development.)
- Course Content Maintenance: A schedule will be established for periodic review of course content based on DAU's Academic Review Process. Instructors should be given time to assist in the course content maintenance responsibilities. An automated system will be used to track needed course revisions. Implementation of the updates will be outsourced.

Technology-Based Development Process: Implementation and Maintenance Stages

ACTIONS

The recommended next steps are as follows:

Task Title
Develop specifications for acquiring a help-desk function.
Contract for help-desk function.
Implement the help-desk services beginning in FY 98.
Develop guidelines for the administrative support functions to be assumed by DAU.
Design and develop training for administrative personnel.
Develop a detailed plan for phasing in converted courses and phasing out classroom delivery.
Revise DAU policies to reflect new processes.
Develop a distance learning facilitation guide for supervisors.
Develop a site guide for teletraining site facilitators.
Design and develop an instructor development program.
Conduct ongoing training for instructors, administrative, and support staff.
Develop a database for scheduling and tracking course maintenance based on DAU's Academic Review Process.
Implement course maintenance program.

Technology-Based Development Process: Evaluation Stage

PURPOSE

The purpose of the evaluation stage is to ensure that the learners can achieve the performance outcomes. Evaluation includes the following two phases:

- Formative Evaluation: Formative evaluation is the systematic collection of information for improving an instructional product before it is implemented fully.
- Summative Evaluation: Summative evaluation is an assessment of cost-effectiveness of an instructional product after it has been implemented.

FORMATIVE EVALUATION:

TECHNOLOGY-BASED TRAINING

In a traditional design/development approach, formative evaluation is conducted after the instructional product has been developed fully. In developing technology-based products, formative evaluation should not wait until the end of the development process. The literature suggests that changes need to be made in the way formative evaluation is implemented. The following is a summary of recent articles on formative evaluation and technology-based instruction.

- According to Northrup (1995), when the formative evaluation is conducted at the end of the design phase, design teams are often inhibited from making substantial modifications due to technical, time, and cost constraints.

> Implication: Formative evaluation must be an ongoing process during the design and development of technology-based products.

- Byrum (1992) states that using one-to-one and small-group evaluations has resulted in instruction that is significantly better than instruction not evaluated formatively in any way.

> Implication: Alternative methods such as focus groups and one-to-one interviews should be used to gather data. Wide-scale evaluation methods do not need to be used throughout the formative evaluation process.

FORMATIVE EVALUATION:

TECHNOLOGY-BASED TRAINING (CONTINUED)

Technology-Based Development Process: Evaluation Stage

- Dick and Carey (1990) propose phased formative evaluation processes that use different data collection methods based on the types of data being collected. Using the Dick and Carey model, Northrup (1995) proposes the following phased approach to conducting formative evaluations of multimedia projects:

Formative Evaluation Stage	Dick and Carey Approach
Content Development/Evaluation Storyboard Evaluation Rapid Prototype Evaluation	One-to-One Meetings
Full Prototype Evaluation	Small-Group Meetings
Product Evaluation	Field Trial

<u>Implications</u>: A staged approach to formative evaluations is preferred. At the onset of a technology-based project, formative evaluation strategies (one-to-one versus small-group) and participants should be identified. These individuals should <u>not</u> be members of the design/development team.

This independent assessment of the team's work throughout the process will help avoid major revisions following the field test.

<u>Note</u>: The literature indicates that small numbers of reviewers can be used up to the field trial stage.

Technology-Based Development Process: Evaluation Stage

FORMATIVE EVALUATION:

TECHNOLOGY-BASED TRAINING (CONTINUED)

- ChanLin and Okely (1991) stress the importance of going beyond assessing learning acquisition to also evaluating the instructional product itself and the process used to produce it.

> Implication: The DAU formative evaluation process will generate information about how:
>
> ✓ The design/development process can be improved.
>
> ✓ The programming/technical aspects can be improved.
>
> ✓ The learning process can be improved.
>
> ✓ The access to the lesson/resources can be improved.
>
> ✓ The administrative support can be improved.
>
> ✓ The instructor interface/support can be improved.
>
> In addition, testing strategies within courses should include performance-based measures of skill application and not be limited to assessing knowledge acquisition.

SUMMATIVE EVALUATION:

TECHNOLOGY-BASED INSTRUCTION

Summative evaluation for technology-based instruction does not differ from summative evaluation conducted on other forms of instruction. A thorough summative evaluation should measure:

- Training Transfer: An assessment should be made to determine how well new knowledge and skills are applied in the work setting. (This type of evaluation is often referred to as Kirkpatrick's Level 3 evaluation.)
- Organizational Goals: An assessment should be made to determine if organizational goals have been met. (This type of evaluation is often referred to as Kirkpatrick's Level 4 evaluation.)

Technology-Based Development Process: Evaluation Stage

SUMMATIVE EVALUATION:

TECHNOLOGY-BASED INSTRUCTION

Currently, DAU conducts surveys to collect feedback on training transfer and organizational goal attainment from graduates and their supervisors.

This survey process should continue. In the future, this process should be computerized so that surveys are sent and data are collected automatically.

In addition to the surveys, DoD would benefit from conducting a more thorough analysis of the organizational benefits derived from acquisition education and training that have been delivered in a technology-based mode.

ACTIONS

The recommended next steps are as follows:

Task Title
Develop standard processes and instruments for conducting formative evaluations.
Automate the follow-up surveys to DAU graduates and supervisors.

SECTION 2: CURRICULUM

Implementation Strategies

OVERVIEW

This subsection summarizes the recommended action steps presented throughout this section of the report.

MEDIA ANALYSIS

Recommendation: Implement streamlined media analysis process.

Completion Date: March 1999

COURSE CONVERSIONS

Recommendation: Use a rapid prototyping design and development process to transition courses to technology-based delivery modes.

Completion Date: January 2001

DAU KNOWLEDGE BASE

Recommendation: Design and implement the DAU Knowledge Base as described on pages 2-45 and 2-46.

Completion Date: Design completed by October 1997.
Full Implementation by January 2000.

IMPLEMENTATION SUPPORT

Recommendation: Establish the necessary implementation support components including:

- Technical Support and Help-Desk Functions
- Administrative Support (e.g., registration, recordkeeping, course quota, etc.)
- Distance Learning Guides for Supervisors and Site Facilitators
- Ongoing Training and Support of Instructors and Others Involved in Technology-Based Education and Training
- Course Maintenance Program

Completion Date: January 2001 and Ongoing

EVALUATION

Recommendation: Design and implement formative and summative evaluation systems as described on pages 2-59 through 2-62.

Completion Dates: June 30, 1997 (Formative Evaluation) and December 31, 1998 (Summative Evaluation)

ATTACHMENT 2-1:

REFERENCES

Attachment 2-1: References

American Council on Education. (1996). *Distance learning: Evaluation guide.* Washington, DC: Author.

Baker, E., & O'Neil, H. F. (1994). *Technology assessment in education and training*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Byrum, D. C. (1992). Formative evaluation of computer courseware: An experimental comparison of two methods. *Journal of Educational Computing Research, 8*(1): 69-80.

ChanLin, L. J., & Okely, J. R. (1991). *Formative evaluation of outcomes, products, and processes during instructional development*. Paper presented at the 33rd International Conference of the Association for the Development of Computer-Based Instructional Systems, St. Louis, MO.

Defense Acquisition University. (1996). *Graduate and supervisor survey results: Volumes I and II*. Alexandria, VA: Author.

Defense Acquisition University. (1995). *DAU education media selection guide summary report*. Alexandria, VA: Author.

Department of Defense. (July 1995). *Acquisition career management: Mandatory course fulfillment program and competency standards, ADS-95-03-GD*.

Dick, W., & Carey, L. (1990). *The systematic design of instruction (Third edition)*. Harper Collins Publishers.

Duffy, T. M., & Jonassen, D. H. (1992). Constructivism: New implications of instructional technology. In T. M. Duffy & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction: A conversation* (pp. 91-98). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dunn, T. (1994). If we can't contextualize it, should we teach it? *Educational Technology Research and Development, 42*(3): 83-91.

Edmonds, G., Branch, R. C., & Mukherjee, P. (1994). A conceptual framework for comparing instructional design models. *Educational Technology Research and Development, 42*(4): 55-72.

Flagg, B. (1990). *Formative evaluation for educational technologies*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Hannafin, M. J. (1992). Emerging technologies, ISD, and learning environments: Critical perspectives. *Educational Technology Research and Development, 40*(1): 49-61.

Hannafin, M. J., & Peck, K. L. (1988). *The design, development, and evaluation of instructional software*. New York: MacMillan Publishing Co.

Attachment 2-1: References

Harasim, L., Hiltz, S. R., Teles L., & Turoff, M. (1995). *Learning networks: A field guide to teaching and learning online*. Cambridge, MA: The MIT Press.

Heterick, R. C., & Gehl, J. (1995). Information technology and the year 2020. *Educom Review*.

Hudspeth, D. R. (1992). Just-in-time education. *Educational Technology, 32*(6): 7-11.

Keegan, L., & Jacobson, B. (1995). Training goes mod(ular) at Apple. *Training & Development*, *49*(7): 38-40.

Kirkpatrick, D. L. (Ed.). (1986). *More evaluating training programs*. Alexandria, VA: American Society for Training and Development.

Kouki, R., & Wright, D. (1996). Internet distance education applications: Classifications and case examples. *ED, Education at a Distance*, *10*(7): 9-14.

McNeil, D. (1991). *Computer conferencing project: Final report*. Washington, DC: Academy for Educational Development, Inc.

Moore, M., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, CA: Wadsworth Publishing.

Northrup, P. T. (1995). Concurrent formative evaluation: Guidelines and implications for multimedia designers. *Educational Technology,* Nov-Dec: 24-31.

Nunan, T., & Calvert, J. (1992). *Quality and standards in distance education: Report to the national distance education conference*. Deakin University, Victoria, Australia.

Park, I., & Hannafin, M. J. (1993). Empirically-based guidelines for the design of multimedia. *Educational Technology Research and Development, 41*(3): 63-81.

Schwier, R., & Misanchuk, E. (1993). *Interactive multimedia instruction.* Englewood Cliffs, NJ: Educational Technology Publications.

Senge, P.M. (1990). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Tapscott, D. (In press). Six themes for new learning from the digital economy: Promise and peril in the age of network intelligence. *Educom Review 31*(3). (Prepublication Draft)

Thurman, L. (1992). *Ford takes the fast lane to dealer communications and training*. ED Journal, February.

Tripp, S. D., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research and Development, 38*(1): 31-43.

Attachment 2-1: References

Walcoff and Associates. (1994). *DAU remote learning feasibility assessment: Field research report*.

Willis, B. (1993). *Distance education: A practical guide*. Englewood Cliffs, NJ: Educational Technology Publications.

Willis, B. (1994). *Distance education: Strategy and tools*. Englewood Cliffs, NJ: Educational Technology Publications.

Viglante, R. (1996). *Semesters in cyberspace: Evaluation of the 1995 Virtual College Teleprogram*. New York: New York School of Continuing Education, Information Technologies Institute.

Vosniadou, S., De Corte, E., Glaser, R., & Mandl, H. (Eds.). (1996). *International perspectives on the design of technology-supported learning environments.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Xerox Document University. (1994). *Expense and Productivity Analysis for XDU-Net vs. Alternative Delivery Methods*.

ATTACHMENT 2-2:

EFFECTIVENESS OF DISTANCE LEARNING

Attachment 2-2: Effectiveness of Distance Learning

The following studies on the effectiveness of distance learning were compiled by Thomas L. Russell of North Carolina State University.

