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Benefits and Costs of Distance Learning: A Perspective From the Distance Learning Literature Since 1995

Katherine M. Stapp

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June 2001

Annotated Bibliography

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DEPARTMENT OF THE ARMY
TRADOC Analysis Center-White Sands Missile Range (TRAC-WSMR)
White Sands Missile Range, NM 88002-5502

Prepared By	Certified By	Approved By
Study Director TRAC-WSMR	DONNA K. VARGAS SES, US Army Director, TRAC-WSMR	RAYMOND D. BARRETT JR Major General, GS Deputy Chief of Staff for Training

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14. ABSTRACT

The purpose of this report is to provide an overview of the DL literature from 1995 to present and to identify the latest trends and issues in DL. Specific areas reviewed included evaluations of training effectiveness relative to traditional classroom instruction, cost effectiveness and potential cost savings, and course design or redesign requirements for DL courses. There was also an attempt to find research related to initial skill acquisition using DL, since initial skill learning is different from the learning required by advanced students. Findings included that the effectiveness of technology-based DL is dependent on the quality of the course materials, the skills of the instructor to create effective learning situations, learning skills of the student, and the quality of the equipment, technical support, courseware and the technology used. A significant up-front investment is required for DL, both in technology and in instructional design and instructor preparation. Courses need to be redesigned to take into account the inherent design advantages (or disadvantages) of the new technology over the old technology. The requirements for initial skills training vary from refresher training requirements. One of the primary benefits of DL for Army training may well be the increased readiness of our troops due to the potential of being able to train troops anywhere in the world, at anytime, and just-in-time. With distance learning, skills can be trained, retrained, and refreshed with expediency.

15. SUBJECT TERMS

Distance learning, training effectiveness, cost effectiveness, technology infusion, online courses, initial skills, course design, Army training.

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Benefits and Costs of Distance Learning: A Perspective From the Distance Learning Literature since 1995 Executive Summary

Background

In 1997, Training and Doctrine Command (TRADOC) Analysis Center-White Sands Missile Range (TRAC-WSMR) published a DL annotated bibliography which covered over a hundred DL reports in ten different categories, including evaluation, VTT, computer-based training, cost effectiveness, and guidelines for planning and implementing DL (Howard 1997). The studies reviewed covered the time frame prior to 1995. There also have been other literature reviews published since (Metzko, Redding et al. 1996; Russel 1999; Wisher, Champagne et al. 1999). This document attempts to build on the work already done, and does not intend to replicate already published works. Specific areas reviewed included evaluations of training effectiveness relative to traditional classroom instruction, cost effectiveness and potential cost savings, and course design or redesign requirements for DL courses. There was also an attempt to find relevant research on initial skill acquisition using DL, since initial skill learning is different from the learning required by advanced students.

Objective

Objective: Provide an overview of the DL literature from 1995 to the present and identify recent research findings relevant to specific issues and challenges faced by the Army.

Methodology

A literature search was conducted of published studies and reports on the application of DL technologies, with the objective of gathering credible information sources from universities, industry, professional and trade literature, and from the military. The emphasis was in reviewing the literature from 1995 to the present to identify the latest trends, issues, and research in DL. Additionally, the works included were selected because they are unique, well designed and executed, offer insight into current practice or developing DL trends, and/or have relevance to the Army.

The literature search focused on six key subject areas:

- Benefits of DL
- Cost of program development and implementation
- Course design and evaluation

- Instructor and faculty issues
- Automation skills training
- Recent trends in the DL literature

Works for this publication were selected to be of particular interest and utility to Army planners, training developers, and trainers and to provide them with a solid foundation in what is currently known to be sound principles and practices in DL in this dynamic world of technology-based learning and teaching. Seventy abstracts are presented in appendix A. Major findings are summarized in the main body of the report.

Conclusions and Recommendations

The literature is in general agreement that training effectiveness of DL courses can be at least equivalent to that of traditional classroom instruction. Nevertheless, recent literature cites a need for tighter research controls to better quantify differences between DL and traditional training program outcomes. The effectiveness of DL is dependent on the quality of the course materials, the skills of the instructor to create effective learning situations, learning skills of the student, and the quality of the equipment, technical support, and courseware. With respect to costs, most savings projections are in the delivery of DL, not the development, although this may change with evolving technologies. A significant up-front investment is required for DL, both in technology and in instructional design and instructor preparation.

We are witnessing an evolution in the definition of what constitutes a learning event. As the learning event is being redefined, skills required for learning are being delineated: organizing information, inquiry skills, research skills, information literacy, independent study, communication skills, and team problem-solving skills. The tremendous advantages available from technology are lost if the learning tools that truly take advantage of the new media are not being incorporated. It is not enough to simply transfer programs of instruction designed for traditional classroom delivery onto the Web. Courses need to be redesigned to take into account the inherent design advantages (or disadvantages) of the new technology over the old technology.

One of the primary benefits of DL with implications for Army training may well be the increased readiness of our troops due to the advantages of being able to train troops almost anywhere in the world, at anytime, and just-in-time. With DL, skills can be trained, retrained, and refreshed with expediency. Another important finding for the Army is that the requirements for initial skills training vary from refresher training requirements. Multimedia training programs may need to provide more aid to students with less initial knowledge, including more goal-directedness, feedback on activities, and connections with previous knowledge. The Army recruits soldiers from a diverse and heterogeneous population with varying levels of computer experience. Soldier training success can be increased by identifying soldiers with little or no computer experience and providing them with computer literacy training to get them off to a better start.

Table of Contents

Executive Summary . . . iii
Acknowledgments . . . vii

Purpose . . . 1
Background . . . 1
Scope . . . 2
Methodology . . . 2
Benefits of Distance Learning . . . 4
  Training Effectiveness . . . 4
  Other Benefits . . . 5
Cost of Program Development and Implementation . . . 6
Course Design and Evaluation . . . 8
  Student to Instructor Ratios . . . 8
  Student Interaction . . . 9
  Target Audience Assessment . . . 9
  Communication . . . 10
  Course Design . . . 11
  New Guidelines for Course Evaluation . . . 11
Instructor and Faculty Issues . . . 12
  Adverse Faculty Reactions to DL Programs . . . 12
  Good Teaching is Good Teaching . . . 12
  Faculty Roles . . . 12
Automation Skills Training Summary . . . 13
  Computer Literacy . . . 13
  Initial Skills Training . . . 14
Summary of Recent Trends in the DL Literature . . . 14
Implications for Army Training . . . 16

Appendix A. Annotated Bibliography . . . 19

References . . . 67
Acronyms . . . 73
Distribution . . . 77

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Benefits and Costs of Distance Learning: A Perspective From the Distance Learning Literature Since 1995

Purpose

The purpose of this report is to provide an overview of the distance learning (DL) literature from 1995 to present and to identify the latest trends and issues in DL.

Background

In 1997, Training and Doctrine Command (TRADOC) Analysis Center-White Sands Missile Range (TRAC-WSMR) published a DL annotated bibliography that covered 106 DL reports in 10 different categories, including evaluation, video teletraining (VTT), computer-based training, cost effectiveness, and guidelines for planning and implementing DL (Howard, 1997). The studies reviewed covered the period before 1995. There have also been other literature reviews published since (Metzko, Redding, and Fletcher, 1996; Russell, 1999; Wisher et al., 1999). This document attempts to build on the work already done, and does not intend to replicate already published works. Specific areas reviewed included evaluations of training effectiveness relative to traditional classroom instruction, cost effectiveness and potential cost savings, and course design or redesign requirements for DL courses. There was also an attempt to find relevant research on initial skill acquisition using DL, since initial skill learning is different from the learning required by advanced students.

What is distance learning (DL)? A generally accepted definition of DL coined by Los Alamos National Laboratory is the "structured learning that takes place without the physical presence of the instructor." An extended definition from the literature is that "Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques for course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements" (Wisher et al., 1999).

The impact of telecommunications technologies is so great that conceptual models of teaching and of education are coming into question (Syllabus, November/December 1999). Distance education today has exceeded the mere concerns of time and space and is forcing us to question some of the most basic approaches to teaching and learning (Dillon and Granger, 1998).

Scope

While the concentration of effort was in the review of post-1995 literature, some works published before 1995 are included where pertinent to the discussion. The focus was on recent research findings relevant to specific issues and challenges the Army faces in trying to adapt rapidly changing technology to an equally rapidly changing Army.

Methodology

A literature search was conducted of published studies and reports on the application of DL technologies, with the objective of gathering credible information sources from universities, industry, professional and trade literature, and from the military. The emphasis was in reviewing the literature from 1995 to the present to identify the latest trends, issues, and research in DL. Additionally, the works included were selected because they are unique, well designed and executed, offer insight into current practice or developing DL trends, and/or have relevance to the Army.

The literature search focused on six key subject areas:

- Benefits of DL
- Cost of program development and implementation
- Course design and evaluation
- Instructor and faculty issues
- Automation skills training
- Recent trends in the DL literature

Works for this publication were selected to be of particular interest and utility to Army planners, training developers, and trainers, and to provide them with a solid foundation in what is currently known to be sound principles and practices in DL in this dynamic world of technology-based learning and teaching. Keyword searches in several databases such as Defense Technical Information Center (DTIC), Educational Resources Information Center (ERIC), Internet DL sites, libraries, etc., yielded thousands of information sources in the rapidly expanding DL field. From the thousands of information sources available, 70 studies were selected for inclusion in this report. The 70 abstracts are presented in appendix A. The abstracts are presented alphabetically by author and are assigned a reference number. Table 1 provides a cross-reference of topics to the numbered abstracts contained in the bibliography.