Date, Author, Study Title	Finding
1996 Garson, G. D. The Political Economy of Online Education. (unpublished paper) North Carolina State University.	"Studies of computer-mediated education in university settings do not find they 'speed up' learning or make students 'perform better'. Typically, evaluation studies find no difference with traditional education."
1996 Goldberg, M. W. CALOS: First Results From an Experiment in Computer-Aided Learning. University of British Columbia, Canada.	"Students that had access to only WWW-based material or the lectures performed roughly the same. It is encouraging that it seems possible for a WWW-based offering to be as effective as a traditional lecture-based course."
1996 McClure, P. A. Technology Plans and Measurable Outcomes. Educom Review, (May/June) Vol. 31, No. 3, 29-30.	"One reason why online education is 'supposed' to be less expensive education in the minds of many administrators is because evaluation studies do not show it to be pedagogically more effective..."
1996 Moore, M. and Kearsky, G. Research on Effectiveness. Chapter 4-Distance Education: A Systems View. Wadsworth Publishing, ISBN 0-534-26496-4.	"Comparing the achievement of learners (as measured by grades, test scores, retention, job performance) who are taught at a distance and those taught in face-to-face classes is a line of research going back more than 50 years. The usual finding in these comparison studies is that there are no significant differences between learning in the two different environments, regardless of the nature of the content, the educational level of the students, or the media involved...reasonable to conclude (1) there is sufficient evidence to support the idea that classroom instruction is the optimum delivery method; (2) instruction at a distance can be as effective in bringing about learning as classroom instruction; (3) the absence of face-to-face contact is not in itself detrimental to the learning process; and (4) what makes any course good or poor is a consequence of how well it is designed, delivered, and conducted, not whether the students are face-to-face or at a distance."
1996 Wilson, D. L. Self-Paced Studies. Chronicle of Higher Education, Vol. XLII, No. 21 (Feb. 2) A19-A20.	"Grades and performance of the online learners proved neither better nor worse on the average than traditional section students."
1996 Witherspoon, J. P. A "2+2" Baccalaureate Program Using Interactive Video. DEOSNEWS Vol. 6, No. 6, ISSN 1062-9416. Pennsylvania State University.	"...the average grades of Fountain Valley classes were marginally to half-a-grade better than those of their campus-bound counterparts."
1995 Barry, M. and Runyan, G. A Review of Distance-Learning Studies in the U. S. Military. The American Journal of Distance Education 9(3): 37-47.0	"All studies in the table reported no significant differences between resident and distant groups. It appears from the studies reviewed here that student achievement in distance learning courses is comparable to student achievement in resident courses...Studies conducted in military settings tend to show no significant difference in achievement between distance learners and resident learners..."
1995 Dexter, D. J. Student Performance Based Outcomes of Televised Interactive Community College Distance Education. Doctoral dissertation, Colorado State University.	"There is no significant difference between the campus-based students and the distance learners in terms of final course grades."
1995 Hiltz, S. R. Impacts of College-Level Courses via Asynchronous Learning Networks: Focus on Students. Sloan Conference on Asynchronous Learning Networks. Philadelphia.	"In looking at how interesting the course content was, the differences among delivery modes are not significant...results [grades] support the hypothesis of equal or better performance. Some preliminary results for all courses showed no significant differences...Once again, as for the combined results, there are no statistically significant differences..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1995 Hodge-Hardin, S. L. Interactive Television in the Classroom: A Comparison of Student Math Achievement Among Three Instructional Settings. Doctoral dissertation, East Tennessee State University.	"Results showed no significant difference in math achievement among the three groups. There were also no differences in student attitudes toward enrolling in future ITV courses when comparing the host site with the remote site…"
1995 McCleary, I. D. and Egan, M. W. Program Design and Evaluation: Two-way Interactive Television. Video-based Telecommunication in Distance Education, Pennsylvania State University, Readings in Distance Education, Number 4.	"...off-campus students were compared to on-campus students...Neither group was significantly different from the other on their pre-test performance. The same is true of both groups on the objective post-test measure. The t-test revealed no significant difference between the groups..."
1995 Sorensen, C. K. Evaluation of Two-way Interactive Television for Community College Instruction. ACEC Conference, Ames, Iowa.	"...there are generally no differences in achievement between students in traditional classes and those in distance-delivered classes, or between distance students at remote sites and those at origination sites where a teacher is present."
1995 Souder, W. E. The Effectiveness of Traditional Vs. Satellite Delivery in Three Management of Technology Master's Degree Programs. Video-based Telecommunication in Distance Education, Pennsylvania State University, Readings in Distance Education, Number 4.	"This study has shown that distance learners can perform as well as or better than traditional learners in management of technology master's degree programs, as measured by exams, term papers, and homework assignments."
1994 Flaskerud, G. The Effectiveness of An Interactive Video Network IVN Extension Workshop. DEOSNEWS Vol. 4, No. 9, ISSN 1062-9406, Pennsylvania state University.	"Participants in the IVN workshop learned marketing concepts as well as those in the regular workshop."
1994 Gerhing, G. A Degree Program Offered Entirely On-Line: Does It Work? Tel-Ed '94 Conference Proceedings, pp. 104-106.	"...the on-line education programs at the University of Phoenix are proving to be equally as effective (and in many cases, more so) as the real-time classes taught on campus."
1994 McGreal, R. Comparison of the Attitudes of Learners Taking Audiographic Teleconferencing Courses in Secondary Schools in Northern Ontario. Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, pp. 11-23.	"The results of this study support the original hypothesis that there would be no significant difference among the students taking distance education courses...there really is no significant difference between the remote and non-remote groups."
1994 Scheiderman, K. Respiratory Therapy Technician Program: Evaluation of Technical Program. California College of Health Sciences, unpublished.	"...89% of the employers considered the performance of CCHS [primarily print-based] graduates to be the 'same' or 'better' than that of graduates of other programs [classroom-based]."
1994 Schlosser, C. A. and Anderson, M. L. Distance Education: Review of the Literature. Research Institute for Studies in Education, Iowa State University.	"...students learn equally well from lessons delivered with any medium, face-to-face or at a distance...hundreds of media comparison studies that indicated, unequivocally, that there is no inherent significant difference in the educational effectiveness of media...Further comparison of the effectiveness were not needed. The specific medium does not matter...Students learning at a distance have the potential to learn just as much and as well as students taught traditionally."
1994 Threlkeld, R. and Brzoska, K. Research in Distance Education. Distance Education: Strategies and Tools. Educational Technology Publications.	"Studies of media preference are common in comparing face-to-face instruction to telephone-based instruction. In general, there are no differences in preferred media. When faced with the option of traveling to a live class, students prefer learning by telephone."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1993 Jurasek, K. A. Distance Education via Compressed Video: An Evaluation of the Attitudes and Perceptions of Students and Instructors. Iowa State University.	"...students at the distance classroom had a significantly more positive attitude than students at the origination site. There was no significant difference in the average grades earned by the students at the two sites."
1993 Knott, T. D. Distance Education Effectiveness. U. S. Distance Learning Association ED Journal, J7-16.	"...in the French IV class...no difference was found between the traditionally taught students and all DE students...There was no difference found in or mean final grade between the traditional class and the DE-primary class."
1993 Souder, W. F. The Effectiveness of Traditional Vs. Satellite Delivery in Three Management of Technology Master's Degree Programs. The American Journal of Distance Education, Vol. 7, No. 1.	"This study has shown that distance learners can perform as well as or better than traditional learners in management of technology master's degree programs, as measured by exams, term papers, and homework assignments. Thus, this study adds to the burgeoning evidence that distance learners should not be viewed as disadvantaged..."
1992 Bauer, J. W. and Rezabek, L. L. The Effects of Two-way Visual Contact on Student Verbal Interactions During Teleconferenced Instruction. AECT National Convention Research and Theory Proceedings.	"...no significant differences between the audio and the traditional [face-to-face] group in either restricted or expanded thinking questions...no significant differences between the audio and the audio video group, or between the audio and the traditional group."
1992 Dillon, C. and Walsh, S. The Comparative Learning Benefit of One-way and Two-way Videoconferencing for Distance Education Applications. The University of Oklahoma.	"Few found significant differences in learning benefit..."
1992 Figueroa, M. L. Understanding Students Approaches to Learning in University Traditional and Distance Education Courses. Journal of Distance Education, 7(3), 15-28.	"There were no significant differences in reading achievement between the two groups."
1992 Jones, J. I., Simonson, M., Kemis, M. and Sorensen, C. Distance Education: A Cost Analysis. Iowa State University of Science and Technology.	"...distance education is effective when effectiveness is measured by achievement, by attitudes, and by cost-effectiveness...Student achievement in interactive distance education classes has been as good as or better than that of students learning from traditional teaching methods."
1992 Olcott, D. Instructional Television: A Review of Selected Evaluation Research. Oregon State University.	"Most studies comparing traditional classroom instruction with ITV have shown no significant differences in student achievement...instructional television appears to produce comparable academic achievement to traditional classroom instruction."
1992 Russell, T. L. Television's Indelible Impact on Distance Education: What We Should Have Learned from Comparative Research. Research in Distance Education.	"No matter how it is produced, how it is delivered, whether or not it is interactive, low-tech or high-tech, students learn equally well with each technology and learn as well as their on-campus, face-to-face counterparts..."
1992 Simpson, H., Pugh, H. and Parchman, S. Use of Video-teletraining to Deliver Hands-on Training: Concept Test and Evaluation. TN-92-14. San Diego, CA: Navy Personnel R&D Center.	"...observations indicated that the learning processes occurring in the off-line laboratories were very similar to those in traditional resident laboratories."
1992 Thompson, A. D., Simonson, M. R. and Hargrave, C. P. Educational Technology: A Review of the Research. Associate for Educational Communications and Technology.	"Many media practitioners who had a professional interest in demonstrating the superiority of mediated instruction were stunned to read that research indicated that instructional media were not inherently 'better'...The literature clearly demonstrates that for every study that shows the new medium is better, another study shows the opposite."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1992 Williams, A. T. The Efficacy of Premium Broadband Video Conferencing in Teaching Cardiac Arrest Skills: A Comparative Study. Columbia Pacific University, Dissertation.	"Statistical analysis of the data showed that there was no difference in performance of the two skills between those who received in-class instruction and those who received instruction through video conferencing."
1991 Cheng, H. C., Lehman, J. and Armstrong, P. Comparison of Performance and Attitude in Traditional and Computer Conferencing Classes. The American Journal of Distance Education. 5(3), 51-64.	"...no significant differences between the treatment groups examined in the study. Further, at the end of the course, there were no significant differences among the groups in attitude toward the subject matter."
1991 Dillon, C. L. and Harwell, D. Tele-communications in Oklahoma: A Summary of Research. The University of Oklahoma.	"Historically, the introduction of each new medium of instruction is accompanied by research designed to determine if it is as effective as traditional instruction...Each new wave of comparison studies brings similar results--no significant difference..."
1991 Gehlauf, D. N., Shatz, M. A. and Frye, T. W. Faculty Perceptions of Interactive Instructional Strategies: Implications for Training. The American Journal of Distance Education, Vol. 5, No. 3.	"One of the first issues to be investigated was whether students were getting the same education in the technologically delivered classes as in the traditional classroom...there are no significant differences in academic performance for students in the two settings."
1991 Johnson, J. L. Evaluation Report of the Community College of Maine Interactive Television System. University of Southern Maine.	"No significant differences (p<.01) were found between the students in origination sites and those in receive sites."
1991 McNeill, B. J. and Nelson, K. R. Meta-analysis of Interactive Video Instruction: A Ten-Year Review of Achievement Effects. Journal of Computer-Based Instruction, Vol. 18, No. 1, pp. 1-6.	"...there were no significant differences in achievement between students using only videodisc and students using videotape-based units."
1991 Phelps, R., et al. Effectiveness and Costs of Distance Education Using Computer-Mediated Communication. American Journal of Distance Education, 5(3), 7-19.	"Test scores, completion rates, student perceptions, and costs were compared to resident training, and results of instruction by CMC were found to be no different from that of resident instruction."
1991 Simpson, H., Pugh, H. and Parchman, S. Empirical Comparison of Alternative Video Training Technologies. Technical Report-92-3. San Diego, CA: Navy Personnel R&D Center.	"...student achievement was higher and comparable to live instruction with fully-interactive VTT...Student achievement was not higher in the two-way video class when compared to the one-way video class..."
1991 Thomas, R. and Hooper, E. Simulations: An Opportunity We Are Missing. Journal of Research on Computing in Education, Vol. 13, No. 4, pp. 497-513.	"...no difference in knowledge gained when compared to other methods of instruction."
1990 Cennamo, K. S. Squenye, and Smith, P. L. Can Interactive Video Overcome the "Couch Potato" Syndrome? AECT National Conversion Research and Theory Proceedings.	"...although it was predicted that learners would perceive that they invested more mental effort in processing the IV lesson than in processing the ITV lessons and TV lesson, and that learners would perceive that they invested more mental effort in processing an ITV lesson than in processing a TV lesson, there was no significant difference between the three groups."`
1990 Hahn, H. Distributed Training for the Reserve Component: Remote Delivery Using Asynchronous Computer Conferencing. Report No. 2Q263743A794. Boise, ID: Army Research Institute.	"The evaluation found that…there were no differences between resident and ACC students on objective performance measures."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1990 Huffington, D. D. and Young, R. C. Integrating Video Technology into Independent Study: The Missouri Experience. The American Journal of Distance Education, Vol. 4, No. 2.	"...research continues to indicate there is no significant difference in what students learn whether they are in large or small classes, participating in telephone or video conferences, or studying alone in an independent study course."
1990 Kabat, E. J. and Friedel, J. N. The Eastern Iowa Community College Districts Televised Interactive Education Evaluation Report. Eastern Iowa Community College.	"The students at the remote sites received grades an average of .01 lower on a 4.0 scale than students at the origination sites. This was not a significant difference."
1990 Moore, M. G. and Thompson, M. M. The Effects of Distance Learning: A Summary of Literature. American Center for the Study of Distance Education.	"...good teaching by teleconferencing and other distance education techniques has results no better or worse than good teaching by any other method, including good face-to-face instruction."
1990 Rupinski, T. and Stoloff, P. An Evaluation of Navy Video Teletraining (VTT). CRM 90-36. Alexandria, VA: Center for Naval Analyses.	"There were very small, nonsignificant differences in course outcomes between the two groups, and there were no differences between the two groups in the number of course failures."
1990 Simpson, H., Pugh, H. and Parchman, S. A Two-Point Video-Teletraining System: Design, Development, and Evaluation. Navy Personnel R&D Center. Technical Report-90-5.	"Student performance on examinations was comparable in originating and remote classrooms, and student attitudes were similar at both sites."
1990 Stone, H. R. Candid Classroom ITV: An Evaluation of its Effectiveness. University of Delaware.	"Color seems not to increase learning...Students like a talk-back system but seem to learn no more with it than without it...No learning advantage has been demonstrated for 'professional' or 'artistic' production techniques...Eye contact seems not to contribute to learning...adding humor adds not to learning effect."
1990 Stone, H. R. Does Interactivity Matter in Video-Based Off-Campus Graduate Engineering Education? University of Delaware.	"...students do not suffer from the inability to talk back to faculty in real time...distance students perform better where they control not only where but when learning occurs."
1989 Barker, B. O., Frisbie, G. and Patrick, K. R. Broadening the Definition of Distance Education in Light of the New Telecommunications Technologies. The American Journal of Distance Education, Vol. 3, No. 1	"The research base, though scant at present, suggests the students who study via telecommunicated distance education approaches perform as well as their counterparts in traditional classroom settings..."
1989 Barker, B. O. and Platten, M. R. Student Perceptions on the Effectiveness of College Credit Courses Taught via Satellite. Readings in Distance Learning and Instruction No. 2, 104-110, Pennsylvania State University.	"Most students (53.8 percent) felt that televised instruction via satellite maintained their interest as well as did regular classroom instruction."
1989 Beare, P. L. The Comparative Effectiveness of Videotape, Audiotape, and Telelectures in Delivering Continuing Teacher Education. Moorhead State University.	"...individual instructional formats had little effect on student achievement or course evaluation. ...the lack of individual opportunity to interact on a daily basis with the instructor did not reduce student learning..."
1989 Chute, A. G., Balthazar, and Poston, C. O. Learning from Teletraining. Readings in Distance Learning and Instruction No. 2, 87-96, Pennsylvania State University.	"Students appeared to learn from the teletraining mode as well, if not better, than they did from the face-to-face mode."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1989 Gibbons, M. The Effectiveness of Technology Applied to Instruction: A Summary of the Research Literature. San Diego State University.	"...listed a half-dozen studies from [the 1930's and 1940's] which demonstrated no difference in student performance between those who listened to radio lectures and those who attended live classes."
1989 Grimes, P. W., Nielsen, J. E. and Niss, J. F. The Performance of Nonresident Students in the "Economics U$A" Telecourse. Readings in Distance Learning. Pennsylvania State University.	"...no significant differences were uncovered between either of the distant learner groups exposed to 'Economics U$A' and the control group."
1989 Ritchie, H. and Newby, J. Classroom Lecture/Discussion vs. Live Televised Instruction: A Comparison of Effects on Student Performance, Attitudes, and Interaction. American Journal of Distance Education.	"Studies completed during the past three decades indicate performances by students on achievement-type tests are similar regardless of instruction proximity...comparable performance can be expected from students."
1989 Russell, T. L. A Study of Foreign Language Instruction Via TOTE. Research in Distance Education, Vol. 1, No. 2, pp. 2-4.	"The students who saw the lessons on tape felt they did not learn the material as well as they would have in a traditional classroom setting. However, their test scores were not significantly different from those of the traditionally-taught group."
1989 Seigel, A. E. and Davis, C. Delivering Undergraduate Engineering Courses on Television: How Do Grades Compare? University of Maryland.	"...the grade performance of the on-campus student is statistically indistinguishable from that of the off-campus TV student."
1989 Silvernail, D. L. and Johnson, J. L. Evaluative Research Studies of the University of Southern Maine Instructional Television System. University of Maine.	"...no significant differences in the achievement or attitudes of students receiving live classroom instruction and those receiving some type of televised instruction. Overall, no significant differences were found in the achievement levels. ...no significant differences in end of course grades between ITV and non-ITV classes. ...no significant differences in grades between the origination site and remote sites...students do equally well in courses taught over the ITV system as they do in a traditional classroom setting. Students learned course content generally well... Students receiving their course instruction by means of interactive television learned as well as students in a traditional classroom."
1989 Timmons, K. Educational Effectiveness of Various Adjuncts to Printed Study Material in Distance Education. Research in Distance Education, Vol. 1, No. 3, pp. 12-13.	"...an examination of the students' grades indicates no apparent advantage at all..."
1989 Whittington, N. Is Instructional Television Educationally Effective? A Research Review. Readings in Principles of Distance Education. Pennsylvania State University.	"...students taking courses via television achieve, in most cases, as well as students taking courses via traditional methods...Television is a technological device for transmitting communication and has no intrinsic effect, for good or ill, on student achievement. Effective instructional design and techniques are the crucial elements in student achievement whether instruction is delivered by television or by traditional means."
1988 Annenberg/CPB Project. Teaching Telecourses: Opportunities and Options: How Do Telecourses Compare to Other Types of Courses? PBS Adult Learning Service.	"...television-delivered instruction is equivalent to traditional, classroom-based instruction in its learning effectiveness... outcomes of the television courses are roughly equivalent to the outcomes of the comparable traditional courses...telecourse students performed better than or as well as non-telecourse students...a third of the faculty studied reported that Annenberg/CPB courses retained more students than traditionally taught courses. Another third said that retention was equal to traditionally taught courses."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1988 Atherton, J. and Buriak, P. Video Simulation as a Computer Applications Instructional Technique for Professionals and Students. Journal of Vocational Education Research, Vol. 13, No. 3, pp. 59-71.	"...video can be just as effective or more effective than other forms of instruction."
1988 Chute, A. G., Balthazar, L. B. and Posten, C. O. Learning from Teletraining. The American Journal of Distance Education: Vol. 2,. No. 3.	"Students appeared to learn from the teletraining mode as well as, if not better than, they did from the face-to-face mode."
1988 Gibbons, J. F. Tutored Videotape Instruction: An Approach to Educational Productivity. Stanford University.	"...the combined data show that the ITV method was at least as good as live instruction."
1988 Grimes, P. W., Neilsen, J. E. and Niss, J. F. The Performance of Nonresident Students in the "Economics U$A" Telecourse. The American Journal of Distance Education, Vol. 2, No. 2, pp. 36-41.	"...neither distant learner group experienced a significant change in their attitudes towards economics. No significant difference is found between the off-campus and long distance groups...no significant differences were uncovered between either of the distance learner groups exposed to 'Economics U$A' and the control group."
1988 Stone, H. R. Variations in Characteristics and Performance Between On-campus and Video-based Off-campus Engineering Graduate Students. University of Massachusetts.	"...no significant differences between on-campus and off-campus degree students regarding performance."
1988 Woodward, D. B. Teaching Instructional Media Utilization: Video Tape Package vs. Classroom Instruction. Illinois State University.	"...there was no statistically significant difference between the mean score achieved by students who received instruction from the Instructional Media Utilization Package and...by students who received only classroom instruction..."
1987 Grimes, P., Niss, J. and Nielsen, J. An Evaluation of Learning and Attitudinal Changes of Students in Economics U$A. The Annenberg/CPB Project.	"...for the spring semester, no significant differences in learning are found between the groups..."
1987 Kataoka, H. C. Long Distance Language Learning: The Second Year of Televised Japanese. North Carolina State University.	"...no statistically significant differences... students can learn Japanese as well as students in regular classes...performance is not lower."
1987 Kitchen, W. Education and Telecommunications: Partners in-Progress. Testimony before the U. S. Senate Committee on Labor and Human Services.	"...in a wide range of elective programming provided from 1983 to 1986, no statistically significant differences in achievement were found between students taking courses traditionally or by..."
1987 Murray, J. and Heil, M. Project Evaluation: 1986-87 Pennsylvania Teleteaching Project. Mansfield University, Pennsylvania.	"...the pattern of scores across seven courses justifies the conclusion that receiving (distant) students do at least as well and perhaps better than their sending-site counterparts and nonteleteaching control students."
1987 Valore, L. and Diehl, G. The Effectiveness and Acceptance of Home Study. National Home Study Council, Washington, DC.	"All of the research published since 1920 has indicated that correspondence students perform just as well as, and in most cases better than, their classroom counterparts."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1987 Whittington, N. Is Instructional Television Educationally Effective? A Research Review. The American Journal of Distance Education, 1, 47-57.	"...a three-year study...which compared the performance of full-time Stanford students and students obtaining instruction via the live, interactive ITFS system...16,652 students taking traditional, on-campus instruction scored a mean GPA of 3.40, while 1,771 students taking live, interactive video instruction has a mean GPA of 3.39. In addition...Stanford is using tutored video instruction...Research indicates that this method...also promoted equivalent student achievement..."
1986 Bates, A. W. Learning From Television. Open Learning for Adults, Longmans.	"...students can learn just as well. if not better from television...There is a good deal of research which suggests that content may be learned just as well through television as through print."
1986 Bates, A. and Couell, R. N. Distance Education: An Overview. Northwest Regional Educational Laboratory.	"...students learn as well in distance education programs as they do in regular programs..."
1986 Bergin, V. Letter to Nil Whittingham. June 5 (unpublished).	"Television instruction is neither superior nor inferior to traditional classroom presentation. The question is not which medium works best, but what is effective instruction?"
1986 Carvalho, G. F., Graham, G. H. and Gray, M. A. An Evaluation of Telecourse Delivery of a Basic Management Class: A Comparison of Performance and Attitudes with Day and Evening Sections. Wichita State University and Beech Aircraft Corporation.	"The study concluded that while telecourse students might not have liked some aspects of the telecourse as well as the more traditional delivery modes, they performed as well as day and evening students on traditional tests."
1986 Chute, A., Hulick, M., Messmer, C. and Hancock, P. Teletraining in the Corporate Environment. Tele-conferencing and Electronic Communications. University of Wisconsin-Madison.	"...research conducted by Sales and Marketing Education Division has shown teletraining was as effective and in some cases more effective than face-to-face instruction. In general, there were no significant differences between the amount of information students learned in classes that were teletrained and the amount they learned in face-to-face instruction."
1986 Creswell, K. W. Does Instructional TV Make the Grade? Journal of Educational Television, Vol. 12, No. 1.	"Were the 'live' and 'TV' groups different in course performance or attitudes? The data...indicate that they were not; statistical tests (t-tests, Chi-square) applied to all...items showed no significant differences (at the p is less than or equal to .05 level) between the responses in 'live' sections and 'TV' sections...When we conduct telephone surveys in several courses and statistical tests on the data no significant difference between 'TV' and 'live' groups, we conclude that students can learn as well as they learn with professors present."
1986 Kataoka, H. C. Televised Japanese Language Program: The First Year. Foreign Language Annuals, Vol.19, No. 6.	"...students taught under TJaLP can learn as well as those taught in the regular classroom...no statistical significance emerged between the two groups..."
1986 LaRose, R. Adoption of Telecourses: The Adoption and Utilization of Annenberg/CPB Project Telecourses. The ELRA Group, Incorporated.	"...faculty reported that telecourse students performed better than or as well as non-telecourse students..."
1986 Pease, P. The Evaluation of the TIIN Network's Satellite-based Education Network: A Preliminary Report. TI-IN Network. 3 June.	"...student achievement has been consistent with that experienced in traditional classes."
1986 Stone, H. Non-Tutored Video Instruction in Graduate Engineering Education. University of Massachusetts.	"There are no significant differences in graduate performance between traditional and video-based degree students..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1985 Ellis, L. and Mathis, D. College Students Learning from Televised versus Conventional Classroom Lectures: A Controlled Experiment.	"Learning under the two lectures modes was statistically equivalent and class attendance was unaffected by the mode of instruction."
1985 Kirkhorn, J. A Teletraining Study: Student Learning Preferences. University of Wisconsin-Madison.	"...no significant difference in student satisfaction between a telephone-based course and a face-to-face course."
1985 Michael, W. B. and Knapp-Lee, L. Evaluating Learning in Telecourses. Coastline Community College.	"In some instances students recorded gains larger than the on-campus students; however, in general the results indicated no significant differences."
1985 Nelson, R. N. Two-Way Microwave Transmission Consolidates, Improves Education. NASSP Bulletin.	"Teachers and administrators in Iowa's two-way interactive television (TWIT) project found no significant differences between TWIT classes and other sections of the same class taught face-to-face by the same teacher."
1985 Research Communications, Ltd. Research on Student Uses of the Annenberg/CPB Telecourses for the Fall of 1984. Annenberg/CPB Project.	"...performance level equaled that experienced in other on-campus courses. This finding held true for students in both two-year and four-year institutions."
1985 Robinson, R. An Investigation of Technical Innovation: Interactive T.V. AECT.	"...students in remote interactive television classes achieved as well on post-tests as did students in traditional classrooms."
1985 Robinson, R. S., Collins, K. M. and West, P. C. Share Advanced [Secondary] Courses With Other Schools via Interactive Cable Television. Northern Illinois University.	"Students in interactive-television classes achieved as well on the post-test as did students in 'live' classrooms."
1984 Denton, J. J., et al. An Examination of Instructional Strategies Used with Two-Way Television. Texas AandM University.	"...achievement scores were at least as high on materials presented over two-way television as they were on materials presented with the professor present in the classroom."
1984 Kuramoto, A. Teleconferencing for Nurses: Evaluating Its Effectiveness. Teleconferencing and Electronic Communications III. University of Wisconsin-Madison.	"Nurses had comparable achievement regardless of the medium."
1984 Partin, G. and Atkins, E. Teaching Via the Electronic Blackboard. Teleconferencing and Electronic Communications IV 68-73.	"...student achievement was comparable to achievement resulting from resident instruction."
1984 Weingand, D. E. Telecommunications and the Traditional Classroom: A Study of the Delivery of Education. University of Wisconsin.	"...1) there is no evidence to support the idea that face-to-face instruction is the optimum delivery method, 2) Instruct-ion by teleconferencing can facilitate learning as well as or better than can classroom instruction, and 3) the absence of face-to-face contact is not detrimental to the learning process."
1984 Winn, W. Why Media? Instructional Innovator.	"Media are primarily for the delivery and storage of information. Media do not directly determine the type or amount of learning. It is the messages themselves, which are carried by media, that are critical factors for producing achievement or changing attitudes."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1984 Zigerell, J. Distance Education: An Information Age Approach to Adult Education. ERIC Clearinghouse on Adult, Career, and Vocational Education. Columbus, Ohio.	"...performance does not significantly differ between telecourse and classroom students taking equivalent courses."
1983 Allen, M. L. Paper Presented to ASEE at the Arizona State Interactive Video Experience. Arizona State University.	"...overall [24 years], there was no statistically significant difference in the academic performance of the two groups..."
1983 Clark, R. E. Reconsidering Research on Learning from Media. University of Southern California.	"...there are no learning benefits to be gained from employing any specific medium to deliver instruction...The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievements any more than the truck that delivers our groceries causes changes in our nutrition."
1983 Holdampf, B. A. Innovative Associate Degree Nursing Program-Remote Area. Department of Occupational Education and Technology, Texas Education Agency.	"...audioconferencing with an existing nursing school...and videotapes of...classes were combined...there were also no significant differences in course grades or scores on national nursing tests..."
1983 Kurh, J. Student Evaluation of Instructional Teleconferencing. University of Wisconsin.	"...academic achievement and student satisfaction in teleconferencing classes is equal to that of students in resident classes."
1983 Smith, J. Evaluation of the Telecourse Program at Saddleback College: Student Retention and Academic Achievement. Nova University.	"In each instance no difference was found in the amount of learning that occurred between telecourse students and on-campus students."
1982 Christopher, G. R. The Air Force Institute of Technology--the Air Force Reaches Out Through Media: An Update. University of Wisconsin.	"...students learned at least as well as resident students..."
1982 Montgomerie, T. C. Telidon Distance Education Field Trial. Telidon Project Evaluation, Alberta, Canada, Department of Education, Planning and Research Branch, November. 207pp	"Telidon instruction was as effective as the traditional correspondence and conventional in-school instruction."
1981 Cohen, P., Ebeling, B. and Kulik, J. A Meta-Analysis of Outcome Studies of Visual-based Instruction. Educational Communications and Technology Journal.	"...students learned slightly more from visual-based instruction than from traditional teaching, but there was typically no difference between the two groups in regard to course completion, student attitudes, or the correlation between attitudes and achievement."
1981 Sakamoto, T. Innovations in Higher Education. Research Institute for Higher Education, Hiroshima University.	"...conducted a series of televised lectures on identical subject matter in a similar situation...(1) with the professor's face on one TV monitor and two types of instructional material on the other two...(2) with any two TV images frozen...and any single moving image...(3) with no professor's face but two types of instructional material on two TV monitors...There were no significant differences in academic achievement among the three groups."
1980 Wilkenson, G. L. Media in Instruction: 60 Years of Research. AECT and NAVA.	"The results of several decades of research...can be summed up as "no significant difference."
1979 Orlansky, S. and String, J. Cost-Effectiveness of Computer-Based Education in Military Training. IDA Paper, Science, and Technical Division, Institute for Defense Analysis, Arlington, VA.	"...overall difference in achievement had no practical significance because no significant difference in achievement was found in thirty-two studies."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1979 Sakamoto, T. Utilization of Educational Technology in Higher Education of Japan. The Pursuit of Excellence in Higher Education, Keinyong University, Korea.	"In terms of academic achievement there were no significant differences between the groups."
1978 Kelly, J. T. and Anadam, K. Nationwide Prime-Time Television in Higher Education. International Journal of Instructional Media.	"...remote mediated learning combined with appropriate contact with live instructors and peers, can be at least as effective and significantly less costly per unit than traditional lecture modes."
1978 Miller, G. R. and Fontes, N. E. Video Technology and the Legal Powers. Beverly Hills, CA, Sage.	"...no significant differences between information retention of jurors when television was used to present testimony instead of direct live observation."
1977 Crow, M. L. Teaching on Television. Faculty Development Resource Center, University of Texas.	"...participants may favor a 'live' teacher in their classroom, although research studies point out that both the televised image and live presentation are equally effective."
1977 Saloman, G. and Clark, R. E. Reexamining the Methodology of Research on Media and Technology in Education. Review of Educational Research.	"Studies have consistently reported achievement on performance tests was similar regardless of the medium used...media (face-to-face versus television) were not significant factors on achievement..."
1977 Schramm, W. Big Media Little Media. Sage.	"...media are mere vehicles that deliver instruction but do not influence student achievement..."
1977 Wood, D. M. and Wylie, D. G. Educational Telecommunications. Belmont, CA, Wadsworth.	"...there is no statistical basis to conclude that TV itself affects learning situations or grades positively or negatively..."
1977 Dambrot, F. General Psychology Over Closed-Circuit Television. Audio-Visual Communication Review, Vol. 20, No. 2.	A pilot study compared 18 control students enrolled in a regular closed-circuit television class of General Psychology with 18 experimental students who were assigned to an independent study section of General Psychology. Students in independent study viewed the TV lectures at the tape stations at their discretion and took course examinations when they felt prepared. The results indicated no significant difference in course achievement or attitude between the two methods of course preparation. Interaction effects between independent study vs. closed-circuit TV and three levels of scholastic ability were also nonsignificant.
1976 Gordon, G. N. Classroom Television: New Frontiers in ITV-Research and the Wonder Drug: NSD. Communication Arts Books, Hastings House.	"The kind of research that characterizes most of the documents purporting to examine ITV...show no significant difference between courses taught over television and equivalent courses given to live matched groups."
1976 Macken, E. Home-Based Education. U. S. Department of Health, Education, and Welfare. Washington, DC.	"...sixty-seven American studies of the effectiveness of correspondence education at the college, technical, and high school level...there was no significant difference in learning outcomes between correspondence and conventional study."
1975 Chu, G. and Schramm, W. Learning From Television: What the Research Says. ERIC ED 109 985.	"...an experimental study with 80 college students to test the effect of feedback on learning. No difference was found in learning and retention among four treatments...There can no longer be any real doubt that adults learn a great amount from instructional television...The effectiveness of television has now been demonstrated...in many parts of the world, in developing as well as industrialized countries…and with a great variety of subject matter and methods...No difference was found in learning and retention..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1974 Thorman, J. H. and Amb, T. The Video Tape Presentation versus the "Live" Presentation: Better, Worse or the Same?. Moorhead State College.	"...the students learned the same amount, as measured by test performance, whether they were taught by the videotape-discussion method or by the lecture-discussion method..."
1973 Childs, G. B. Correspondence Study: Concepts and Comments. University of Nebraska.	"...it is clear that students who receive instruction by correspondence study achieve at least as well as students who study by other means including classroom instruction, programmed instruction, and television or by use of kinescopes or videotape...students in correspondence courses either matched or slightly exceeded the achievement of students taking the same courses via different formats. Instructional methodology seemed to make no significant difference."
1972 Anderson, C. M. In Search of a Visual Rhetoric for Instructional Television. Audio-Visual Communication Review, Vol. 10, No. 1.	"Administration decisions on the use of television seem to have assigned a positive evaluation to the same no significant differences, deducing that, if television can perform as well as conventional instruction, it holds great potential for solving some of the logistical and personnel problems in education."
1972 Schram, W. Quality in Instructional Television: What Research Says About ITV. University Press of Hawaii	"Students like a 'talkback' system, but seem to learn no more with it than without it...No learning advantage has been demonstrated for 'professional' or 'artistic' production techniques..."
1971 Johnson, L. Cable Television and Higher Education: Two Contrasting Experiences. ERIC	"...students can learn about as well from television as from classroom instruction..."
1970 Forsythe, R. Instructional Radio. An Evaluation of Instructional Technology.	"Experimental studies comparing radio teaching with other means or media have found radio as effective as the so-called 'conventional methods'. Even though radio has been criticized for being only an audio medium, studies have shown that visual elements in learning are not uniformly important."
1970 Gordon, G. N. Classroom Television: New Frontiers in ITV. New York: Hastings House.	"...participants may favor a 'live' teacher in their classroom, although research studies point out that both the televised image and live presentation are equally effective."
1969 Davis, R., Johnson, C., Dietrich, J. Students Attitudes, Motivations Shown to Influence Reception to Televised Lectures. College and University Business, Vol. 46, No. 5, pp. 59-63.	"The overall distribution of grades for students who saw lectures live was not significantly different from students who saw lectures on TV."
1969 Dubin R. and Hedley, R. A. The Medium May Be Related to the Message. University of Oregon, pp. 2 and 16.	"We started with some promising results that led us to the conclusion that face-to-face instruction is better than televised instruction. However, when we turned attention to variations in the television medium we discovered that the apparent reason for the face-to-face instructional superiority lay in the distinct inferiority of two-way television instruction. When we limited attention only to one-way television instruction it was not demonstrably inferior to face-to-face teaching. We found nothing in our analysis by teaching methods and subject matter taught that led us to a conclusion other than there was no measurable difference between the two media."
1969 Kittross, J. M. The Farther Vision-Educational Television Today: Chapter 14 Meaningful Research in ETV. University of Wisconsin.	"To our initial surprise and later disappointment we found over and over again that there were "no significant differences" (NSD) between television and conventional instruction."
1969 Madson, M. L. Methods, Including CCTV, of Presenting Introductory Biology: Their "Affect" on College Freshmen. Minnesota University.	"There was no difference in achievement between groups."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1969 Twyford, L. C. Educational Communications Media. Encyclopedia of Educational Research, p. 370.	"...in almost 90 percent of the comparisons there were no substantial differences in achievement or information gain [with media] over conventional instruction...Students learn about as well irrespective of the methods employed."
1968 Boswell, J. J., Mocker, D. W. and Hamlin, W. C. Telelecture: An Experiment in Remote Teaching. Adult Leadership.	"Pre- and post-test results showed no significant differences in mastery of content; student course evaluations showed no difference in student attitudes."
1968 Chu, G. C. and Schramm, W. Learning from Television: What the Research Says. National Association of Educational Broadcasters.	"...there is no statistical basis to conclude that TV itself affects learning situations or grades positively or negatively..."
1968 Mielke, K. Questioning the Questions of ETV Research. Educational Broadcasting Review.	"Media comparison studies, regardless of media employed, tend to result in no significant differences..."
1968 Thornton, J. W. and Brown, J. W. New Media and College Teaching: Instructional Television. NEA: Department of Audiovisual Instruction.	"There is no longer any question as to the efficacy of television in extending and improving instruction in higher education. In nearly every situation where it has been tried and carefully evaluated, results show that it permits learning equal to and not rarely superior to that achieved under traditional classroom practices."
1967 Chu, C. and Schramm, W. Learning from Television. Stanford University.	"Of the 421 separate comparisons made...308 showed no significant differences, 63 showed television instruction to be superior, and 50 found conventional instruction better. In a total of 202 comparisons of television and conventional teaching at the college level, 152 showed no significant difference in student performance, 22 showed television to be more effective, and 28 showed conventional teaching to be more effective."
1967 Reid, J. C. and MacLennan, D. W. Review of Trends in Research on Instructional Television and Film. University of Missouri.	"The vast majority of these studies has revealed no significant differences in measured performances between students who were instructed via television, and those who were taught directly."
1966 Hartley, J. New Education.	"...examined 112 studies that compared programmed instruction with conventional instruction and found that on measures of achievement 41 showed programmed instruction superior, 6 showed programmed instruction significantly worse, and 37 showed no significant difference between the two treatments."
1966 Murphy, J. and Gross, R. Learning by Television: The Question of Quality. Academy for Educational Development, Inc.	"...studies preponderantly document no significant differences in the measured results of the two modes of instruction."
1966 Skornia, H. J. What We Know from New Media Research. NAEB.	"Oregon reported students learning as well. The Hagerstown experiment reported that in no subject did TV fail to produce results at least as good as those achieved when classroom instruction alone was used."
1965 Gottschalk, G. H. Closed Circuit Television in Second Semester College German. Modern Language Journal.	"...students learning German from closed-circuit television did significantly better in aural and reading comprehension than students taught by the conventional method. However, the two groups had no differences on written finals."
1965 Razik, T. A. What Instructional Television Research Tells Us. State University of New York at Buffalo.	"...students taught by television learned content as well as or better than those taught without it. ...judged equal in the teaching of elementary music... ...found the TV group of medical school students superior, but not significantly so."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1964 Erdos, R. Unpublished report. New England University, Australia.	"...over a ten-year period correspondence study students and internal students of New England University in New South Wales both showed a pass rate of 74%."
1964 Greene, H. Improvement of Teaching by Television: Current Status of the Texas Educational Microwave Project. NAEB National Conference Proceedings.	"TEMP courses are as effective as face-to-face teaching. Even faculty members who may have objections to television for other reasons acknowledge this."
1964 Sykes, R. A. The Effectiveness of Closed-circuit Television Observation and of Direct Observation of Children's Art Classes for Implementing Teachers' Training in Art Education. Dissertation Abstracts 25, 2387.	"...no significant differences between the scores of face-to-face and TV observation groups...Scores of the two observation groups on the class were about the same."
1963 Carpenter, C. R. Research on Instructional Television. Pennsylvania State University.	"The assessments and evaluations show at least that the use of television does not adversely affect the quality of instruction..."
1963 Castle, C. H. Open-circuit Television in Postgraduate Medical Education. Journal of Medical Education 38, 254-260.	"...open-circuit television can be used in postgraduate medical education without undesirable effects."
1963 DeViney, R. D. An Evaluation of Closed-circuit Television Observation for Students Taking Certain Courses in Elementary Education. Dissertation Abstracts 23, 3198-3199.	"No differences were found between mean difference scores on either of the content tests, on the scores of the problem-solving test, or on the mean difference scores on attitudes..."
1963 Grant, T. S., et al. Effectiveness of Television within the Dental Laboratory. University of California, San Francisco Medical Center.	"No differences were found when achievement was compared between groups receiving instructions by television and illustrated lecture, despite a televised demonstration..."
1963 Greenhill, P. L., Lottes, J. J. and Pagano, A. Comparative Research on Methods and Media [Television] for Presenting Programmed Courses in Mathematics and English. Pennsylvania State University.	"...no significant differences between the two groups on any of the three measurements."
1963 Meacham, E. A. The Relative Effectiveness of Face-to-Face Lecture versus Instructional Television in a College Clothing Course. Dissertation Abstracts 24, 276.	"Multiple-regression techniques showed no significant differences between groups..."
1963 Reede, A. H. and Reede, R. K. Televising Instruction in Elementary Economics. Pennsylvania State University.	"...no significant differences in over-all achievement..."
1963 Skinner, T. B. An Experimental Study of the Effects of Prestige and Delivery Skill in Educational Television. University of Michigan, Ann Arbor.	"...no main effect for the prestige variable. A supplemental experiment indicated no significant differences between the two perceived prestige images..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1963 Souder, M., et al. Study of the Effectiveness of Televised Instruction in a Physical Education Course. NAEB Journal 22, 1-2.	"...no significant difference between methods of instruction...No significant difference between methods of instruction was found for attitudes..."
1963 Spencer, R. E. Comparisons of Televised with Teaching and Televised with Instructor Presentations of English Grammar. Pennsylvania State University.	"...no significant differences between the high school TV and teaching machine groups or any of the criterion measures...no significant differences between the college TV and face-to-face groups on any of the achievement measures."
1963 Stickell, D. W. A Critical Review of the Methodology and Results of Research Comparing Televised and Face-to-Face Instruction. Pennsylvania State University.	"...10 [studies] were classified as 'interpretable'. Of these 10, all showed no significant differences in learning at the .05 level...no significant difference in learning...between televised teaching and conventional teaching."
1963 Walton, N. R. A Pilot Study of Student Attitudes in a Closed-circuit Television Course by Use of Stimulated Recall. Dissertation Abstracts 24, 1082.	"There were no differences between the groups on scores...or on achievement in the course."
1962 Alexander, F. D. An Experiment in Teaching Mathematics at the College Level by Closed-circuit Television. Dissertation Abstracts 22, 2805.	"...there is no difference in achievement scores between the television and non-television lectures..."
1962 Devault, M. V., Houston, W. R., Boyd, C. C. Television and Consultant Services as Methods of Inservice Education for Elementary School-Teachers of Mathematics. University of Texas.	"...no significant differences between television and face-to-face lecture-discussion groups in changing teacher's attitudes toward the inservices program, or in changing teacher's understanding of mathematics and methods or in changing mathematics achievement and interest of pupils."
1962 Diamond, R. M. The Effect of Closed Circuit Resource Television upon Achievement in the Laboratory Phase of a Functional Anatomy Course: A Comprehensive Investigation of Television as a Magnification Device during Laboratory Demonstrations. Dissertation Abstracts 23, 884.	"...no significant differences between groups taught conventionally and by television..."
1962 Martin, H. S. The Relative Effectiveness of Teaching Dramatic Understanding as Compared to Conventional Classroom Instruction. University of Nebraska.	"TV appears to be an equally effective means of instruction compared to face-to-face instruction..."
1962 Rogers, W. F. Television Utilization in the Observation Program for Teacher Education. San Jose State College.	"...no significant differences among scores of students in the five groups...no significant differences among groups on the four rating scales."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1962 Schramm, W. What We Know About Learning from Instructional Television: The Next Ten Years. Stanford: Institute for Communication Research.	"...the results of 393 studies were summarized. Of these, 83 showed differences in learning in favor of television, 255 reported no significant differences, and 55 favored direct classroom teaching... There can no longer be any doubt that students learn efficiently from instruction television. The fact has been demonstrated now in hundreds of schools, by thousands of students, in every part of the United States and in several other countries. Instruction Television is at least as effective as ordinary classroom instruction, when the results are measured by the usual final examinations or by standardized tests...employing the usual tests that schools use...we can say with considerable confidence that in 65 percent of a very large number of comparisons between televised and classroom teaching, there is no significant difference. In 21 percent, students learned significantly more, in 14 percent, they learned significantly less, from television."
1962 Schueler, H., Gold, M. J. and Mitzel, H. E. The Use of Television for Improving Teacher Training and for Improving Measures of Student-teaching Performance. Phase I. Improvement of Student Teaching. Hunter College of the City of New York.	"...no significant differences among scores on a behavioral instrument used to record performance of the student teachers in the three treatments."
1961 Abel, F. P. Use of Closed-circuit Television in Teacher Education: Relationship to Achievement and Subject Matter Understanding. University of Minnesota.	"No significant differences were found among the three groups..."
1961 Gropper, G. L. and Lumsdaine, A. A. An Investigation of the Role of Selected Variables in Programmed TV Instruction. American Institute for Research.	"...no significant differences between scores of any of the groups on the four experiments."
1961 Janes, R. W. An Educational Experiment with On-campus Open-circuit Television. Journal of Educational Sociology 34, 300-308.	"There was no significant difference in attitudes toward sociology for either method of instruction."
1961 Myers, L. An Experimental Study of the Influence of the Experienced Teacher on Television. Syracuse University.	"...no significant differences in content scores of students in the television or face-to-face treatments."
1961 Popham, W. J. Tape Recorded Lectures in the College Classroom. AV Communications Review, 9.	"...the effectiveness of using audio tape recorded lectures versus live lectures...no significant difference in student achievement..."
1961 Starlin, G. and Lallas, J. E. Inter-institutional Teaching by Television in the Oregon State System of Higher Education. Oregon State System of Higher Education. Report No. 2: 1959-61. Oregon State System of Higher Education.	"From the 6 years of study, the authors concluded that students on all campuses learned equally well when taught by television from one campus. Students also learned as well when taught by television as when taught by face-to-face methods."
1961 Wolgamuth, D. A Comparative Study of Three Techniques of Student Feedback in Television Teaching: The Effectiveness of an Electrical Signal Feedback System. American University.	"...no significant differences among groups or posttest subject matter scores when adjusted for pretest subject matter scores, and no significant differences when adjusted for both pretest and IQ scores. Analysis of variance indicated no significant differences among groups on retention scores. Analysis of variance on students' attitude of teacher effectiveness on televised teaching indicated no significant differences among groups..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1960 Almstead, F. E. Graf, R. W. Talkback: The Missing Ingredient. New York State Department of Education.	"...compared favorably with classroom students."
1960 Johnson, F. C. Feedback in Instructional Television. Journal of Communication 10, 140-146.	"...no significant difference in learning between the groups taught by an instructor with feedback and those taught by an instructor without feedback. Feedback, as provided in this study, does not appear to have a significant effect on communication."
1960 Kanner, J. H. and Rosenstein, A. J. Television in Army Training: Color vs. Black and White. Audio-Visual Communication Review 8, 243-252.	"...no significant differences between groups in the number of color or noncolor test items answered correctly."
1960 The Nebraska Experimental Program in the Use of Television and Correspondence Study. University of Nebraska.	"Achievement in algebra, literature, and general mathematics was about the same for the face-to-face and television groups."
1960 Reid, J. C. An Experimental Study of a Comparison of Content Learned, Attitude Toward Subject Matters, and Attitude Toward Instructional Television of Students in a Public Speaking Course Presented by Television and Face-to-Face Methods. University of Missouri.	"...no significant differences between the two sections in mean scores on either the mid-semester or the final subject-matter test, and there were no significant differences between the two sections on final grades...no significant differences between the two sections on attitudes toward public speaking scores for any of the testings."
1960 Seibert, W. F. and Honig, J. M. A Brief Study of Televised Laboratory Instruction. Audio-Visual Communication Review 8, 115-123.	"...no significant differences...only one difference in six comparisons - this in favor of the television group...An analysis of variance indicated no significant differences between the ITV and face-to-face groups for either the immediate or delayed post knowledge tests."
1960 Starlin, G. and Lallas, J. E. Inter-institutional Teaching by Television in the Oregon State Systems of Higher Education. Report No. 1: 1957-59. Oregon State System of Higher Education.	"School in American life-...no significant differences on final examination scores...Human development-...no significant differences for any of the three examinations between face-to-face and ITV students...Chemistry-...no differences in the final examinations...Educational psychology- An analysis of variance on final examination scores between face-to-face and ITV students indicated no significant differences."
1959 Driscoll, J. P. Can TV Improve College Teaching? NAEB, Journal 18.	"...no significant difference between groups on the final examination...no significant difference between groups on the course content test gains...no significant difference in the test performance..."
1959 Gordon, O. M., Nordquist, E. C., and Engar, K. M. Teaching the Use of the Slide Rule via Television. University of Utah.	"...no significant differences in final examination scores between ITV and face-to-face students..."
1959 Irwin, J. V. and Aronson, A. E. Television Teaching: Conventional Lecture versus Highly Visualized Film Presentations University of Wisconsin, Madison.	"...there was no statistically significant difference between TV and face-to-face taught groups."
1959 Kanner, J. H., Katz, S. and Goldsmith, P. B. Evaluation of "Intensive" Television for Teaching Basic Electricity. Audio-Visual Communications Review 7, 307-308.	"...no consistent differences between the scores of the experimental and control groups. Aptitude level was more important than the instructional medium in determining test performance."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1959 King. C. E. A Comparative Study of the Effectiveness of Teaching a Course in Remedial Mathematics to College Students by Television and by the Conventional Method. Dissertation Abstracts 20, 2177.	"...no significant differences in achievement scores of students taking the course by ITV and those who had taken it face-to-face."
1959 Teaching by Television. Summary. Fund for the Advancement of Education and Ford Foundation.	"On the final examination there was no difference in achievement between the students in the television classes and those in the regular classes. ...the average total score for the semester also revealed no difference in achievement between the classes taught by the two methods. It is clear, however, that in many college courses students can be expected to do equally well in examinations whether they have been taught by a teacher in a regular classroom or by the same teacher over television. When the final scores were adjusted to compensate for the initial inequality, it was found that there was no difference among students..."
1959 Penn State Report	"SUMMARY OF FINDINGS AT PENN STATE Comparative Effectiveness 1. In 29 out of 32 controlled comparisons in seven different courses, there were no significant differences in achievement between students taught via closed-circuit television and those taught in the conventional manner. 2. In three different courses, there were no significant differences between scores on course-related aptitude tests taken by students taught via TV and those taught by the same teachers in the conventional way. 3. No significant differences in students' achievements were found when proctors of varying status were used to supervise classroom groups of students in televised classes. 4. No significant differences in student achievement were found in comparisons of classes of various sizes taught via television. 5. Several methods of providing for teacher-student interactions were studied in different courses. These included the use of questions and answers over an intercommunication system between the TV classrooms and originating room, and the rotation of students through the TV originating room. Neither of these methods produced measurable increments in learning, but the students strongly favored the use of the intercommunication system."
1959 Westley, B. H. and Barrow, L. C. Exploring the News: A Comparative Study of the Teaching Effectiveness of Radio and Television. University of Wisconsin, Madison.	"...no significant differences between radio high-medium-, and low-ability groups and ITV high-medium, and low-ability groups on delayed recall scores."
1958 Carpenter, C. R. and Greenhill, L. P. An Investigation of Closed Circuit Television for Teaching University Courses. Instructional Television Research, Report Number Two. Pennsylvania State University.	"...studies of the comparative effectiveness of conventional and televised instruction, even though carefully designed to control variables...yielded non-significant differences in student's achievement scores."
1958 Dreher, R. E. and Walcott, H. B. An Experimental Study of College Instruction Using Broadcast Television. San Francisco State College.	"...no significant differences in profiles...no significant differences among any of the three presentation groups...no significant differences among presentation methods..."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1958 Dyer-Bennett, J., Fuller, W. R., Seiberg, W. F., Shanks, M. E. Teaching Calculus by Closed-circuit Television. American Mathematical Monthly 63.	"...no significant differences between experimental groups and control groups..."`
1958 Kanner, J. H. et al. Television in Army Training. Audio-Visual Communication Review 6, 255-291.	"No indication was found that intensive television sessions are more detrimental to classroom learning than face-to-face instruction."
1958 Los Angeles City School Districts. An Evaluation of Closed-circuit Television for Teaching Junior College Courses. Audio-Visual Communications Review 6, 237.	"...no significant differences in achievement scores of students in the studio, in TV classrooms, and in face-to-face classes."
1958 Meierhenry, W. C. A Study of Teaching by Television Under Two Conditions. University of Nebraska.	"...no significant differences in final test scores between the two groups."
1958 Purdue University. Closed-circuit Television Instruction. Audio-Visual Communications Review 6, 77-78.	"There were no differences in learning."
1958 Siepmann, C. A. TV and Our School Crisis. Doff, Mead and Co.	"Students in massed groups, taught by television, appear to learn as much as students taught in classes, large or small, by conventional methods."
1958 Westover, F. L., et al. Report Evaluation the Results of Teaching Accounting I by Means of closed-circuit Television Presentation. University of Alabama.	"Analysis of variance conducted between experimental and control groups on final examination scores and on average course scores indicated no significant differences between groups...no significant differences between groups in the number of dropouts...ITV and face-to-face students tended to make about the same grades and to do as well (or as poorly)..."
1957 Becker, S. L., Dunlap, R., and Gerber, J. C. A Comparison of Three Methods of Teaching. Modern Literature. The State University of Iowa.	"...part of a class discussed in the studio with the instructor while the rest of the class watched. There were no differences in the final performances..."
1957 Benschoter, R. P. and Charles, Don C. Retention of Classroom and Television Learning. Journal of Applied Psychology 41, 253-256.	"Students taught by TV retained their material over 3 years as well as students taught by face-to-face methods of instruction."
1957 Davis, R., Johnson, C., Dietrich, J. Closed-Circuit Television Experimentation on Campus. Michigan State University (unpublished.)	"...no statistically significant difference between the two groups, over two successive quarters using different methods of analysis...How well do the students like courses taught via closed-circuit TV? An analysis of variance revealed no difference among the TV and non-TV groups."
1957 Lofthouse, Y. M. S. An Experiment with Closed-Circuit Television Instruction in Teacher Education. Dissertation Abstracts 17, 1513.	"...no significant differences in students' attitudes toward the course, whether taught on ITV or by face-to-face methods..."
1957 Macomber, F. G., et al. Experimental Study in Instructional Procedures. Oxford: Miami University.	"...no significant differences between scores of students in face-to-face or ITV classes when students were divided by ability levels."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1957 Parsons, T. S. A Comparison of Instruction by Kinescope, Correspondence Study and Customary Classroom Procedures. Journal of Educational Psychology, 48: 27-40.	"...compared instruction by kinescope, correspondence study, and classroom procedures in a course in child development and found no advantage for any one procedure."
1956 Dowell, E. C. An Experiment in Training by Television. Audio-Visual Communication Review.	"It was concluded that the presentation methods were equally effective."
1956 Kumata, H. An Inventory of Instructional Television Research. University of Michigan.	"...the effects of television as a variable operating in a field of perhaps hundreds of other potential variables is of minor significance. Therefore, no significant differences in results are to be expected."
1956 Macomber, F. G., et al. Experimental Study in Instructional Procedures. Oxford: Miami University, Oct. 1, 1956.	"...no significant differences in achievement test scores between ITV and face-to-face students...no significant differences in achievement test scores between high-ability ITV students and high-ability face-to-face students...Similar results were obtained for low-ability students."
1956 Pollock, T. C., et al. Closed-circuit Television as a Medium of Instruction 1955-56. New York University	"...no significant differences in the final grades of ITV and face-to-face students..."
1956 Stuit, D. B., et al. An Experiment in Teaching. Iowa Closed-circuit Television Teaching Experiment: Summary Report. State University of Iowa.	"Analysis of variance on television, lecture, and discussion groups achievement scores indicated no significant differences among groups on either of two achievement tests."
1955 Carpenter, C. R. Greenhill, L. P. An Investigation of Closed-Circuit Television for Teaching University Courses. Instructional Television Research, Project Number One. Pennsylvania State University	"The difference between the effectiveness of televised instruction versus conventional instruction was not statistically significant..."
1955 Frank, J. H. An Evaluation of Closed Circuit Television for Interceptor Pilot Training. Dissertation Abstracts 15, 2060-2061.	"...no significant differences in test scores..."
1954 Anderson, G. R. and VanderMeer, A. W. A Comparative Study of the Effectiveness of Lessons on the Slide Rule Presented via Television and in Person. Mathematics Teacher 47, 323-327.	"TV is an equally effective, compared to face-to-face, means of instruction..."
1954 Kanner, J. H., Runyon, R. P., and Desiderato, O. Television in Army Training: Evaluation of Television in Army Basic Training. George Washington University.	"In five of 17 tests given, the TV group scored significantly higher. In the remaining 12 tests no significant differences were found."
1954 Shimberg, B. Effectiveness of Television in Teaching Home Nursing. Educational Testing Service, Research Bulletin. RB-54-19.	"Television instruction was found to be as effective as classroom instruction in teaching facts...No significant differences were found between the TV-only and TV-plus-practice groups..."
1952 Stromberg, E. L. College for Television Home Study. American Psychologist 7, 507-509.	"The author concludes that open-circuit TV is an effective means of reaching college credit students in their homes."