Table 1. Literature References by Topic	
Topic	**Reference Number**
Benefits of DL	1, 5, 8, 9, 10, 11, 12, 14, 15, 20, 21, 22, 24, 28, 31, 34, 35, 36, 38, 39, 41, 44, 45, 46, 49, 50, 51, 52, 53, 57, 58, 59, 60, 61, 62, 65, 66, 67, 69, 70
Cost of Program Development and Implementation	4, 5, 6, 7, 13, 22, 23, 24, 28, 29, 31, 34, 35, 39, 46, 47, 48, 53, 58, 63, 66, 68
Course Design and Evaluation	2, 4, 5, 7, 8, 14, 15, 17, 18, 19, 20, 22, 24, 25, 26, 27, 30, 31, 32, 36, 41, 45, 50, 53, 55, 56
Instructor and Faculty Issues	8, 14, 22, 26, 31, 32, 45, 48, 53, 54, 55, 59, 60
Automation Skills Training	3, 24, 25, 30, 31, 33, 41, 51, 56, 62, 64, 66, 69
Recent Trends in the DL Literature	16, 37, 39, 40, 42, 43, 49, 53, 54, 55, 61, 69

The pace of technology-driven change is quickening and, as a result, it becomes difficult to keep up with and classify the quantities of information now available at one's fingertips. If one enters the keywords, distance learning, into an Internet search engine such as Yahoo, one will get back literally hundreds of thousands of hits. Hara and Kling (Hara and Kling, 2000) define at least five major kinds of DL literature: (1) specialized research literature, which includes journals such as the Journal of Asynchronous Learning and the American Journal of Distance Education, research monographs, and specialized conferences; (2) practitioner literature whose audience is administrators and faculty who may be involved in such courses (e.g., The Chronicle of Higher Education) (3) instructional materials for students (course materials); (4) popular accounts (mainstream press); and (5) marketing descriptions of courses and degree programs.

Table 2 contains a breakout of the 70 DL literature abstracts contained in this report by the classification of DL literature described above (Hara and Kling, 2000). The concentration of effort focused on the specialized research and practitioner literature, with lesser attention given to popular press and marketing materials. The reader is directed to appendix A for an overview of DL information sources, many of which are online.

Table 2. References by Literature Classification	
Classification	**Number of References (n = 70)**
Specialized Literature	56
Practitioner Literature	12
Instructional Materials	0
Popular Press	2
Marketing Descriptions	0

Benefits of Distance Learning

Training Effectiveness

The evidence from the literature overwhelmingly supports the tenet that DL is as effective as traditional instruction in achieving a wide range of instructional objectives. The evidence comes from such studies as the Institute for Defense Analyses (IDA) review of over 300 studies (Metzko et al., 1996), Kulik and Kuliks' meta-analysis of 254 computer-based instruction (CBI) studies (Kulik, 1994), and Russell's "No Significant Difference" phenomenon as reported in 218 studies (Russell, 1999), among many others.

However, two recent comprehensive reviews, one military and one academic, have called into question the way that effectiveness has been studied with respect to DL. The issues are both complex and subtle. DL is effective, but how effective it is depends on the quality of the courseware (indeed the question might better be what constitutes good teaching, whether face-to-face or at a distance), the learning skills and maturity of the students, the skill of the instructor teaching with this medium, the motivation of students and instructors, as well as the technology used. The two studies, "What's the Difference? A Review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education," by the Institute for Higher Education Policy, April 1999 (Phipps and Merisotis, 1999), and "Training Through Distance Learning: An Assessment of Research Findings," by the United States (US) Army Research Institute (ARI), June 1999 (Wisher et al., 1999), point out that many evaluations on DL outcomes are anecdotal, and that there is a relative paucity of true, quality research dedicated to explaining or predicting phenomena related to DL. Implications of recent research are that technology cannot always replace the human factor in education and the technology employed is secondary to pedagogical factors such as learning skills, student motivation, and the quality of both the courseware and the instructor.

The report by Phipps and Merisotis (Phipps and Merisotis, 1999) has itself come under fire. In an article by Brown and Mack (Brown and Mack, 1999) their evaluation of DL literature is described as convoluted, naïve, and contradictory, and their expectations of the research as unrealistic. Another critique, in an editorial on the report, further points out that a basic problem with critiques of individual studies, such as the one by Phipps and Merisotis, is that they ignore the fact that all of the studies show no significant difference. The piece of the critique that is missing, one that would make the criticism even more convincing, is a list of studies showing that there is a significant difference, and that the difference is in favor of classroom instruction (Ewell, 1999). Another point brought out in the debate over significance studies in general was that the comparison of a DL course to a control group, a traditional classroom, has limits, among which are the quality of the traditional course of instruction. In the case where the traditional course is of marginal quality, all the comparison is saying is that DL performed as well as a course taught poorly.

A key issue with respect to empirical studies of skills training in general was documented in the third report of the National Academy of Sciences' select Committee on Techniques for the Enhancement of Human Performance (CTEHP), which is the tendency of trainees and trainers to inadvertently fool themselves and each other about what and how much has been learned and trained (Druckman and Bjork, 1994). This unique 14-member committee was formed in 1985 to evaluate the potential of a number of innovations and specific techniques that were claimed to have enhanced human performance to a significant degree. The committee found that the traditional climate of military training, including pressures for efficiency and intolerance of errors, may reinforce such tendencies to over-measure success. The purpose of training, after all, is post-training performance. Their analysis indicated that training conditions that enhance skill acquisition might retard skill retention and transfer to job performance.

Indeed, many who study these issues in universities believe that new paradigms of DL and online instruction call for new paradigms of evaluation (Faculty, 1999). New research has set forth sets of guiding principles for DL teaching and learning, which can be viewed in light of determining key elements for evaluation (Association of Distance Education Colleges (ADEC), 2000; Harasim, Hiltz, Teles, and Turoff, 1995; Indiana Higher Education Telecommunication System (IHETS), 2000). In addition to the question on whether learning competence is equal to or superior to that of a traditional classroom, DL related issues include the following: is the teaching style innovative, are students engaged in the material, is there interaction between professors and their students and between the students themselves, is access to technical support readily available, and are the signs of academic maturity evident, e.g., are the students thinking critically, and is there a desire for life-long learning being fostered in them?

Other Benefits

Benefits that can accrue from DL also include improved access for students. Individual motivation and access may be improved by the distance education course because it either: (1) appeals to a broader range of individual learning styles than does classroom instruction or (2) it makes it easier for individuals to participate in learning activities. Another benefit noted from academic publications is a sense of institutional renewal for both the university and the faculty, such as new energy, fresh ideas, and a renewed sense of discovery and innovation. It is demonstrated in its potential to motivate the institution and the faculty to rethink and reform the curriculum and the way courses are offered. Faculty enthusiasm provides the basis for institutional change and is acknowledged to be a very important aspect for adoption of DL. Further, improved exam scores and course completion rates ultimately translate into improved performance in other courses, a reduced rate of withdrawal from the university, and higher degree completion rates. There is also a potential social benefit of an increased proportion of the population that is better educated (Jewett, 1999).

Military studies have also identified training benefits associated with DL courses (Howard, 1997; Metzko et al., 1996; Westfall, 1998). "The economic value of increased training accessibility and the resulting increased readiness available from more

comprehensive use of DL technologies ... may prove to be the primary payoff from systematic adoption of DL technologies for RC training" (Metzko et al., 1996).

The benefits of DL for military training include:

- Can be just as effective as resident instruction
- Offers "just-in-time" scheduling
- Saves travel time and per diem costs
- Offers the ability to reach soldiers who could not otherwise be reached
- Can reduce backlog of training requirements
- Can offer enhanced instruction, remediation techniques, and real-time methods of communication and feedback
- Can make correspondence programs interactive
- Encourages life-long learning

Cost of Program Development and Implementation

A number of recent university studies have evaluated the costs of DL courses relative to traditional delivery modes. Major highlights from these cost studies are summarized below.

The University of California Special Project, which evaluated the benefits and costs of 10 different case studies in distributed learning, found that economies of scale could exist at the course level (Jewett, 1999). Average costs decline as the fixed costs are spread over larger course enrollments. The total costs of distance education rise more slowly than those of classroom instruction. This is because the incremental costs of adding students to a distance course are less than those of a classroom course, and the two cost functions ultimately converge, and at some level of enrollment, they intersect. Their cost model showed the crossover point in the range of 150-300 average annual course enrollments with an assumed course production cost of $200,000, a 5-year useful life for the instructional materials, and interaction/evaluation costs in the range of $150 to $250 per student. Doubling course production costs moves the crossover point closer to 400 enrollments. Course sharing, in which two or more campuses share the course production costs and all list the shared course as its own (each campus continues to incur the student interaction and evaluation costs associated with its own students), provides the potential for total course enrollments sufficient to obtain the benefits of economies of scale (Jewett, 2000).

A note of caution with regard to economies of scale is also found in recent DL literature. The large, industrial-sized economies of scale envisioned by some university administrators may not be realistic according to the findings of an 18-month long academic review of the value of DL by an interdisciplinary faculty group (University of Illinois Faculty Seminar) that convened to study online teaching and learning (Faculty, 1999). Because high quality online teaching is time and labor intensive, it is not likely

to be the income source envisioned by some university administrators. The scenario once envisioned of hundreds of students enrolling in a well developed, essentially instructor-free online course does not appear realistic. With some exceptions, the successful online course features low student to faculty ratios. The exceptions involve extraordinary amounts of the professor's time. Besides the initial investment in technology, technical support for professors and students and maintenance of hardware and software are very expensive. Online instruction is not likely to cost significantly less than traditional instruction unless the number of students taught is large or the materials do not require frequent updates.

Six recent university studies commissioned by the Alfred P. Sloan Foundation indicated that most of the universities that participated in the studies are near the break-even point with their DL programs (Bishop and SchWeber, 2000; Geith and Vignare, 2000; Hislop, 2000; Miller, 2000; Sachs, 2000; Wentling, 2000). The studies also found that defining costs is a difficult process, that university accounting procedures were not always well suited to a case-study approach, and that small variations in class size could affect profitability. While costs of technology and technical support required for DL programs are greater than traditional programs, the physical infrastructure that is needed to support traditional programs will ultimately make the difference in profitability. Unlike technology, the cost of land, buildings, and utilities do not go down over time. There is potential for online courses to be 20 percent cheaper than traditional courses due to the costs of the physical infrastructure required for traditional delivery.

Technology is expected to go down in price, or rather, computational power per unit cost will increase, and at an exponential rate (Kurzweil, 1999). Ray Kurzweil, an award-winning physicist, computer scientist, and author, projects that by 2019, a $1,000 personal computer will have the computational capability of the human brain (20 million billion calculations per second) and computers will be largely invisible and embedded everywhere. The growth in computational power is irrespective of the particular computer hardware technology, as new computing technologies are being developed that will replace the current chip-based systems. According to Kurzweil, people will soon be routinely using three-dimensional displays built into their glasses or contact lenses. Most learning will be accomplished using intelligent software-based simulated teachers. To the extent that teaching is done by human teachers, the teachers will not be in the local vicinity of the students and will play a mentoring and counseling role as opposed to being the sources of learning and knowledge. Reading books, newspapers, and other Web documents, listening to music, watching movies or television, and entering virtual environments will all be done through a communications web that does not require any equipment, devices or objects that are not worn or implanted. These projections and others like them indicate the likely development over the next 10 to 20 years of new technologies that we have not even visualized today. Their impact is understandably unknown at this time, but potentially revolutionary.

Course Design and Evaluation

The impact of telecommunications technologies is so great that conceptual models of education are coming into question. The term "paradigm shift," first introduced in the early 1960s by science historian Thomas Kuhn to describe the discontinuous nature of the progress of science, is being applied more and more frequently to the rapidly growing movement toward digital instruction. According to Kuhn, scientific knowledge is organized within paradigms or conceptual systems. Scientists hang on to familiar frames and concepts for as long as they can, only allowing a paradigm shift to take place long after it should have become plain that the old concepts do not suffice. This paradigm shift is similar to how all learning takes place. It is not a smooth, gradual process, but can be best illustrated as a series of jumps from one plateau to the next. With the current technology infusion within teaching and learning, the very notion of a course or a classroom are issues of current debate (Dillon and Granger, 1998). What is "the class" for? This is the question being posed by educators. New technologies are making information access and learning possible in ways that previously did not exist. Learning itself is becoming the significant activity, which coincides with increasing learning needs in an information society. A new "learning space," in which the total context, or set of conditions, within which learning takes place, is being defined (Raschke, 1999).

Current issues in the course design and evaluation literature include the following:

Student to Instructor Ratios

Online class size may have an inherent limitation, determined by the amount of effort required to form "a community of learners." The instructor's challenge is to create appropriate conditions for a group-learning environment. To be really effective, there must be a great deal of interaction between the students themselves. In online courses, the workload of faculty is directly related to the number of students. Students have expressed frustration when there is a lack of immediate feedback from the instructor, from ambiguous instructions, or from ineffective communication (Hara and Kling, 2000).

Small class sizes and the development of a sense of community may be especially important in light of recent research on the impacts of heavy Internet usage on family and social networks. The study, published in the American Psychologist in September 1998 (Kraut et al., 1998) used longitudinal data to examine the impacts of the Internet on 73 households during their first 2 years online. Greater use of the Internet was found to be associated with declining communication with family members, declining size of social circles, and increasing depression and loneliness.

Network and distance technology tools can be used successfully to enhance student success rates in large classes (Kashy, Thoennessen, Tsai, Davis, and Wolfe). In large classes, technology tools can be used for computer-assisted grading of assignments, quizzes, and examinations, permitting a reallocation of instructors' and teaching

assistants' time away from repetitive jobs such as grading and record keeping to tasks more directly related to student achievement.

Student Interaction

In DL classes, student interaction has become an important measure for assessment and evaluation (Chickering and Ehrmann, 1997; Hara and Kling, 2000; (IHETS), 2000; Policy, 2000). During the 1980s, educators came up with the pivotal seven principles for good undergraduate education, which have been updated recently to reflect technology advances (Chickering and Ehrmann, 1997). Two of these principles deal directly with student interaction among themselves and with faculty. The first of the seven principles is that "Good Practice" encourages contacts between students and faculty. The update concludes that new communication technologies can increase access to faculty members and provide for joint problem solving and shared learning and can strengthen faculty interactions with all students, but especially with shy students, or non-English native speakers. The second principle is that "Good Practice" develops reciprocity and cooperation among students. Learning is enhanced when it is more of a team effort than a solo race. The update notes that the increased opportunities for interaction noted above with faculty apply equally to communication with fellow students. Study groups, group problem solving, collaborative learning, and feedback can all be strengthened through communication tools such as e-mail.

Student interaction is also one of the 24 assessment benchmarks for distance education recently delineated by the Institute for Higher Education Policy (Policy, 2000). "Student interaction with faculty and other students is an essential characteristic" of a high quality Internet-based course.

Target Audience Assessment

Multimedia training programs may need to provide more aid to students with less initial knowledge (Lee, Gillan, and Harrison, 1996). This laboratory assessment found that the multimedia software package was less beneficial for students with less initial knowledge in the topic and that for training such students, multimedia software may need to include more goal-directedness, feedback on activities, and connections with previous knowledge.

The need for motivation, a key component of a student's involvement in learning, is a function of a student's age and background, intellectual capacity, and psychological makeup. Young students may require more frequent student-faculty contact in and out of class than older, more mature students. This is the primary reason given for advocating that young students experience the traditional university on-site educational delivery, at least in part, rather than going wholly DL for their undergraduate degree programs. The role of attentiveness given by the professor to his students imparts the "human touch," providing the spark for the process of socialization and competence building (Faculty, 1999).

Another issue related to target audience assessment is the different computer backgrounds of individuals entering computer-mediated instruction and/or a DL course. Several recent studies have documented the heterogeneous computer backgrounds of the US population (Bachman, Segal, Freedman-Doan, and O'Malley, 2000; Gladieux and Swail, 1999; Hoffman and Novak, 1998). Although computer literacy may be on the rise, mixing computer-savvy individuals with those who have little to no experience can lead to less than successful results. Solutions mentioned in the literature include requiring students to enter the class with a basic literacy of computer skills provided by paid classes at a local community college or training center for example, or to extend the training program to include these skills. Prerequisite courses in general computing was also a suggested solution. Another suggestion from the literature was to group students in small teams with at least one skilled user on each team to help the others (Compton, 1999).

Some major universities are requiring that students who take distance education courses take an "online orientation course." Also emerging are some new internal consulting groups and workshops for prospective DL instructors. University administrators are starting to recognize online courses as a complex instructional engagement requiring new materials and new behaviors on both the part of the students and the instructors (Hara and Kling, 2000).

Communication

The teaching paradigm is changing for online instruction, away from the traditional lecture format. The online environment is essentially a space for written interaction at the present time, and writing is yet another fundamental medium of expression with its own properties and powers. In the hands of professors who know what they are doing, online instruction can be superior to face-to-face instruction (Harasim et al., 1995). The ability to sit and think through questions and comments generally result in students' contributing material that is much better than something they would say off the top of their heads in a face-to-face class. However, those students without solid writing and/or typing skills are at a distinct disadvantage.

On the other hand, brief and incomplete responses often lead to miscommunication. The study performed by Hara and Kling (Hara and Kling, 2000) documents students' communication problems and other sources of distress while taking an online course. When the main form of communication is in writing, complexities and ambiguities arise due to the nature of text-based media. The students must anticipate the level of detail and phrasing that will be sufficiently helpful to others. In this study, students were unsure of the appropriateness of certain kinds of e-mail, for example, an e-mail that represents the nodded heads of a face-to-face group; does this type of message help to confirm one's understanding of the subject matter or does it simply result in yet more e-mail glut? The authors note that key issues regarding reliable and well-timed communication need to be negotiated within a class so that students and instructor's expectations regarding e-mail, feedback, technical support, etc. can be aligned, thereby reducing frustration and anxiety.

The instructor has an important role in moderating the online course interaction. The role of the instructor as online moderator is required to compensate for the absence of physical cues found in the traditional classroom. Students must be informed as to the exact nature of the online conference, whether it is a class, or a meeting, or a support group, for example. Communications must be monitored to assure that all students are participating and, finally, the instructor-moderator must provide "weaving comments" which summarize the state of the discussion and provide a sense of accomplishment and direction (Faculty, 1999). New technologies such as video streaming will render obsolete many of the problems encountered with the text-based medium of current asynchronous online course offerings, while no doubt creating new and equally complex pedagogical issues.

Course Design

Course design requirements are tied to the media used for presentation. A good discussion of different media presentation features with respect to learning tasks and developing skills can be found in A.W. Bates "Technology, Open Learning, and Distance Education" (Bates, 1995). Bates warns that it is common for educators and media specialists to carry over modes of design associated with an "old" technology to a newer technology, even though the new technology may have inherent design advantages (or disadvantages) over the old technology. Thus, professors often use television, for example, to relay lectures, rather than designing their lecture to maximize televisions' presentational characteristics. Another practice, often referred to as shovelware, is for faculty to simply put their syllabi on the Web and then transfer over their lectures as text. Again, with this approach, the learning tools that truly take advantage of the Web media are not being incorporated (Davis, 1999). The tremendous opportunities available from technology are lost if its advantages are not fully exploited.

Using video as a broadcast medium for DL continues to be a very viable option for many universities and colleges. At the Public Broadcasting System (PBS), video is a key instructional medium due to the high level of motivation and understanding it can engender, according to the director of learning innovations for the PBS Adult Learning Service (ALS) (Davis, 2000). PBS, in collaboration with Intel, is also becoming actively involved in "enhanced television," a recently developed distribution method that enables supplemental digital information to be broadcast along with a digital video signal that can be captured by a computer for nonlinear access. Over the past 5 years, the biggest change in communications around the world has been the emergence of mature digital technologies, as nearly all communications move from analog to digital. "We are just beginning to understand their potential for education," according to Davis (Davis, 2000).

New Guidelines for Course Evaluation

New benchmarks for evaluating distance education courses have been developed over the last year. A study undertaken by the Institute for Higher Education Policy (Policy, 2000) culminated in a list of 24 benchmarks to ensure quality Internet-based courses. The new benchmarks reflect the new requirements of teaching and learning at

a distance. Some of the 24 benchmarks listed include: having a documented technology plan; setting minimum standards for course development, design and delivery; ensuring that students engage themselves in analysis, synthesis, and evaluation; and student interaction with faculty and students and the measurement of this interaction. Students also need to have access to sufficient library resources that may include a "virtual library" accessible through the World Wide Web (WWW).

Other benchmarks refer to faculty support requirements in the forms of technical assistance in course development, help in transitioning from classroom to online instruction, and instructor training and assistance, including peer mentoring, throughout the course.

Instructor and Faculty Issues

Nowhere does the two-sided, promise or peril, nature of distance education come into play more directly than with respect to instructors and faculty. Their issues and concerns cover topics ranging from quality of education, defining what comprises good teaching, retraining to learn the new skills and technologies, to copyright and intellectual property issues.

Adverse Faculty Reactions to DL Programs

Early ventures to create the California Virtual University, a consortium of public and independent colleges, and the California Educational Technology Initiative (CETI), which was formed to facilitate business transactions between California State University (CSU) and a number of computer firms, were defeated due to concerned faculty resistance and lack of fundamental support. Proposals for radical retooling of universities have provoked faculty hostility. Faculty argue that administrators are mainly concerned with the money-making potential of distance education, and that when administrators are solely in charge of implementing technology in the classroom, there is the risk of "technology driving pedagogy" instead of "pedagogy driving technology" (Faculty, 1999).