Attachment 2-2: Effectiveness of Distance Learning

Date, Author, Study Title	Finding
1945 Woelfel, N. and Tyler, I. K. Radio and the School. Tarrytown-on-Hudson, N.Y.: World Book.	"The results of the study yielded no significant difference between the reading and listening groups. The most significant finding...the radio group did equally well as compared to the standard reading group...[also] reviewed several research studies that were designed to compare the effectiveness of instructional radio with traditional methods... no significant difference in achievement resulted from the majority of studies reviewed."
1936 Sorenson, H. Comparative Abilities of Extension and Non-Extension Students. Twenty-third Annual Meeting, Association of Urban Universities, pp. 54-60.	"[Results of this study were very similar to Crump 1928 and showed]...no differences in test scores of college classroom and correspondence study students enrolled in the same subjects..."
1928 Crump, R. E. Correspondence and Class Extension Work in Oklahoma. Doctoral Dissertation, Teachers College, Columbia University	"...no differences in test scores of college classroom and correspondence study students enrolled in the same subjects."

ATTACHMENT 2-3:

SAMPLE USES OF TECHNOLOGY

Attachment 2-3: Sample Uses of Technology

The following table presents a sample of current uses of technology-based training. This list is not a comprehensive list. Rather, it is meant to show a range of sample uses of technology. Many other organizations not mentioned below are doing innovative applications of technology.

Organization	Sample Uses of Technology
Utah Educational Network	Developed EDNET. EDNET is a two-way, fully interactive video network that allows students to take classes. Fiber optics, microwave, and phone lines are used to deliver this service to over 65 sites statewide. See http://www.uen.org.
Mind Extension University	Developed an educational network that combines the use of cable and satellite technologies. Offers more than 150 credit courses per year at the undergraduate level, 45 credit courses at the graduate level, and 150 noncredit courses.
Disney University	Established contracts with universities to provide training after hours via satellite. Many organizations are entering into collaborative agreements with colleges and universities for course delivery.
Xerox Corporation	Developed computer-based training and teletraining to train sales and technical staff. The sales workforce has regular teletraining conferences to keep current on new products.
Hewlett-Packard's Distance Learning System	Developed Information Technology Education Network (ITE-Net). ITE-Net provides instantaneous two-way voice communications (via phone lines and satellite) and one-way video communications (via satellite). Hewlett-Packard reports that training via ITE-Net costs one-half that of traditional classes.
National Technological University (NTU)	Replaced analog transmission with compressed digital delivered via satellite. This use of technology is an integral step to on-demand education at the workstation. Offers degrees in 10 engineering fields to its 41 participating universities and 385 sites in 130 organizations. See http://www.ntu.edu.
New York University	Developed the virtual college teleprogram in computer systems topics. The new teleprogram is delivered using Lotus VideoNotes technology. Lotus VideoNotes allows users to capture and embed Indeo-format video files in Notes documents and databases. Students activate an icon in the course to have the instructional video sent from the virtual college server to their desktop computer equipped with audio boards. The lesson formats include 30 minutes of video presentations that contain hypertext links to related tutorials, readings, discussions, and laboratories. Fifteen hours of individual and group assignments are associated with each presentation. A four-credit course consists of six sessions. The university plans to make the delivery of these courses more flexible by allowing students to access them on demand rather than on a set schedule.

Attachment 2-3: Sample Uses of Technology

Organization	Sample Uses of Technology
Open University	Pioneered courses using computer networking and computer-mediated communication techniques. Students communicate with each other and faculty using a computer network technology. In addition, students collaborate on writing assignments and other projects using collaborative software tools. Computer networking and computer-mediated teaching have been incorporated into most academic distance learning programs. See http://www.ac.open.uk.
Atahabasca University	Developed a Web-site repository for information about administrative registration procedures and the course study plan. Hypertext student manuals, lists of Internet resources, and Internet tools are provided. Many schools are now providing complete online administrative services to students. See http://ccism.pc.athabascau.ca/htmUcourses/mdde615/cover.htm.
New Jersey Institute of Technology	Developed a computer conferencing system that supports collaborative learning and teaching. The institute offers video learning delivered in the following three modes: broadcast on public television, distributed via videotapes, or satellite delivered. A study of the institute's virtual classroom found that learning outcomes were higher than those from traditional classrooms for motivated students.
University of Maryland	Developed Learning Theaters to replace traditional classrooms. These technology-based classrooms allow more active learning by using software during class, small-group collaborative learning experiences, group decision-making exercises using groupware products, and large group simulations. A study found that electronic classroom students had significantly higher final exam scores. See http://www.umcp.umd.edu/TeachTech/Welcome.html.
University of Florida and Virginia Tech	Used the MBONE (virtual network) to share the expertise of professors between the two institutions. New technologies allow faculty with special expertise to be in many places at the same time.
Colorado Electronic Community College	Created the Educational Technology Training Center to provide training and support to educators who wish to implement technology-based instruction. Center users learn how to create and offer video, CD-ROM, Internet, video-conferencing, and cable courses.
University of Pennsylvania	Offered online courses and asynchronous "office hours" for student support and assistance. Professor James O'Donell was able to "speak" with every student in his courses via the Internet. O'Donell indicated that this level of communication was not possible in traditional lecture courses.

Attachment 2-3: Sample Uses of Technology

Organization	Sample Uses of Technology
Virtual Online University (VOU)	Developed a virtual educational environment for its electronic campus. Students can have a virtual tour of the university department offices and classes. Instructors can incorporate multimedia into their class sessions using an Internet client called Pueblo. Hypertext-based quizzes and exams are given. Discussions are held using a text-based chat forum. See http://www.athena.edu.
Maricopa College	Developed the Learner Centered System (LCS). The system is designed to provide critical student support functions to augment learning, help with administrative tasks, and foster personal development. Maricopa College ranks among the nation's leading institutions in the use of computers and telecommunications. See http://www.mcli.dist.maricopa.edu.
National Aeronautic and Space Administration	Incorporated artificial intelligence support into traditional computer-based training. This system, called Intelligent Tutors, can diagnose and correct math, physics, and highly technical procedural skills deficiencies as the student learns. DoD has developed some prototype troubleshooting tutors that reduce the time required to develop high levels of expertise. The biggest drawback to these systems is the high development costs.
University of Pittsburgh, Learning Research and Development Center	Taught novices complex problem-solving skills using intelligent tutors in a fraction of the time. Similar work has been conducted by the Air Force.
Arthur Anderson	Used a "case-based" approach to accelerated learning. In case-based learning, the student learns rules and principles as he or she attempts to solve problems. Case-based learning uses a form of artificial intelligence to guide the learning process. Northwestern University developed this approach to learning.
U.S. Army	Used computer conferencing system called SMART (System for Managing Asynchronous Remote Training) to deliver a portion of the Engineer Officer Advanced Course. A variety of media was used including paper-based materials, computer-assistance instruction modules, videotapes, and synchronous/asynchronous discussions. Mean tests scores for students enrolled in the SMART course were higher when compared to those who took the traditional course delivery.
Indiana Higher Education Telecommunications System (IHETS)	Formed a statewide collaborative venture with Indiana's colleges and universities to provide distance education to all Indiana citizens where they live and work. Distance education is provided through traditional correspondence courses, audio-based courses, satellite courses, cable television programs, videotapes, and computer-based instruction. Degree programs are available in a wide variety of fields. IHETS also used its systems to conduct a one-way video, two-way audio faculty development symposium over a 5-month period. A total of 18 sessions were presented. An online faculty development guide was used to supplement the training.

Attachment 2-3: Sample Uses of Technology

Organization	Sample Uses of Technology
Microsoft Corporation	Created a virtual university interface for students who enroll in their classes. Navigation through the campus occurs by clicking on one of the buildings or kiosks. In the Advising Building are class descriptions, online offerings, and information about the Microsoft Certification Program. The Class Info Building contains course syllabi, certification exam listings, and courseware. The Library Building has free newsletters, Microsoft Product information, and links to other related Web sites. See http://www.microsoft.com/Services/Menu.map?209,25.
AT&T Global Information Solutions	Delivered just-in-time training on changing product lines to sales and technical personnel and training to national and international resellers using a desktop video conferencing system. The system is Windows-based, runs on a 486 PC, and has two-way video, audio, and collaborative conferencing features. The trainees can see the products being discussed and engage in interactions. The system also allows for rapid updating of information.
Lucent Technologies Bell Labs Innovations	Sponsors the Center for Excellence in Distance Learning (CEDL). The center funds research and development projects and provides an information database for people implementing distance learning. See www.lucent.com/cedlID:cedlPSSW:welcome

SECTION 3

ORGANIZATIONAL & HUMAN RESOURCES

SECTION 3: ORGANIZATIONAL & HUMAN RESOURCES

PURPOSE

This section describes the impact and influences of implementing technology-based learning on the organizational and human resources within DAU and the communities with which it interacts.

CONTENTS

This section includes the following topics:

- Management Framework
  - DAU Steering Committee
- Human Resource Roles and Responsibilities
  - Defense Acquisition University
  - Directors of Acquisition Career Management (DACMs)
  - Functional Boards
  - Consortium Members
  - Instructors
  - Learners
  - Implementation Strategies

This section includes the following attachment:

- Attachment 3-1: Instructor Development References

Management Framework

ORGANIZATIONAL APPROACH

To support the successful implementation of change, it is critical that a flexible but effective management structure be established. The primary purpose of this structure is to:

- Address the impacts of change on the current operational environment in a structured and controlled manner.
- Ensure that solutions identified to accommodate change are integrated successfully.

The DAU Technology-Based Education and Training Program will form a Technology-Based Education and Training Steering Committee. This organizational structure will have three primary objectives:

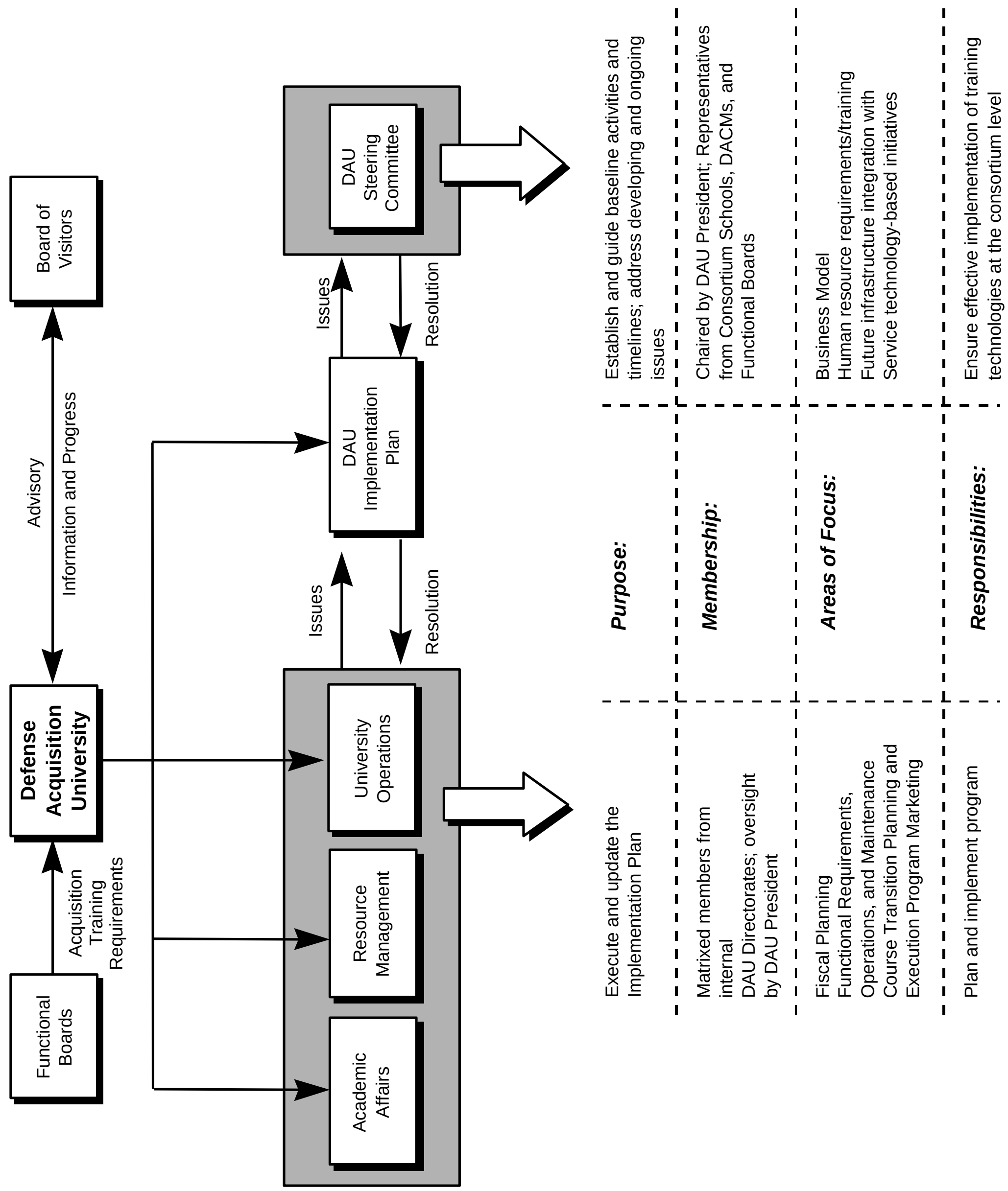
- Proactively identify, assess, and resolve technology-based education and training issues.
- Ensure solutions are integrated successfully into the ongoing operational environment.
- Measure performance of implementing solutions and, through continuous improvement actions, factor lessons learned into the forward progress of the program.

This proposed management structure is consistent with the Integrated Product Teams being used to manage the acquisition life cycle. These organizational structures will follow the guidelines set forth in the DoD 5000 series directives and instructions. Figure 3-1, on the following page, illustrates the proposed organizational structure.

Management Framework

Figure 3-1 shows the proposed organizational structure.

Figure 3-1. Proposed Organizational Structure



Management Framework

STEERING COMMITTEE

A Technology-Based Education and Training Steering Committee will be formed and will serve as the management forum. The committee will have representation from DAU, DACMs, Functional Boards, and Consortium schools. The principal focus of the Steering Committee will be on issues that affect all stakeholders impacted by the implementation of technology-based education and training solutions. The primary purpose of the Steering Committee is to identify obstacles, assess their impacts, study the alternatives, make final recommendations for implementation, and ensure solutions agreed upon are infused into the operational environment in a timely and cost-effective manner.

MEMBERSHIP

The Steering Committee, chaired by the President of DAU, will consist of senior personnel selected from among the Consortium schools, the Functional Boards, and the Directors of Acquisition Career Management (DACMs). Specific members selected to support the Steering Committee will be appointed by each respective organization with approval of the DAU President. Appointees must have the requisite knowledge and expertise regarding modern/advanced training delivery methods, technology applications, and related operational procedures. These individuals must possess the appropriate authority for addressing Steering Committee issues.

The Steering Committee will remain in operation until all objectives have been achieved and technology-based education and training have been fully operational within the DAU and Consortium working environment.

Management Framework

STEERING COMMITTEE RESPONSIBILITIES

The Steering Committee has the overall responsibility to guide and evaluate the implementation of technology-based education and training within the Consortium members. Specific responsibilities associated with the Steering Committee will be provided in a charter prepared by the DAU President. In general, these responsibilities will include the following:

- Identify, assess, and resolve implementation issues and problems.
- Continuously review program progress against the established goals.
- Ensure that all technology-based education and training operational requirements have been identified.
- Review ongoing progress to ensure compatibility and consistency of efforts among participating activities.
- Provide a semi-annual assessment of the Implementation Team's progress to the DAU President.
- Measure performance of implemented solutions.
- Ensure compliance with life-cycle policies and documentation standards established within DoD.

AREAS OF FOCUS

The Steering Committee will address issues having a direct impact on all participants in the Defense Acquisition Education and Training Program regarding the implementation of technology-based education and training. However, through the execution of regular meetings, specific program issues requiring committee action will be identified and tabled for discussion and resolution. In addition, interaction at these meetings will further develop and refine the responsibilities and accountability, reporting channels, team activities, and specific methods of operation outlined in this Plan. During the inception of this program, the following issues, as they relate to this Plan, will be given immediate attention by the Steering Committee:

- Transition of existing courses to technology-based delivery methods.
- Human resource requirements and impacts.
- Systems infrastructure required to support current and planned technology-based education and training developments.

Management Framework

OPERATING PROCEDURES

The Steering Committee will schedule meetings at the request of the Chair to review program progress, assign action items, and resolve emerging issues. An Executive Secretary will be assigned by the DAU President and have the responsibility to coordinate the initial appointing of committee members, manage the development of agenda items, schedule the meetings, and document the results and pending actions for the next meeting.

ISSUE RESOLUTION

The Steering Committee will establish procedures to be used as a management tool to resolve issues during the implementation process. The procedures provide an orderly and disciplined means to:

- Identify issues affecting the technology-based education and training implementation process.
- Assign action to cognizant activities to study issues, including evaluating alternatives, assessing design, cost, and scheduling impacts, and providing recommended disposition.
- Coordinate with cognizant activities impacted by the disposition and resolution of the issues.

ISSUE RESOLUTION RESPONSIBILITIES

Specific responsibilities associated with the Steering Committee issue resolution process are as follows:

- Steering Committee Chair (DAU President)
  - Determine which issues warrant further study.
  - Assign responsible activity(s) to conduct issue resolution study(s).
  - Review issues and establish priorities for resolution.
  - Establish the required completion dates.
  - Approve and provide final disposition upon completion of the issue report study.
  - Identify issues as appropriate.

Management Framework

ISSUE RESOLUTION RESPONSIBILITIES (CONTINUED)

- Steering Committee Executive Secretary
  - ◊ Document, track, and maintain an issues report for historical records.
  - ◊ Coordinate the issue disposition with impacted organizations.
  - ◊ Coordinate the resolution of issues with assigned activity(s).
- Other Steering Committee Members
  - ◊ Identify issues as appropriate.
  - ◊ Provide input to the issue resolution process.
  - ◊ Conduct issue resolution studies.

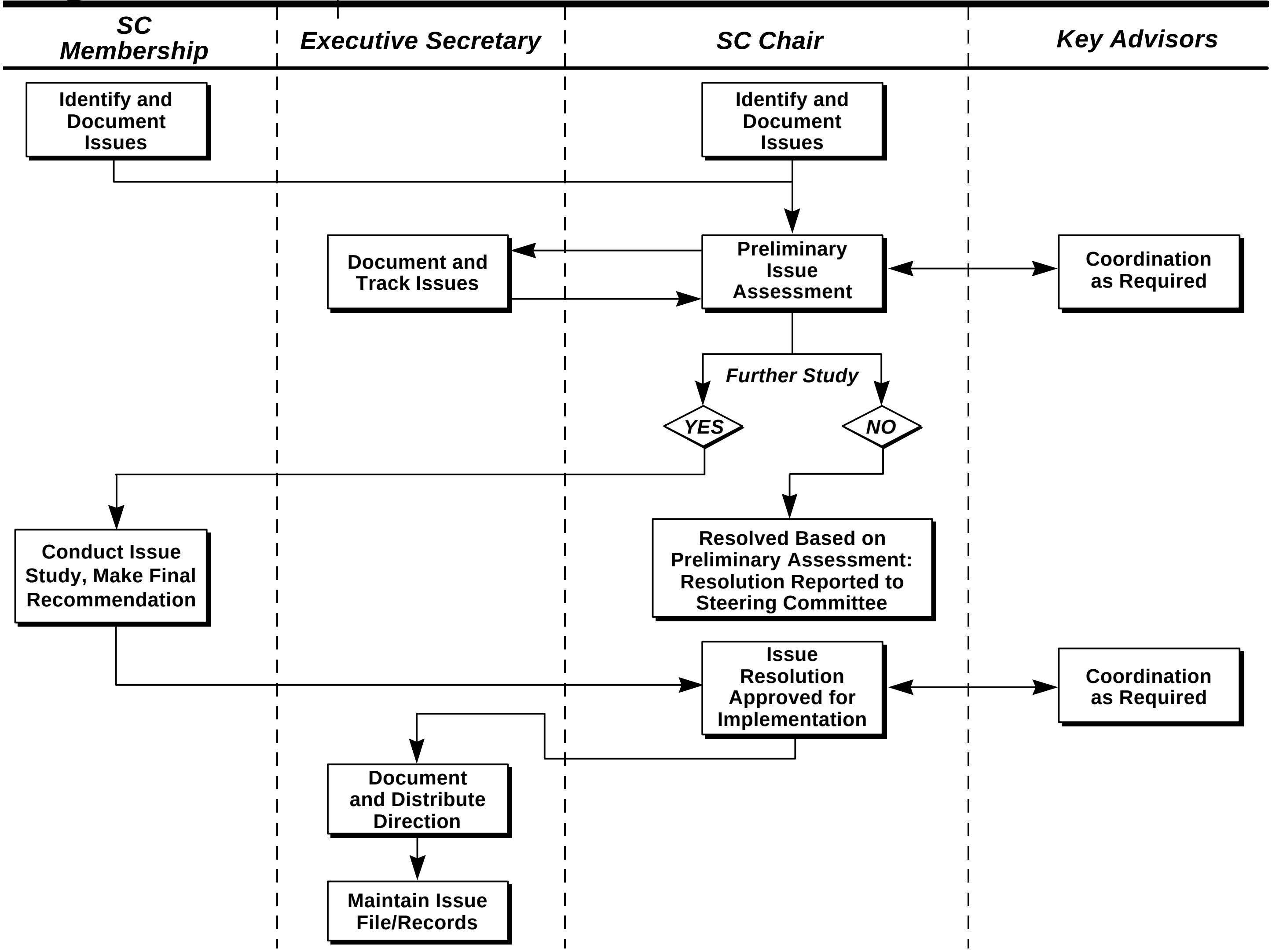
ISSUE RESOLUTION PROCEDURES

Issues may be identified by any Steering Committee member whenever a problem exists that cannot be resolved through routine coordination. Issues will be submitted to the Executive Secretary prior to the Steering Committee meeting to ensure all issues are identified and documented as agenda items at the next meeting. If it is determined at the Steering Committee meeting that further study is warranted to resolve the issue, the Chair will approve and assign action to the appropriate activity(s).

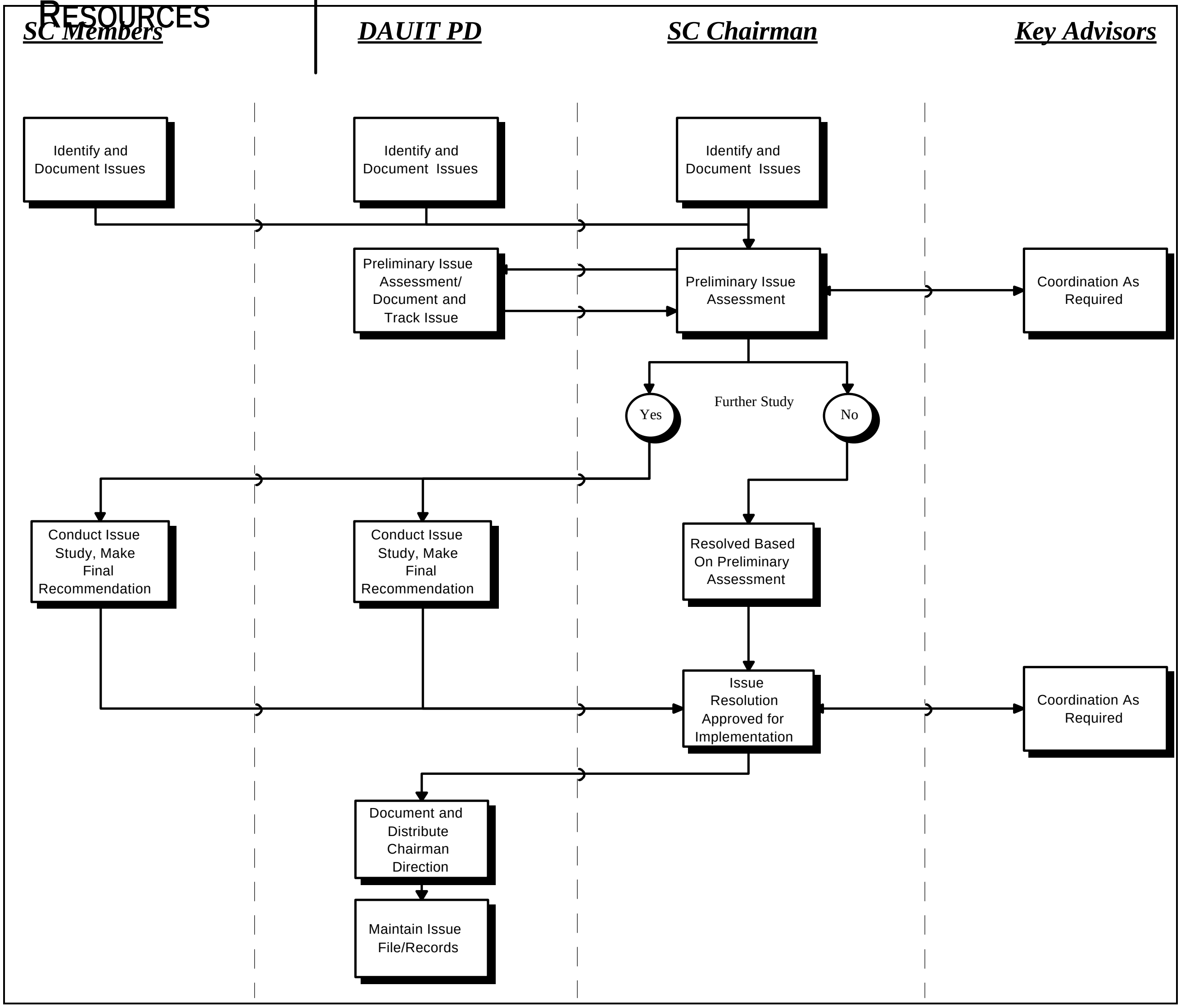
The activity(s) assigned the responsibility to further study the issue will do so within an agreed-upon timeframe. The responsible activity(s) will ensure that all members with whom coordination is required are identified and contacted for inputs. Upon completion of the study, the responsible activity will prepare and submit a final report to the Steering Committee Chair. Upon receipt, the Chair, with support from the DAU Implementation Team Program Director, will evaluate the results and provide further direction and/or approval as required. The final disposition of the issue will be documented and presented at the next scheduled Steering Committee meeting. Figure 3-2 outlines the overall issue resolution process.

Figure 3-2. Steering Committee Issue Resolution Procedure

Management Framework



Management Framework



Management Framework

DAU STAFF

The DAU staff's primary objective is to execute and update the technical, schedule, and cost considerations contained in this Plan. Secondary objectives include the ongoing identification of new requirements and their subsequent transition into the overall implementation planning process.

STAFF PARTICIPATION

The DAU staff's efforts will be coordinated by the DAU Distance Learning Coordinator. It will incorporate part-time matrixed team members selected from each of the four DAU Directorates—Academic Affairs, Resource Management, University Operations, and Acquisition Reform Communications Center. Selection of team members will be orchestrated through a coordinated effort among the DL Coordinator, DAU Directorate Department Heads, and the DAU President. Team members selected will be involved in the day-to-day planning and execution activities associated with the implementation process. Each member's level of involvement and expenditure of time will vary. However, the team as a whole will remain in operation until all objectives have been achieved and technology-based education and training have become fully operational within the DAU working environment.

KEY ADVISORS

The DAU Distance Learning Coordinator will solicit the support of key advisors from the DACMs and Consortium schools. In addition, the private and public sectors will be called upon to provide specialized knowledge and expertise, on an as-needed basis, regarding future acquisition training requirements, implementation/ operational procedures, and the optimal use of developing technologies to support the training requirements identified.

Management Framework

DL COORDINATOR RESPONSIBILITIES

The DL Coordinator will be the principal coordinator of activities regarding the implementation of technology-based education and training, and will act as program liaison with the Steering Committee regarding program progress, issues, and resolutions.. Specific responsibilities include the coordination of staff activities that:

- Provide configuration management of the overall Plan.
- Identify and coordinate future technology-based education and training opportunities including course transition process, systems infrastructure development, human resources, and fiscal resources.
- Ensure project completion within budget and schedule.
- Identify technology-based implementation issues that require Steering Committee resolution.
- Manage the transition of targeted courseware to a technology-based education and training delivery format.
- Monitor and report on the overall progress of the implementation activities as defined in the Action Plan component of this Plan.
- Ensure quality control and performance measurement of implementation solutions.
- Provide configuration management to ensure that all changes to courses and systems are warranted and documented.
- Conduct and evaluate program marketing, promotions, and public relations activities.

Management Framework

AREAS OF FOCUS

Through day-to-day program execution, the DAU staff will further develop and refine the responsibilities and accountability, reporting channels, team activities, and specific methods of operation needed to implement this Plan. Immediate issues addressed by the staff include:

- Establish levels of resources required.
- Continually refine the course transition process.
- Continually refine and develop functional requirements for the systems infrastructure.
- Monitor fiscal resources to ensure that savings are reinvested.

OPERATING PROCEDURES

General procedures will include the following:

- Convene DAU team working group meetings on a regular basis.
- Meet with the DAU President as needed.
- Attend issue resolution meetings with the Steering Committee.
- Exchange information with key advisors, as required.

Human Resource Roles and Responsibilities

ROLES AND RESPONSIBILITIES

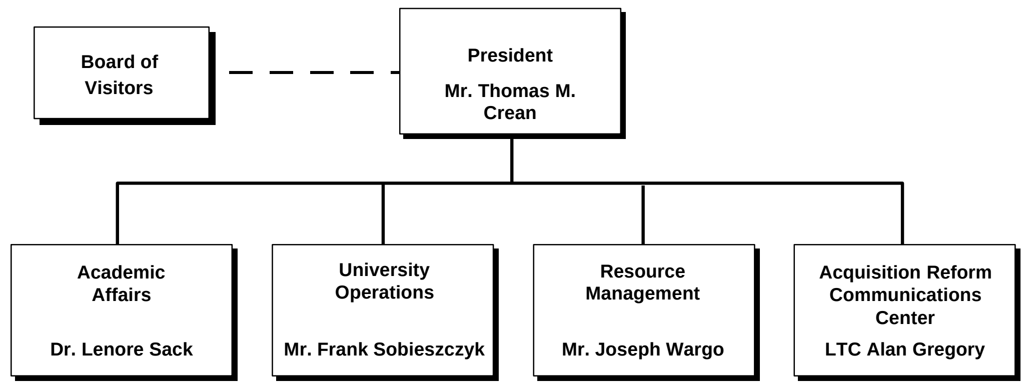
The implementation of technology-based education and training technologies impacts human resource roles and responsibilities. The following paragraphs identify the current state and potential future state roles and responsibilities of key players involved in the implementation process.

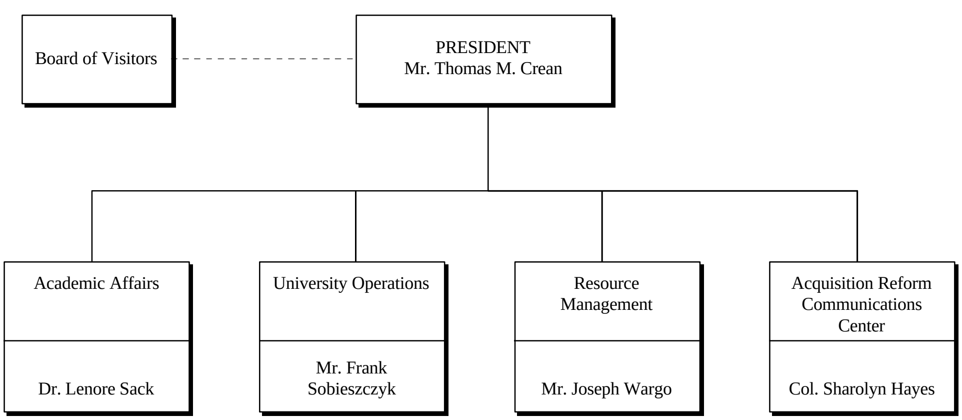
DAU CURRENT STATE

The current roles and responsibilities within DAU are summarized in Figure 3-3.

Human Resource Roles and Responsibilities

Figure 3-3. DAU Organizational Structure





Human Resource Roles and Responsibilities

Launching the Technology-Based Education and Training Program will require the leadership and support of all DAU senior staff. Key future state positions and functions are summarized below.

DAU Position	Functions in Technology-Based Projects
President	♦ Assume role of chief decision maker ♦ Chair the Steering Committee ♦ Manage the Steering Committee issue resolution process ♦ Determine issues for further study
Academic Affairs Director	♦ Establish training priorities and transition schedule ♦ Set academic and evaluation standards ♦ Oversee training quality ♦ Manage staff development efforts for all participants involved in technology-based education and training ♦ Member of Implementation Team
Operations Director	♦ Design management and administrative support systems for technology-based learning ♦ Design and oversee operation of management information/data collection systems ♦ Develop and implement a plan for integrating legacy and new management information and operational systems ♦ Member of Implementation Team

Human Resource Roles and Responsibilities

DAU FUTURE STATE (CONTINUED)

DAU Position	Functions in Technology-Based Projects
Resource Management Director	♦ Manage economic facets of program implementation ♦ Manage reimbursements to Consortium schools for supporting technology-based education and training ♦ Member of Implementation Team
Acquisition Reform Communications Center Director	♦ Manage dissemination of current information ♦ Oversee marketing of technology-based education and training initiatives ♦ Member of Implementation Team
Systems Administrator (New Position)	♦ Manage operation of training, communications, and server-based delivery systems for DAU courses ♦ Manage administrative support systems (class rosters, etc.) ♦ Manage DAU systems support activities and systems contractors ♦ Manage data and communication security
Distance Learning Coordinator	♦ Coordinate staff activities in support of the Plan ♦ Manage product timeframes and resources ♦ Oversee implementation contracts ♦ Manage course production/technical aspects

Human Resource Roles and Responsibilities

DACMS CURRENT STATE

The DACMs are responsible for planning and managing the career development of acquisition professionals in their organizations.

DACMS FUTURE STATE

Technology-based education and training will allow learners and supervisors easier access to courseware, changing the ways DACMs perform their career training responsibilities. With the new central system and database, learners will be able to self-register for technology-based courses. DACMs will continue to be responsible for ensuring that the system meets the needs of their workforce, but the responsibility for ensuring that existing assets do not become overburdened will shift more to DAU. The new DAU Systems Administrator, overseeing the new central system and database, will be responsible for providing access to course registration and completion information to the Operations Director and the DACMs. New procedures will also be required regarding the allocation of travel funds to DACMs as technology-based training reduces the amount of travel required to complete courses.

ACTIONS

The recommended next steps are as follows:

- DAU will provide network communication links to management data and other information systems.
  - These links will permit the DACMs direct access to the management information they need.
  - Through this new communication system, DACMs will be able to perform their roles quickly and efficiently.
- DACMs will need to provide the technical infrastructure and support required to interface with the central facility (most already have these resources).
- DACMs will communicate information about available technology-based education and training to the field.