Good Teaching is Good Teaching

Another issue highlighted in recent DL literature is how to translate good teaching in the classroom to good teaching online (Chickering and Ehrmann, 1997; Faculty, 1999; Policy, 2000; Ragan, 1998). Seven principles of good teaching developed by the American Association for Higher Education in 1987 have been updated for online teaching in 1997 by taking each of the original seven principles and applying them to new learning technologies (Chickering and Ehrmann, 1997).

Faculty Roles

As universities rapidly develop courses for delivery via the Internet, what will be the impact on faculty roles and responsibilities? One impact discussed in the literature is the division of labor between those who develop and prepare content and those who

teach it (Moore, 2000). It is unlikely that universities will be able to compete in the global market of distance education without changing its organizational structures, including the roles of its faculty. Institutions that deliver distance education courses as an "add-on" to traditional teaching will eventually be overtaken by the higher quality of design and facilitation provided by distance education specialists. There may be fewer subject specialists who design and prepare the course content, with the majority of the faculty functioning as supporting facilitators. Institutions will have to invest in areas where they have a comparative advantage and close out areas in which they do not have the expertise. Paying famous professors to design or give their seal of approval for a course will become a one-time cost. Online teaching can be done by teaching assistants and qualified facilitators anywhere in the world.

The Army can take advantage of the economies of scale available in online teaching, such as savings in travel and per diem, without having to deal to a great extent with faculty role issues, because the Army has traditionally separated the course design/development and teaching roles. The Army may also benefit from DL in that all soldiers requiring training in a particular subject area could feasibly be exposed to training designed by the very best experts in that field.

Automation Skills Training Summary

Computer Literacy

Computer literacy is so important that it needs to become an explicit goal of the armed services, advised a group of Silicon Valley chief executive officers (CEOs) during a Marine Corps Advanced Warfighting Experiment (AWE) that paired 10 generals and 5 admirals with 15 top business leaders from Silicon Valley. The primary purpose of the wargame was for the military to obtain the advice and business perspective of the leading commercial information technology (IT) corporations with respect to IT investments. Advice from the business executives included reexamining the disparity between IT investment in garrison (41 percent of total budget) versus the tactical level (17 percent) and investing more into internal Marine training to advance computer literacy, adding that they believed the entire force should be trained to be computer literate by 2010 (West, 1999).

Computer literacy, especially the ability for leaders and staffs to use digital command and control (C2) systems, has become a decisive battlefield skill. What is not clear is how best to achieve it. The results of an Army training experiment at the US Army Command and General Staff College (CGSC) indicated that both computer performance skills and brigade-level tactical competency could be achieved using the same amount of time previously devoted to tactics training alone. The existing tactics course was extensively redesigned to integrate a previously separate 40-hour computer operator course. The new course design was based on the constructivist approach to instruction, which places the learner in an active role in which knowledge is discovered in interaction with the environment. Using the constructivist model, the classroom environment must be as close to the environment that the task is performed under as is

practical. The learner must become engaged in the learning process, interpreting experiences and constructing his/her own guide to how knowledge can be used. The instructor intervenes only when the students reach a point of no progress. The after action review (AAR) is a key component of the approach (Ross and Yoder, 1999).

Since the Army began experimenting with digitization in 1994, researchers have learned that how information is conveyed is as important as what information is conveyed. Studies revealed that information needed to be displayed on large screens at the battlefield headquarters. Commanders made decisions on visually seeing how things are presented. Second, data from different systems needed to be integrated to make it useful for commanders, e.g., staff officers had to be able to synchronize data arriving through intelligence and logistics channels with data arriving through combat system channels. In addition, soldiers have to develop a higher-than-average level of computer literacy to use and maintain the digitized systems effectively. There is a constant need for training and for maintenance of this highly technical infrastructure (Peters, 1999).

Initial Skills Training

A recent military pilot study assessed the training effectiveness of interactive multimedia instruction (IMI) training packages for training soldiers on complex automated systems (George, Bretl, and Jackson, 2001). The study found that soldiers who had difficulty learning these complex automated systems greatly benefited from interaction with instructors and other students. This finding creates a challenge for "instructorless" training for soldiers who do not have a base level of skill or knowledge in the subject area. IMI was generally found to be more effective for incremental learning, as opposed to initial learning, on the automated systems the soldiers operate in their military occupational specialty (MOS 92A). Soldiers with some job experience faired better with IMI than soldiers with little or no basic computer skills or on-the-job experience. Thus, teaching initial skills to students requires different types of instruction than teaching students with a foundation in the subject matter. Use of multimedia instruction for initial skills training may not be worth the cost, since it has to be constructed to provide the structure, motivation, and task focusing that the instructor would provide in a more traditional classroom setting.

For computer-based or assisted learning, including online instruction, students require basic computer skills. The Army can reduce attrition and increase soldier training success by leveraging knowledge on computer backgrounds and basic computer literacy. By identifying soldiers who enter the service with minimal computer experience, the required basic skills can be provided to them before the main course of training, thereby reducing recycles and failure rates.

Summary of Recent Trends in the DL Literature

The pace of distance education is increasing. There are increasing numbers of new DL programs both nationally and internationally. Technology is moving faster than the

pedagogy. Research on how to use this technology in teaching is lagging far behind the pace of the development of the technology. Good teaching practices have taken decades to develop. Accelerating this process to keep pace with technology is a big challenge (Faculty, 1999).

Technology development will continue to move quickly (Kurzweil, 1999). Things like streaming videos will be very common in instructional material in the near future, and, as the technology gets better, the costs of that technology will be decreasing. Many of the different technologies being explored today will change dramatically, or go away, and still unforeseen technologies will emerge tomorrow to complicate plotting a course for today. Whatever the Army does with DL, it should be positioned for constant change and upgrading.

Recent literature cites a need for tighter research controls to better quantify differences between distance learning and traditional training program outcomes. Of all the different trials, experiments, and technology insertion efforts going on, the quality of the planning, equipment, teaching skill, and other factors vary widely. Comparisons have to be made carefully and conclusions made cautiously because of the wide variance in quality and circumstances pertaining to DL programs (Wisher et al., 1999).

We are witnessing an evolution in the definition of what constitutes a learning event (Raschke, 1999). As the learning event is being redefined, skills required for learning are being delineated: organizing information, inquiry skills, research skills, information literacy, independent study, communication skills, and team problem-solving skills.

Development of new benchmarks for assessment and evaluation of DL programs have been pursued in the last couple of years (Policy, 2000). Both students and instructors have to learn new ways to interact and to learn and teach. Additionally, instructors, students, and administrators all see different things in the same events. External evaluators, when used, also often see things differently from all trial participants. Most carefully planned pilot projects have high quality, motivated instructors, as well as technical support. Once those move to everyday practice, those factors that may have greatly influenced the outcome of the trials will be replaced with typical teachers and support. The effect of that shift is largely unknown, but could be substantial (Hara and Kling, 2000).

A growing conservatism with regard to cost benefits is evident in recent literature (Faculty, 1999). Cost savings are not clear for several reasons: explosive technology growth, coupled with competitive market factors; the emergence of a global economy/marketplace; and although numerous trials and experiments are underway, it is still too early to know what will work and what will not. It is known that a significant up-front investment is required for DL, both in technology and in instructional design and instructor preparation. At present, most savings projections are in the delivery of DL, not the development, although this may change with evolving technologies.

Equity of access issues are of growing concern and are being studied, both nationally and internationally (Gladieux and Swail, 1999).

The trend toward a global economy/society is emerging (Council, 2000).

The effectiveness of DL is dependent on the quality of the course materials, the skills of the instructor to create effective learning situations, learning skills of the student, and the quality of the equipment, technical support, and courseware (Policy, 2000). Not all DL courses require the highest technological applications to be successful (Wisher and Priest, 1998).

Implications for Army Training

As a final summary, some implications for Army training from this recent review of DL literature are provided.

Perhaps the most striking phenomenon evident in the literature is the rapid advance in technology. Clearly, policy-makers, program designers, and training developers are all trying to keep abreast of a fast-moving train. Changes are happening much faster than in even the recent past. The Army's (and society's in general) need to invest in new innovation requires significant monetary investments. While the Army must invest in technology in order to advance its skills and take advantage of new innovation, the need is balanced by the potential risk of over-investing in a technology that soon becomes outdated or ineffective. Information technology CEOs from Silicon Valley suggested that the military develop several prototype systems for fielding and not try to go with a "one size fits all" approach for technology investment (West, 1999).

Second, the literature is in general agreement that training effectiveness of DL courses can be at least equivalent to that of traditional classroom instruction. One of the primary benefits of DL with implications for Army training may well be the increased readiness of our troops due to the advantages of being able to train troops almost anywhere in the world, at anytime, and just-in-time (Metzko et al., 1996). Many of the battlefield automated systems are very complex. Studies have documented the highly perishable nature of complex automation skills (Throne and Lickteig, 1997). With DL, skills can be trained, retrained, and refreshed with expediency. This could give the US the advantages it needs in the coming decades to combat terrorism and to deploy rapidly and efficiently to global hotspots.

The tremendous advantages available from technology are lost if the learning tools that truly take advantage of the new media are not being incorporated. It is not enough to simply transfer programs of instruction designed for traditional classroom delivery onto the Web. Courses need to be redesigned to take into account the inherent design advantages (or disadvantages) of the new technology over the old technology (Bates, 1995). The literature also points out that the requirements for initial skills training vary from refresher training requirements (George et al., 2001; Hara and Kling, 2000; Lee et al., 1996). Multimedia training programs may need to provide more aid to students with less initial knowledge, including more goal-directedness, feedback on

activities, and connections with previous knowledge. The Army recruits soldiers from a diverse and heterogeneous population with varying levels of computer experience (Bachman et al., 2000). Soldier training success can be increased by identifying soldiers with little or no computer experience and providing them with computer literacy training to get them off to a better start.

Computer literacy is now considered an essential battlefield skill. The Silicon Valley CEOs mentioned earlier in this report recommended that IT investment at the tactical fighting level, what they referred to as a "core competence," be reappraised, given the huge disparity between the amount of IT investment for garrison (41 percent of total IT budget) and the tactical level (17 percent) (West, 1999).

History suggests that the introduction of new technologies, such as the new digital information technologies, is usually accompanied by major changes in the organization of work (Bates, 2000). The universities are currently undergoing substantial organizational changes to accommodate the emerging DL infrastructures, including providing for a responsive online service environment for such student services as admissions, advising, library services, disability services, tutorial services, technical support, and certification. This is a challenge the military also faces. A totally online environment requires an extensive technical and support infrastructure, to include new strategic partnerships that allow for these services.

Appendix A. Annotated Bibliography

1. (ADEC) A. D. E. C. (2000), *Guiding Principles for Distance Learning and Teaching*, [online]. Available: http://www.adec.edu/admin/papers/distance-learning_principles.html.

One of a recent series of articles that articulate emerging guidelines for DL courses and applications. Guiding principles include design for active and effective learning, support for the needs of learners, guidelines for developing and maintaining the technological and human infrastructure, and guidelines for sustaining administrative and organizational commitment.

Keywords: Benefits, Specialized Literature

Knowledge on the backgrounds of people who enlist in the service can be leveraged to design training in such a way as to increase soldier training success and to reduce attrition rates.

2. Bachman, J. G., Segal, D. R., Freedman-Doan, P., and O'Malley, P. M. (2000), Who Chooses Military Service? Correlates of Propensity and Enlistment in the US Armed Forces, *Military Psychology, 12*(1), 1-30.

This article examines factors correlated with plans for military service and actual enlistment. It reports bivariate and multivariate regression analyses using survey data from nationwide samples totaling more than 100,000 US high school seniors (classes of 1984-1991), and follow-up data from a subsample of more than 15,000 of the high school seniors obtained 1 to 2 years after graduation.

Three broad categories of potential correlates of military propensity among high school seniors were defined: (a) family and demographic background, (b) educational background and aspirations, and (c) a wide range of values, attitudes, and behaviors. All analyses were conducted separately for men and women due to substantial differences in enlistment levels and in a variety of other gender differences in correlates of enlistment.

Racial Differences: African American students showed by far the highest average levels of propensity and enlistment; Hispanic students were next highest, and White students were lowest.

Parents' Educational Level: Higher levels of parental education are associated with lower levels of military propensity and, as parental education rises, the likelihood of enlistment grows progressively smaller.

Plans for College: Those students expecting definitely to complete college show the lowest rates of propensity and enlistment, and those expecting not to get a college degree show the highest rates. Among women, the relations between college plans, propensity, and enlistment are weak and nonlinear.

The lower an individual's high school grade average, the more likely he or she is inclined toward military service.

Attitudes, Values, and Behaviors: Attitudes about military service and performance were found to have a linear correlation with propensity and enlistment - the more pro-military the attitude, the higher the levels of propensity and rates of enlistment. Behaviors found relevant to propensity included frequency of vigorous exercise (relevant to meeting military fitness requirements) and substance use/abuse. All of the substance use measures show extremely low relations with military propensity and enlistment.

The authors note that the factors that had influenced which men served in the military during the early years of the volunteer force have persisted into the second decade of the volunteer force. Men who serve come disproportionately from minority racial and ethnic groups, below-average socioeconomic background, nonsuburban residence, and regions other than the Northeast or West. They tend to have received mediocre grades in high school, to come from nonacademic programs, and to have low college aspirations. Women have a much lower likelihood of enlisting and although propensity to enlist is the strongest predictor of their service, it is a weaker predictor for women than it is for men.

Keywords: Course Design, Specialized Literature

As the battlefield goes digital, what is the effect on the soldier, upon the leaders, and upon the mechanisms of warfare itself? The following book of essays written by military specialists and officers explores these and other issues related to digitization.

3. Bateman, R. L. I. (Ed.) (1998), *Digital War: A View from the Front Lines*, Novato, CA, Presidio Press.

Digitization, the latest revolution in the course of military affairs, is predicted to change almost every aspect of warfare. This book contains a series of reports written by military specialists and officers on the impacts of digitization on warfare, the battlefield, and the soldier. Bateman poses the question in the first chapter, entitled Pandora's Box, of what impact digitization will have on two constants of military affairs: fear and leadership. What is the impact of the issue of information processing upon leaders and leader development due to the phenomenal explosion of information now made available through digitization? In other essays, officers examine the abilities that computers and digital communications provide the soldier and how they might be employed to create greater velocity in warfare (Robert Leonhard), examine the potential of digitization and simulation for training the National Guard (Mike Pryor), and examine the costs for new technologies and probable future equipment scenarios given current budgetary realities (Daniel Bolger). This book provides a multifaceted military perspective on the future digital battlefield.

Keywords: Automation Skills, Specialized Literature

One of the pioneers of DL, Tony Bates provides educators and decision-makers a framework in which to create, organize, and assess a DL program in the following two selections from the literature.

4. Bates, A. W. T. (1995), *Technology, Open Learning, and Distance Education*, London and New York, Routledge.

This book provides a methodology for decision-makers by which they can arrive at their own conclusions regarding DL technology selection. The author provides a decision-making framework based on a series of questions that each institution needs to ask, grouped under the following criteria: access, costs, teaching and learning, interactivity and user-friendliness, organizational issues, novelty, and speed (ACTIONS).

Keywords: Costs, Course Design, Specialized Literature

5. Bates, A. W. T. (2000), *Managing Technological Change: Strategies for College and University Leaders,* San Francisco, Jossey-Bass Publishers.

A. W. Tony Bates has over 30 years experience as an educator in the field of DL and IT. He has worked with the British Open University, with the Open Learning Agency in British Columbia, and currently with the University of British Columbia, where he is responsible for developing distance education programs.

Bates summarizes his findings in new technology for education as follows: (1) New technologies widen access to new learners, increases flexibility for traditional students, and improves the quality of teaching by achieving higher levels of learning, such as analysis, synthesis, problem solving, and decision making. (2) New technologies are unlikely to lead to a reduction in spending by higher education institutions, at least in the short run, because of the high and recurrent cost of investment. However, improved cost effectiveness can be realized by enabling new target groups to be reached and higher quality learning outcomes to be gained at a lower marginal cost per student than through conventional classroom methods. To achieve gains in cost effectiveness, teaching and learning need to be substantially reorganized. (3) History suggests that the introduction of new technology is usually accompanied by major changes in the organization of work.

Keywords: Benefits, Costs, Course Design, Specialized Literature

6. Bishop, T. and SchWeber, C. (2000, September 17-20, 2000), *UMUC's Online MBA Program: A Case Study of Cost-Effectiveness and the Implications for Large-Scale Programs.* Paper presented at the Asynchronous Learning Networks (ALN) Workshop 2000: Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness, Lake George, NY.

This report describes the cost analysis case study of the online Master of Business Administration (MBA) program at University of Maryland University College (UMUC).

In 1999 to 2000, online enrollments at UMUC had grown to 40,000 worldwide, or 40 percent of total enrollments, and there were more than 1,200 different course offerings at the undergraduate and graduate levels. Large-scale ALN operations require broad institutional support - such as the IT infrastructure, student services, library and information services - which has important cost implications.

The graduate school developed a formal program proposal that included a cost analysis to project the fiscal viability of the program. The analysis of cost recovery over a 5-year period projected a net loss in Year 1 with modest net profit in Year 2, continuing over the next 3 years. The cost analysis estimated course development and delivery costs based on varying class enrollments of 15, 20, 25, and 30 students. Fixed costs included faculty salary, faculty training, course development, instructional designer, course evaluation (a mere $200), peer review, program coordinator, Web administration, and marketing costs. Variable costs, which fluctuate depending on the number of students, included electronic library costs, online student services, IT help desk support, and administrative overhead. The preliminary cost analysis indicated that a small change in class size could impact the program profit margin.

The online MBA program was initially offered in 1999 to 2000. The preliminary data indicate that actual enrollments were 92 percent higher than projected, and as such, revenue exceeded the projection prepared in the original cost analysis and the program experienced a positive return on investment in the first year. The enrollment growth requires additional resources, including full-time faculty and staff, and teaching assistants are being added in Year 2 to help faculty with the additional workload demands.

Keywords: Costs, Specialized Literature

The number of accredited DL colleges is over 900 and the number of accredited degree and certificate DL programs has reached over 1,200 in the US alone. With all of this activity, a whole new industry has sprung up in the development and marketing of DL courseware.

7. Blumenstyk, G. (1999), The Marketing Intensifies in Distance Learning, *Chronicle of Higher Education*, 9 April 1999.

According to this article, the marketing brochures, information kits, and compact disk-read only memory (CD-ROMs) that distance education companies use to promote course design tools and other services are going to be flying fast and furious over the coming months. Such companies as Blackboard, Convene, Embanet, and Real Education are maneuvering on multiple fronts to gain more visibility for their products. Real Education, of Denver, is quadrupling its sales force. Blackboard, in Washington, is wooing professors with free Web sites for online courses. Convene, in San Francisco, has just hired a top official away from the University of Phoenix's 6,000-student distance education operation to head up marketing. The Connecticut State University System recently signed a 3-year contract with Real Education after its Trustees decided that the State should use technology to make education more widely available throughout the state.

Keywords: Costs, Course Design, Instructor, Practitioner Literature

The success of Britains' Open University has been attributed in part to the emphasis on meeting the needs of nontraditional students, utilizing a mix of flexible thinking and creativity to make higher education accessible to new audiences.

8. Blumenstyk, G. (1999), Distance Learning at the Open University, *Chronicle of Higher Education*, 23 July 1999.

Since 1971, more than 2 million students have taken a course using the Open University's virtual education model and more than 227,000 people have earned their degrees at Britains' once controversial Open University. The school uses old-fashioned correspondence course methods combined with multimedia materials, personal tutoring, and in some instances, a weekend or weeklong class session at a residential school.

The Open University challenged social perceptions of what higher education was for, designing its courses for part-time students and working adults rather than the traditional high-achieving 18-year-olds. With its use of distance education and flexible standards, the Open University made higher education much more available to people. Nontraditional part-time students remain the core constituency: the median age of its entering undergraduates is 34 and a third of its students already have a degree. Created in the 1960s, the Open University is a proven success story that employs 900 full-time faculty members and about 7,000 tutors known as "associate lecturers," and has an annual budget of 215 million pounds.