SECTION 3:
ORG. & HUMAN
RESOURCES

Human Resources Roles and Responsibilities—Functional Boards

FUNCTIONAL BOARDS CURRENT STATE

Functional Boards, consisting of senior-level acquisition staff of the DoD components, advise the Under Secretary of Defense for Acquisition and Technology on issues of career development and recommend education, experience, and training for each functional area. The Functional Boards:

- Define all performance outcomes and standards for their career fields.
- Assign subject-matter experts as members of development teams for the entire course transition process.
- With DAU, review courses to ensure that they are based on the identified performance outcomes.
- Certify the technical accuracy and currency of courses.

FUNCTIONAL BOARDS FUTURE STATE

With the implementation of the Technology-Based Education and Training Program, the role of the Functional Boards will, over time, change significantly.

> In support of the current initiative, it is expected that existing courses would be segmented into meaningful modules tailored and packaged for distant and continuing education. Therefore, the Functional Boards will need to provide the leadership and guidance necessary to effect this change.

Human Resources Roles and Responsibilities—Functional Boards

ACTIONS

The recommended next steps are as follows:

- DAU will inform the Functional Boards regarding the specific features of the new technology-based delivery methods.
- DAU will collaborate with the Functional Boards to modularize courses and tailor course content to the needs of particular job functions and individuals.
- Functional Boards will assign experts to the development teams as requested.

The above actions will be an ongoing process over the next 2 to 3 years. As courses are converted, the Functional Boards will need to be continually in the loop to help tailor the packaging of course content to workforce needs.

Human Resources Roles and Responsibilities—Consortium Members

CONSORTIUM MEMBERS CURRENT STATE

The Consortium members include the Army, Navy, Air Force, and Defense Logistics Agency schools and activities, including the Defense Systems Management College and the Industrial College of the Armed Forces. Currently, the Consortium members:

- Develop and revise courses based on performance outcomes approved by the Functional Boards.
- Maintain and update course materials and assessments, conduct ongoing internal course reviews, and gather course evaluation data from learners.
- Certify that new or revised courses are ready for implementation.
- Provide administrative and performance data to the DAU President.
- Deliver courses.
- Assign instructors in support of course delivery.

CONSORTIUM MEMBERS FUTURE STATE

The future roles and responsibilities of Consortium schools will include:

- Assign instructors to design teams for the transition of courses to technology-based training.
- Provide instructors and technical support staff to facilitate delivery of Web-based courses.
- Assign instructors for teletraining sessions.
- Provide administrative support to instructors to reduce their burden in providing Web-based courses. (For example, an administrative person may send notices to learners who are not meeting course completion deadlines, may help manage the discussion rooms by organizing comments, etc.)
- Assist with course maintenance by providing input for content updates. (Note that in most cases maintenance of course elements will be outsourced.)
- Manage instructional assets in support of this Plan.

Human Resources Roles and Responsibilities—Consortium Members

CONSORTIUM MEMBERS FUTURE STATE (CONTINUED)

- As required, provide technical support, to include the following:
  - ◊ Assist instructors with the use of new procedures and software (chat rooms, frequently asked questions, etc.).
  - ◊ Assist instructors with the use of teletraining equipment.
  - ◊ Maintain local databases of instructor and learner records and link them to DAU systems.

ACTIONS

Launching the new Technology-Based Education and Training Program requires a number of key actions:

- DAU will brief each school on the Implementation Plan, and each school will need to determine its level of participation.
- Schools will transition to their new roles and phase in the infrastructure required to meet the requirements of this Implementation Plan.
- DAU's Academic team will work with the schools regarding the new roles and skills required of instructors and support staff. Areas of key importance will include:
  - ◊ Instructor participation in the course conversion process and development of content for new courses.
  - ◊ The instructor's new roles in managing and monitoring the delivery of distance learning courses (e.g., monitoring chat rooms, responding to frequently asked questions, managing courses and learners).
- DAU's Operations team will develop the technology and communication support system, and establish operational procedures for Consortium interface and how they will accommodate the new procedures for course delivery, learner/instructor recordkeeping, etc.

Human Resources Roles and Responsibilities—Consortium Members: Instructors

INSTRUCTORS CURRENT STATE

Most instructors currently teach DAU courses using traditional classroom techniques. One DAU course is delivered by satellite whereas some others use software packages in the classroom.

INSTRUCTORS FUTURE STATE

Studies of successful distance learning projects consistently stress the importance of training and supporting instructors while they transition from classroom to technology-based instruction and become facilitators of learning. New systems will be needed to identify, select, train, and support instructors. The following subsections discuss these processes.

RECRUITING INSTRUCTORS

Implications: DAU will begin working with Consortium heads to identify instructors who are interested in using technology-based instruction. These individuals should provide the leadership needed for change. This effort will be targeted at the course areas that will be converted first.

In addition, the recruiting effort will educate instructors on the skills required, the expectations, and the benefits of technology-based instruction.

Human Resources Roles and Responsibilities—Consortium Members: Instructors

SELECTING INSTRUCTORS

A review of distance learning studies addressing instructor issues found that the following competencies are essential:

Teletraining	Web-Based Training
♦ Ability to apply basic learning theory and motivation.	♦ Ability to apply basic learning theory and motivation.
♦ Subject-matter expertise.	♦ Subject-matter expertise.
♦ Administration/evaluation skills.	♦ Administration/evaluation skills.
♦ Ability to plan/organize/manage learning session and materials. (Ability to attend to details.)	♦ Ability to organize/manage computer-mediated textual information.
♦ Verbal and nonverbal presentation skills.	♦ Ability to communicate through brief written messages.
♦ Questioning techniques (and other skills to encourage creative interactivity).	♦ Questioning techniques (and other skills to encourage creative interactivity).
♦ Ability to be responsive to learners and personalize the technology.	♦ Ability to be responsive to learners and personalize the technology.
♦ Ability to coordinate group activities.	♦ Ability to use groupware-type software.
♦ Ability to be a team player working well with technicians, site coordinators, and other support personnel.	♦ Ability to guide computer-mediated discussions without controlling them.
♦ Ability to use teletraining skills and equipment.	♦ Basic computer skills.
	♦ Ability to manage time well and respond to learners quickly.

Human Resources Roles and Responsibilities—Consortium Members: Instructors

SELECTING INSTRUCTORS (CONTINUED)

Implications: DAU will develop instructor selection guidelines for use by the Consortium schools.

A training package should be available for instructors working with teletraining and Web-based courses.

TRAINING INSTRUCTORS

Each school will be responsible for selecting instructors best qualified to work in the DAU Distance Learning Program. Studies of distance education programs report that instructors may more readily adapt to technology-based instruction if its introduction is accompanied by effective training. *(See Dillion & Walsh, 1992; Gehlauf, et al., 1991; Schaeffer, et al., 1990.)*

Although instructor training programs vary widely in length and approach, the following common elements are present in most programs:

- Introduction: An introduction to the technology includes how it meets the needs of learners and instructors.
- Hands-On Experience: Instructors see the technology demonstrated and use the technology as it is being discussed.
- Practice: Opportunities are provided for instructors to practice using the technology and to receive feedback.
- Support: Support (coaching) is provided as the instructors begin to use the technology and continues to be available on an as-needed basis.

Human Resources Roles and Responsibilities—Consortium Members: Instructors

TRAINING INSTRUCTORS (CONTINUED)

Implications: DAU will support a Consortium-wide instructor development effort. This instructor development effort should include the following components:

- Workshops: Workshops provided by contracted experts to introduce the use of the new technologies should be offered. DAU should screen "off-the-shelf" teletraining workshop providers and develop a list of acceptable sources. DAU may need to contract for the development of a workshop on the use of Web-based training. Web-based training is a new technology. In addition, instructors should be trained on the basic design features being used for new DAU courses.
- Coaching: Coaching should be provided by contracted personnel. All management plans for course development efforts should include tasks for supporting instructors during the first offering of a course and on an as-needed basis after that.
- Web-Based Instructor Resources: Many universities have created Web sites where instructors can download documents, exchange information, and access other technology-based training sites. In addition, these sites allow instructors to request needed support such as graphics support or instructional design consultations. The Indiana Higher Education Telecommunications System has a complete instructor handbook that can be used online or downloaded as an Acrobat file.
- Information Push Systems: Push systems should be developed for sending information/messages to instructors based on the topic areas taught or the types of technology used. (An example is Pointcast™ news distribution on the Web.)
- Minimum Training Requirements: DAU should establish minimum training requirements for instructors and other personnel involved in the delivery of technology-based instruction.

Human Resources Roles and Responsibilities—Consortium Members: Instructors

SUPPORTING INSTRUCTORS

Most instructors report that distance learning can entail more work than teaching classroom-based courses. Moore and Kearsley, in their book titled *Distance Education: A Systems View*, emphasize that distance education requires a team approach.

Implications: New team approaches to training will need to be adopted. Training teams should include the following individuals:

- Administrative Personnel: Support staff should be assigned to do all tasks that do not require content expertise. For example, administrative staff should ensure that materials are sent to receive sites for teletraining or help track progress of learners in the Web-based training courses.
- Technical Personnel: Technical personnel should be assigned to help instructors operate teletraining equipment or configure computer files in Web-based training.
- Instructors: Instructors should concentrate on facilitating the learning process by making teletraining presentations, engaging with learners online, or reviewing assignments that are not automatically graded.
- Site Facilitators: Site facilitators are the key to effective teletraining. The role of the site facilitator includes ensuring that the equipment functions properly, breaks are managed, materials are distributed, and exercises are completed. The site facilitator is not an instructor. Rather, this individual helps facilitate the learning process. In Web-based training, the individual's supervisor should serve a role similar to the teletraining site facilitator. Training and guidance must be provided to site facilitators. *(See page 2-57 for additional information.)*

Human Resources Roles and Responsibilities—Consortium Members: Instructors

ACTIONS

As warranted by the level of course content converted to a distance learning format, the recommended next steps are as follows:

- Develop guidelines describing the distance learning program and the role of the instructor based on the distance learning course team using the competency list on page 3-21.
- Develop a detailed plan for instructor development.
- Develop a list of acceptable sources for training instructors in teletraining skills.
- Design and develop a workshop on delivering DAU Web-based training courses.
- Design and develop an instructor resource Web site.
- Establish and publish minimum training standards for instructors who teach technology-based DAU courses.
- Develop guidelines for the administrative support functions to be assumed by DAU.
- Develop guidelines for all members of a distance learning course team described on page 3-24.
- Design and develop training for administrative personnel who support instructors.
- Develop distance learning facilitation guide for supervisors. *(See page 2-57.)*
- Develop site facilitator guide for teletraining site facilitators. *(See page 2-57.)*
- Conduct ongoing training for instructors and the distance learning support team. *(See page 2-57.)*

While all of the above actions are judged to be important, it must be emphasized that rollout of these elements must be properly phased with the overall course conversion process. There will be only modest need for new training and new support features until the first large wave of technology-based courses is implemented.

Human Resources Roles and Responsibilities—Consortium Members: Learners

TRAINING AND JOB AIDS

The use of computer-based technology is widespread throughout DoD and has been for some time. Nonetheless, it is expected that learners will require some training in the use of the new methods for course delivery.

Specifically, it is recommended that floppy-disk-based training and text-based job aids be developed for the following:

- Accessing and using the Internet.
- Installing and using CD-ROM-based programs.
- Web-based training features such as discussion groups, "Ask the faculty," frequently asked questions, etc.
- Learner logon and downloading of lessons or modules.
- How to state questions and write responses in a Web environment.

LEARNER GUIDEBOOK

In addition to the above training materials, a Learner Guidebook to DAU's new distance learning environment should be prepared in multiple delivery systems.

Implementation Strategies

OVERVIEW

This subsection summarizes the recommended action steps presented throughout this section of the report.

MANAGEMENT ORGANIZATION

Recommendation: Transition of DAU courses is already underway. It is therefore imperative that the proposed Steering Committee and Implementation Team be formed and staffed.

Completion Date: Both the Steering Committee and the Implementation Team will be established and operational as soon as possible.

DACMS

Recommendation: The changed roles and responsibilities of the DACMs will evolve over the next 8 months. For the DACMs to fully assume their new roles and responsibilities, the new central systems facility should be in place, along with the new registration system.

Completion Date: Assuming that the systems infrastructure elements are in place, the DACMs will make this transition by March 1998.

FUNCTIONAL BOARDS

Recommendation: The Contracting Functional Board has already been engaged in reviewing a Web-based course, Simplified Acquisition Procedures (SAP). A key role of the Functional Boards will be to provide the guidance necessary to modularize elements of the DAU curriculum.

Completion Date: The Functional Boards will be educated on the above requirement by October 1997.

CONSORTIUM MEMBERS

Recommendation: As detailed earlier in this section, the Consortium members will have a number of new roles and responsibilities. The full support of the Consortium is critical to the success of this Implementation Plan. Therefore, it is recommended that senior DAU representatives meet with each school to provide a complete briefing on this Plan and to address questions and concerns.

Completion Date: Implementation Plan briefing for all Consortium members has been completed.

Implementation Strategies (Continued)

LEARNERS

Recommendation: Transition of selected courses to a Web-based/ CD-ROM delivery format is already underway. Therefore, work should start immediately on initial development of the Learner Guidebook and the recommended training and job aids for learners.

Completion Date: Initial revisions of the learner training and reference materials should be produced by August 1, 1997.

IMPLEMENTATION SCHEDULE

A schedule outlining implementation tasks through the year 2000 is included in the Action Plan for use by the Implementation Team.

ATTACHMENT 3-1:

INSTRUCTOR DEVELOPMENT REFERENCES

Attachment 3-1: Instructor Development References

Beaudion, M. (1990). The instructor's changing role in distance education. *The American Journal of Distance Education, 4*(2): 21-29.

Berquist, W., & Phillips, S. (1977). Components of an effective faculty development program. *Journal of Higher Education, 46*: 177-211.

Carter, A. Developing faculty training for interactive distance education. *IETI Journal 32*(2): 147-152.

Clark, T. (1993). Attitudes of higher education faculty toward distance education: A national survey. *The American Journal of Distance Education, 7*(2): 19-33.

Dillion, C., & Walsh, S. (1992). Faculty: The neglected resource in distance education. *The American Journal of Distance Education, 6*(3): 5-21.

Gehlauf, D., Shatz, M., & Frye, T. (1991). Faculty perception of interactive instructional strategies: Implications for training. *The American Journal of Distance Education, 5*(3): 20-28.

Gunawardena, C. (1992). Changing faculty roles for audiographics and online teaching. *The American Journal of Distance Education, 6*(3): 58-71.

Heinich, R., Molenda, M., & Russell, J. (1993). *Instructional media and the new technologies of instruction (Fourth Edition).* New York, NY: Macmillan Publishing Co.

Moore, M., & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth Publishing.

Indiana Partnership for Statewide Education. (1995). The faculty symposium on distance education series. (Published on the Internet: www.ind.net/IPSE/facultysymposium)

Schaeffer, J., Kipper, P., Farr, C., & Muscarella, D. (1990). Preparing faculty and designing courses for delivery via audio teleconferencing. *MPAEA Journal*, Spring: 11-18.

Strain, J. (1987). The role of the faculty member in distance education. *The American Journal of Distance Education, 1*(2): 61-65.

Wolcott, L. (1993). Faculty planning for distance teaching. *The American Journal of Distance Education, 7*(1): 26-36.

Willis, B. (1993). *Distance education: A practical guide.* Englewood Cliffs, NJ: Educational Technology Publications.

Attachment 3-1: Instructor Development References

SECTION 4

SYSTEMS INFRASTRUCTURE

SECTION 4: SYSTEMS INFRASTRUCTURE

PURPOSE

The purpose of this section is to document existing technology-based education and training resources available to DAU, evaluate and quantify additional systems required to deliver future courses, and describe a high-level implementation approach.

The curriculum analysis section of this plan indicates a requirement to utilize a variety of media to meet the mix of Level One, Two, and Three courses. These media include video teletraining and a hybrid combination of desktop multimedia and online Web-based training. Therefore, system resources are defined as those resources required to develop, deliver, and maintain the courses and to provide learner tracking and support.

OVERALL STRATEGY

DAU will centrally manage a single, integrated systems infrastructure to support technology-based education and training requirements. Education and training requirements will drive the design of the systems infrastructure.

CONTENTS

This section includes the following topics:

- Applicable Policy and Guidance
- Current State Systems
  - ◊ Connectivity
  - ◊ Consortium Capabilities
- Future State Systems
- Implementation Strategy

This section includes the following three attachments:

- Attachment 4-1: Summary of Current DAU VTT Resources
- Attachment 4-2: Federal Government Video Teletraining Database
- Attachment 4-3: Industry Trends

SECTION 4: SYSTEMS INFRASTRUCTURE

Applicable Policy and Guidance

SYSTEM ARCHITECTURE CONCEPTS

The proposed DAU systems architecture will be developed and implemented in accordance with DoD and industry standards for open systems, interoperability, and reuse. The architecture described in this section emphasizes the following key system development concepts:

- Tailoring of DoD and industry standards related to information systems acquisition to support commercial acquisition of Information Technology (IT).
- Emphasis on interoperability through compliance with DoD Technical Architecture for Information Management (TAFIM) and Joint Technical Architecture (JTA) strategies.
- Maximization of the use of commercial-off-the-shelf (COTS) and nondevelopmental items (NDI), as required by the DoD 5000 series directives and instructions.
- Development of software reuse strategies and repositories.
- Compliance with common data environment (CDE) initiatives.
- Application of disciplined systems development and rapid prototyping development methodologies.

STANDARDS AND GUIDANCE

Where applicable, the following standards and guidance will guide DAU infrastructure implementation:

- Information Technology Reform Act of 1996
- Technical Architecture for Information Management (TAFIM)
- DoD Joint Technical Architecture (JTA)
- DoD Information Infrastructure Common Operating Environment (COE)
- DoD 5000.2R—Mandatory Procedures for Major Defense Acquisition Program and Major Automated Information System (MAIS) programs
- MIL-STD 498—Software Engineering
- Federal Information Processing Standards
- Aviation Industry Computer-Based Training (CBT) Committee Interoperability Standards

Current State Systems—Connectivity

INTRODUCTION

This section documents the existing infrastructure available to support technology-based education and training. It is divided into DAU and Consortium school resources. Currently, there is a variety of distributed training resources within the DoD and DAU's Consortium schools. These include correspondence, limited multimedia, and video teletraining.

DAU concluded an infrastructure study in July 1996 that assessed the resources available to the Consortium schools. The data in this section are drawn from the infrastructure study and interviews with DAU personnel. The intent of this section is to provide a high-level picture of existing resources rather than reiterating significant portions of the infrastructure study.

DAU TO CONSORTIUM SCHOOL CONNECTIVITY

E-mail is the primary resource utilized between DAU and the Consortium schools. There is a Consortium-wide e-mail system that allows DAU personnel to communicate with the various Consortium schools. DAU uses Digital Equipment Corporation's "Teamlinks Information Manager" e-mail software. The Consortium schools use a diverse range of e-mail packages. However, text messaging and data file attachments can be sent between the Consortium schools and DAU.

DIGITAL CONNECTIVITY

Currently, there is no large-scale wide area network (WAN) connecting DAU to the Consortium schools. To support technology-based education and training, future requirements may evolve for a high-bandwidth network between DAU and the Consortium schools. Specific systems requirements will be developed after course development, distribution, and maintenance scenarios are clearly defined.

Current State Systems—Consortium Capabilities

CONSORTIUM FUNCTIONAL CAPABILITIES

The ability of the existing Consortium school systems to support technology-based education and training will be a function of their system infrastructure, planned course media mix, and course design.

Table 4-1 documents the functional capabilities reported by each of the Consortium schools in the July 1996 Infrastructure Report. The capabilities reported are stand-alone multimedia, Web via Internet, and VTT. (Note: The gray cells indicate that the data were not available for the infrastructure study.)

FUNCTIONAL CAPABILITIES MATRIX

Table 4-1. Technology-Based Education and Training Functional Capabilities Matrix

Consortium Member School	Stand-Alone Multimedia Systems	Web Delivery	VTT (1V/2A) Delivery	VTT (1V/2A) Receive	VTT (2V/2A)
AFIT	88	Yes	Yes	Yes	Yes
ALMC	10	Yes	Yes	Yes	Yes
AMEC	24	No	No	No	No
DCAI	0	No	No	No	No
DSMC		Yes	Yes	Yes	Yes
IRMC	121	No	No	No	No
LTF	20	No	No	No	No
NCAT					
NFCTC	23	Yes	No	Yes	No
NPS	0	Yes	No	No	No
OASN	0				

Current State Systems—Consortium Capabilities

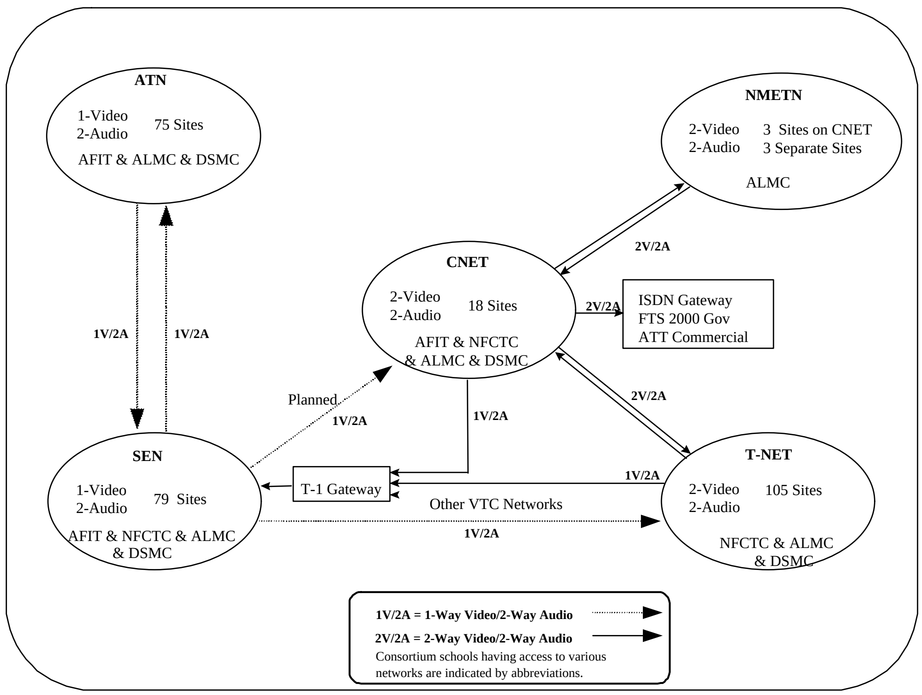
VIDEO TELETRAINING RESOURCES

There are multiple VTT networks within DAU. Attachment 4-1 documents some of DAU's major VTT networks and their individual capabilities.

VTT GATEWAYS

Figure 4-1 graphically depicts the system gateways between the DoD VTT networks.

Figure 4-1. DoD Video Teletraining Connectivity Diagram



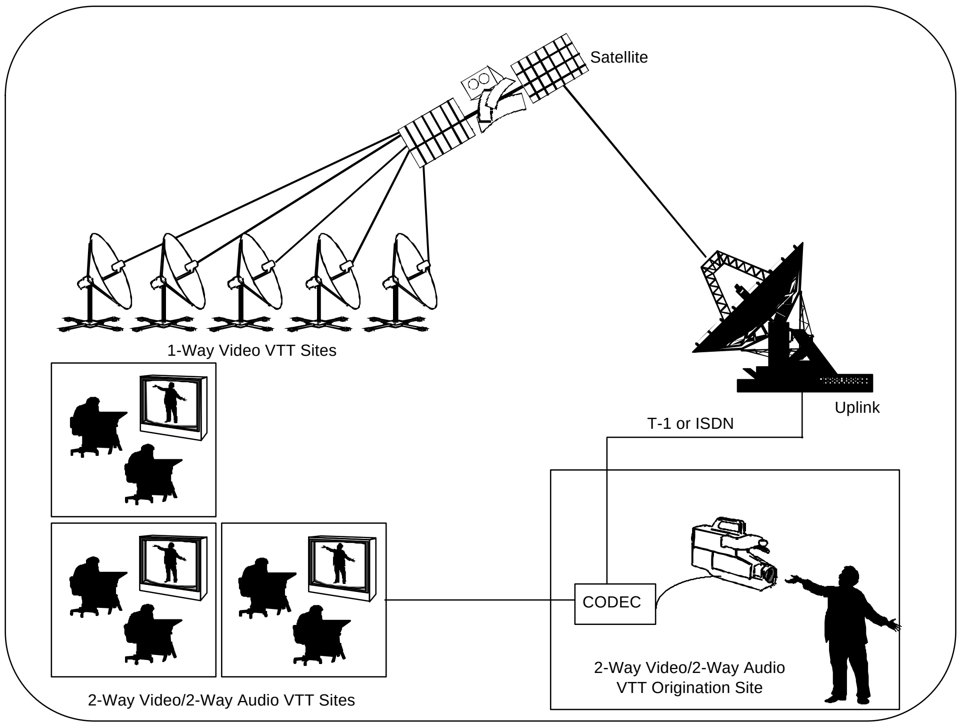
It is important to note that there can never be full interoperability between a 1-way video VTT system and a 2-way video VTT system because the 1-way video VTT supports video in only one direction. The video connectivity provided by the system gateways depicted in Figures 4-2 and 4-3 on the following pages can expand the reach and flexibility of a VTT but never allow for full interoperability between 1-way video and 2-way video systems. These considerations will have to be factored into the course design process.

Current State Systems—Consortium Capabilities

EXTENDING THE REACH OF VTT VIA GATEWAYS

Figure 4-2 depicts a scenario in which 2-way video/2-way audio VTT courses could be sent to numerous 1-way video/2-way audio Government receive sites. There are approximately 750 Government 1-way video/2-way audio VTT receive sites nationwide.

Figure 4-2. 1-Way Video Gateway to 2-Way Video Receive Sites



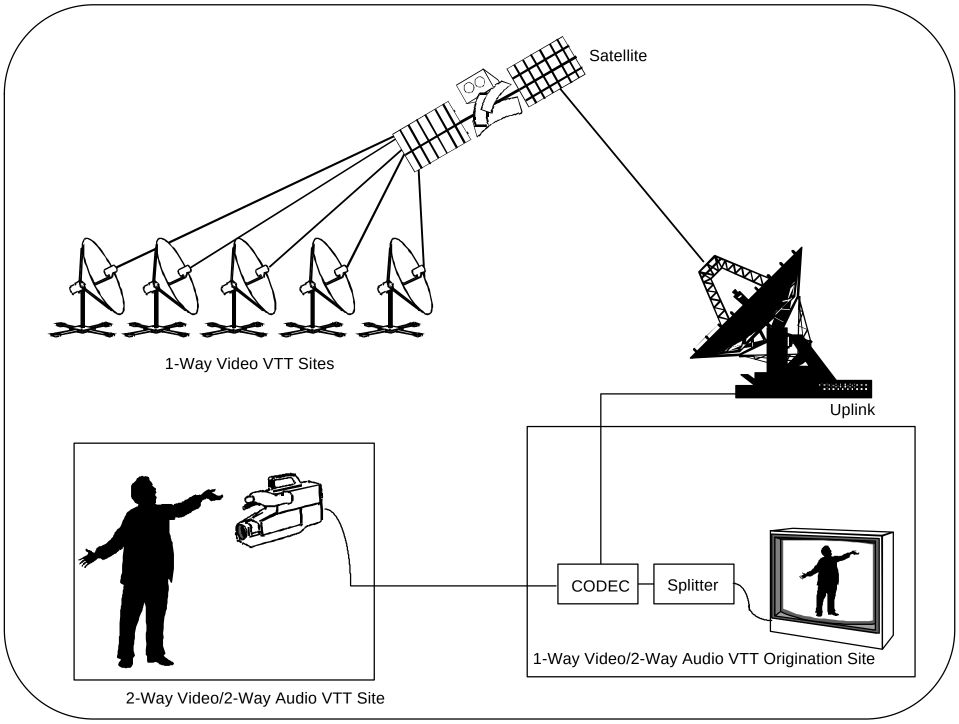
2-way video/2-way audio VTT networks such as CNET and TNET can send courses to over 750 (1-way video) receive sites nationwide.

Current State Systems—Consortium Capabilities

ACCESSING REMOTE INSTRUCTORS VIA VTT GATEWAYS

Figure 4-3 depicts a scenario in which a 1-way video/2-way audio teletraining network can patch in remote instructors from any CNET, TNET, or other Government VTT site. These configuration options increase flexibility in VTT course design.

Figure 4-3. Remote Instructor Access via 2-Way Video Gateway



MULTIMEDIA AND WEB-BASED COMPUTER RESOURCES

The curriculum analysis in Section 2 documents a requirement to deliver hybrid Web-based/multimedia courses. For the purpose of this plan, multimedia is defined as text, graphics, audio, animation, and video.

Digital video can be integrated into course materials via hardware or software encoding and decoding. DoD policy does not support the procurement of hardware (e.g., MPEG) encoding equipment for multimedia purposes. Additionally, software-based digital video puts a significant strain on the personal computer (PC) and typically requires a minimum configuration of Pentium 133 MHz with 6X CD-ROM. Course design techniques will have to minimize the use of digital video unless off-line download techniques are used.

SECTION 4: SYSTEMS INFRASTRUCTURE

Current State Systems—Consortium Capabilities

EXISTING PCS SUPPORT ONLY LOW-END MULTIMEDIA

Table 4-2 summarizes the IBM-compatible PCs reported by the Consortium schools. (Note: The gray cells indicate that data were not available for the infrastructure study.)

Table 4-2. Consortium School Computer Resources

Member	# of PCs	# With CD-ROM	% With CD-ROM	# With Audio	% With Audio	# Multimedia Enabled	% Multimedia Enabled
AFIT	273	168	61.5	88	32.2	88	32.2
ALMC	614	349	56.8	10	1.6	10	1.6
AMEC	125	24	19.2	24	19.2	24	19.2
DCAI	50	0	0.0	0	0.0	0	0.0
DSMC	537	537	100.0				
NCAT*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IRMC	121	121	100.0	121	100.0	121	100.0
LTF	50	35	70.0	20	40.0	20	40.0
NFCTC	58	22	37.9	23	39.7	23	39.7
NPS	54	0	0.0	0	0.0	0	0.0
OASN	12	0	0.0	0	0.0	0	0.0

* NCAT leases computer resources to support individual course offerings.

Only 15 percent of the 1,894 PCs reported by the Consortium schools are capable of playing CD-ROM-based multimedia courses with audio files. In light of the existing Consortium computer resources, the following guidance is provided for computer systems accessing future DAU on-line courses.

Minimum Recommended Platform: 486 Class PC, 16 MB RAM, 66 MHz, SVGA Graphics Card with supporting 14" monitor, 14.4 Kbps Modem, Hard Drive (minimum 85 MB free), & Keyboard/Mouse.

Recommended Future Platform: New platforms should be capable of supporting desktop audio and video conferencing through MMX-enable technology and include audio input device, video input device, speakers/headset jack, and T-1 line access to the Internet.

Current State Systems—Consortium Capabilities

EXISTING CONSORTIUM NETWORK CONNECTIVITY

The infrastructure study indicated that all Consortium schools have their computers networked on a local area network (LAN). In addition, e-mail support is available across the 12 Consortium schools and at DAU. Currently, 9 of the 12 schools report access to the Web/Internet; however, the availability on an individual PC level was unreported.

Table 4-3. Consortium School Network Connectivity

Member	Network Available	E-Mail	Operate BBS	Web Access
AFIT	Yes	Yes	Yes	Yes
ALMC	Yes	Yes		Yes
AMEC	Yes	Yes		Yes
DCAI	Yes	Yes	Yes	
DSMC	Yes	Yes	Yes	Yes
IRMC	Yes	Yes		Yes
LTF	Yes	Yes		
NCAT	Yes	Yes		Yes
NFCTC	Yes	Yes		Yes
NPS	Yes	Yes		Yes
OASN				

CURRENT STATE SUMMARY

- As outlined previously, significant VTT resources are available to the DAU that can be configured to support 1-way video/2-way audio and 2-way video/2-way audio requirements. There are currently 126 2-way video/2-way audio compatible VTT sites. Additionally, both CNET and TNET have gateways to other Government 2-way video VTT sites.
- In addition to the 154 1-way video/2-way audio downlinks reported as part of ATN and SEN, there are over 750 compatible 1-way video/2-way audio downlinks Government-wide. (Note: A copy of the Government-wide video teletraining database is included in Attachment 4-2.) With proper logistical planning and coordination, these VTT resources are available to support DAU's Technology-Based Education and Training Program.

Current State Systems—Consortium Capabilities

CURRENT STATE SUMMARY (CONTINUED)

Additional investment in VTT resources is not required at this time. Calculations of learner accessibility must be made on a course-by-course basis to ensure that DAU end users have access to VTT receive sites within local driving range of their work sites. The accessibility study can begin after a careful load projection for VTT courses has been completed.

- The curriculum analysis provided in Section 2 outlines a mix of technology-based education and training delivery to meet DAU's Level One, Two, and Three courses. In particular, Section 2 documents a projection for significant Web-based/CD-ROM training.
- The next topic, Future State Systems, discusses the functional requirements and systems considerations involved in supporting technology-based education and training.

Future State Systems

INTRODUCTION

Given the VTT resources available to DAU and the requirement for significant Web-based/CD-ROM training, this subsection discusses how DAU can take advantage of Web technology to construct a *distributed*, *seamlessly integrated, virtual schoolhouse* that provides *production, delivery, maintenance,* and *accounting* functionality to *appropriate authorized users*. In order to ensure a common point of reference, it is necessary to provide background information regarding possible uses of Web technology.

DISTRIBUTED WEB TECHNOLOGY

- Distributed: Web technology provides a mechanism for constructing networks of interconnected components that are scalable from the LAN to the Internet. Through the use of existing safeguards, these components may be deployed locally (that is, completely behind a firewall) as a separate physical Intranet, as a virtual Intranet to an authorized subset of the Web community, or globally on the Internet.

SEAMLESSLY INTEGRATED WEB TECHNOLOGY

- Seamlessly Integrated: The Web was designed on open standards in order to maximize compatibility and interoperability. While most Web tool manufacturers do offer unique system extensions in order to differentiate their products from the pack, nearly all are realistic enough to support a lowest common denominator that provides significant functionality. Careful component selection and well-thought-out course design specifications can ensure that all system users—from the learner to the course developer to the system administrator—can operate in an environment that, from their point of view, provides the richest possible experience.

VIRTUAL SCHOOLHOUSE

- Virtual Schoolhouse: This is the collective name for the process of delivering formal instruction via the Internet using text posted on-line, e-mail, newsgroups, chat, and like mechanisms. The virtual schoolhouse concept is being exercised successfully around the world, and its popularity is growing exponentially.

Future State Systems

PRODUCTION

- Production: Two different production issues will be addressed: The conversion of existing courses to a format that is suitable for delivery in the virtual classroom and the development of new courses in the future.

MAINTENANCE

- Maintenance: Courses change. While Web-based courses are easier to update and enhance than traditional training media, the mechanisms through which these updates and enhancements are applied must be determined.

DELIVERY

- Delivery: Quality computer-based training delivery requires leading-edge Web technology, which places the minimal compliance level on the learner's playback environment. The optimal bandwidth for use with computer-based training delivery is 128 Kbps. Currently, high-speed bandwidth connections are not widely available to the general public. Using a lower bandwidth will result in slower response time, causing learners to experience fewer on-line interactions. These potential bandwidth limitations can be mitigated through the use of various strategies. Strategies such as proxy servers, hybrid CD-ROMs, caching techniques, or downloading courses prior to start for slower links can help to overcome bandwidth limitations. Application of these techniques will support the use of bandwidths as low as 28.8 Kbps or 14.4 Kbps.