The design of an Open University course is a sophisticated, resource intensive collaboration, usually taking 2 to 3 years to develop and they are very expensive to produce. The materials for one course "Pacific Studies," included four books, several study guides, five specially produced half-hour television (TV) shows, and a set of audiotapes. A 40-person "course team" oversaw the development of "Pacific Studies." The Open University takes pride in the quality of the TV shows, shooting scenes from three continents for Pacific Studies. Generally, the programs are aired on the British Broadcasting Company (BBC) during off hours, but sometimes the courses make it into prime time. The core of the classes is the written material, and the books, often used at other universities and purchased by some 45,000 readers annually who are not formally enrolled in an Open University course, are published with collaboration with outside publishers. The Open University owns and keeps all the intellectual-property rights from its course materials. Courses are generally designed for an 8-year life span, with major revisions planned at 3-year intervals. The course team also meets regularly to create new examinations and assignments.

Tutors interface between the university and the students. They are the students' translators and guides, helping to explain material and answer questions through regularly scheduled tutorial sessions, by telephone, and by e-mail. The tutors grade the papers devised and prescribed by the course teams, referred to as "tutor-marked assignments." Tutors, many of them professionals in business or social work or moonlighting professors from other universities, are hired under 8-year contracts.

Keywords: Benefits, Course Design, Instructor, Practitioner Literature

9. Brown, G. and Mack, M. (1999), The Difference Frenzy and Matching Buckshot with Buckshot, *The Technology Source*, 5.

The recent report entitled "What's the Difference" by Phipps and Merisotis on the effectiveness of DL in higher education comes under fire in this article. The authors fail to "unpack" the real questions embedded in their assertion that an entire body of research needs to be developed to determine if students that participate for their whole program in DL compare favorably with students taught in the conventional classroom, thus making their premise for evaluating the research on distance education seem overly simplistic. Phipps and Merisotis lament the paucity of "true, original research..." without defining what they mean by true or original. Brown and Mack point out that most of the criticisms in the report could be and are applicable to conventional face-to-face models of educational practice and that clear, comprehensive evidence is rarely obtainable in the "complex, messy world of teaching and learning, even after decades of educational research."

Keywords: Benefits, Specialized Literature

A software-based cognitive tutor developed by Carnegie Mellon researchers has been shown to improve standard math test scores and significantly increase student achievement in algebra and geometry over traditionally delivered classes.

10. Carnegie Mellon (1999), *Carnegie Mellon Forms Carnegie Learning Inc.* [Carnegie Mellon Web site, Computers & Information Technology, What's New]. Available: http://whatsnew.andrew.cmu.edu/ComputersInformation.qry.

Carnegie Mellon has formed Carnegie Learning, Inc., a new company to market its series of software-based cognitive tutors that have been teaching algebra and geometry to middle through college students since 1993. The tutors are backed by nearly 2 decades of research and more than 11 million in funding from government and foundations. The tutors have been used by thousands of students and have been shown to improve standard test scores and significantly increase student achievement gains over traditionally delivered classes. Experts say the cognitive tutors are one of the few educational products available today that have the research behind them to prove they work. The original tutor was developed by John R. Anderson, a professor of psychology and computer science at Carnegie Mellon. It is built around the theory that students learn best by actively participating in the learning process rather than receiving static, verbalized information. Tutor-taught students learn material in one-third less time than in traditional learning situations. They score 15 percent higher on standardized tests and 100 percent better than their peers in applying mathematics in authentic problem solving situations. Robert A. Longo, a marketing executive and former educator has been named president and chief executive officer of the new firm.

Keywords: Benefits, Practitioner Literature

11. Carnevale, D. (2001), Assessment Takes Center Stage in Online Learning, *Chronicle of Higher Education, 13* April 2001, A43-A45.

Assessment is becoming an important aspect of a distance education program, as online educators seek to prove that they are teaching effectively. Two distance education institutions that are creating assessment techniques are the Western Governor's University and the University of Phoenix. According to Peter Ewell, senior associate at the National Center for Higher Education Management Systems, all of higher education is moving toward outcome-based assessments, a movement led by online education. Critics often hold distance education to a higher standard than traditional education when judging quality, probably because of its relative newness. There are also pressures being placed on traditional education to do more to assess quality, from accreditation agencies, state governments, and policy boards. Both traditional and distance education institutions are struggling to figure out how to use the results of assessment examinations.

Keywords: Benefits, Practitioner Literature

12. Carr, S. (2000), US Army Chooses PricewaterhouseCoopers to Run Big Distance-Education Project, *Chronicle of Higher Education* (Daily News 12/15/00), 5.

The consulting company, PricewaterhouseCoopers, has been selected to be the integrator/coordinator for the $453 million project to deliver DL courses to soldiers all over the world. The company has formed a team of 10 companies and 29 colleges to work together on the initial offering.

The project, called Army University Access Online, will provide DL courses to soldiers at little or no charge. The first courses will be offered at three Army bases next month, with an estimated 15,000 students. The initial 29 academic institutions were selected primarily for their experience in working with the military, as well as providing a diverse mixture of institutions. The company will begin expanding the pool of academic institutions in subsequent offerings. This article includes a list of the 29 academic institutions and the 10 corporate partners, which include Blackboard, Peoplesoft, and Smartthinking.

Keywords: Benefits, Practitioner Literature

13. Carr, S. (2001), Is Anyone Making Money on Distance Education?, *Chronicle of Higher Education,* 16 February 2001, 10.

Six new studies commissioned by the Alfred P. Sloan Foundation analyzed the costs of online education and its potential profitability. The six universities that participated in the cost studies all had received grants from the Foundations' ALN to develop online programs. Most of the reports indicate that the universities are near the break-even point with their DL programs. The studies also found that defining costs is a difficult process, that university accounting procedures were not always well-suited to a case-

study approach, that small variations in class size could affect profitability, and that costs are not likely to be significantly cheaper than traditional delivery. While costs of technology and technical support required for DL programs are greater than traditional programs, the physical infrastructure that is needed to support traditional programs will ultimately make the difference in profitability. Unlike technology, the cost of land, buildings, and utilities do not go down over time.

Keywords: Costs, Practitioner Literature

14. Chickering, A. W. and Ehrmann, S. C. (1997), Implementing the Seven Principles: Technology as Lever, *American Association for Higher Education*, 6 pp.

In 1987, the American Association for Higher Education (AAHE) Bulletin published "Seven Principles for Good Practice in Undergraduate Education." This article updates the seven principles with respect to technology and the new learning tools.

The seven principles are:

1. Good Practice Encourages Contacts Between Students and Faculty. The update concludes that new communication technologies can increase access to faculty members and provide for joint problem solving and shared learning and can strengthen faculty interactions with all students, but especially with shy students or non-English native speakers.

2. Good Practice Develops Reciprocity and Cooperation Among Students. Learning is enhanced when it is more of a team effort than a solo race. The update notes that the increased opportunities for interaction noted above with faculty apply equally to communication with fellow students. Study groups, group problem solving, collaborative learning, and feedback can all be strengthened through communication tools such as e-mail.

3. Good Practice Uses Active Learning Techniques. Learning by doing, or apprentice-like learning, has been supported by many traditional technologies, research libraries, laboratories, art and architectural studios, athletic fields. Newer technologies can also enrich and expand these opportunities. Time-delayed exchange and real-time conversation technologies can also help students to talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives.

4. Good Practice Gives Prompt Feedback. In getting started, students need help in assessing their existing knowledge and competence, and in classes, students need frequent opportunities to perform and to receive feedback on their performance. New technologies can provide feedback in many ways, some obvious, and some more subtle. Computers can provide rich storage and easy access to student products and performances, can keep track of early efforts and thereby provide a benchmark to demonstrate gains in knowledge, competence, or other valued outcomes.

5. Good Practice Emphasizes Time on Task. New technologies can dramatically improve time on task for students and faculty members. DL can also save hours otherwise spent commuting to and from campus, finding parking spaces, going to the library to get access to important resources, etc.

6. Good Practice Communicates High Expectations. Expecting students to perform well becomes a self-fulfilling prophecy. Students may be motivated, for example, by knowing that their work may be published on the Web. General criteria can be illustrated with online samples of excellent, average, and faulty performance.

7. Good Practice Respects Diverse Talents and Ways of Learning. Technologies can provide different learning repertoires for different learning styles and learning curves.

Keywords: Benefits, Course Design, Instructor, Specialized Literature

Industry experts in the field of automation training point out the importance of training for the success of a new automation project, and indicate that at least 6-10 percent of the new projects' budget must be allocated to training for the effort to be successful.

15. Compton, J. (1999), CRM Training by the Book, Sales and Field Force Automation - The Executive's Guide to Customer Relationship Management.

This article highlights the importance of training for the success of a new sales automation project. Training is a prerequisite for success; without it your project can potentially cost more in the long run and foster discontent that can jeopardize the unity of your sales organization. Its hard to measure what you are getting for training dollars, and top management is often reticent to put a lot of money in when they cannot see what they are getting, says Thomas Minero, president of Training Resources, Inc. of New Jersey. Wendy Close, research director with the Gartner Group, recommends allocating 6 to 10 percent of a total sales and field force automation (SFA) implementation budget to training. Enterprises adopting or reengineering their sales automation solutions are starting to get the message; a recent survey of over 200 companies by Insight Technology Group found that on average 5 percent of total SFA project cost is going to training. This new enthusiasm for training may be due in part to past experience; over half of all SFA projects have failed historically. Further, firms that develop and implement SFA projects are walking away from projects in which the potential clients are unwilling to properly invest in training. Support costs are much higher for struggling projects.

Set reasonable goals for your project and plan for training at least 3 to 6 months before delivery, says Debra Exner, presidents of software training firm Exner and Associates. Strongly consider training management before the pilot rollout of the new system. How well the manager is onboard supporting the new system is highly correlated with how fast the sales representatives pick it up. Finally, you will need to make an early decision of how to handle required basic computer skills. Many people

are still clumsy at best with standard Windows interface. Some solutions include requiring students to come to class with a basic literacy of computer skills (which can be provided by paid classes at a local community college or training center) or to extend the training program by a half-day and add a required course on general computing.

Deciding whether to go with your own internal training staff or outsource the training program is a big decision and will largely be made by the availability and experience of your trainers. If you outsource, you have an additional decision whether to go with a full service SFA consultant or a dedicated training firm. No matter who does your training, make sure they understand and communicate your sales process as part of the education process. By building training that incorporates real-world sales process examples, the chances are greatly improved that representatives will adopt more of the software in their daily business. Training must answer "What's in it for me?" and not just provide a feature-by-feature list of its functionality.