ACCOUNTING

- Accounting: The ease with which Web-based technology can interface with legacy applications and databases enables automation of the collection and maintenance of all user records, from registration to progress reports to certification.

Future State Systems

APPROPRIATE AUTHORIZED USERS

- Appropriate Authorized Users: Even though it is reasonable for the DAU Web site and virtual schoolhouse to take advantage of the economies and efficiencies of Web technology, many of the components of the site should not be made available to the Web community at large. In fact, most sections of the DAU Web presence should behave as a virtual private network (VPN) that can be accessed only by users who have been granted permission to use the data stored therein.

The Web provides the tools and supporting services that DAU needs to produce and maintain a new generation of computer-based education and training, to deliver these courses to authorized users, and to track learner progress through the course of instruction offered by the DAU virtual schoolhouse.

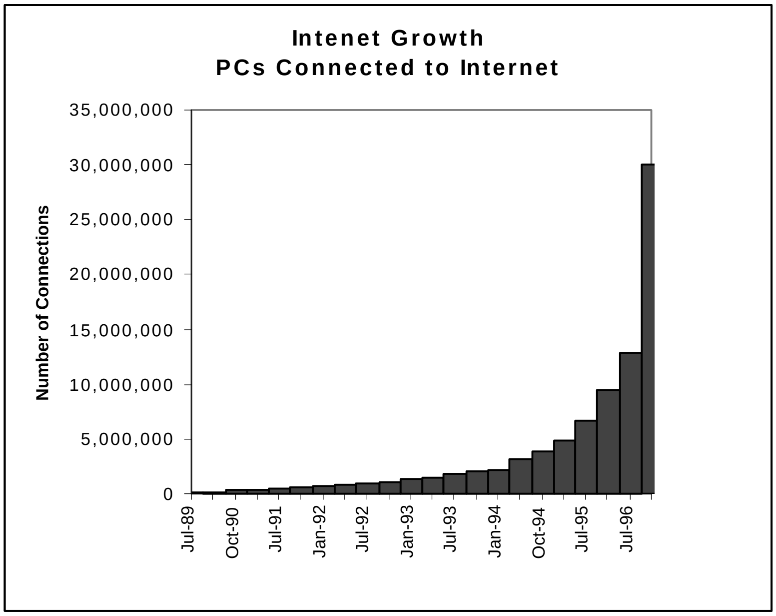
INTERNET GROWTH

The existence of the Internet offers DAU the potential of providing ubiquitous connectivity to the acquisition population anywhere, anytime. The growth of the Internet has been truly phenomenal and continues to exceed experts' projections. Figures 4-4 and 4-5 on the following page document the exponential growth of the Internet over the last 7 years.

Future State Systems

PCS CONNECTED TO THE INTERNET

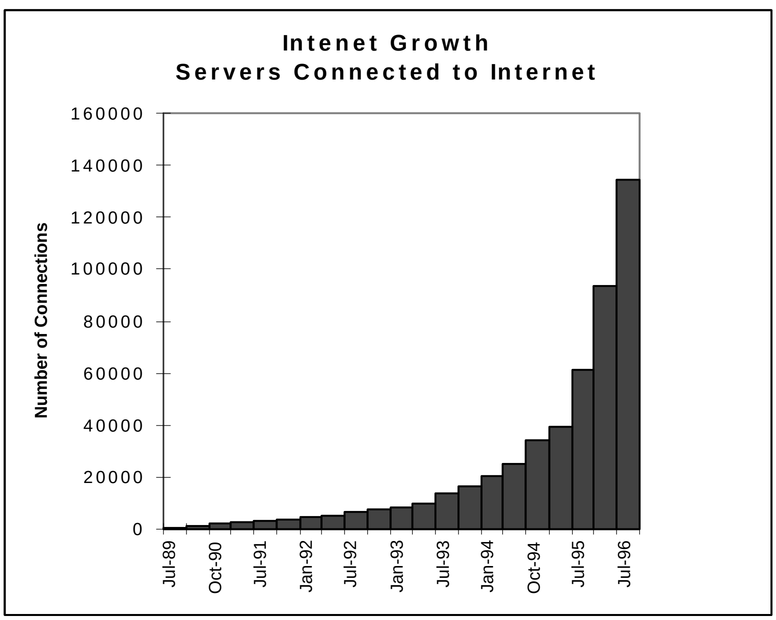
Figure 4-4. PCs Connected to Internet



INTERNET SERVERS

The growth of servers, which host the content that makes the Internet a rich source of information, has also increased dramatically.

Figure 4-5. Servers Supporting the Internet



Future State Systems

WEB-BASED TRAINING

Web-based training is an innovative approach to technology-based education and training, in which computer-based training is transformed by the capabilities of the World Wide Web, the Internet, and Intranets. Web-based training presents course content in a structure allowing self-directed, self-paced instruction on any topic.

> Web-based training is an ideal vehicle for delivering training to learners anywhere in the world at anytime. Advances in computer network technology and improvements in bandwidth will continuously increase multimedia capabilities and access.

With today's tools, instructional designers can produce highly effective courses to meet the training needs of a diverse population. Web browsers now support animation, chat and conferencing, and real-time audio and video.

ADVANTAGES OF WEB-BASED TRAINING

The advantages of Web-based training are numerous:

- Easy delivery of training to students via the existing Internet.
- Multiplatform capabilities (Windows, Mac, UNIX).
- Easy updating of content.
- Controllable access: By user ID, number of accesses, date/time of access.
- Options for installations on private networks for security or greater bandwidth.
- Options to link with other training systems.

DISADVANTAGES OF WEB-BASED TRAINING

There are, however, some disadvantages of Web-based training:

- Formatting of content in current browsers is limited.
- Bandwidth/browser limitations may restrict media design options.
- Limited bandwidth means slower performance for sound, video, and intense graphics.

To address these limitations, DAU is pioneering the use of lesson downloading and hybrid Web-based/CD-ROM course formats.

SECTION 4: SYSTEMS INFRASTRUCTURE

Future State Systems

NETWORK CONNECTIVITY TO THE LEARNERS

Network connectivity between DAU and the learner population is a key requirement to support the Technology-Based Education and Training Program. The demographics of DAU's learner population make the network connection issue a major systems infrastructure consideration. The ability of DAU's learners to connect to the Internet at home or work via standard phone lines has a dramatic effect on the feasibility and cost of this initiative.

A number of network connection technologies are currently available, and new technologies are evolving daily. Table 4-4 provides an overview of selected transmission technologies and their availability.

NETWORKING TECHNOLOGIES

Table 4-4. Networking Technologies and Availability

Network Connection	Bandwidth	Geographic Availability
Standard Modem	14.4 or 28.8 Kbps	100% (standard phone lines)
ISDN (Integrated Switched Digital Network)	64 Kbps per channel bidirectional 24 channels = 1.54 MBps	100% metropolitan 35-50% rural
ADSL (Asynchronous Digital Subscriber Line)	1.5 MBps send 64 Kbps return	0% (available 2nd quarter, 1997)
Cable Modems	4 MBps Send	0% only R&D test beds (Only 10% of cable networks in America will support cable modems)

ADSL COULD DRASTICALLY CHANGE INTERNET ACCESS

The Asynchronous Digital Subscriber Line (ADSL) is a very promising emerging technology that could drastically change the face of the entire Internet Service Provider (ISP) industry. ADSL promises to provide Integrated Switched Digital Network (ISDN) speeds over standard phone lines. Utilizing standard phone lines is extremely attractive because the wiring infrastructure already exists nationwide.

Current product specification projections for ADSL are between 128 Kbps and 1.54 MBps outbound and 64 Kbps return between the ISP and the end user.

Future State Systems

BANDWIDTH EFFECTS ON FILE TRANSFER TIMES

Table 4-5 illustrates the effect of network bandwidth on file transfer times for a 220 Kb file. Note that these data are representative of system performance with no additional load beyond a single user on the network. Although this is not a realistic scenario, it demonstrates the relative speeds of various network connections. These data are the result of tests at Bell Labs.

Table 4-5. Unloaded Network File Transfer Times

Network Connection	Bandwidth	Download Time (sec)	Times as Fast as a 28.8 Modem
Standard Modem	28.8 Kbps	60	1
ISDN	128 Kbps	8.8	6.8
ADSL	1.5 MBps	.7	85.7
Cable Modems	4 MBps	.4	150

EFFECTIVE BANDWIDTH REALITIES

There is significant confusion about the differences between effective bandwidth and component bandwidth. Effective bandwidth is the final bandwidth that the network provides the end user after all loading and bottlenecks are taken into account. This is in contrast to component bandwidth, which is the maximum bandwidth of an individual system such as a modem or a network card. When an individual uses a 28.8 modem to connect to the Internet, the modem is dedicated for the individual PC; thus there is no effective loading. But if a LAN with hundreds of users is connected to the Internet with a T1 circuit (1.54 MBps), an individual on the network will have an effective bandwidth connection to the Internet that is highly dependent on the load (i.e., the number of users).

Effective bandwidth drops dramatically when normal network loading is present. Table 4-6 compares file transfer times for a 5.4 MB file with both a nonloaded and a loaded network. These data are the result of tests at Bell Labs.

Table 4-6. Network Loading Effect on File Transfer Times

Network Connection Technology	Unloaded Download Time (min)	Loaded Download Time (min)	Performance Decrease
28.8 Modem	24.54	24.5	None
ADSL	.29	1.8	6.2 times slower
Cable Modems	.13	4.05	29.3 times slower

Future State Systems

EFFECTIVE BANDWIDTH REALITIES (CONTINUED)

Beyond Internet connection alternatives available to the general public, DAU may also pursue a DoD-based solution. Currently, initial requirements for a DoD-wide Global Combat Support System (GCSS) are under development. Based on early projections, this system might connect DAU with much of the learner population at their DoD work sites. The GCSS will be a high-bandwidth backbone comprising a combination of terrestrial and satellite transmission methods. Although this system may provide the learner connectivity that DAU requires, it will have to be evaluated against the flexibility that a non-site-specific solution (i.e., available via standard phone lines) provides.

COURSE DELIVERY OPTIONS AND CONSIDERATIONS

Interactive training can be created and delivered in a variety of different formats and technologies, each with its own strengths and limitations. Over the past few years, Internet and private Intranet-related technologies have taken center stage for training delivery as a result of the rapid expansion of network infrastructures. While these technologies have enabled huge advances in the remote delivery of education and training, there are complexities and constraints that must be taken into account during course deployment.

In general, there are four basic methods for the delivery of courses: Internet, private Intranet, local networks, and stand-alone media (sometimes described as packaged media such as diskette, CD-ROM, or other portable media). Depending on the requirements of a particular DAU course, a hybrid Web-based/CD-ROM approach may be used.

INTERNET DELIVERY

Internet delivery of courses is achieved by placing the course software on a server that is connected to the Internet so that anyone with an Internet connection can access the application. Such a connection could be through a private dial-up Internet account, an organization's internal LAN that is in turn connected to the Internet, or services such as America Online or CompuServe.

INTRANET DELIVERY

Intranet delivery uses the exact same software tools, browsers, and protocols that are used for Internet applications, but the server on which the courseware resides is connected only to specific private networks. These networks are usually configured to serve the needs of a particular organization in terms of speed, security, and access. Intranet users must connect to, or already be a part of, an existing private network. Access to outside networks (e.g., the Internet) may or may not be available in these cases.

Future State Systems

LOCAL NETWORK DELIVERY

Local networks consist of client systems connected to one or more central file servers. The main difference between local networks and Intranets is that local networks may or may not rely on Internet protocols (TCP/IP) and tools for the delivery of data from the server to the client. In these situations, client-server applications can exist in which portions of a course are executed by the server and portions by the client. Or, the server might simply be a data repository for courses that are fully executed by the client.

STAND-ALONE MEDIA DELIVERY

Stand-alone media include any portable storage media that can contain course content. These include diskette, CD-ROM, and very soon, DVD-ROM. Courses delivered by stand-alone media may consist of any type of software that will execute on the local system or can be the same as those delivered via the Internet, the Intranet, or LANs. Usually, stand-alone media provide a great deal more speed (bandwidth) than networks can provide; therefore, multimedia-rich applications are usually based on local stand-alone media.

CD-ROM DISTRIBUTION

Initially, some of the Web-based courses will be delivered in a Web-enabled/CD-ROM hybrid environment. This is due to current Internet limitations regarding bandwidth and network response time. To this end, packaged and/or stand-alone multimedia in the form of CD-ROMs will be required for courses that are multimedia intensive (e.g., extensive video), and/or for users who do not have Internet access. The CD-ROM may also “house” interface tools like the “branded” browsers discussed earlier.

As required, each learner will be supplied with CD-ROM packages prior to course initiation, in a fashion similar to receiving learner guides for VTT courses. Distribution of these CD-ROMs would be from the central registration facility. For learners with Internet access, changes in course content and/or annual course updates will be delivered via the Web-based course component. Configuration management (CM) of these course packages will be accomplished by the DAU Program Director.

Section 4: Systems Infrastructure

Future State Systems

Web-Based Course Production

Much of the existing body of DAU training materials has been shown to be appropriate for hybrid Web-based/CD-ROM delivery of training. Moreover, as the acquisition regulations that form the basis for the DAU curriculum are revised, these courses must evolve to keep pace. The relative ease with which Web-based training material can be adapted to meet this continuous need for change is a significant plus.

Shared Course Development and Maintenance Environments

Sophisticated processes for course development, maintenance, and support will be required by the DAU virtual schoolhouse. This process will be a collaborative effort managed by the DAU Program Director and supported by course development contractors and instructors from the Consortium schools and Functional Board experts. Web technology is very well suited to this production and maintenance model.

Each course in the curriculum will be designed and developed in strict accordance with configuration management practices established by the Program Director.

Consortium-Wide Intranet

To support course development and maintenance, Consortium-wide connectivity will be established via an Intranet, a private subset of the Internet. This privacy may be enforced either by installing dedicated circuits among the member institutions or by using a well-thought-out security policy enforced by “firewall” technology. The completed and approved courses will be centrally managed and controlled.

Delivery Systems

A professional course delivery and maintenance capability will support one or more Web servers hosted on one or more NT or UNIX workstations. Server capacity will be scaled to course production schedules and user demand requirements.

Integrated Server Suites

Integrated Web server suites are highly recommended as the environment for developing the DAU virtual university. This architecture provides the highest quality Web server environment, is well integrated and relatively inexpensive, and provides most of the required services (except course and authoring software). It is therefore recommended that DAU work within the integrated Web server environment.

Future State Systems

INTEGRATED SERVER SUITE ENVIRONMENT

There are several software products available under an integrated server suite environment that can be purchased separately or together. These software packages typically include the following:

- Enterprise Server: Manages and publishes content and executes on-line applications to form the foundation of an Intranet.
- Catalog Server: Provides indexing, searching, and browsing of all the content and services on an Intranet.
- Certificate Server: Issues and manages public-key certificates and security keys for users and servers, making possible a highly secure Intranet.
- Directory Server: Provides a universal directory service for enterprise-wide management of user, access control, and server configuration information.
- Proxy Server: A high-performance Web server that replicates and filters content, improving performance, control of content, and network security.
- Messaging Server: Provides administration, scalability, security, performance, and remote connectivity.
- News Server: Facilitates secure groupware-style discussion groups that enable team collaboration and easy information sharing.

COURSE MAINTENANCE

A well-designed course delivery system will also meet the virtual schoolhouse's site maintenance needs. Web-based courses are relatively easy to modify. In the case of server-resident content, the responsible organization need only change the data on the host. In the case of CD-resident data, the responsible organization must place the corrected data on the host and also change all links to that data so that the links point to the host resident data instead of the outdated material on the CD. These changes will be invisible to learners who are completing the course across the Web.

Administering course maintenance activities requires significant planning. To this end, written policies and procedures will be developed by the Program Director.

Future State Systems

WEB-BASED COURSE DELIVERY AND ACCOUNTING

Three components come into play during the distribution of Web-based training materials. Two of these components—the server (host facility) and the client—are under DAU's control. The Internet Service Provider's (ISP's) responsiveness must be specified in contractual arrangements.

HOST FACILITY

The Web server(s) responsible for delivering the Web-based component of the course materials would reside at one or more host facilities. The host facilities are, from the learner's perspective, a single logical site; that is, all learner interaction is processed through a single Uniform Resource Locator (URL).

As currently envisioned, the course component of the virtual schoolhouse will be hosted at a commercial Web Server Provider. The course administrative database will be maintained on a separate DoD-managed server. As a backup, the virtual schoolhouse will be mirrored at a separate facility.

SECURITY AND COST

> Security and cost perspectives make housing the production system at a facility designed from the ground up to host such operations the best option, and the volatility of technology makes leasing a better business choice than purchasing over the short term.

SYSTEM ADVANTAGES

Because all of the clients whose content is hosted at the Web Server Provider share infrastructure requirements, the following advantages can be expected:

- Server suites will be in place, current, and stable.
- Learners will enjoy higher speed Internet connectivity.
- A Webmaster and skilled System Administration staff will maintain the facility.
- Mirrored backup will ensure system integrity at all times.
- Twenty-four-hour-a-day, 7-day-a-week up-time can be guaranteed.

Future State Systems

ESTIMATED WEB COURSE PROFILE

A rough profile of DAU's initial Web courses has been developed using the current initiative to develop the Simplified Acquisition Procedures (SAP) Web-based course. Each SAP lesson is approximately 1 hour in length and currently has a compressed file size of approximately .5 MB. To allow for expansion in course design complexity, an estimated file size of 1 MB for a 1-hour lesson is assumed. Additionally, each course will have an HTML shell and course download resources that contain the course link maps. The shell is currently 3-4 MB, so 5 MB is assumed.

A course administration database will be required to maintain learner profiles, learner records, prerequisite information, percent completion, test scores, etc. For the purpose of this estimate, each learner is allocated 10 Kb for tracking files. The total file size of the learner tracking database is a function of the average user load. On average, the user load per course is estimated to be 500 learners. A key objective of technology-based training is to increase training opportunities, so an estimate of 1,000 learners per course will be used. Based on the above assumptions, the course size can be calculated as follows:

- Each Lesson (1 Hour) = **1 MB/Hr**.
- HTML Shell and Download Course Resources = **5 MB**.
- Learner Database Tracking Files = 10 Kb/Learner x 1,000 Learners/Course = **10 MB**.
- Average Course = 40 Hours = 40 x 1 MB of Files/Hr (40 MB) + 5 MB Shell + 10 MB Learner Database = **55 MB/Course**.
- Given the above, assume the average course size will be **70 MB**.

SYSTEM ADMINISTRATOR

Given an outsourced solution to host Web content, there will be a requirement for additional DAU technical personnel. It is envisioned that initially one full-time person will be required as a System Administrator. The System Administrator's responsibilities are described in Section 3.

YEARLY SERVER PROJECTIONS

There will be an increasing need for server capacity as DAU converts courses to Web-based training. Using the course projections provided in Section 2, server capacities are specified in the Action Plan that will be used by the Implementation Team.

Future State Systems

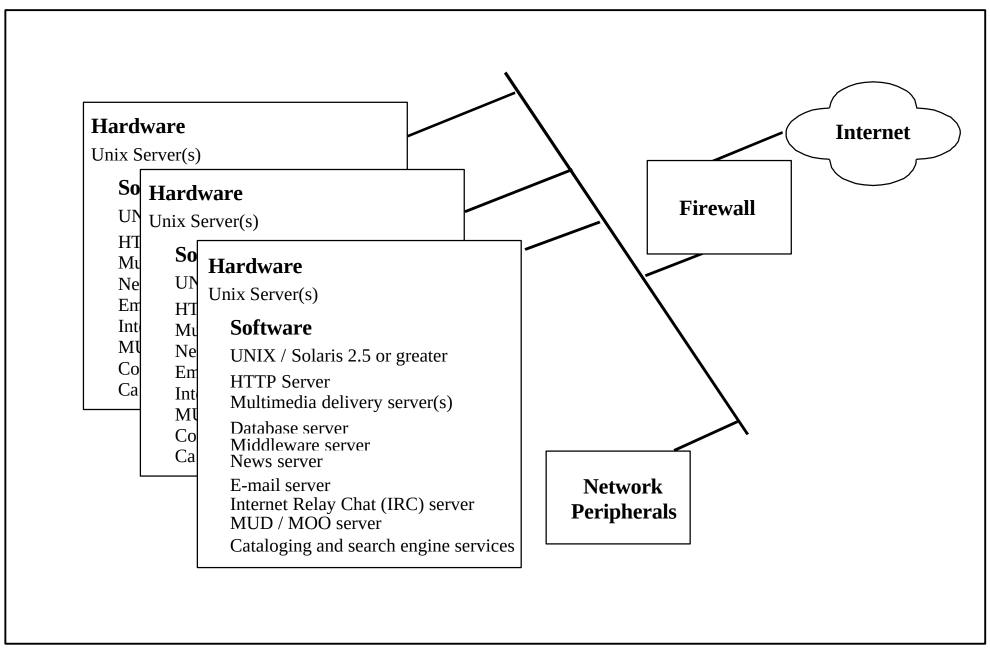
SERVER HARDWARE

A Web site the size and complexity of the DAU virtual schoolhouse typically resides on a distributed system of networked UNIX workstations connected to the Internet via T1 or T3 lines. The site is protected from unauthorized access by a firewall. Table 4-7 specifies minimal requirements for the delivery hardware. Figure 4-6 provides an overview of the optimal delivery environment.

Table 4-7. Minimal Delivery Server Hardware Suite

System	Sun Sparc Ultra Server(s) or equivalent
Operating System	UNIX/Solaris 2.5 or greater
Memory	128 MB
Hard Disk	1 GB hard drive free
Connectivity	LAN and T1 or T3 to Internet
Security Infrastructure	Firewall

Figure 4-6. Optimal Course Delivery Environment



Future State Systems

SERVER SOFTWARE

The DAU Web site(s) will consist of a wide variety of server software packages distributed across one or several hardware platforms, depending on the nature and volume of the content to be delivered. The delivery site(s) will likely require server applications such as:

HTTP SERVER

- HTTP Server: The basic HTML delivery vehicle.

MULTIMEDIA DELIVERY SERVERS

- Multimedia Delivery Servers: Special data formats like streaming audio and streaming video require specialized server software. The use of these formats can significantly enhance courses.

DATABASE SERVERS

- Database Servers: These servers are required to support the interactivity, faculty function automation, records storage, and the remediation functions of the Web-based course environment.

MIDDLEWARE SERVERS

- Middleware Servers: These servers will support enhanced integration of database functions in the course environment.

NEWS SERVER

- News Server: A news server is the underlying system used to support the USENET on the Internet. Fundamentally, these servers set up a series of bulletin-board-style forums sorted by subject and in effect form communities of interest. Functionally, a news group provides a mechanism for a learner to ask a question of a group and potentially get an answer back that is of some interest to others in the group who did not think to ask the question themselves. This process has led to collections of frequently asked questions and answers called FAQs. A news group also provides the means to disseminate news about a particular subject to a broad audience. The system works like an e-mail list server but is more user friendly because the learner logs onto a site and only downloads/views the information (based on subject) of specific potential interest. The system uses standard e-mail as a mechanism for posting, and viewers are easily available and often found as components of Web browsers such as Netscape Navigator.

Future State Systems

SMTP SERVER

- Simple Mail Transport Protocol (SMTP) (e-mail) Server: Providing an e-mail server enables a training center to provide each learner (who may not have an existing account) and instructor with a consistent mailing address for personal exchange of information not appropriate for a group.

IRC SERVER

- Internet Relay Chat (IRC) Server: IRC is useful as an adjunct to e-mail and news by allowing real-time exchange of questions and answers on a subject basis similar to a news server. Functionally, IRC sessions can be set up (e.g., using news) to schedule a time in which an instructor would be available to answer questions.

MUD/MOO SERVER

- Multi-User Dimension (MUD)/MUD Object Oriented (MOO) Server: MUD/MOOs are efforts to create a virtual world and are in essence a sophisticated form of IRC. MUD classrooms and extensions are being developed as a means for computer-based remote learning. MUD servers are generally accessible through Telenet, and freeware clients of all types are available.

CATALOGING AND SEARCH ENGINE SERVICES

- Cataloging and Search Engine Services: In addition to CBT course material, it is important to have reference materials available for learners to conduct unstructured research and collect background information. These on-line documents can be placed into an automated cataloging library using automated tools, and their contents can be searched by sophisticated keyword style search engines.

SERVER SOFTWARE FACTORS

It is important to note that multiple software servers (e.g., SMTP servers, IRC servers) can be hosted on a single hardware server. The performance will vary with the number of simultaneous users and the type of application. A single hardware server would be more than enough to support DAU's learner population for standard textual and graphics Web content. Textual information creates a very low file transfer duty cycle. That is, an end user only downloads files about 5 percent of the time he or she is on-line. Conversely, streaming audio and video have 100-percent duty cycles (i.e., while the files are being heard or viewed by the end user, they must be continuously downloaded).

Future State Systems

CLIENT

The power, flexibility, affordability, and new possibilities presented by Web-based technology have an even greater impact on the learner. Given a well-designed virtual schoolhouse, anyone with Web access can participate in the on-line learning experience. Clearly, the more capable the client machine and Internet connection, the more satisfying the experience.

CLIENT HARDWARE

While it is possible to access the Internet on a 386-based PC through a text-only-based browser, such a configuration is below the minimum that should be required to attend the DAU virtual university. As outlined in Table 4-8, a 486/66 MHz is recommended as the current minimal receive machine.

Table 4-8. Current Minimal Courses Receive/Playback Hardware

Microprocessor	486/66 (Pentium with local bus video recommended) or PowerPC processor
Memory	16 MB RAM
CD-ROM	4-6X Speed (optional)
Monitor	14 inch
Graphics Card	SVGA (640x480)
Hard Disk	Minimum 85 MB free
Sound Card	Sound Blaster-compatible (optional)
Connection	Internet connectivity (14.4 Kbps modem; 28.8 Kbps recommended)
Pointing Device	Mouse or other

Future state client hardware should be capable of supporting desktop audio and video conferencing through MMX-enabled technology and include audio input device, video input device, speakers, headset jack, and T-1 access to the Internet.

CLIENT SOFTWARE

Properly designed courses should not require any custom software on the client side. Properly designed courses imply that the following limits are maintained:

- Small file sizes.
- Minimal image resolutions.
- Appropriate compression techniques.
- Reuse of components (graphic and applets) to leverage caching.
- Consistent data types (e.g., not mixing AVI, QuickTime, and MPEG).
- Freely available, multiplatform, plug-ins.
- JavaScript versus Java should be used if possible.

With respect to Web browsers, it is recommended that DAU courses be designed to function with either Microsoft Explorer or Netscape Navigator.

Future State Systems

ADMINISTRATION AND ACCOUNTING

The adoption of Web technology will allow DAU and the Consortium Schools to develop and deploy virtual schoolhouse applications that:

- Are platform-independent to allow course developers to author once and run anywhere, even across both client and server platforms, rather than force them to port and customize applications repeatedly for different proprietary platforms.
- Run on clients or servers without recompilation to enable universal partitioning of the application.
- Use common technologies and skill sets.
- Use open standards that are flexible enough to cooperate with existing applications from different vendors today and in the future.
- Leverage existing infrastructure investments in desktop computers, servers, mainframes, databases, applications, and networks.
- Scale from the LAN to the Intranet, enabling the exposure of business processes through the corporate firewall to connect applications directly to learners, course developers, and Consortium schools.
- Can be deployed and managed centrally from the server rather than requiring costly updates to static, individual desktops or laptops.
- Support Consortium-wide component reusability, increasing the Consortium's ability to develop new courseware and applications rapidly from existing services.

Because of the security features and the ability of the Web-based components to interface with existing databases, DAU can automatically provide administration and accounting services—a virtual registrar. By leveraging the unique, two-way communications capability of the Internet, it is possible to certify that an individual has received a course, observe a learner's progress, and record test results and other valuable feedback. In this way, DAU will be able to verify each learner's level of understanding and thereby enable certification programs.

INDUSTRY TRENDS

Attachment 4-3 discusses industry trends related to the development and delivery of technology-based education and training.

Implementation Strategy

TRAINING REQUIREMENTS DRIVE THE SYSTEM(S) REQUIREMENTS

The system(s) implementation strategy must be driven by the training requirements as depicted below:

The training requirements provided in Section 2 document the necessity of a media-rich learning environment. This will be provided by a combination of video teletraining and Web-based/CD-ROM courses.

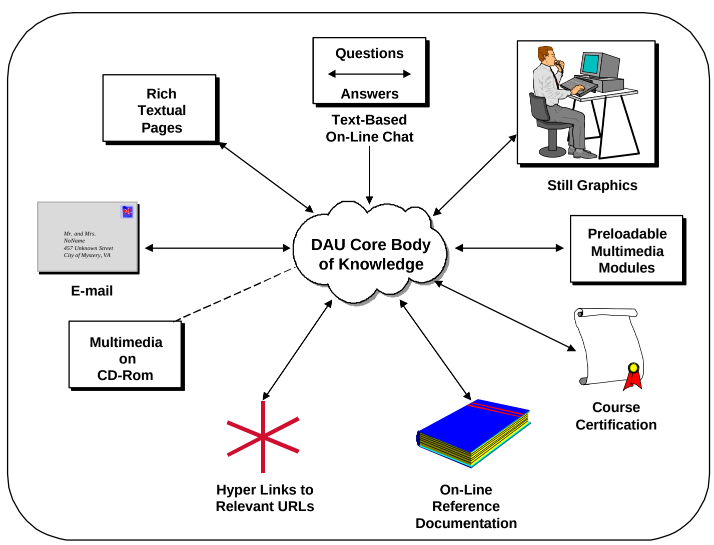
The required course design characteristics (file size, functionality, media) are the input variables for the system requirements. The design and media characteristics of DAU courses will evolve as the supporting technology evolves. This subsection describes and graphically depicts the course and systems infrastructure characteristics for the three main implementation phases:

- Logical (years 1 and 2)
- Conceptual (years 3 and 4)
- Perceptual (years 5+)

Figures 4-7 through 4-9 show a dramatic evolution of course design characteristics from the current state to the future state. The Internet and Intranet systems capabilities that are currently evolving will allow DAU's training methodology to evolve from front-end/scheduled training events to a media-rich, just-in-time training environment.

WEB-BASED TRAINING, YEARS 1 AND 2

Figure 4-7. Web Training Characteristics, Yrs 1 and 2

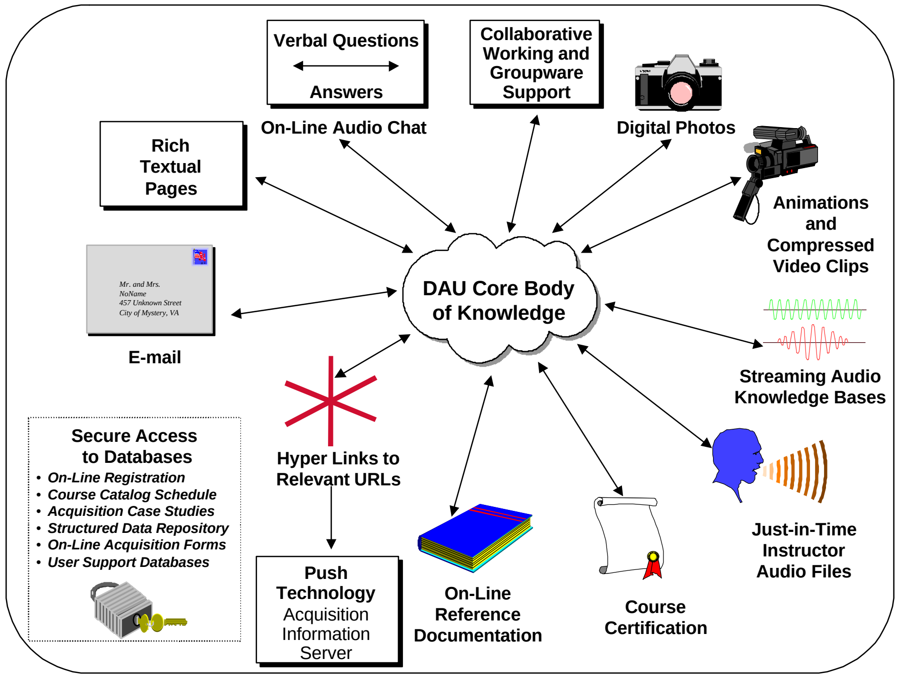


Implementation Strategy

WEB-BASED TRAINING, YEARS 3 AND 4

Figure 4-8 depicts the Web training characteristics in years 3 and 4.

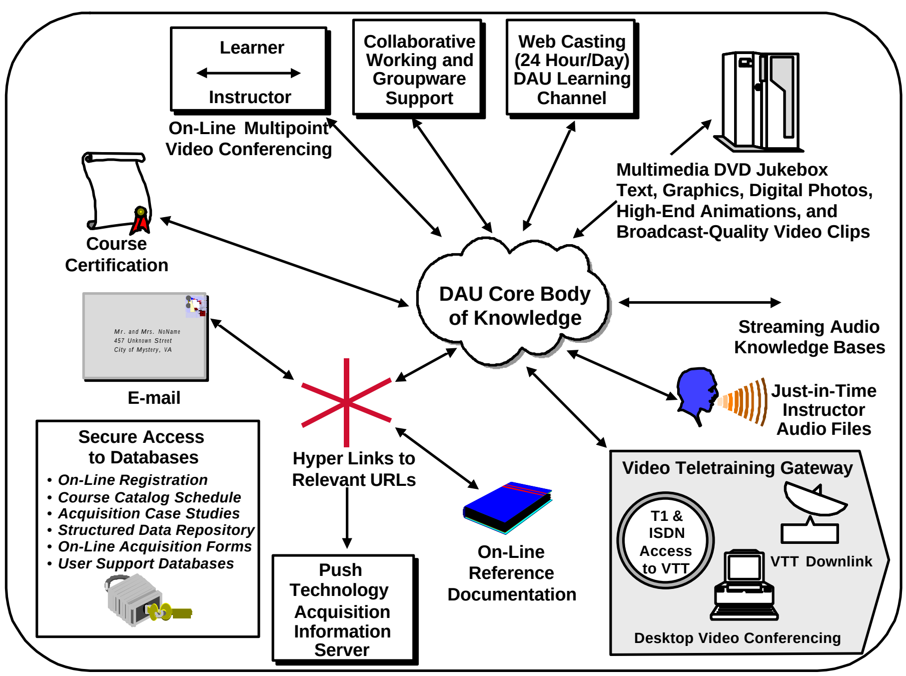
Figure 4-8. Web Training Characteristics, Yrs 3 and 4



WEB-BASED TRAINING, YEARS 5+

Figure 4-9 depicts the Web training characteristics in years 5+.