Keywords: Benefits, Course Design, Practitioner Literature

16. Council, N. I. (2000), *Global Trends 2015: A Dialogue About the Future with Nongovernment Experts* (NIC 2000-02), Washington, DC, National Intelligence Council, Central Intelligence.

This report, produced by the National Intelligence Council in close collaboration with a wide range of experts outside of the government, defines major drivers and trends that will shape the world of 2015. Major drivers include demographics, natural resources, science and technology, the global economy, future conflict, and the role of the US.

Among the projections are that the world population in 2015 will be 7.2 billion, up from 6.1 billion in 2000, and life spans are on the increase. Overall, food production will be adequate, but political instability and poor infrastructure will still result in famine in parts of Sub-Saharan Africa. Energy supplies will be able to meet the 50 percent increase in global energy demand. Science and technology will continue to experience quantum leaps in development and major paradigm shifts will result. Older technologies will continue lateral development into new markets, and US adversaries around the world will gain additional access to early generation ballistic missile and weapons of mass destruction (WMD) technologies. Disaffected states, terrorists, and organized criminals will take advantage of the new high-speed information environment and other advances in technology to threaten stability and security around the world. Biotechnology will drive medical breakthroughs.

The networked global economy will be characterized by rapid and largely unrestricted flows of information, ideas, values, capital, goods and services, and people. Increasing reliance on computer networks is making critical US infrastructures more attractive as targets. Rapid advances in biotechnology, nanotechnology, and the materials sciences will add to the capabilities of our adversaries to engage in biological warfare or bioterrorism. This report provides some clues to the types of global encounters the Army of the 21st century will likely face.

Keywords: Trends, Specialized Literature

Shirley M. Davis, another pioneer in DL, discusses the new Age of Learning, in which developments in technology have brought dramatic changes in both the learning needs and the way learning opportunities are delivered in business, labor, government, and academia.

17. Davis, D. S. M. (1999), Ushering in the Learning Age, *Education at a Distance, 13*(7).

We are becoming a society in which continuous learning is an emerging mindset and a key to success in life and career. Learners in the Age of Learning must take increased responsibility for control and direction of the learning process. In addition, a new set of skills needed for the workforce of the future have been identified, which include communication skills, inquiry skills, team skills, research skills, information literacy, and problem-solving skills. DL and developments in telecommunications technologies have not only transformed our needs for education and training, but have expanded our capacity to respond to these needs. DL is now a mainstream method of education and training that is both flexible and responsive to learners' needs. New learning tools are being developed that encourage collaborative learning, that offer Web-based simulations, and that offer approaches that support the new Age of Learning.

An example of new course design projects include those developed under the NSF-funded SCANS 2000 project at Johns Hopkins. These learning modules were developed for use in college classrooms by interdisciplinary teams of students who address real problems and develop their collaborative solution through asking questions and accessing information in a nonlinear mode to answer those questions.

Keywords: Course Design, Practitioner Literature

18. Davis, D. S. M. (2000), Speaking Personally - with Shirley M. Davis, *The American Journal of Distance Education, 14*(2), 71-74.

Shirley M. Davis is the director of learning innovations for the PBS Adult Learning Service (ALS), the nation's largest satellite- and Web-based service for higher education. In 1999, Davis became president of the United States Distance Learning Association (USDLA).

In this interview for the American Journal of Distance Education, Davis describes how she is responsible for making recommendations for how and when to adopt emerging DL technologies. One of the missions of the ALS is to help colleges use technology to serve "nontraditional students" and to provide professional development for faculty and administrators. Another ALS initiative is to begin developing a Web-based certificate program that prepares K-12 teachers to integrate technology into their curricula.

PBS, in collaboration with Intel, is becoming actively involved in "enhanced television," a recently developed distribution method that enables supplemental digital information to be broadcast along with a digital video signal that can be captured by a computer for nonlinear access. Over the past 5 years, the biggest change in communications around the world has been the emergence of mature digital technologies, as nearly all communications move from analog to digital. "We are just beginning to understand their potential for education," according to Davis.

Keywords: Course Design, Specialized Literature

19. Dillon, C. and Granger, D. (1998), Guest Editorial, *The American Journal of Distance Education, 12*(1).

What is "the class" for? This is the question posed by this editorial. Distance education has outdistanced the distance and is forcing us to question basic approaches to teaching and learning. New technologies are making information access and learning possible in ways that previously did not exist. Learning itself is becoming the significant activity, which coincides with increasing learning needs in an information society. The combination of three factors - need, understanding, and capacity - has resulted in a shift in higher education, and a corresponding growth in virtual universities. "I am not a teacher of things, I am an orchestrator of ideas. My university is not a physical plant with classrooms and trees, but a hub of resources no longer constrained by time and place. My students are no longer my students, but we are all students together." When "the class" loses its meaning, so does the credit hour production, the basic unit of production in higher education. Can we redefine productivity in education and explore new ways of using our resources?

The shift to alternative modes of teaching and learning is a migration, with innovators and early adopters breaking ground for those who advance more slowly.

Keywords: Course Design, Specialized Literature

20. Druckman, D. and Bjork, R. A. (Eds.) (1994), *Learning, Remembering, Believing: Enhancing Human Performance*, Washington, DC, National Academy Press.

This book is the third report of the Committee on Techniques for the Enhancement of Human Performance (CTEHP). This 14-member science committee was formed in 1985 by the National Research Council of the National Academy of Sciences to evaluate a set of specific "new age" techniques designed to enhance human performance. While the members of the committee change over time, what has stayed largely in place is its method of operation. Site visits to applied settings, both military and civilian, are an intrinsic aspect of the committee process, as are briefings to the entire committee by advocates, critics, and neutral parties. Every member of the committee must sign off on all of the committee's final conclusions and recommendations; therefore highly interactive discussions are also an indispensable part of the research process.

This study stresses that the purpose of training is post-training performance. The authors' empirically-based analysis documents the tendency of trainees and trainers to inadvertently fool themselves and each other about what and how much has been learned and trained. The traditional climate of military training, including pressures for efficiency and intolerance of errors, may reinforce such tendencies. Some prevailing training conditions that enhance skill acquisition may actually retard skill retention and transfer to job performance. A more effort, more effect approach to training may slow skill acquisition but enhance retention and transfer.

Keywords: Benefits, Course Design, Specialized Literature

21. Ewell, P. (1999), Editorial: No Significant Difference?, *Change, May/June 1999*, p. 4.

Keywords: Benefits, Specialized Literature

This article summarizes the major conclusions of the review of research on DL presented by Merisotis and Phipps in their report sponsored by the American Federation of Teachers and the National Education Association. Of interest is the editorial that introduces the piece, in which the editor points out that precisely the same ills identified by Merisotis and Phipps in the DL literature are present in the published research about virtually every method of instructional delivery, including the classroom-based ones we presently use. While the call for better research about learning and its causes are warranted, it applies to all the ways teaching and learning are performed, not just the newest. Second, the editorial points out that the finding in question, one of "no significant difference" between DL and traditional classroom-based learning, persists across good studies and bad, for different populations and different technologies. Wouldn't a more reasonable predicted outcome be "some better and some worse?" Ewell points out that it is the robustness of these results that is of interest. What works for one kind of learner may not work for another, a fact researched thoroughly about traditional classrooms. Distance education is likely no different and further inquiry into the interactions among different kinds of learners and specific learning modalities is warranted.

22. Faculty, U. o. I. (1999), Teaching at an Internet Distance: The Pedagogy of Online Teaching and Learning, the Report of a 1998-1999 University of Illinois Faculty Seminar, University of Illinois.

This year-long faculty seminar was convened at the University of Illinois during the 1998-1999 academic year to discuss pros and cons of implementing technology for teaching, particularly teaching at a distance. Its 16-member team was evenly split between "skeptical" and "converted" faculty and focused on pedagogy, the discussions centering on what makes teaching to be good teaching, whether in the classroom or online.

The seminar concluded that online teaching and learning can be done with high quality, particularly when professors make the effort to create and maintain a high

degree of interaction between professor and student and among the students themselves. The seminar concurred with the "no significant difference" findings prevalent throughout the literature; however, the seminar questioned the emphasis placed on the method used to deliver instruction, noting that the evaluation of online learning is multifaceted and subtle, and learning competence is only part of the evaluation need. The seminar did support the continued need to examine learning effectiveness with at least some of the rigor called for by Phipps and Merisotis.

The faculty seminar identified a number of policy issues for administrators that included the caveat that DL may not be the moneymaker anticipated by university administrators. The scenario once envisioned of hundreds of students enrolling in a well developed, essentially instructor-free online course does not appear realistic. With some exceptions, the successful online course features low student to faculty ratios. The exceptions involve extraordinary amounts of the professor's time. Besides the initial investment in technology, technical support for professors and students and maintenance of hardware and software are very expensive. Quality teaching does not come cheaply. Online instruction is not likely to cost less than traditional instruction.

Another important issue concerns the determination of whether online teaching is successful. Before history answers the question, the faculty members advocated rigorous comparison of learning competence between online and traditional classes, pointing out that much of the current DL research is anecdotal. High quality online teaching is not just a matter of transferring class notes and lectures to the Internet. New paradigms of delivery and evaluation are needed. Some features to look for in new DL courses are the strength of the professor-student and student-student interactions, the depth of student engagement with the course materials, and access to technical support.

Keywords: Benefits, Costs, Course Design, Instructor, Specialized Literature

23. Geith, C. and Vignare, K. (2000, September 17-20, 2000), *Online Degree Programs: Service and Cost.* Paper presented at the ALN Workshop 2000: Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness, Lake George, NY.

The Rochester Institute of Technology (RIT) uses asynchronous online learning to support 5,000 students per year in 13 degree programs and 19 certificate programs (as of 31 August 2000). The online programs are taught by the same faculty as the on-campus versions and support a wide variety of teaching methods, from lecture-based courses to team project-based courses. Multiple media options are available for online courses; from print, videotapes distributed through the bookstore, Internet Web resources, and computer-mediated communication.

Online degree programs, like their campus counterparts, require a dedicated service environment. The overall service environment creates the stage for engaging individuals in a way that creates a memorable learning event. Student services are an integral part of the online environment, just as it is for on-campus students.