Figure 4-9. Web Training Characteristics, Yrs 5+



Implementation Strategy

LOGICAL PHASE SYSTEMS STRATEGY

The Logical Phase (years 1 and 2) will be primarily focused on establishing two fundamental elements of the Web delivery program: (1) course standards/specifications, and (2) the baseline delivery environment. There are four primary systems elements in the DAU course delivery environment:

1. Course Hosting and Server Strategy
2. DAU Course Maintenance Scenario
3. User Support Databases
4. User Access Requirements

Each component should be implemented with the primary mission in mind—to provide high-quality, cost-effective acquisition training to the acquisition workforce anywhere, anytime.

The pace of change for both server hardware and software makes it cost prohibitive to consider purchasing the systems required to host DAU's Web courses. The look and feel of DAU's Web courses will change dramatically over the first 2 years, and these changes will require different plug-ins, add-ons, and extensions for the supporting server software.

COURSE HOSTING AND SERVER STRATEGY

Ultimately, a Web Server Provider and an Internet Service Provider will be chosen that can support an evolving course environment and that will be responsive to supporting these changes. The initial Web Server will run the UNIX operating system, which currently provides the most flexible robust server environment.

To support on-line chat sessions, IChat software has been selected for its flexibility and tight integration into the current family of Web browsers. The size of DAU Web courses is currently estimated at 70 MB per course (40-hour course), with a maximum number of simultaneous users estimated at 500. Consequently, DAU will require a T2 connection between the Web Server Provider and the Internet. Future courses will use streaming audio and larger graphics and animations files and have significantly higher user loading. Consequently, a higher bandwidth connection (e.g., T3) will be required between the ISP and the Internet in the future.

Implementation Strategy

DAU COURSE MAINTENANCE SCENARIO

DAU will provide periodic updates to the Web courses. In addition, DAU will oversee collection and maintenance of course administration data on the server. As previously described, this function will require a Systems Administrator to manage DAU's Web courses and DAU's learner database system.

To simplify course updates, the following items will be provided between the Web Server Provider and the DAU Systems Administrator: Unlimited 24-hour access; a secure, password-protected environment to prevent intrusion and file corruption; a mirror directory for automatic course updates without bringing the courses off-line; and FTP software access between the Systems Administrator and the server provider.

USER SUPPORT DATABASES

The course administration function is very important to the initial success of DAU's Web course initiatives. The following learner data will be tracked to monitor the success of the Web initiatives: Learner access, course modules completed, course completion, test scores, learner questions, learner feedback, etc. COTS course administration software with flexible data maintenance features and easy course integration is being evaluated.

USER ACCESS REQUIREMENTS

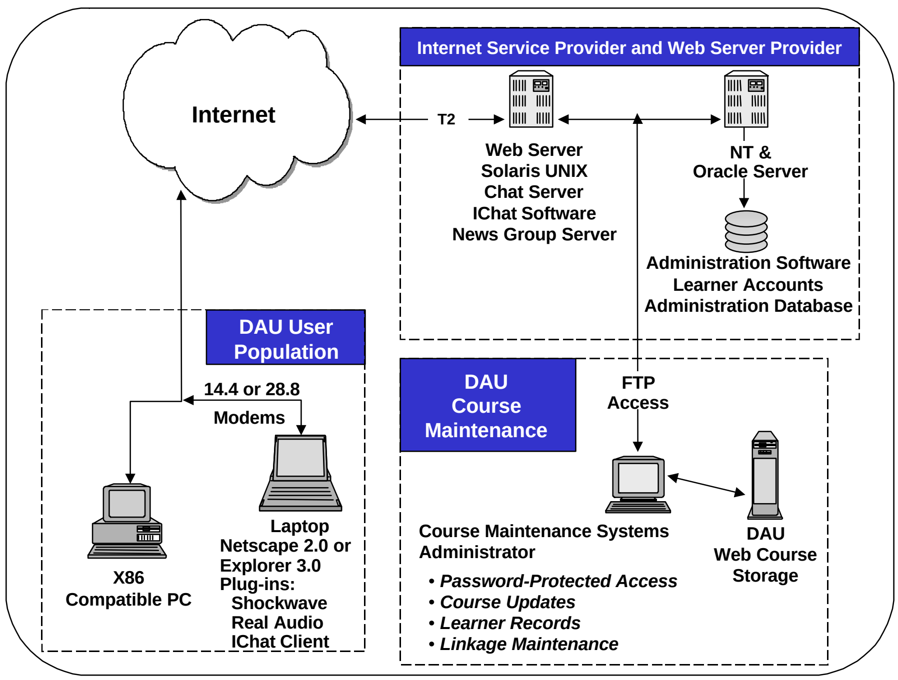
To provide the most flexible access by the DAU user population, the initial systems requirement for Web access will be a 14.4 Kbps modem. This will allow learners to access DAU's Web course via a standard telephone line. Currently, a high percentage of computers available to the acquisition workforce have 14.4 Kbps modems.

Implementation Strategy

SYSTEMS INFRASTRUCTURE, YEARS 1 AND 2

Figure 4-10 depicts the Web System characteristics in the Logical Implementation Phase (years 1 and 2).

Figure 4-10. Systems Infrastructure Implementation, Yrs 1 and 2



CONCEPTUAL PHASE SYSTEMS STRATEGY

The Conceptual Phase (i.e., years 3 and 4) will be very important to the Implementation Plan. By the third year in the program, course design features will be well established, and new media features should be added without a major perturbation in the delivery concept. There will be three primary components to the DAU course delivery environment:

1. Course Hosting and Server Strategy
2. DAU Centralized Course Repository
3. User Access Requirements

Implementation Strategy

COURSE HOSTING AND SERVER STRATEGY

Internet hardware/software technology and accompanied communications infrastructure are projected to change rapidly over the next 5 years. Consequently, the cost-effectiveness of outsourcing Web server functions will only increase as the program expands.

The look and feel of DAU's Web-based courses will have matured significantly by the third year of the program. Course functionality testing, scheduling, and supporting databases will have evolved to meet the needs of DAU's training and certification model. As communications technology evolves, learners will have higher bandwidth connections to the Internet, which will increase the flexibility of course design. The increased bandwidth will be used to enhance the fidelity of the learning experience, increase learner interactions, and provide real-time access to the instructor. This can be accomplished by:

- Increasing the quality of the graphics in addition to optimizing digital photos.
- Increasing the use of audio files where audio narration can enhance the learning experience.
- Providing real-time, learner-to-instructor audio chat sessions to simulate classroom interactions.
- Enhancing access to supporting databases (acquisition policy, case studies, recent legal rulings, etc.).

Three years into the program, course file size could easily be 10 times that of the initial courses because of additional media integration. In addition to larger file sizes, the user load will have increased from hundreds to thousands. Consequently, a requirement for a 10 MBps connection between the Web Server Provider and the Internet is projected to avoid unacceptable file download times.

DAU CENTRALIZED COURSE REPOSITORY

The importance of on-line storage and course maintenance will increase dramatically by the third and fourth years of the program. DAU will establish rigorous configuration management policies to organize and archive all digital course files. In addition to supporting course updates, the maintenance system will provide access to DAU's Consortium schools. The Consortium schools will provide instructors for learner support and course updates. DAU will develop the procedures and systems for processing unformatted course materials from the Consortium schools and formatting these materials for Web delivery.

Implementation Strategy

USER ACCESS REQUIREMENTS

To provide the most flexible access to courses, DAU will support users in a variety of learning environments. Many educational institutions are striving to provide flexible access to educational materials. It will be feasible to offer courses to learners in their homes, workplaces, hotels, and temporary duty stations.

Learners will access courses via a variety of devices including, but not limited to, desktop personal computers, laptop PCs, Network PCs (NetPCs), WebTVs, and Personal Digital Assistants (PDAs). This flexible access scenario will reduce the impact on time-off-job, which is a costly element of training today.

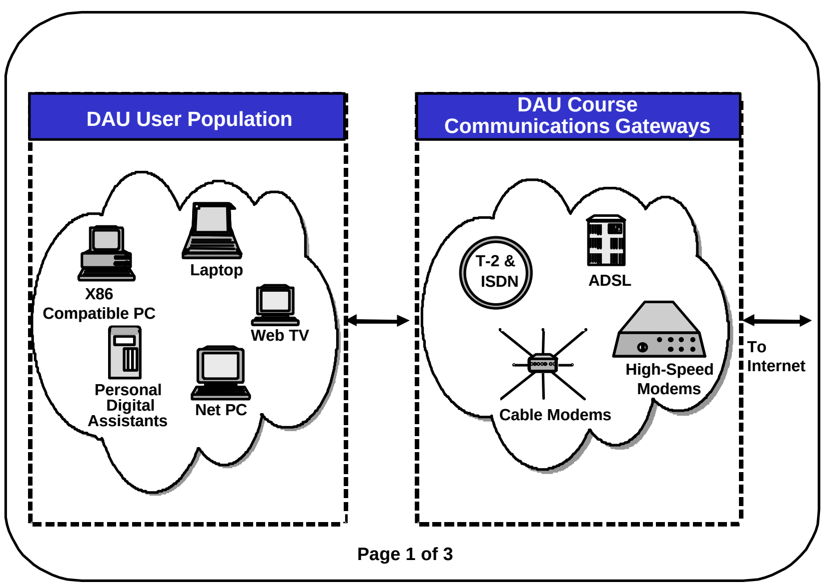
In the near term, there is a variety of communications devices that will provide much higher bandwidth access to the Internet than today's 14.4 Kbps and 28.8 Kbps modems. These devices include high-speed modems (56 Kbps), ISDN modems (384 Kbps), Asynchronous Digital Subscriber Line (1.54 Kbps), and cable modems (4 MBps). These communications protocols and their respective devices will allow DAU to design media-rich courses, provide real-time, learner-to-instructor interaction, and support a truly collaborative learning environment.

SYSTEMS INFRASTRUCTURE, YEARS 3 AND 4

DAU USER POPULATION AND COMMUNICATIONS GATEWAYS

Figure 4-11 graphically depicts the Systems Infrastructure requirements for the Conceptual Implementation Phase (i.e., years 3 and 4).

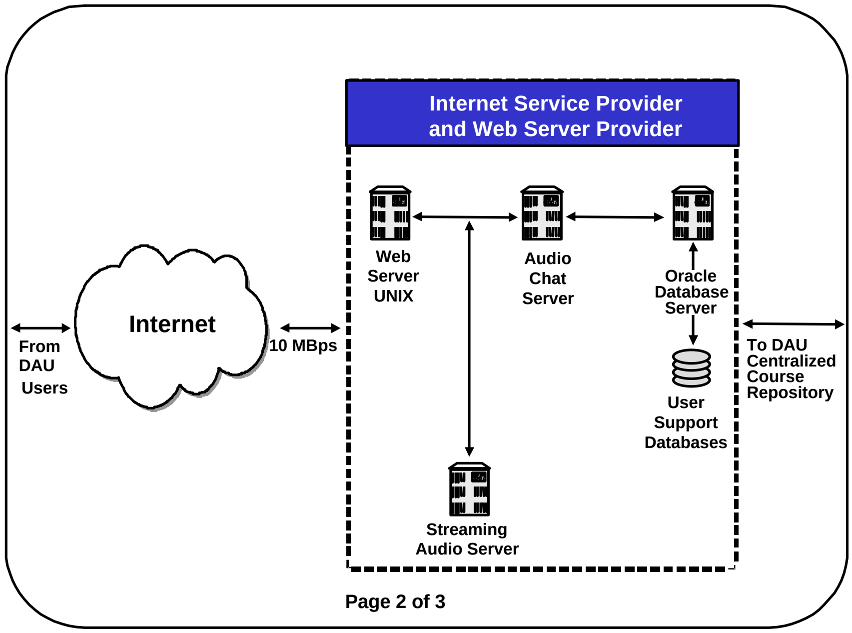
Figure 4-11. Systems Infrastructure Implementation, Yrs 3 and 4



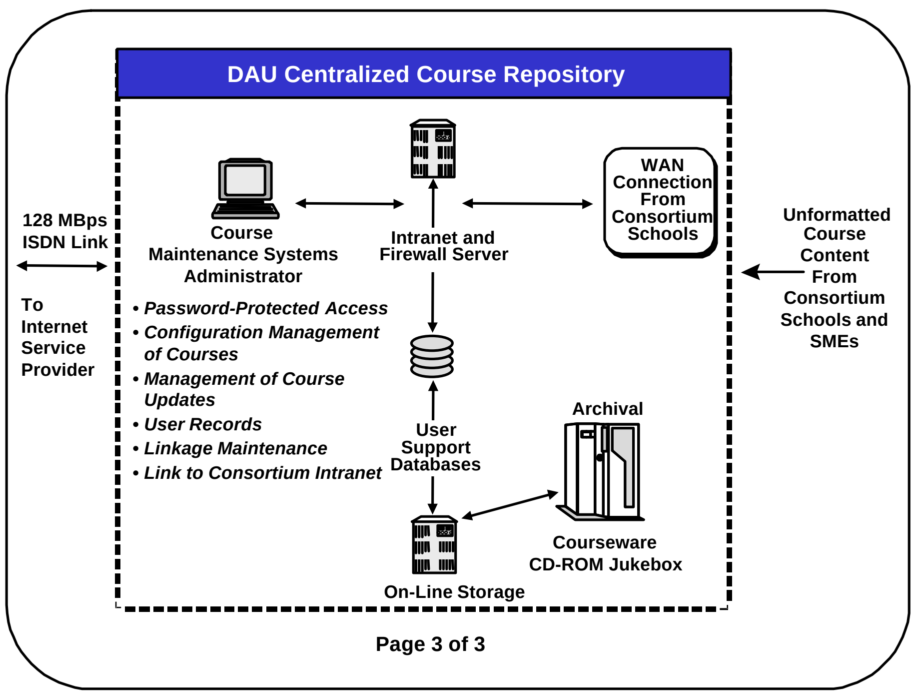
Implementation Strategy

INTERNET SERVICE AND WEB SERVER PROVIDERS

Figure 4-11. Systems Infrastructure Implementation, Yrs 3 and 4 (Continued)



DAU COURSE REPOSITORY



Implementation Strategy

PERCEPTUAL PHASE SYSTEMS STRATEGY

The Perceptual Phase implementation strategy (i.e., years 5+) will optimize all the Internet's media delivery modes. By the fifth year in the program, access to the Internet should approximate access to cable television. There will probably be between 95- and 99-percent connectivity from all workplaces and between 75- and 80-percent access to people's homes via WebTV.

There will be two primary components to the DAU course delivery environment during the Perceptual Phase:

1. Internet Access and Course Hosting
2. User Access Requirements

INTERNET ACCESS AND COURSE HOSTING

Internet hardware/software technology and accompanied communications infrastructure will evolve rapidly and continue to be costly. Consequently, outsourcing Web server functions will continue to be the long-term strategy. To eliminate duplication of contracting costs, DAU will integrate the staffing and systems requirements of three major components of the Internet into one large services contract. The "DAU Virtual Schoolhouse" contract will include all staff, systems, and services required to accomplish:

- High-Bandwidth Internet Access
- Course Hosting
- Centralized On-Line Repository and Archiving

DAU will develop detailed systems requirements and load projections in order to secure volume discounts for the Web Server contract. The complexity of DAU's Centralized Repository will have increased dramatically with the expansion of Web course characteristics to all types of media and the integration of video teletraining gateways. Five years into the program, course file size could easily be hundreds of times that of the initial courses because of additional media and video teletraining integration. In addition to larger file sizes, the user load will have increased from thousands to tens of thousands. Consequently, a requirement for a T3 connection between the Web Server Provider and the Internet is projected to avoid unacceptable file download times.

SECTION 4: SYSTEMS INFRASTRUCTURE

Implementation Strategy

USER ACCESS REQUIREMENTS

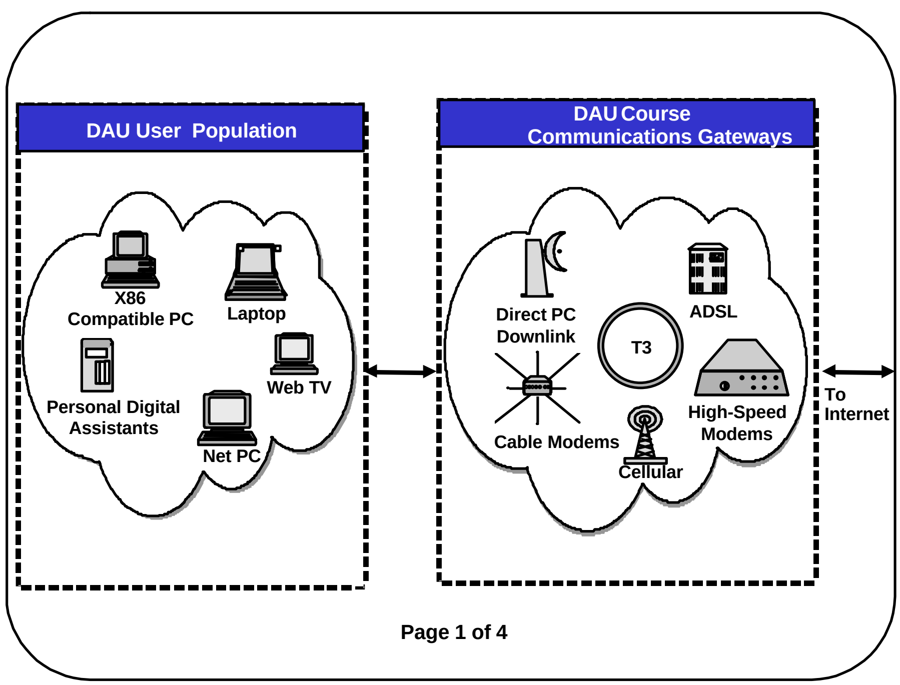
In order to increase the flexibility of student access to courses, DAU will have support contracts with Internet Service Providers who are constantly updating their communications infrastructures. It will be feasible to offer courses to learners in their homes, workplaces, hotels, temporary duty stations, and during travel (e.g., planes, trains, buses). As in the Conceptual Phase, learners will access courses via a variety of devices including, but not limited to, desktop PCs, laptop PCs, Network PCs (Net PCs), WebTVs, and Personal Digital Assistants (PDAs). This flexible access scenario will reduce the impact on time-off-job, which is a costly element of training today. A variety of communications devices will provide much higher bandwidth access to the Internet than today's modes. These devices include high-speed digital modems (128 Kbps), ISDN modems (756 Kbps), Asynchronous Digital Subscriber Line (9 MBps), and cable modems (4 MBps). These communications protocols and their respective devices will allow DAU to design media-rich courses; provide real-time, learner-to-instructor interaction; and support a truly collaborative learning environment.

SYSTEMS INFRASTRUCTURE, YEARS 5+

Figure 4-12 graphically depicts the Systems Infrastructure requirements for the Perceptual Implementation Phase (i.e., years 5+).

DAU USER POPULATION AND COMMUNICATIONS GATEWAYS

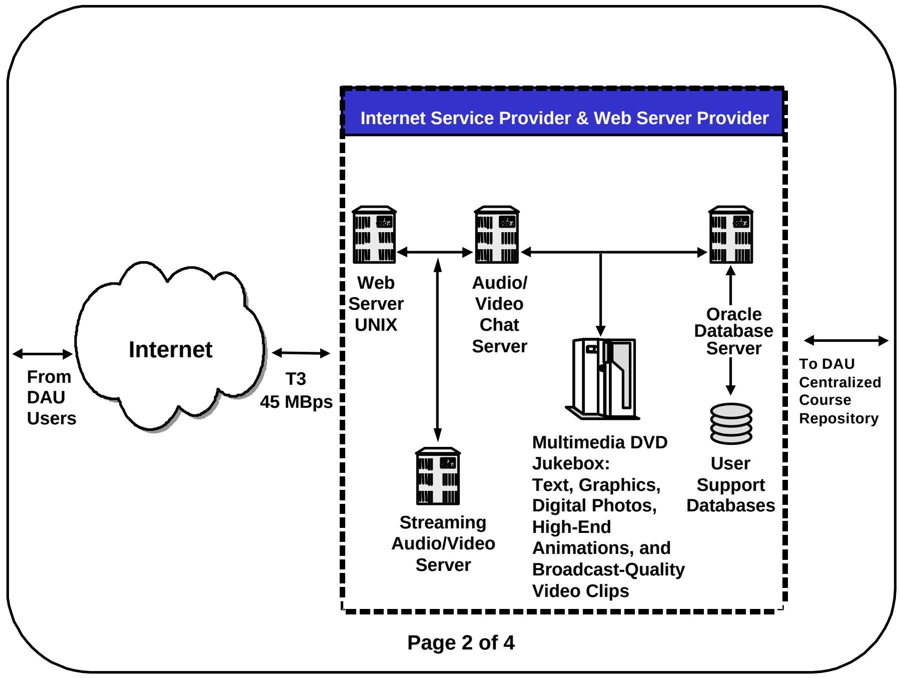
Figure 4-12. Systems Infrastructure Implementation, Yrs 5+



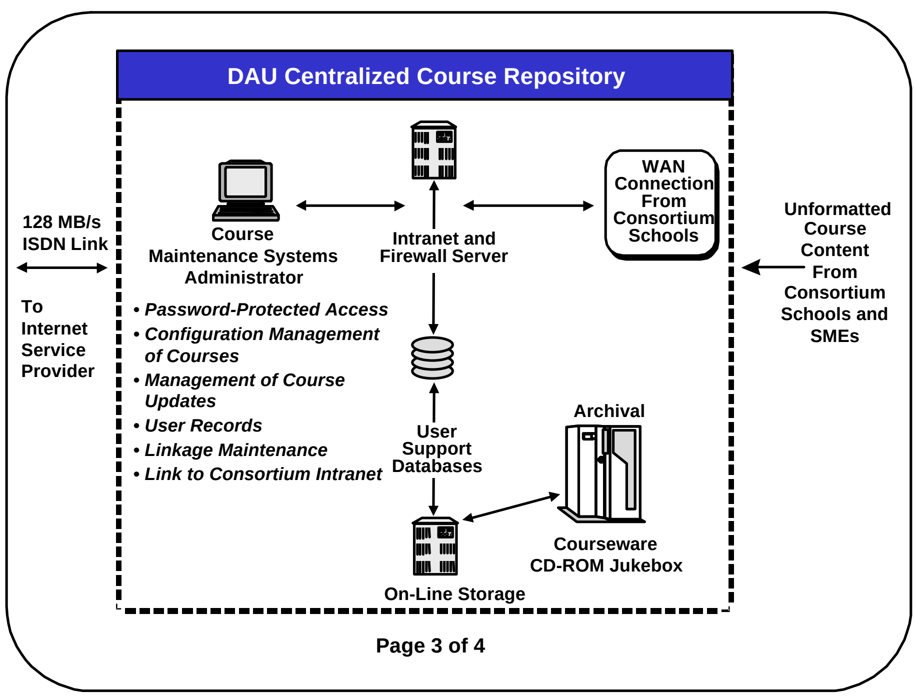
Implementation Strategy

Figure 4-12. Systems Infrastructure Implementation, Yrs 5+ (Continued)

INTERNET SERVICE AND WEB SERVER PROVIDERS



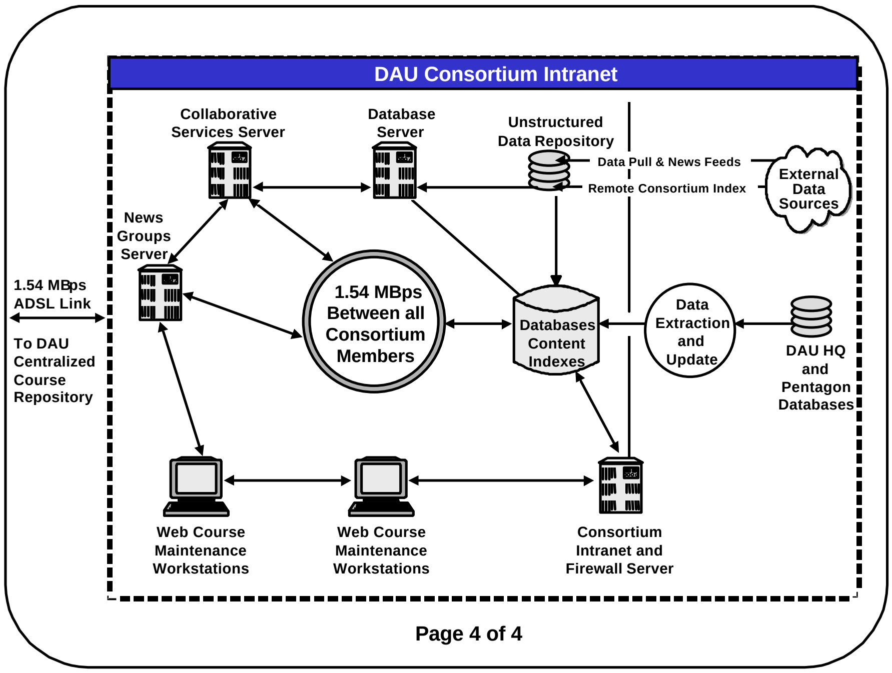
DAU COURSE REPOSITORY



Implementation Strategy

DAU CONSORTIUM INTRANET

Figure 4-12. Systems Infrastructure Implementation, Yrs 5+ (Continued)



IMPLEMENTATION SCHEDULE

A schedule outlining implementation tasks through the year 2000 is included in the Action Plan for use by the Implementation Team.

ATTACHMENT 4-1:

SUMMARY OF CURRENT DAU VTT RESOURCES

Attachment 4-1: Summary of Current DAU VTT Resources

The following tables provide a quick reference to video teletraining (VTT) resources:

AIR TECHNOLOGY NETWORK

Service	Air Force
Consortium School	Air Force Institute of Technology
Network Name	Air Technology Network (ATN)
Origination Site	Wright-Patterson Air Force Base, Ohio
# of Receive Sites	75 (all active Air Force Bases)
Video Teletraining Type	1-way video/2-way audio
External Network Connectivity	Audio/video transmission to SEN or any other civilian agency using FTS 2000 Network A downlinks. Audio/video send-only capability to CESN. A TVRO downlink is planned for the Dam Neck CNET Hub.
Carrier	FTS 2000
Digital Environment	Audio & video, unidirectional, synchronous
Bandwidth	3.3 MBps (effectively full broadcast)

CHIEF NAVAL EDUCATION AND TRAINING

Service	Navy
Consortium School	Access via Naval Facilities Contracts Training Center (NFCTC)
Network Name	Chief Naval Education and Training (CNET)
# of Origination/ Receive Sites	18 sites, Hub at Dam Neck, VA, and San Diego
Video Teletraining Type	2-way video/2-way audio
External Network Connectivity	Full duplex audio/video send & receive to TNET system via TNET gateway at Dam Neck. Full duplex audio/video transmit & receive to Navy Surgeon General's Medical Education and Training Network (NMETN).
Carrier	FTS 2000 and Public ISDN
Digital Environment	Data, audio & video, bidirectional, synchronous
Bandwidth	VTEL at 384 Kbps (30 frames/sec at reduced resolution)

Attachment 4-1: Summary of Current DAU VTT Resources

Service	Army
Consortium School	Access via Army Logistics Management College (Fort Lee, VA)
Network Name	Army Satellite Education Network (SEN)
Origination Site	Army Training Support Center, Fort Lee, VA (studio configuration)
# of Receive Sites	79
Video Teletraining Type	1-way video/2-way audio
External Network Connectivity	Audio/video send to ATN or any other civilian agency using FTS 2000 Network A downlinks. Audio/video send-only capability to TNET.
Carrier	FTS 2000 for compressed digital video. Capable of analog C-Band & Ku-Band uplink.
Digital Environment	Audio & video, unidirectional, synchronous
Bandwidth	Full broadcast via analog or digital (3.3 MBps).

Attachment 4-1: Summary of Current DAU VTT Resources

ARMY TRAINING NETWORK

Service	Army
Consortium School	Access via Naval Facilities Contracts Training Center (NFCTC)
Network Name	Army Training Network (TNET) Managed by Army Training Systems Center, Fort Eustis, VA
# of Origination/ Receive Sites	105 total sites 47 fixed sites on Air Force Reserve, 58 Army sites
Video Teletraining Type	2-way video/2-way audio
External Network Connectivity	Full duplex audio/video send & receive to CNET system via TNET gateway at Dam Neck.
Carrier	Sprint ISDN
Digital Environment	Audio & video, bidirectional, synchronous
Bandwidth	VTEL 384 Kbps (30 frames/sec at reduced resolution)

SUMMARY

DAU can reach a significant portion of the DoD learner population that works within local travel range of existing video teletraining sites.

ATTACHMENT 4-2:

FEDERAL GOVERNMENT VIDEO TELETRAINING DATABASE

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
EPA			
EPA	Environment Canada	Hull, Quebec, Canada	
TNET	Sinai, Egypt	Sinai, Egypt	
IRS	Anchorage District	Anchorage	AK
ANG	176MSF/DPMT	Anchorage	AK
SSA		Anchorage	AK
FAA	Alaska RO	Anchorage	AK
USAF	Elmendorf AFB	Anchorage	AK
ANG	168MSF/DPMP	Eielson AFB	AK
USAF	Eielson AFB	Eielson AFB	AK
NPS	Gates of the Arctic National Park & Preserve	Fairbanks	AK
ANG	HQ AK ANG/ESSO	Fort Richardson	AK
SSA		Anniston	AL
SEN	Fort McClellan	Anniston	AL
TNET	Fort McClellan	Anniston	AL
SEN	Anniston Army Depot	Anniston Army Depot	AL
EPA	Jefferson County Department of Health	Birmingham	AL
IRS	Birmingham District	Birmingham	AL
ANG	117MSF/DPMP	Birmingham	AL
SSA		Birmingham	AL
SSA	Southeastern Program Service Center	Birmingham	AL
SEN	Fort Rucker	Daleville	AL
TNET	Fort Rucker	Daleville	AL
HTVN	Decatur Housing Authority	Decatur	AL
ARNG	ARNG Multi Media Branch	Fort Rucker	AL
ANG	226CCG/TE	Gadsden	AL
EPA	Div. of Nat. Res. & Environ. Mngt.	Huntsville	AL
SEN	Redstone Arsenal	Huntsville	AL
TNET	Redstone Arsenal	Huntsville	AL
DISA	DMC Arsenal	Huntsville	AL
SSA	Brookley Complex	Mobile	AL
EPA	AL Dept of Environ. Mngt.	Montgomery	AL
ANG	187FG/DPMT	Montgomery	AL

AGENCY	FACILITY NAME	CITY	STATE
ANG	HQ AL ANG/ESSO	Montgomery	AL
USAF	Maxwell/Gunter Annex AFB	Montgomery	AL
TNET	Maxwell/Gunter Annex AFB	Montgomery	AL
DISA		Montgomery	AL
HTVN	Ozark Housing Authority	Ozark	AL
ANG	188MSF/DPMP	Fort Smith	AR
ANG	223CBCS/CCQT	Hot Springs	AR
USAF		Jacksonville	AR
IRS	Little Rock District	Little Rock	AR
EPA	AR Dept of Polution Control & Eco.	Little Rock	AR
SSA		Little Rock	AR
USAF	Little Rock AFB	Little Rock	AR
ANG	189MSF/DPMT	Little Rock AFB	AR
ANG	HQ AR ANG/ESSO	Little Rock AFB	AR
ARNG	Camp Robinson	North Little Rock	AR
SEN	Pine Bluff Arsenal	Pine Bluff Arsenal	AR
DISA	Fort Huachuca	Fort Huachuca	AZ
NPS	Albright Training Center	Grand Canyon	AZ
TNET	Luke AFB	Luke AFB	AZ
NPS	Petrified Forest National Park	Petrified Forest	AZ
ANG	161MPF/DPMT	Phoenix	AZ
ANG	HQ AZ ANG/ESSO	Phoenix	AZ
EPA	Maricopa County APC	Phoenix	AZ
IRS	Phoenix District	Phoenix	AZ
SSA		Phoenix	AZ
SSA		Phoenix	AZ
SEN	Fort Huachaca	Sierra Vista	AZ
TNET	Fort Huachuca	Sierra Vista	AZ
ANG	162MSF/DPT	Tucson	AZ
SSA		Tucson	AZ
USAF	Davis-Monthan AFB	Tucson	AZ
TNET	Tucson	Tucson	AZ
SEN	Yuma Proving Ground	Yuma	AZ

Source: Major Rick Gividen, Army National Guard

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
FDA	ORA/San Francisco District Office	Alameda	CA
USAF	Beale AFB	Beale AFB	CA
SSA		Berkeley	CA
DISA	North Island NAS	Coronado	CA
ANG	222 CBCS	Costa Mesa ANGS	CA
EPA	South Coast Air Quality	Diamond Bar	CA
USAF	Edwards AFB	Edwards AFB	CA
SEN	Fort Irwin	Fort Irwin	CA
TNET	National Training Center	Fort Irwin	CA
FAA	Oakland ARTCC	Fremont	CA
ANG	144FW/DPMP	Fresno	CA
IRS	Fresno Service Center	Fresno	CA
SSA	Central Valley/Sierra Branch	Fresno	CA
EPA	San Joaquin Valley APC Dist.	Fresno	CA
SSA		Glendale	CA
FAA	Western Pacific RO	Hawthorne	CA
ANG	234CBCS/CCT	Hayward	CA
ANG	216th EIS	Hayward	CA
SEN	Sierra Army Depot	Herlong	CA
SSA	S. Cal.Regional Training Center	Huntington Park	CA
SSA		Inglewood	CA
FDA	ORA/Los Angeles District Office	Irvine	CA
IRS	Laguna Niguel District	Laguna Niguel	CA
DOE	Lawrence Livermore National Lab	Livermore	CA
SSA		Long Beach	CA
IRS	Los Angeles District	Los Angeles	CA
SSA	L.A. West/L.A. North Branch	Los Angeles	CA
SSA	L.A. East/L.A. South Branch	Los Angeles	CA
SSA	Westwood	Los Angeles	CA
USAF	Los Angeles AFB	Los Angeles	CA
ANG	163MSF/DPT	March AFB	CA
TNET	McClellan AFB	McClellan AFB	CA
ANG	129ARG/DPMP	Moffett Federal Airfield	CA
SEN	Presidio of Monterey	Monterey	CA
TNET	Presidio of Monterey	Monterey	CA
TNET	March AFB	Moreno Valley	CA
IRS	Sacramento District	N. Highlands	CA
ANG	162CCG/DPMP	North Highlands	CA
FDA	ORA/Pacific Regional Office	Oakland	CA
IRS	San Francisco District	Oakland	CA
SSA	Golden Gate/Bay Area Branch	Oakland	CA
DOE	Oakland Opns Office	Oakland	CA
ANG	148CBCS/CCQT	Ontario	CA
FAA	Los Angeles ARTCC	Palmdale	CA
SSA		Pasadena	CA
ANG	146MSF/DPT	Port Hueneme	CA
SSA	Western Program Service Center	Richmond	CA
SSA	Richmond Training Center	Richmond	CA
SSA	Roseville Branch	Roseville	CA
ANG	HQ CA ANG/ESSO	Sacramento	CA
EPA	Cal. Air Resources Board	Sacramento	CA
SSA		Sacramento	CA
SSA	Sacramento Branch	Sacramento	CA
SSA	Salinas MEGATSC	Salinas	CA
ANG	147CBS/CCQT	San Diego	CA
EPA	Air Pollution Control District	San Diego	CA
SSA	San Diego Branch/La Jolla Branch	San Diego	CA
SSA		San Diego	CA
SEN		San Diego	CA
EPA	Bay Area AQ Mngt. District	San Francisco	CA
IRS	San Francisco - Regional Office	San Francisco	CA

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA	Bay Area Regional Training Center	San Francisco	CA
IRS	San Jose District	San Jose	CA
SSA	San Jose (Downtown) Office	San Jose	CA
EPA	Dept of Environ. Sci.	San Luis Obispo	CA
ANG	261st CCS	Sepulveda ANGS	CA
SSA		Stockton	CA
SEN		Tracy	CA
TNET	Travis AFB	Travis AFB	CA
SSA		Van Nuys	CA
EPA	Ventura County APCD	Ventura	CA
NPS	Yosemite National Park	Yosemite	CA
ANG	140CETO	Aurora	CO
DOE	Rocky Flats	Boulder	CO
SSA		Colorado Springs	CO
FDA	ORA/Denver District Office	Denver	CO
NPS	Denver Service Center	Denver	CO
EPA	CO Dept of Health, APC Div.	Denver	CO
IRS	Denver District	Denver	CO
SSA	Denver Regional Training Fac.	Denver	CO
SSA		Denver	CO
SSA		Denver	CO
TNET	Denver	Denver	CO
ANG	HQ CO ANG/ESSO	Englewood	CO
SEN	Fort Carson	Fort Carson	CO
SSA		Lakewood	CO
FAA	Denver ARTCC	Longmont	CO
NPS	Great Sand Dunes National Monument	Mosca	CO
TNET	Peterson AFB	Peterson AFB	CO
HTVN	Bridgeport Housing Authority	Bridgeport	CT
HTVN	Satellite Telecommunications, Inc.	Cheshire	CT
ANG	103TFG/DPT	East Granby	CT
SSA		Hartford	CT

AGENCY	FACILITY NAME	CITY	STATE
ANG	HQ CT ANG/ESSO	Hartford	CT
IRS	Hartford District	Hartford	CT
ANG	103ACS/DPMP	Orange	CT
SSA		Windsor	CT
FAA	FAA Headquarters	Washington	DC
SSA		Washington	DC
IRS	Main Building - Washington, DC	Washington	DC
IRS	A/C International - WDC	Washington	DC
ANG	HQ DC ANG/ESSO	Washington	DC
SSA		Washington	DC
USAF	Bolling AFB Education Center	Washington	DC
EPA	DC Air Resources Management	Washington	DC
ARNG	BBTS	Bethany Beach	DE
EPA	Dept. of Nat. Resources	Dover	DE
USAF	Dover AFB	Dover AFB	DE
TNET	Dover AFB	Dover AFB	DE
ANG	166MSF/DPMT	New Castle	DE
HTVN	Wilmington Housing Authority	Wilmington	DE
ARNG	Delaware STARC	Wilmington	DE
IRS	Wilmington District	Wilmington	DE
SSA		Wilmington	DE
EPA	Dept of Env. Mngt. Air Qual. Div.	Cearwater	FL
EPA	Florida DEP So. District	Fort Myers	FL
USAF	Eglin AFB	Fort Walton Beach	FL
TNET	Eglin AFB	Fort Walton Beach	FL
IRS	Ft. Lauderdale	Ft. Lauderdale	FL
FAA	Jacksonville ARTCC	Hilliard	FL
TNET	Homestead AFB	Homestead	FL
USAF	Hurlburt Field	Hurlburt Field	FL
ARNG	Craig Field Armory	Jacksonville	FL
EPA	FL DEP, Air Quality Div.	Jacksonville	FL
IRS	Jacksonville District	Jacksonville	FL

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Jacksonville	FL
SSA	Jacksonville (Downtown)	Jacksonville	FL
DISA		Jacksonville	FL
ANG	125FW/DPMT	Jacksonville Iap	FL
FAA	Miami ARTCC	Miami	FL
SSA	SSA Miami (Central)	Miami	FL
SSA	Miami South Center	Miami	FL
SSA		Miami	FL
sSSA		Orlando	FL
FDA	ORA/Florida District Office	Orlando	FL
EPA	FL Dept of Env. Protection	Orlando	FL
SSA		Orlando	FL
SEN	Orlando NTC	Orlando	FL
FAA	CMD	Palm Coast	FL
ANG	Tyndall AFB	Panama City	FL
EPA	Florida DEP	Pensacola	FL
ANG	HQ FL ANG/ESSO	St Augustine	FL
SSA		St. Petersburg	FL
EPA	FL Dept of Environ. Protection	Tallahassee	FL
SSA		Tallahassee	FL
SSA		Tallahassee	FL
EPA	Millsborough Cty Air Mngt. Div.	Tampa	FL
SSA		Tampa	FL
EPA	FL DEP Southwest District	Tampa	FL
EPA	Hillsborough Cty ARMD	Tampa	FL
EPA	Palm Beach Co. Health Unit	West Palm Beach	FL
EPA	FL Dept of Environ. Protection	West Palm Beach	FL
EPA	Palm Beach Cty Hlth Unit	West Palm Beach	FL
HTVN	Americus Housing Authority	Americus	GA
SSA	Atl. Reg. Ofc.	Atlanta	GA
FDA	ORA/Atlanta Region, District, Lab Offices	Atlanta	GA

AGENCY	FACILITY NAME	CITY	STATE
ANG	HQ GA ANG/ESSO	Atlanta	GA
IRS	Atlanta - Regional Office	Atlanta	GA
IRS	Atlanta SC - Chamblee, GA	Atlanta	GA
EPA	Georgia APC EP Div.	Atlanta	GA
HTVN	Augusta Housing Authority	Augusta	GA
HTVN	Augusta Housing Authority	Augusta	GA
FAA	Southern RO	College Park	GA
TNET	Fort Benning	Columbus	GA
SSA		Decatur	GA
ANG	116MSF/ DPMP	Dobbins AFB	GA
SEN	Fort Benning	Fort Benning	GA
SEN	Fort Gordon	Fort Gordon	GA
TNET	Fort Gordon	Fort Gordon	GA
SEN	Fort Stewart	Fort Stewart	GA
ANG	165AG/DPMP	Garden City	GA
FAA	Atlanta ARTCC	Hampton	GA
SSA		Macon	GA
TNET	Dobbins AFB	Marietta	GA
HTVN	Monroe Housing Authority	Monroe	GA
HTVN	Savannah Housing Authority	Savannah	GA
TNET	Robins AFB #1	Warner-Robins	GA
SSA		Waycross	GA
ANG	254ABG/DPMT	Agana	GU
ANG	HQ GU ANG/ESSO	Tamuning	GU
USAF	Hickam AFB	Hickam	HI
ANG	154MSF/DPMT	Hickam AFB	HI
ANG	HQ HI ANG/ESSO	Honolulu	HI
IRS	Honolulu District	Honolulu	HI
SSA		Honolulu	HI
TNET	Kunia	Kunia	HI
EPA	IA Dept of Nat. Res.	Des Moines	IA
IRS	Des Moines District	Des Moines	IA
ANG	132FW/DPMP	Des Moines	IA
SSA		Des Moines	IA
TNET	Fort Dodge	Fort Dodge	IA

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
ANG	HQ IA ANG/ESSO	Johnston	IA
ANG	185MSF/DPMT	Sgt Bluff	IA
EPA	Iowa Dept of Nat Res	Urbandale	IA
SSA		Waterloo	IA
NPS	Craters of the Moon National Monument	Arco	ID
ANG	124MSF/DPMT	Boise	ID
ANG	HQ ID ANG/ESSO	Boise	ID
IRS	Boise District	Boise	ID
SSA		Boise	ID
DOE		Idaho Falls	ID
ANG	126MSF/DPMT	Air ReserveStation	IL
FAA	Chicago ARTCC	Aurora	IL
TNET	Scott AFB	Belleville	IL
HTVN	Chicago Housing Authority	Chicago	IL
EPA	School of Public Health	Chicago	IL
SSA	H Washingtn SSC	Chicago	IL
FDA	ORA/Mid-West Regional Office	Chicago	IL
FDA	ORA/Chicago District Office	Chicago	IL
IRS	Chicago - Regional Office	Chicago	IL
IRS	Chicago District - Tony Dragic	Chicago	IL
TNET	O'HARE	Chicago	IL
SSA		Chicago Heights	IL
FAA	Great Lakes RO	Des Plaines	IL
SSA		Elgin	IL
EPA	Cook Cnty Environmental Control	Maywood	IL
ANG	182MPT/DPMT	Peoria	IL
SSA		Peoria	IL
SEN	Rock Island Arsenal	Rock Island	IL
DISA	Rock Island Arsenal	Rock Island	IL
DISA	Scott AFB	Scott AFB	IL
ANG	HQ IL ANG/ESSO	Springfield	IL
EPA	Illinois DEP	Springfield	IL
IRS	Springfield District	Springfield	IL
ANG	183MSF/DPMT	Springfield	IL
SSA		Springfield	IL
SSA		Springfield	IL
SSA		Waukegan	IL
ARNG	Midwestern Combat Arms Training Bde	Edinburgh	IN
HTVN	Fort Wayne Housing Authority	Fort Wayne	IN
ANG	122MSF/DPMT	Fort Wayne IAP	IN
SSA		Gary	IN
TNET	Grissom AFB	Grissom AFB	IN
EPA	Hammond Dept of Env. Mngt	Hammond	IN
FAA	Indianapolis ARTCC	Indianapolis	IN
EPA	IN Dept of Environ. Mngt.	Indianapolis	IN
IRS	Indianapolis District	Indianapolis	IN
ANG	HQ IN ANG (MDI-AI)	Indianapolis	IN
SSA		Indianapolis	IN
SSA		Indianapolis	IN
SEN	Fort Benjamin Harrison	Indianapolis	IN
NPS	Indiana Dunes National Seashore	Porter	IN
HTVN	South Bend Housing Authority	South Bend	IN
ANG	181MSF/DPMT	Terre Haute	IN
SEN	Fort Riley	Junction City	KS
SSA		Kansas City	KS
SEN	Fort Leavenworth	Leavenworth	KS
TNET	Fort Leavenworth	Leavenworth	KS
FDA	ORA/Kansas District Office	Lenexa	KS
ANG	184MSF/DPMT	McConnel AFB	KS
TNET	McConnel AFB	McConnel AFB	KS
FAA	Kansas City ARTCC	Olathe	KS
IRS	Kansas City SC - Overland Park	Overland Park	KS
ANG	190MSF/DPT	Topeka	KS
ANG	HQ KS ANG/ESSO	Topeka	KS
SSA		Topeka	KS

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Topeka	KS
EPA	Kansas Dept of Hlth & Env.	Topeka	KS
IRS	Wichita District	Wichita	KS
SSA		Corbin	KY
IRS	Cincinnati SC - Covington, KY	Covington	KY
SEN	Fort Campbell	Fort Campbell	KY
EPA		Frankfort	KY
ANG	HQ KY ANG/ESSO	Frankfort	KY
SSA	First City Complex	Frankfort	KY
EPA	Kentucky DEP, Div for Air Qual.	Frankfort	KY
TNET	Greenville	Greeenville	KY
SSA		Lexington	KY
SEN	Lexington Army Blue Grass	Lexington	KY
EPA	Jefferson Cty APC	Louisville	KY
IRS	Louisville District	Louisville	KY
ANG	123MSF/DPMT	Louisville	KY
SSA		Louisville	KY
SEN	Fort Knox	Radcliffe	KY
TNET	Fort Knox	Radcliffe	KY
SSA		Alexandria	LA
EPA	Louisana DEQ	Baton Rogue	LA
SSA		Baton Rouge	LA
TNET	Barksdale AFB	Bossier City	LA
USAF	Barksdale AFB	Bossier City	LA
SEN	Fort Polk	Fort Polk	LA
TNET	Fort Polk	Fort Polk	LA
SSA	New Orleans DDS	Metairie	LA
SSA		Monroe	LA
FDA	ORA/New Orleans District Office	New Orleans	LA
IRS	New Orleans District	New Orleans	LA
ANG	159MSF/DPMP	New Orleans	LA
ANG	HQ LA ANG/ESSO	New Orleans	LA
SSA		New Orleans	LA
TNET	New Orleans	New Orleans	LA
DOE		New Orleans	LA
SSA		Shreveport	LA
IRS	Andover, MA	Andover	MA
USAF	Hanscom AFB	Bedford	MA
EPA	NESCALIM	Boston	MA
SSA	Boston Regional Office	Boston	MA
IRS	Boston District	Boston	MA
SSA		Boston	MA
SSA	Boston Training Fac.	Boston	MA
FAA	New England RO	Burlington	MA
ARNG	Camp Edwards	Cataumet	MA
ANG	102MSF/DPMT	Cataumet	MA
SSA		New Bedford	MA
SSA		Somerville	MA
TNET	Westover AFB	Springfield	MA
FDA	ORA/Boston District	Stoneham	MA
ANG	253CCG/IMT	Wellesly	MA
ANG	104FG/DPT	Westfield	MA
FDA	ORA/Winchester Engineering & Analytical Ctr (WEAC)	Winchester	MA
SSA		Worcester	MA
ARNG		Aberdeen Proving Ground	MD
SEN	Aberdeen Proving Ground	Aberdeen Proving Ground	MD
TNET	Aberdeen Proving Ground	Aberdeen Proving Ground	MD
ANG	113MSF/ DPMT	Andrews AFB	MD
ANG	8201 MSSF	Andrews AFB	MD
TNET	Andrews AFB	Andrews AFB	MD
HTVN	Baltimore Housing Authority	Baltimore	MD
EPA	MD Dept of Environment	Baltimore	MD
SSA		Baltimore	MD
FDA	ORA/Baltimore District Office	Baltimore	MD
IRS	Baltimore District	Baltimore	MD
ANG	135MSF/DPT	Baltimore	MD
ANG	HQ MD ANG/ESSO	Baltimore	MD
SSA	ODIO Processing Center-Incl. D	Baltimore	MD
SSA		Baltimore	MD

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Baltimore	MD
USAF	Andrews AFB	Camp Springs	MD
SEN	Fort Dietrick	Fort Dietrick	MD
DISA	Fort Richie	Fort Richie	MD
FDA	Center for Devices and Radiological Health	Gaithersburg	MD
DOE		Germantown	MD
ARNG	Laurel Armory	Laurel	MD
SEN	Fort Meade	Laurel	MD
TNET	Fort Meade	Laurel	MD
TNET	National Cryptological School	Linthicum	MD
ARNG	Camp Fretterd	Reisterstown	MD
FDA	Center for Devices & Radiological Health	Rockville	MD
FDA	Center for Devices & Radiological Health	Rockville	MD
FDA	ORA/ORM/DHRD /HFC-60	Rockville	MD
FDA	ORA/Office of Enforcement	Rockville	MD
SSA		Towson	MD
SSA		Towson	MD
IRS	Augusta District	Augusta	ME
ANG	HQ ME ANG/ESSO	Augusta	ME
SSA		Augusta	ME
ARNG		Bangor	ME
ANG	101MPF/ DPMT	Bangor	ME
SSA		Portland	ME
EPA	Dept of Enivron & Industrial Hlth.	Ann Arbor	MI
ANG	110MSF/DPT	Battle Creek	MI
SSA	Detroit (East Grosse Point) Center	Detroit	MI
FDA	ORA/Detroit District Office	Detroit	MI
IRS	Detroit Computing Center	Detroit	MI
IRS	Detroit District	Detroit	MI
SSA		Detroit	MI
SSA	Northwest Detroit	Detroit	MI
EPA	Wayne Cnty Dept of Environ.	Detroit	MI
SSA	Downtown Detroit (Highland Park)	Highland Park	MI
SSA		Kalamazoo	MI
EPA	Michigan Dept of Env. Quality	Lansing	MI
HTVN	Lansing Housing Commission	Lansing	MI
ANG	HQ MI ANG/ESSO	Lansing	MI
SSA		Lansing	MI
SSA		Lansing	MI
ANG	127FW/DPMT	Mt. Clemens	MI
TNET	Selfridge ANG	Mt. Clemens	MI
SSA		Traverse City	MI
SEN		Warren	MI
ANG	148MPF/DPMT	Duluth	MN
FAA	Minneapolis ARTCC	Farmington	MN
SSA		Hibbing	MN
ARNG	Camp Ripley	Little Falls	MN
FDA	ORA/Minneapolis District Office	Minneapolis	MN
SSA	Minneapolis (Downtown) Center	Minneapolis	MN
TNET	Minneapolis-St. Paul	Minneapolis-St. Paul	MN
ARNG	Army Aviation Support Facility	St. Paul	MN
IRS	St. Paul District	St. Paul	MN
ANG	133MSF/DPMT	St. Paul	MN
SSA		St. Paul	MN
ANG	HQ MN ANG/ESSO	St. Paul	MN
EPA	Minn. Poll. Ctrl Agency, APC	St. Paul	MN
SSA		Cape Girardeau	MO
SEN	Fort Leonard Wood	Fort Leonard Wood	MO
TNET	Fort Leonard Wood	Fort Leonard Wood	MO
SSA		Jefferson City	MO
ANG	HQ MO ANG/ESSO	Jefferson City	MO
SEN		Jefferson City	MO

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
FAA	Central RO	Kansas City	MO
SSA	Kansas City Regional Trg Ctr	Kansas City	MO
SSA		Kansas City	MO
DOE		Kansas City	MO
SSA		Springfield	MO
ANG	139MSF/DT	St Joseph	MO
ANG	131MSF/DPMT	St Louis	MO
SEN		St Louis	MO
DISA		St Louis	MO
IRS	St. Louis District	St. Louis	MO
SSA	St. Louis (Southside)	St. Louis	MO
SSA		St. Louis	MO
EPA	St. Louis Air Pollution Control	St. Louis	MO
TNET	Whiteman AFB	Whiteman AFB	MO
USAF	Keesler AFB	Biloxi	MS
TNET	Keesler AFB	Biloxi	MS
USAF	Columbus AFB	Columbus AFB	MS
SSA		Hattiesburg	MS
IRS	Jackson District	Jackson	MS
ANG	172MSF/DPMT	Jackson	MS
ANG	HQ MS ANG/ESSO	Jackson	MS
EPA	Mississippi DEQ, Air Qual. Div.	Jackson	MS
SSA		Madison	MS
ANG	186ARG/DPMT	Meridian	MS
SSA		Tupelo	MS
NPS	Vicksburg National Military Park	Vicksburg	MS
ANG	120FG/DPT	Great Falls	MT
IRS	Helena District	Helena	MT
SSA		Helena	MT
ANG	HQ MT ANG/ESSO	Helena	MT
EPA	Montana Dept of Hlth & Env. Sci.	Helena	MT
HTVN	Asheboro Housing Authority	Asheboro	NC
EPA	Western NC APC	Asheville	NC
SEN	Fort Bragg	Bragg	NC
TNET	Fort Bragg	Bragg	NC
SSA	Charlotte (Downtown)	Charlotte	NC
ANG	145MSF/DPMT	Charlotte	NC
EPA	Environ. Mngt Div, Mecklenburg Cty.	Charlotte	NC
SEN	Cherry Point MCAS	Cherry Point	NC
NPS	Carl Sandburg Home National Historic Site	Flat Rock	NC
TNET	Seymour Johnson AFB	Goldsboro	NC
IRS	Greensboro District	Greensboro	NC
TNET	Camp LeJeune	Jacksonville	NC
EPA	NC DEHNR Mooresville Reg. Off.	Mooresville	NC
EPA	NC DEH&NR	Raleigh	NC
SSA		Raleigh	NC
ANG	HQ NC ANG/ESSO	Raleigh	NC
EPA	North Carolina State Univ.	Raleigh	NC
EPA	US&PA Office of Air Qual. Planning & Standards	RTP	NC
EPA	Wash. Reg. Off. Div. Env. Mgt.	Washington	NC
EPA	Div. of Environmental Mngt.	Wilmington	NC
EPA	Forsyth Cty Env. Affairs Dept.	Winston Salem	NC
EPA	NC DEH&NR	Winston-Salem	NC
EPA	North Dakota Dept of Health	Bismarck	ND
ANG	HQ ND ANG/ESSO	Bismarck	ND
SSA	West Central Human Services Center	Bismark	ND
IRS	Fargo District	Fargo	ND
SSA		Fargo	ND
ANG	119MSF/DPMT	Fargo	ND
USAF	Grand Forks AFB	Grand Forks AFB	ND
NPS	Homestead National Monument of America	Beatrice	NE
SSA		Lincoln	NE

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
ANG	155ARG/DPMP	Lincoln	NE
ANG	HQ NE ANG/ESSO	Lincoln	NE
ANG	155ARG/DPMP	Lincoln	NE
EPA	Nebraska DEW, Air Qual. Prgm.	Lincoln	NE
IRS	Omaha District	Omaha	NE
SSA		Concord	NH
ANG	HQ NH ANG/ESSO	Concord	NH
FAA	Boston ARTCC	Nashua	NH
ANG	157.MPF/DPMP	Pease ANGB	NH
IRS	Portsmouth District	Portsmouth	NH
HTVN	Atlantic City Housing	Atlantic City	NJ
FAA	FAA Tech Center	Atlantic City	NJ
SEN	Picatinny Arsenal	Dover	NJ
ARNG		Fort Dix	NJ
SEN	Fort Monmouth	Fort Monmouth	NJ
DISA	Fort Monmouth	Fort Monmouth	NJ
HTVN	Long Branch Housing Authority	Long Branch	NJ
ANG	108ARW/DPMP	Mcguire AFB	NJ
SSA		New Brunswick	NJ
EPA	Rutgers, Dept of Environ. Sci.	New Brunswick	NJ
IRS	Newark District	Newark	NJ
SSA		Newark	NJ
SSA		Newark	NJ
FDA	ORA/New Jersey District Office	Parsippany	NJ
HTVN	Paterson Housing Authority	Paterson	NJ
SSA		Patterson	NJ
TNET	Fort Dix	Pemberton	NJ
SEN	Fort Dix	Pemberton	NJ
SSA		Pleasantville	NJ
ANG	177MPF/DPMT	Pleasantville	NJ
SSA		Trenton	NJ
ANG	HQ NJ ANG/ESSO	Trenton	NJ
EPA	NJ DEC Air Monitoring	Trenton	NJ
TNET	McGuire AFB	Wrightstown	NJ
FAA	Albuquerque ARTCC	Albuquerque	NM
IRS	Albuquerque District	Albuquerque	NM
SSA		Albuquerque	NM
SSA		Albuquerque	NM
ANG	150FG/DPMT	Albuquerque	NM
USAF	Kirtland AFB	Albuquerque	NM
DOE		Albuquerque	NM
USAF	Cannon AFB	Cannon AFB	NM
DOE	WIPP	Carlsbad	NM
USAF	Holloman AFB	Holloman AFB	NM
SEN	White Sands Missile Range	Las Cruces	NM
DOE		Los Alamos	NM
ANG	HQ NM ANG/ESSO	Santa Fe	NM
EPA	New Mexico Environment	Santa Fe	NM
SSA		Carson City	NV
ANG	HQ NV ANG/ESSO	Carson City	NV
EPA	Nevada Bureau of Air Quality	Carson City	NV
SEN	Hawthorne Army Ammunition Point	Hawthorne Army Ammunition Point	NV
IRS	Las Vegas District	Las Vegas	NV
SSA		Las Vegas	NV
DOE		Las Vegas	NV
DOE		Mercury	NV
ANG	152MSQF/DPMA T	Reno	NV
HTVN	Albany Housing Authority	Albany	NY
SSA		Albany	NY
IRS	Albany District	Albany	NY
SSA		Albany	NY
EPA	New York State DEC	Albany	NY
EPA	New York State DEC	Avon	NY
HTVN	Binghamton Housing Authority	Binghamton	NY
SSA	North Bronx	Bronx	NY
DOE		Brookhaven	NY
SSA	Boro Hall	Brooklyn	NY
FDA	ORA/New York Region/District/La b	Brooklyn	NY
IRS	Brooklyn District	Brooklyn	NY

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Brooklyn	NY
SSA	Federal Building	Buffalo	NY
FDA	ORA/Buffalo District Office	Buffalo	NY
IRS	Buffalo District	Buffalo	NY
SSA	Ellicott Square Bldg	Buffalo	NY
SEN	Fort Drum	Fort Drum	NY
		Fort Drum	NY
HTVN	Geneva Housing Authority	Geneva	NY
SSA		Greece	NY
IRS	Holtsville, NY (Brookhaven)	Holtsville	NY
FAA	Eastern RO	Jamaica	NY
SSA		Jamaica	NY
SSA		Jamaica	NY
ANG	DMNA/ANG-DPME	Latham	NY
SSA		Melville	NY
SSA	New York Reg.Of	New York	NY
IRS	New York - Regional Office	New York	NY
IRS	Manhattan District - NYC	New York	NY
SSA	Manhattan DDS	New York	NY
SSA	New York (Midtown)	New York	NY
SSA	Bronx South	Newburgh	NY
ANG	105MSF/DPMT	Newburgh	NY
TNET	Niagara	Niagara	NY
HTVN	Niagara Falls Housing Authority	Niagara Falls	NY
ANG	107MSF/DPMT	Niagara Falls Iap	NY
ARNG		Rochester	NY
USAF	Griffiss AFB	Rome	NY
FAA	NY ARTCC	Ronkonkoma	NY
ANG	109AG/DPMT	Scotia	NY
SEN	Seneca Army Depot	Seneca Army Depot	NY
EPA	New York State DEC	Stonybrook	NY
SSA		Syracuse	NY
ANG	174FW/DPMT	Syracuse	NY
SEN	Watervliet Arsenal	Watervliet Arsenal	NY
FAA	NY TRACON	Westbury	NY
ANG	106RQG/DPMP	Westhampton Beach	NY

AGENCY	FACILITY NAME	CITY	STATE
HTVN	Akron Metropolitan Housing	Akron	OH
EPA	Akron Regional AQM District	Akron	OH
HTVN	Stark Metropolitan	Canton	OH
EPA	Div of Air Pollution Control	Canton	OH
EPA	Univ. of Cincinnati Env. Trng Inst.	Cincinnati	OH
FDA	ORA/Cincinnati District Office	Cincinnati	OH
IRS	Cincinnati - District Office	Cincinnati	OH
IRS	Cincinnati Regional Office	Cincinnati	OH
SSA	Cincinnati (Downtown) Federal	Cincinnati	OH
IRS	Cleveland District	Cleveland	OH
ANG	121MSF/DPT	Colombus ANGB	OH
EPA	Ohio EPA, DAPC	Columbus	OH
SSA		Columbus	OH
SSA		Columbus	OH
ANG	HQ OH ANG/ESSO	Columbus	OH
SEN		Columbus	OH
SEN		Columbus	OH
DISA		Columbus	OH
EPA	RAPCA	Dayton	OH
TNET	Wright-Patterson AFB	Fairborn	OH
SSA	Cleveland West, Lakewood CTR Brch	Lakewood	OH
HTVN	Adams Metropolitan Housing	Manchester	OH
ANG	179MSF/DPMT	Mansfield	OH
FAA	Cleveland ARTCC	Oberlin	OH
ANG	200RHS/DPT	Port Clinton	OH
ANG	178MSF/ DPMAT	Springfield	OH
ANG	180FG/DPMP	Swanton	OH
EPA	Toledo DOES	Toledo	OH
SSA		Toledo	OH
DISA	Wright Patterson AFB	Wright Patterson AFB	OH

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
TNET	Youngstown	Youngstown	OH
USAF	Altus AFB	Altus	OK
TNET	Camp Gruber	Braggs	OK
SEN	Fort Sill	Lawton	OK
TNET	Fort Sill	Lawton	OK
SEN	McAlester Army Ammunition Plant	McAlester Army Ammunition Plant	OK
TNET	Tinker AFB	Midwest City	OK
HTVN	Oklahoma City Housing	Oklahoma City	OK
FAA	MM Aeronautical Center	Oklahoma City	OK
IRS	Oklahoma City District	Oklahoma City	OK
SSA		Oklahoma City	OK
SSA		Oklahoma City	OK
ANG	137MSF/DPMT	Oklahoma City	OK
ANG	HQ OK ANG/ESSO	Oklahoma City	OK
EPA	Dept of Env. Protection	Oklahoma City	OK
TNET	Oklahoma State University	Oklahoma City	OK
DISA		Oklahoma City	OK
HTVN	Stillwater Housing Authority	Stillwater	OK
NPS	Chickasaw National Recreation Area	Sulphur	OK
SSA		Tulsa	OK
ANG	138MSF/DPT	Tulsa	OK
SSA		Eugene	OR
ANG	114FS/DPMT	Klamath Falls	OR
ARNG	Oregon Military Academy	Monmouth	OR
EPA	Oregon DEQ Air Quality Div.	Portland	OR
IRS	Portland District	Portland	OR
SSA		Portland	OR
ANG	142MSF/DPMT	Portland	OR
TNET	Portland	Portland	OR
SSA		Salem	OR
ANG	HQ OR ANG/ESSO	Salem	OR
ARNG	Camp Rilea	Warrenton	OR
SSA		Allentown	PA
ARNG	Fort Indiantown Gap	Annville	PA
ANG	HQ PA ANG/ESSO	Annville	PA
SEN	Carlisle Barracks	Carlisle	PA
DISA		Chambersburg	PA
ANG	171MSF/DP	Coraopolis	PA
SSA		Dubois	PA
ARNG	Eastern Aviation Area Training Site	Fort Indiantown Gap	PA
SSA		Greensburg	PA
SSA		Harrisburg	PA
EPA	Bureau of Air Quality	Harrisburg	PA
ARNG	Johnstown Armory	Johnstown	PA
SEN	Lettterkenny Army Depot	Lettterkenny Army Depot	PA
DISA	Navy Supply Depot	Mechanicsburg	PA
ANG	193SOG/DPMT	Middletown	PA
SEN	New Cumberland Army Depot	New Cumberland	PA
SSA		Philadelphia	PA
SSA	Philadelphia Regional Center	Philadelphia	PA
FDA	ORA/Philadelphia Region/District Offices	Philadelphia	PA
IRS	Philadelphia District	Philadelphia	PA
IRS	Philadelphia Service Center	Philadelphia	PA
SSA	Philadelphia (NorthEast) Center	Philadelphia	PA
SSA		Philadelphia	PA
EPA	Philadelphia Air Mngt. Service	Philadelphia	PA
EPA	Pennsylvania DER	Pittsburg	PA
SSA	Pittsburgh (Downtown) Center	Pittsburgh	PA
IRS	Pittsburgh District	Pittsburgh	PA
SSA	Pittsburgh) (East Liberty) Center	Pittsburgh	PA
TNET	Pittsburgh	Pittsburgh	PA
HTVN	Reading Housing Authority	Reading	PA
HTVN	Scranton Housing Authority	Scranton	PA

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SEN	Tobyhanna Army Depot	Tobyhanna	PA
DOE		West Mifflin	PA
SSA		Wilkes-Barre	PA
SSA		Wilkes-Barre	PA
ANG	111FG/DPMP	Willow Grove	PA
TNET	Willowgrove	Willow Grove	PA
ANG	156MPF/DPMP	Carolina	PR
SSA	San Patricio Branch	Guaynabo	PR
EPA	PR EQA	Hato Rey	PR
IRS	A/C Internet. - San Juan, PR	Hato Rey	PR
SSA		Hato Rey	PR
FDA	ORA/San Juan District Office	San Juan	PR
ANG	HQ PR ANG/ESSO	San Juan	PR
ANG	140ADS/CC	Toa Baja	PR
HTVN	Central Falls Housing	Central Falls	RI
ANG	281CCG/DPMP	Coventry	RI
ANG	143MPF/DPMT	North Kingstown	RI
HTVN	Pawtucket Housing Authority	Pawtucket	RI
HTVN	Providence Housing Authority	Providence	RI
SSA		Providence	RI
IRS	Providence District	Providence	RI
SSA		Providence	RI
ANG	HQ RI ANG/ESSO	Providence	RI
DOE	Savannah Rivier OPS Officer	Aiken	SC
SSA		Charleston	SC
TNET	Charleston NS	Charleston NS	SC
SSA		Columbia	SC
IRS	Columbia District	Columbia	SC
ANG	HQ SC ANG/ESSO	Columbia	SC
EPA	South Carolina DHEC	Columbia	SC
SEN	Fort Jackson	Columbia City	SC
TNET	Fort Jackson	Columbia City	SC
ANG	169FG/DPMT	Eastover	SC
SSA		Greenville	SC
USAF	Charleston AFB	North Charleston	SC

AGENCY	FACILITY NAME	CITY	STATE
SSA		West Columbia	SC
IRS	Aberdeen District	Aberdeen	SD
USAF	Ellsworth AFB	Ellsworth AFB	SD
EPA	SD Dept of Env & Nat. Res.	Pierre	SD
ANG	HQ SD ANG/ESSO	Rapid City	SD
SSA		Sioux Falls	SD
ANG	114MSF/DPMT	Sioux Falls	SD
USAF	Arnold AFB	Arnold AFB	TN
SSA		Chattanooga	TN
ANG	241EIS/CCT	Chattanooga	TN
EPA	Chattanooga-Hamilton Cty APCS	Chattanooga	TN
SSA		Knoxville	TN
EPA	Knox County Dept of APC	Knoxville	TN
ANG	134MSF/DPMT	McGhee Tyson ANGB	TN
FAA	Memphis ARTCC	Memphis	TN
IRS	Memphis Service Center	Memphis	TN
EPA	Memphis-Shelby Co Hlth Dept.	Memphis	TN
ANG	164MPF/DPMT	Memphis	TN
HTVN	Metropolitan Development &	Nashville	TN
FDA	ORA/Nashville District Office	Nashville	TN
IRS	Nashville District	Nashville	TN
SSA		Nashville	TN
SSA		Nashville	TN
EPA	Tennessee APC	Nashville	TN
ANG	118MSS/DPMP	Nashville	TN
ANG	HQ TN ANG/ESSO	Nashville	TN
DOE		Oakridge	TN
USAF	Dyess AFB	Abilene City	TX
DOE		Amarillo	TX
EPA	EITT/ Sweet Center/UTA	Arlington	TX
IRS	Austin District	Austin	TX
IRS	Austin Compliance Center	Austin	TX
IRS	Austin Service Center	Austin	TX

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Austin	TX
EPA	Texas NRCC	Austin	TX
ANG	HQ TX ANG/ESSO	Austin	TX
TNET	Camp Mabry	Austin	TX
TNET	Bergstron AFB	Austin	TX
EPA		Bellaire	TX
SEN	Chorpus Christi Army Depot	Corpus Christi	TX
SSA	Dallas Regional Training Center	Dallas	TX
FDA	ORA/Dallas District Office & Lab	Dallas	TX
FDA	ORA/Southtwest Regional Office	Dallas	TX
IRS	Dallas - Regional Office	Dallas	TX
IRS	Dallas District	Dallas	TX
ANG	136MPF/DPMT	Dallas	TX
HTVN	El Paso Housing Authority	El Paso	TX
EPA	El Paso City/Cty Hlth & Env. Dist.	El Paso	TX
SSA		El Paso	TX
TNET	Fort Bliss	El Paso	TX
FAA	Ft Worth ARTCC	Euless	TX
FAA	Southwest RO	Fort Worth	TX
EPA	Texas WRCC	Fort Worth	TX
TNET	Carswell AFB	Fort Worth	TX
HTVN	Galveston Housing Authority	Galveston	TX
ANG	254CCG/IMX	Garland AGS	TX
HTVN	Houston Housing Authority	Houston	TX
FAA	Houston ARTCC	Houston	TX
FDA	ORA/Houston Resident Post	Houston	TX
IRS	Houston District	Houston	TX
SSA	Houston (NorthEast)	Houston	TX
EPA	Texas NRCC	Houston	TX
ANG	147MSF/DPMT	Houston	TX
TNET	Houston	Houston	TX
ANG	149MSF/DPMT	Kelly AFB	TX
USAF	Kelly AFB	Kelly AFB	TX
TNET	Kelly AFB	Kelly AFB	TX
SEN	Fort Hood	Killeen	TX

AGENCY	FACILITY NAME	CITY	STATE
TNET	Fort Hood	Killeen	TX
USAF	Laughlin AFB	Laughlin	TX
SSA		Lubbock	TX
SSA		McAllen	TX
USAF	Goodfellow AFB	San Angelo	TX
TNET	Goodfellow AFB	San Angelo	TX
HTVN	San Antonio Housing Authority	San Antonio	TX
SSA	San Antonio (Downtown) Branch	San Antonio	TX
SEN	Fort Sam Houston	San Antonio	TX
USAF	Brooks AFB	San Antonio	TX
USAF	Lackland AFB	San Antonio	TX
TNET	Fort Sam Houston	San Antonio	TX
DISA		San Antonio	TX
ANG	HQ UT ANG/ESSO	Draper	UT
USAF	Hill AFB	Hill AFB	UT
TNET	Hill AFB	Hill AFB	UT
NPS	Natural Bridges National Monument	Lake Powell	UT
IRS	Ogden SC	Ogden	UT
FAA	Salt Lake City ARTCC	Salt Lake City	UT
EPA	Utah Div. of Air Quality	Salt Lake City	UT
IRS	Salt Lake City District	Salt Lake City	UT
SSA		Salt Lake City	UT
SSA		Salt Lake City	UT
ANG	151MPF/DPMT	Salt Lake City	UT
SEN	Tooele Army Depot	Tooele Army Depot	UT
TNET	CNET		VA
TNET	Virginia Public Works		VA
TNET	T School		VA
SSA		Alexandria	VA
SEN	Fort Belvoir	Alexandria	VA
ARNG	ARNG Readiness Center	Arlington	VA
TNET	Pentagon	Arlington	VA
DISA		Arlington	VA
ARNG	Blackstone Armory	Blackstone	VA
TNET	Call	Call	VA

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
IRS	IRS TV Studio - Uplink	Crystal City	VA
IRS	Training Facility - Crystal City	Crystal City	VA
SSA	Northern VA Regional DDS	Fairfax	VA
SSA	One Skyline Tower	Falls Church	VA
SEN	Fort Eustis	Fort Eustis	VA
TNET	Fort Eustis	Fort Eustis	VA
SEN	Fort Lee	Fort Lee	VA
TNET	Fort Lee	Fort Lee	VA
USAF	Langley AFB	Langley AFB	VA
FAA	DC ARTCC	Leesburg	VA
SEN		Newport News	VA
TNET	OSIA 1	OSIA 1	VA
SSA	Richmond (Downtown) Center	Richmond	VA
IRS	Richmond District	Richmond	VA
SSA	Central Regional DDS	Richmond	VA
EPA	Dept of Envir. Quality	Richmond	VA
SSA	Southwest VA Regional DDS	Roanoke	VA
ANG	192FG/DPM	Sandston	VA
ANG	HQ VA ANG/ESSO	Sandston	VA
ARNG	General Sands Armory	Virginia Beach	VA
SSA	Tidewater Regional DDS	Virginia Beach	VA
SSA		Wise	VA
EPA	Div of Env. Protection	Christiansted	VI
ANG	285CCF	Kingshill	VI
IRS	Burlington District	Burlington	VT
ANG	HQ VT ANG/ESSO	Colchester	VT
ARNG	Vermont NG Regional Training Institute	Jericho	VT
TNET	Vermont Interactive Television	Randolph Center	VT
ANG	158MPF/DPMT	South Burlington	VT
SSA		Waterbury	VT

AGENCY	FACILITY NAME	CITY	STATE
NPS	Mount Rainer National Park	Ashford	WA
FAA	Seattle ARTCC	Auburn	WA
SSA		Auburn	WA
FDA	ORA/Seattle District office	Bothell	WA
ANG	DET 1, HQ WA ANG/DPMP	Camp Murray	WA
ANG	141MSF/DPMT	Fairchild AFB	WA
USAF	Fairchild AFB	Fairchild AFB	WA
TNET	Fort Lewis	Fort Lewis	WA
TNET	McChord AFB	McChord AFB	WA
FAA	Northwest Mountain RO	Renton	WA
SSA		Renton	WA
DOE		Richland	WA
EPA	Dept of Civil Engineering	Seattle	WA
IRS	Seattle	Seattle	WA
SSA	Seattle Reg Ofc	Seattle	WA
SSA		Seattle	WA
SSA		Spokane	WA
SSA		Tacoma	WA
ANG	HQ WA ANG/ESSO	Tacoma	WA
SSA		Tumwater	WA
ARNG	WI Regional Training Institute	Fort McCoy	WI
SSA		Green Bay	WI
EPA	Wisc. Dept. of Nat. Res.	Madison	WI
SSA		Madison	WI
ANG	115MSF/DPMT	Madison	WI
ANG	HQ WI ANG/ESSO	Madison	WI
HTVN	Milwaukee Housing Authority	Milwaukee	WI
SSA	Milwaukee (North) Center	Milwaukee	WI
IRS	Milwaukee District	Milwaukee	WI
ANG	128ARW/DPMT	Milwaukee	WI
TNET	Gen Mitchell Airport	Milwaukee	WI
EPA	WV Dept. of Environ. Protection	Charleston	WV
ARNG	Charleston Armory	Charleston	WV

Attachment 4-2: Federal Government Video Teletraining Database

AGENCY	FACILITY NAME	CITY	STATE
SSA		Charleston	WV
SSA		Charleston	WV
ANG	130MPF/DPMT	Charleston	WV
ANG	HQ WV ANG/ESSO	Charleston	WV
SSA		Clarksburg	WV
SSA		Clarksburg	WV
ARNG	Fairmont Armory	Fairmont	WV
NPS	Harpers Ferry Center	Harpers Ferry	WV
ARNG	Mountain State Center for Indep. Living	Huntington	WV
IRS	Martinsburg Computing Center	Martinsburg	WV
ANG	167AG/DPMT	Martinsburg	WV
IRS	Parkersburg District	Parkersburg	WV
TNET	Camp Guernsey	Camp Guernsey	WY
EPA	Wyoming DEQ	Cheyenne	WY
IRS	Cheyenne District	Cheyenne	WY
SSA	Cheyenne Office	Cheyenne	WY
ANG	153AG/DPMP	Cheyenne	WY
ANG	HQ WY ANG/ESSO	Cheyenne	WY
USAF	F E Warren AFB	FE Warren	WY

Attachment 4-3: Industry Trends

OVERVIEW

This section discusses industry trends related to the development and delivery of technology-based education and training.

DELIVERY OF INTERACTIVE COURSES

The delivery of interactive courses is not limited to one distribution system or technology. Hybrid applications employing multiple approaches can take advantage of existing infrastructures and result in relatively high performance. The following subsections review state-of-the-art course delivery instructors.

HYBRID APPLICATIONS

Hybrid applications are applications that use both stand-alone media, such as CD-ROM, and network connections (for example, to the Internet). Because of the severe bandwidth limitations of data networks, applications that require a high multimedia level are increasingly using stand-alone media to distribute the multimedia part of the application and data networks to tie in more up-to-date content. The imminent release of DVD-ROM will permit extremely high-quality audio and video to be coupled with networked-based courses that include up-to-the-minute subject matter as well as connectivity between remote instructors and instructors.

Hybrid applications should be considered for courses that require a high level of multimedia content as well as on-line connections between learners and instructors and frequent updates or changes in curricula.

"WIRELESS" DATA BROADCAST

In an effort to overcome the inherent bandwidth limitations of most networks, new data broadcast services are becoming available. These systems differ from typical data networks because they basically flow one way (from a server to users) over the air in response to requests received over a traditional data network. Usually, these services broadcast within a local area. The signals are decoded by a local receiver and then sent to the user's computer. Thus, there are two paths for data: One path is low-speed over low-bandwidth networks which, in turn, requests high-bandwidth data be sent over the air.

Attachment 4-3: Industry Trends

"WIRELESS" DATA BROADCAST (CONTINUED)

This form of wireless system should be considered for course applications that need to transmit high bandwidth to users but do not need a high-speed return channel. Because these types of networks require local area transmitters and a receiver for each system (or cluster of systems on a LAN), this approach can be complex and costly to implement. Nearly the same results can be achieved by using a hybrid approach (see the description on the previous page) without the expense and system administration (if the high-bandwidth data are not frequently updated or changed).

"INFORMATION PUSH" TECHNOLOGY

In another effort to overcome bandwidth limitations over networks in general, and the Internet in particular, so-called "information push" technology has emerged over the past year. With this approach, software operates in the background, requesting large volumes of data over a network in non-real time. These data are accumulated in a large cache on the local hard drive of the user's computer. When the user activates the application, the data are rapidly delivered from the local drive as though they were actually being received from the network.

Information push systems allow information to be frequently updated and refreshed, thus giving the illusion of high-performance, real-time content even when connected to relatively low-bandwidth networks. For such systems to work, the user's computer must be continuously connected to a network (as is the case on LANs), or the computer must dial in periodically for the latest data download.

Information push technology is still relatively young and so far is being used only for information gathering applications such as news, sports, stock quotes, etc., which can be customized by users. As a method for deploying courses, this approach still lacks tools and appropriate client software. This is likely to change over the next several years.

SOFTWARE DOWNLOADING

An attractive and simple approach to course distribution is to use existing networks simply as a means to convey traditional computer-based training courses from a central server to the end user's computer. Internet systems have long supported data transfer through standardized utilities such as FTP (File Transfer Protocol) over the Internet. It is now possible and relatively easy to move files from nearly any networked location to a local system for execution.

Attachment 4-3: Industry Trends

SOFTWARE DOWNLOADING (CONTINUED)

With this approach, courses that could have been sent to the end user on a stack of floppy diskettes or on a CD-ROM can easily be delivered over the network. The speed of delivery is, of course, tied directly to the bandwidth of the network. For example, using a 28.8 Kbps modem, a 1.2 MB floppy would take about 5.5 minutes. This is a considerable amount of data, which could be loaded before a training session and can produce very effective results with a modest amount of multimedia content. By contrast, however, downloading a full CD-ROM (640 MB) at this same data rate would take approximately 49 hours. Thus, this approach is useful only for smaller data "chunks" and doesn't replace the need for CD-ROMs for multimedia-rich applications.

Download speeds certainly increase on computers connected to higher speed networks, but for most situations this approach works best for courses that have a low to medium amount of multimedia content (e.g., graphics, medium resolution images and audio, little or no video). As with courses that are distributed on stand-alone media, the software may have specific dependencies that require a particular platform and configuration for this strategy to succeed. As in previous cases, configuration management is a key issue.

EMERGING NETWORK TOOLS AND TECHNIQUES

A number of new technologies are being developed and integrated that will be able to be applied to technology-based education and training applications over existing networks in the future. Although they are in the early stages of development, it is reasonable to expect that these and other approaches will be deployable within the next 2 years as part of an overall distribution strategy.

SLIDEWARE

- "Slideware": Companies such as Microsoft offer software converters that permit slide presentations prepared with packages such as Microsoft PowerPoint to be converted directly to an Internet-friendly form that can be incorporated directly into Web pages (complete with interactive spots and media objects).

INTERNET BANDWIDTH MANAGEMENT

- Internet Bandwidth Management: Internet standards groups are making good progress in designing protocols, such as RSVP, that permit bandwidth to essentially be "reserved" for users over the Internet. If successful, higher bandwidth sessions could become possible, permitting audio and video teleconferencing between learners and instructors. Similarly, multicast technology is being developed for the network that permits data broadcasts from "one to many" so that instructors may send one data stream to many user locations, thus consuming less overall bandwidth.

Attachment 4-3: Industry Trends

CHALKBOARDS

- Chalkboards: A number of tools are in development that create a direct data link between one teacher and many learners. Such systems permit questions to be queued so that the teacher may address one or all learners with responses. Streamed audio from instructor to learners can be added, along with low-grade video (10 to 15 frames per second, quarter screen) for networks with relatively high bandwidth (128 Kbps typical minimum).

Many of these approaches are available today in the research phase. However, they have not yet been tested and integrated as large-scale standardized product offerings.

COMMUNICATIONS

Several new trends are emerging in the communications field that will impact technology-based education and training applications.

ADSL

Asynchronous Digital Subscriber Line (ADSL) is a new modem technology that works over ordinary phone lines to deliver high-speed transmissions such as true multimedia, full motion video, and Internet downloads. ADSL can transmit up to 9 MBps to a subscriber and up to 640 Kbps from the subscriber to the provider.

Two ADSL modems are required on an ADSL circuit, one on each end of the twisted-pair phone line. Three separate frequency channels make up the circuit. The first channel carries plain telephone system signals. The second carries information upstream from the subscriber's home to the provider at 16 to 640 Kbps. The third carries high-speed downstream data to the subscriber at a rate of 1.5 to 9 MBps. ADSL modems will also accommodate ATM technology when market requirements mature.

ADSL uses sophisticated digital signal processing (DSP) and creative algorithms to squeeze massive amounts of data over standard twisted-pair phone lines. It utilizes many technological advances in transformers, analog filters, and analog-to-digital converters.

Attachment 4-3: Industry Trends

ADSL (CONTINUED)

Hundreds of ADSL lines have been installed in North America and Europe by as many as 30 telephone companies. Some uses for ADSL include video on demand, personal shopping, interactive games, educational programming, and most importantly, high-speed Internet access.

Very-high-data-rate Digital Subscriber Line (VDSL) promises even greater speeds than ADSL because it can operate at rates between 13 and 55 MBps.

CABLE MODEMS

A cable modem is a device that uses existing cable TV networks to deliver high-speed data access to entities such as the Internet. Download speeds range from 500 Kbps to 30 MBps, while upload speeds can potentially range from 96 Kbps to 10 MBps.

The cable modem modulates and demodulates the cable signal, hence its name. It also incorporates a tuner, network adapters, bridges, routers, network management software agents, and encryption devices. A cable modem sends modulated digital signals downstream by placing them on a 6 MHz television carrier, between the frequencies of 42 MHz and 750 MHz. This does not disturb the existing cable TV signals that allow the consumer to watch cable TV programming by means of the cable modem. The upstream signal has to contend with noise and interference from CB radios, household appliances, lights, and other devices and is transmitted between the frequencies of 5 MHz and 40 MHz.

Cable modem costs will be comparable to that of a high-end computer modem. An option will be for the consumer to rent the cable modem from the provider for a monthly fee.

Standardization for cable modems is underway. Nine vendors announced that their future products will work together. Four vendors (AT&T, Intel, Hewlett-Packard, and Hybrid Networks) were planning to publish a standard. Others, including CableLabs, the Video Electronics Association, and the Digital Audio-Visual Council, are working on standardization efforts,

Internet access via cable modems won't be widespread for about 5 years. Once they are fully up and running though, cable modems could offer the best price for performance ratio, delivering 10 MBps speed at very modest cost.

Attachment 4-3: Industry Trends

ISDN

Integrated Services Digital Network (ISDN) is a two-wire phone line that carries digital signals. ISDN is completely digital; thus, it takes only seconds to make a connection, unlike analog modems, which have to negotiate each call. Lines with three digital signals are referred to as Basic Rate Interface (BRI). In BRI, there is a "D," or delta, channel that handles control and signaling information, such as the amount of bandwidth the line uses or the phone number information. There are two "B," or bearer, channels that can carry voice and/or data. The B-channels can handle 56 Kbps or 64 Kbps. They can also be combined to form a single channel capable of 128 Kbps.

Lines with 24 digital signals are referred to as Primary Rate Interface (PRI). PRI consists of 23 "B" channels and one "D" channel. This is often referred to a 23B + D and can operate at 1.544 MBps.

ISDN is not available in all areas. Even if a "neighborhood" is served by a digital switch, it might not be compatible with ISDN. And if it is compatible, the consumer must be located within 18,000 feet of a central office. Even if the phone company offers ISDN service, not all Internet Service Providers (ISPs) offer ISDN access.

The equipment needed depends on how many computers require ISDN access. The equipment includes ISDN modems, adapter cards, and a bridge/router. Routers are needed for hooking up multiple computers to an ISDN line. ISDN modems do not modulate or demodulate as do analog modems. They take the digital signal and pass it to the computer's serial port. The signal is not converted to analog as with regular computer modems.

ISDN modems are different from ISDN adapters. ISDN modems are connected to the computer's serial port and are limited to the port's speed. ISDN adapters however, are connected to the computer's bus and don't have this limitation, but are more difficult to set up than modems. Some popular models include Digi PC IMAC by Digi International and LANLine by Gandalf Technologies.

Attachment 4-3: Industry Trends

Internet access via satellite is available today by Hughes Network Systems' DirecPC. Vendors will install and mount dishes on a consumer's property for a fee. Configuring and maintaining them is, however, somewhat difficult, and there is no return data path for uploading functions. In order to "upload," a separate dial-in account to an ISP is required.

The DirecPC satellite has been tested for its download speeds. It downloaded a 2.6 MB file in 143 seconds. That is a rate of 182 Kbps, much slower than the advertised speed of 400 Kbps. The same file can be downloaded on an ISDN line at 149 Kbps.

Internet access via satellites could be the wave of the future for businesses because it is more cost-effective than a leased T1 line, but it is not quite ready for home use.

Table 4-9 shows the different access technologies and their specifications.

Table 4-9. Communications Alternatives

Access Technology	Upload Speed	Download Speed
ADSL	16 - 640 Kbps	1.5 - 9 MBps
Cable Modems	96 Kbps - 10 MBps	500 Kbps - 30 MBps
Analog Modems	14.4 - 33.6 Kbps	14.4 - 33.6 Kbps
ISDN (BRI)	56 - 128 Kbps	56 - 128 Kbps
Leased Lines (T1)	64 Kbps - 1.5 MBps	64 Kbps - 1.5 MBps
Satellite	NA	180 - 400 Kbps

Appendix A

Glossary

Appendix A: Glossary

Acquisition Community—Civilian and military personnel working at designated acquisition organizations.

Affective Domain—The area of human learning associated with attitudes, feelings, interests, opinions, world views, and values.

Artificial Intelligence (AI)—A field of computer science that deals with designing computer software that can reason and solve problems. AI includes expert systems (computer programs that offer advice and form the basis of performance support systems).

Asynchronous—Communication in which interaction between parties does not take place simultaneously.

ATM (Asynchronous Transfer Mode)—High speed (up to 155 Mbps), high bandwidth, low-delay, transport technology, integrating multiple data types (voice, video, and data). ITU has selected ATM as the basis for the future broadband network because of its flexibility and suitability for both transmission and switching. ATM may be used in the phone and computer networks of the future.

ATN—Air Force Training Network.

Bandwidth—A measure of spectrum (frequency) use or capacity. For instance, a voice transmission by telephone requires a bandwidth of about 3000 cycles per second (3 Khz). A TV channel occupies a bandwidth of 6 million cycles per second (6 Mhz) in terrestrial systems. In videoconference-based systems a larger bandwidth of 17.5 to 72 Mhz is used to spread or dither the television signal in order to prevent interference.

Baud—The rate of data transmission based on the number of signal elements or symbols transmitted per second. Today most digital signals are characterized in bits per second.

Bit—A single digital unit of information.

Bit Rate—The speed of a digital transmission, measured in bits per second.

Bloom's Taxonomy—A classification of learning objectives developed by Benjamin Bloom that addresses affective and cognitive learning outcomes in hierarchical fashion. The taxonomy cites six cognitive behaviors—knowledge, comprehension, application, analysis, synthesis, and evaluation. The taxonomy also cites five affective behaviors—receiving, responding, valuing, organization, and characterization. (Psychomotor behaviors were not addressed by Bloom.)

Bps—Bits per second; a unit of measurement of the speed of data transmission and thus of bandwidth.

Broadband—The term applied to networks having bandwidths significantly greater than those found in telephony networks. Broadband systems are capable of carrying a large number of moving images or a vast quantity of data simultaneously. Broadband techniques usually depend on coaxial or optical cable for transmission. They utilize multiplexing to permit the simultaneous operation of multiple channels or services on a single cable. Frequency division multiplexing and cell relay techniques can both be used in broadband transmission.

Byte—A group of eight bits; usually the smallest addressable unit of information in a data memory storage unit.

CBT—Computer-based training.

CD ROM (Compact Disk Read Only Memory)—The ISA physical, optical, and electronic standard for the 5¼-inch compact disk audio and data storage medium. The format holds 660 MB of data and approximately 60 minutes of stereo audio. This standard has been in place for 15 years.

Client—A component of the client/server network topology, which has replaced the mainframe/dumb terminal network topology. The server contains the bulk of the operating software for a network and provides mass storage of data that can be accessed by any of the "client" computers on the network. A network may have many users which are all equipped with a client computer system attached to the file server.

CNET—Chief of Naval Education and Training.

Cognitive Domain—The area of human learning associated with intellectual skills, such as assimilation of information or knowledge.

Compression—The process of reducing the information content of a signal so that it occupies less space on a transmission channel or storage device.

Constructivism—A learning theory postulating that learning only takes place when an individual constructs new mental frameworks. Applications of this theory emphasize active learning in situations that have high fidelity to those encountered in the job context.

COTS Software—Software that may be purchased as a commercial-off-the-shelf item.

Course Validation—A process designed to ensure that a training course is capable of achieving its intended aims and functions.

CU-SeeMe—Program providing real-time audio and video communication over the Internet, available from Cornell University.

Data Compression—The process of reducing the size of a data file by reducing unnecessary information, such as blanks and repeating or redundant characters or patterns.

DAWIA—Defense Acquisition Workforce Improvement Act.

DAWIA Workforce—Civilian and military personnel subject to the provisions of 10 USC Chapter 87.

Distance Education—*See Distance Learning*.

Distance Learning—An instructional method in which the instructor or facilitator is geographically separated from the learners.

DoD 5000.52-M, Career Development Program for Acquisition Personnel—This document established mandatory and desired training standards for the defense acquisition workforce.

DVD (Digital Versatile Disc)—The new ISA physical, optical, and electronic standard for a 5¼-inch double-sided optical disk format for storing up to 17.4 gigabytes of digital data. The new standard is a joint development effort of the Hollywood movie industry and the largest names in the electronics industry. The new standard provides 2 hours of high-definition video with up to six separate language tracks. It promises to revolutionize the multimedia industry.

Electronic Performance Support System (EPSS)—A computer-based system that improves worker productivity by providing on-the-job access to integrated information, advice, and learning experiences. An EPSS may provide any combination of expert system, hypertext, embedded animation, computer-assisted instruction, and hypermedia to an employee on demand. Such systems allow employees to perform with a minimum of support and intervention from others. Examples include help systems, electronic job aids, and expert advisors.

Ethernet—A LAN running on coaxial or twisted pair wiring, at 1 or 10 Mbps.

Expert System—Program that offers on-the-job advice to a user, thus assisting the user to take appropriate action. Expert systems are the principle component of electronic performance support systems.

FACNET—Federal Acquisition Computer Network, which allows for electronic commerce/electronic data interchange of acquisition information between the Government and the private sector.

Fast Ethernet—A way to run ethernet at 100 Mbps on one or two pairs of standard, unshielded telephone copper wire.

File Server—The central computer system on a network which all the “client” computers connect to in order to share and archive information. The file server is typically a much higher powered computer system than the clients that are attached.

Formative Evaluation—The evaluation of instructional content and methods conducted during early developmental stages for the purpose of revising and improving materials before widespread use.

Fps—Frames per second.

Fraction T1 (FT1)—Any data transmission rate between 56 Kbps and 1.544 Mbps. It is typically provided by a carrier in lieu of a full T1 connection and is a point-to-point arrangement. A specialized mutliplexer is used by the customer to channelize the carrier's signals.

FTP (File Transfer Protocol)—The Internet protocol (and program) used to transfer files between hosts.

FTS 2000—The name of the Government-wide telecommunications contract put in place by the General Services Administration (GSA). This 10-year contract provides a wide range of communications services (e.g., telephone, switched 56, ISDN, T1, compressed digital video).

GUI—Graphical user interface.

Guided Social Simulations (GuSS)—An expert system that allows learners to practice decision making in simulated situations while being guided by simulated expert characters.

GuSS—*See Guided Social Simulations*.

Hertz (Hz)—The name given to the basic measure of radio frequency characteristics. An electromagnetic wave completes a full oscillation from its positive to its negative pole and back again in what is known as a cycle. A single hertz is thus equal to one cycle per second.

HTML Formats—Hypertext Markup Language formats. HTML is a convention of codes used to access documents over the World Wide Web. Without HTML codes, a document would be unreadable by a Web browser.

Hub—A network's or system's signal distribution point where multiple circuits convene and are connected. This allows switching or information transfer to take place. Switching hubs can also be used in Ethernet LAN environments in an arrangement whereby a LAN segment might support only one workstation. This relieves congestion through a process called micro-segmenting.

Hypermedia—A program that links different media under learner control in much the same way as hypertext links text. Hypermedia links such media as text, graphics, video, voice, and animation.

Hypertext—A program that links nonlinear text, so that the user can browse to seek additional information by moving between related documents along thematic lines without losing the context of the original inquiry. Such text has been marked to allow the user to select words or pictures within the document in order to access further information. Hypertext is the basis of the World Wide Web.

Instructional Systems Design (ISD)—A systematic process for developing instructional programs that ensures personnel learn the knowledge, skills, and attitudes essential for successful job performance. The phases of ISD are: analysis, design, development, implementation, and evaluation.

Internet—An international computer network made up of scores of smaller networks that are linked together by international protocols.

Internet Relay Chat (IRC)—A worldwide online text-based conferencing system that allows for multiparty discussions.

Interoperability—The ability of electronic components produced by different manufacturers to communicate across product lines. The trend toward embracing standards has greatly furthered the interoperability process.

Intranet—A TCP/IP complaint network that is set up within an organization to share information. The Intranet uses the same protocols that the Internet uses, so a wide range of computers can communicate (Workstations, PCs, Macintoshes, etc.). The network can be many separate physical networks that are connected by high-speed telecommunications links. The Intranet is typically separated from the outside world via an electronic security layer referred to as a “fire wall.”

IRC—*See Internet Relay Chat*.

ISD—*See Instructional Systems Design*.

ISDN (Integrated Services Digital Network)—A CCITT standard for integrated transmission of voice, video, and data. Bandwidths include Basic Rate Interface - BR (144 Kbps - 2 B & 1D channel) and Primary Rate - PRI (1.544 and 2.048 Mbps). A set of protocol and interface standards that effectively constitute an integrated (voice, video, and data) telephone “network.” These standards promote global availability and compatibility of ISDN products and services. ISDN PRI is the ISDN equivalent of a T1 circuit.

ISP (Internet Service Provider)—A company that provides an organization with communication and computer access to the Internet. There are thousands of ISPs nationwide. Some of the larger ones are UUNet, PSI Net, MCI, and AT&T.

JPEG—ISO Joint Picture Expert Group standard for the compression of still pictures.

Just-in-Time Training—A networked instructional system that electronically provides modules of instruction, when needed, at a level and with materials best suited for the individual learner.

Kbps—Kilobits per second. Refers to transmission speed of 1,000 bits per second.

Kilohertz (kHz)—Refers to a unit of frequency equal to 1,000 hertz.

Kirkpatrick Model of Evaluation—A classic four-level model of summative evaluation developed by Donald Kirkpatrick. The evaluation levels are: (1) reaction, (2) learning, (3) behavior, and (4) results. For example, a Level 3 evaluation would assess training transfer, and a Level 4 evaluation would examine whether organizational goals for the training have been met.

Knowledge Workers—Personnel whose main job tasks involve obtaining, analyzing, and processing information.

LAN (Local Area Network)—A computer network linking workstations, file servers, printers, and other devices within a local area, such as an office. LANs allow the sharing of resources and the exchange of both video and data.

Leased Line—A dedicated circuit typically supplied by the telephone company.

MBONE—*See Multicast Backbone of the Internet*.

MBps—Megabits per second.

Megahertz (MHz)—Refers to a frequency equal to one million hertz, or cycles per second.

Metacognition—A synonym for learning to learn; knowledge of the human cognitive process.

Microwave—Line-of-sight, point-to-point transmission of signals at high frequency. Many CATV systems receive some television signals from a distant antenna location with the antenna and the system connected by microwave relay. Microwaves are also used for data, voice, and indeed all types of information transmission. The growth of fiber optic networks has tended to curtail the growth and use of microwave relays.

MMX-Enabled PC—The new enhanced Pentium microprocessor released by INTEL Corporation to provide high performance handling of video and graphics. The MMX-based Pentium contains a special instruction set which speeds the processing of multimedia-based graphics and video by up to 600 percent.

MOO—*See MUD-Object Oriented*.

MPEG—An acronym of the Motion Picture Experts Group (MPEG). The MPEG developed the MPEG digital compression standard to encode and decode motion video from an analog waveform to a digital data stream.

MUD-Object Oriented (MOO)—MUDs that allow for the manipulation of and interaction with objects in addition to chatting with people.

MUDs—*See Multiuser Dimensions*.

Multicast Backbone of the Internet (MBONE)—A virtual network of host and routers connected to the Internet that is used for multimedia conferencing. The MBONE is used as a multicast channel on which various audio and video programs are sent.

Multiplexing—A technique that allows a number of simultaneous transmissions over a single circuit.

Multipoint—Communication configuration in which several terminals or stations are connected. This differs from point-to-point, in which communication is between two stations only.

Multiuser Dimensions (MUDs)—Multiuser text-based virtual realities accessible via the Internet that allow people to access the same place at the same time.

Network—A group of stations (computers, telephones, or other devices) connected by communications facilities for exchanging information. Connection can be permanent, via cable, or temporary, through telephone or other communications links. The transmission medium can be physical (copper, wire, fiber optic cable, etc.) or wireless, for example via satellite.

NMETN—Navy Medical Education Training Network.

Node—A concentration point in a network where numerous trunks come together at the same switch.

NTIS—National Technical Information Service.

On-Demand Training—*See Just-in-Time Training*.

One-Way Video Teletraining—A distance learning method using audio conferencing between two or more sites combined with video signals from the sending facility.

PointCast Systems—An Internet application that allows information to be sent to users/students based on their interests/profile information.

POTS (Plain Old Telephone Service)—Conventional analog telephone lines using twisted-pair copper wire. POTS are used to provide residential service.

Psychomotor Domain—The area of learning associated with physical movement and skills.

Rapid Prototyping—In technology-based training design, the early development of a small-scale prototype used to test key features of the design.

SEN—Satellite Education Network.

SMTP—Simple Mail Transport Protocol.

Summative Evaluation—The evaluation of instruction that is conducted during and after delivery in order to assess the instructional environment, learning, on-the-job use, and return on investment. Summative evaluation occurs during the evaluation phase of ISD.

SVGA Graphics (Super Video Graphics Adapter)—A computer video display standard developed originally by IBM to provide 1040 horizontal x 768 vertical resolution with up to 16,777,216 colors.

Synchronous—Communication in which interaction between participants is simultaneous.

T1—The transmission bit rate of 1.544 million bits per second (Mbps). This is also equivalent to the ISDN Primary Rate Interface for the United States. The European T1 or E1 transmission rate is 2.048 Mbps.

T2—The transmission bit rate of 6.2 million bits per second (Mbps).

T3—The transmission bit rate of 45 million bits per second (Mbps).

Telecommuting—The process of commuting to work electronically rather than physically. Telecommuting will find much greater acceptance as the public switched telephone network becomes more robust and digital and as videoconferencing and multimedia technologies arrive at the desktop.

TNET—Army Training Network.

Training Transfer—The application of new knowledge and skills, acquired during training, in the work setting (on-the-job application).

Two-Way Video Teletraining—A distance learning method using audio and video images exchanged between two or more locations.

Uplink—The system that transmits an audio, data, and video signal to a satellite. The Uplink consists of a large parabolic reflector disk, feed horn (vertical/horizontal/circular), low noise bandwidth (LNB) amplifier, and high-power amplifier. An Uplink can be fixed or steerable, and the size of an Uplink varies depending on the bandwidth (number of channels), satellite power, and operating frequency (e.g., C-Band, Ku-Band).

URL—Uniform Resource Locator.

Video Gateway—A system that “bridges” two different video networks. The “video gateway” provides audio/video signal routing between two separate and incompatible networks. The gateway may permit some level of interoperability by allowing partial communication between dissimilar networks.

Video Teletraining (VTT)—A form of live real-time distance learning that provides either one-way video/two-way audio or two-way video/two-way audio communications between the instructor and the learners. Typically the two-way video/two-way audio uses videoconferencing CODECs and ISDN or T1 land lines to communicate to multiple sites, and the one-way video/two-way audio uses satellite broadcast to reach many downlink sites.

Virtual Classroom Interface—A display used in Web-based/CD-ROM courses to simulate being in a classroom/university setting.

Virtual Office Simulations—A display used in Web-based/CD-ROM courses to simulate being in an office work environment.

Virtual Private Network—A series of separate physical computer networks that are connected via a wide area network and provide a common security layer to allow a virtual network to exist on separate networks.

WAN (Wide Area Network)—A communications network that services a geographic area larger than that served by a local area network or metropolitan area network. WANs include commercial or educational dial-up networks such as CompuServe, Internet, and BITNET.

Whiteboarding—A term used to describe the placement of shared documents on an on-screen "shared notebook" or "whiteboard." Desktop videoconferencing software includes "snapshot" tools that enable the user to capture entire windows or portions of windows and place them on the whiteboard. Familiar Windows operations may also be used (e.g., cut and paste) to put snapshots on the whiteboard. The electronic whiteboard is marked up much like a traditional wall-mounted board.

Wireless—Transmission via radio waves or satellite. Wireless transmission is likely to be used in many computer networks of the future.

World Wide Web (www)—A graphical hypertext-based Internet tool that provides access to homepages created by individuals, businesses, and other organizations.

ATTACHMENT 4-3

INDUSTRY TRENDS

APPENDIX B

PLAN COMMENTS RECEIVED

Appendix B: Plan Comments

Introduction

This Appendix provides a listing of the organizations and one individual that have provided written and/or verbal comments to DAU's Technology-Based Education and Training Plan. This list is current as of 4 April 1997.

Organizations Providing Comments

Organization	Date	Format of Comments
Defense Systems Management College	13 March 1977	Five-page fax
Defense Logistics Agency	7 March 1997	One-page letter
Robert Hawkins	14 March 1997	Six-page e-mail
DAU Consortium Members	3 March 1997	List of comments consolidated from meeting of Consortium members held at DAU on 3 March 1997
DAU Board of Visitors	4 March 1977	List of comments consolidated from meeting of the Board of Visitors held at DSMC on 4 March 1997
DAU Consortium Members	18 March 1997	List of comments consolidated from meeting of Consortium members held at DAU on 18 March 1997