The systems and services supporting the online student environment include admissions, academic advising, library services, disability services, tutorial services, and technical support, evaluating evidence of learning, and granting certification. When online degree programs are offered to primarily off-campus students, the on-campus services are unlikely to be able to provide the rich and responsive environment needed for a successful online program. Most on-campus systems rely on the physical campus and individual instructors to act as the primary service contacts for students. The pressure is already on for online instructors to facilitate and manage the important role of interactivity and human communication without being the primary contact for student technical support as well.

The costs of a responsive online service environment need to be factored in to cost comparisons with on-campus counterparts to reflect the true costs of online programs (a challenge the military also faces). A totally online environment requires an extensive technology infrastructure and/or new strategic partnerships that allow for these services.

Keywords: Costs, Specialized Literature

24. George, E. L., Bretl, D., and Jackson, G. (2001), *MOS 92A Distance Learning Training Effectiveness Analysis*, TRADOC Analysis Center-White Sands Missile Range (TRAC-WSMR) (In Press).

One of the major findings of this military study was that a key element in the effectiveness of the DL programs is structuring the courseware for the kind of material being taught. For example, thinking and leadership skills are not taught the same way manual skills are taught. In addition, effective courseware also must be tailored to meet the skill level and maturity of the student. Soldiers who had difficulty learning the complex automated systems used in their military occupational specialty (MOS 92A) benefited greatly from interaction with instructors and other students. This creates a challenge for potential "instructorless" training for soldiers who do not have basic skills and knowledge in the subject areas. Soldiers with some job experience did not have difficulty with the multimedia learning approach. Thus, teaching initial skills to students requires different types of instruction than teaching students with a foundation in the subject matter. The study found that while the evidence is overwhelming that DL works, use of multimedia instruction for initial skills training may not be worth the cost, since it has to be constructed to provide the structure, motivation, and task focusing that the instructor would provide in a more traditional classroom setting.

Keywords: Benefits, Costs, Automation, Specialized Literature

> *Not everyone in our society has equal access to computers and technology. The military recruits individuals from diverse cultural, ethnic, and economic groups. Some soldiers may be at a disadvantage with respect to their computer experiences and background. Providing some basic computer skills training initially may alleviate potential training problems and frustrations and help advance computer literacy for the force.*

25. Gladieux, L. E., and Swail, S. (1999), The Virtual University and Education Opportunity - Issues of Equity and Access for the Next Generation, The College Board.

The authors of the report, Lawrence E. Gladieux and Scott Swail, policy analysts for the College Board, say people of low income, African Americans, Hispanics, and people with less education are less likely to have access to computers or online services than those with higher incomes, Whites, Asians, and people with college education. E-mail usage is higher among college freshmen at universities and private 4-year colleges than it is at 2-year and historically Black institutions. Mr. Gladieux, at a recent briefing in Washington, also said educators should be worried about the cost of online education for both institutions and students. He cited studies showing that distance education programs were more costly for institutions to offer and some colleges charge more for online courses. The authors recommend making widespread access a goal when designing online courses. The report is available online.

Keywords: Course Design, Automation, Specialized Literature

26. Hara, N., and Kling, R. (2000), Students' Distress with a Web-based Distance Education Course: An Ethnographic Study of Participants; Experiences, Bloomington, IN, Center for Social Informatics, Indiana University.

The thesis of this report is that the majority of literature pertaining to distance education courses that rely on the Internet as a core communication medium tend to emphasize the benefits of these courses and minimize the difficulties of "routinely providing high quality courses." There are at least five major kinds of literature about asynchronous distance education courses that rely upon the Internet as a core communication medium: (1) a specialized research literature, which includes journals such as the Journal of Asynchronous Learning and the American Journal of Distance Education, research monographs, and specialized conferences; (2) a practitioner literature whose audience is administrators and faculty who may be involved in such courses (e.g., the Chronicle of Higher Education, written advice for instructors); (3) instructional materials for students taking specific courses (e.g., syllabi, orientation documents, tip sheets); (4) popular accounts of such courses written for the public (i.e., the mainstream press); and (5) marketing descriptions of courses and degree programs provided by educational institutions to their prospective students and their parents, employers, and others.

This article documents the difficulties students experienced while taking a particular graduate-level DL course. Students noted frustration, a feeling of isolation, anxiety, confusion, and panic. DL students commonly work alone at night and resolving technical and communication problems can be more difficult under these conditions than in a face-to-face class meeting. Confusion over assignments and instructor expectations are also harder to resolve in the distance mode. Relying on e-mail as a primary communication mode, some students fell behind with reading and posting e-mail and some felt overwhelmed by the volume of e-mail. It is time-consuming

responding to e-mail traffic as opposed to conversation. The instructor also commented that at the beginning of the semester she was spending all day reading and responding to e-mail messages. There can also be a lag time between students' queries and/or need for assistance/feedback and the instructors' response. Students also experienced frustration attempting to obtain information over the Web.

The authors note that key issues regarding reliable and well-timed communication need to be negotiated within a class so that students and instructor's expectations regarding e-mail, feedback, technical support, etc. can be aligned, thereby reducing frustration and anxiety. The reliance on text-based media also increases the communicative complexity of constructing adequately unambiguous conversations and instructions. What is the level of detail and phrasing that will be sufficiently helpful to others?

Academic administrators often encourage faculty to teach online courses by representing them as easy to take on rather than as a complex instructional engagement that can require new materials and new behaviors. High quality education, whether online or face-to-face, is neither cheap nor easy.

Keywords: Course Design, Instructor, Specialized Literature

27. Harasim, L., Hiltz, S. R., Teles, L., and Turoff, M. (1995), *Learning Networks: A Field Guide to Teaching and Learning Online*, Cambridge, MA, MIT Press.

Evaluation of online learning is multifaceted, and learning competence is only one part of the evaluation need. Harasim et al., discuss both top-down or "summative" and bottom-up or "formative" evaluation styles. Rigorous evaluation of learning effectiveness had been lacking in the early 1990s but should and could be performed. A multiplicity of evidence beyond written exercises and test scores should be considered; some examples include participation by students in class discussions, project work, and individual and group interviews. The book also offers a checklist for faculty to facilitate collaborative learning, such as do not lecture, be flexible and patient, monitor and prompt for participation, etc. A checklist for students is also provided and includes such pointers as the learning curve can be steep, make sure you have convenient access to the personal computer (PC) you will be using for the class, and respond to the ideas and questions of other students as well as the instructor.

Keywords: Course Design, Specialized Literature

The Navy has developed a training delivery assessment model to identify existing classroom training courses that present the best resource saving opportunities for conversion to a DL format.

28. Hassen, J. E., and Wieckhorst, R. A. (1998), TRADAM: A Catalyst for Training Technology Infusion, *Modern Simulation and Training.*

This article describes the Navy's Training Delivery Assessment Model (TRADAM), which is designed to assist training sponsors, managers, course developers, and instructors in selecting the most appropriate advanced training technologies for cost effective training delivery. The Chief of Naval Operations' Office of Training Technology initiated the development of a model to select the best opportunities for improving training effectiveness and training efficiency through the application of advanced technology in December 1995. The TRADAM is intended to provide a quick, but fairly accurate, identification of existing classroom training courses that present the best training resource saving opportunities. The TRADAM process includes three phases. The first phase performs a quick screening on all training courses to ensure that the best candidates for advanced training delivery technology application are examined first, to ensure that the labor intensive requirements and economic analyses are first performed on the courses with the most potential for cost avoidances. Phase two is an assessment of training delivery technology alternatives that match the learning requirements of each candidate course. Phase three is the economic analysis of training delivery technology alternatives.

The initial screening process starts with assessing each courses' potential for exportability. The exportability criteria determine whether a course could be taught in other than a formal resident schoolhouse or typical classroom environment. Exportability criteria include: (a) short duration course (up to 3 weeks); (b) no special training equipment required; (c) stand-alone course, not part of a training pipeline; (d) no face-to-face interaction required between students. If a course fails to meet all exportability criteria, the TRADAM subsequently will focus on course compression opportunities that will result in a reduction of personnel, schoolhouse infrastructure, and per diem costs.

Keywords: Benefits, Costs, Specialized Literature

29. Hislop, G. W. (2000, September 17-20, 2000), *Cost Effectiveness of an Online Degree Program.* Paper presented at the ALN Workshop 2000, Lake George, NY.

This paper discusses the cost effectiveness of a completely online graduate degree program leading to a master of science (MS) in Information Systems (MSIS) at Drexel University. Students in the online degree program move through their courses in a group, an approach that made program startup more manageable since all the courses did not need to be available online at once. The MSIS is a professional degree with no research option. Students, whether online or traditional, are typically part-time students who work full-time.

The online MSIS was the first substantial effort in online education at Drexel University. The expectation from the start was that the new online degree program would make money by increasing the number of students paying tuition. The online

MSIS could attract students outside the Philadelphia metropolitan area, where most of the traditional MSIS program students, comprised primarily of working professionals, live and work. In addition, as Drexel positions itself as "Philadelphia's technological university," supporting online degree programs fits the university image.

How do the costs of online education compare to the costs of traditional education? To begin to answer this question, a framework for measuring online program costs must be established. This framework may be difficult at first to establish because university accounting methods are not well matched to this type of cost analysis. It is difficult to identify expenses or revenue for a particular degree, or course, or student, etc., given the fund accounting methods of most universities. This article presents a cost allocation framework for comparing the costs of the online MSIS degree program with the traditional MSIS degree program. The results are briefly summarized: (1) The three primary costs that differentiate the online program costs are the cost of technical support staff, the cost of communication and server hosting, and the incentive pay being paid to faculty members who teach online; (2) The difference in cost of physical capital increases the expense of the traditional program. With all costs included, the two delivery modes are similar in operational cost, with the cost of physical capital balancing out the technology related costs of the online program; (3) The focus of the analysis presented in this article was on operational factors not course development and maintenance.

Keywords: Costs, Specialized Literature

30. Hoffman, D. L. and Novak, T. P. (1998), Bridging the Racial Divide on the Internet, *Science.*

This article presents findings from a recent survey of Internet access. Income and education are the variables found to most likely influence access to and use of interactive electronics media. The differences between Whites and African Americans in the US with respect to computer access and Web use was explored to examine whether observed race differences in access and use can be accounted for by differences in income and education.

The data for this analysis were provided by Nielsen Media Research, from the Spring 1997 CommerceNet/Nielsen Internet Demographic Study (IDS), conducted from December 1996 through January 1997. Survey results included that Whites were significantly more likely than African Americans to have a home computer in their household; while nearly twice as many African Americans as Whites stated that they planned to purchase a home computer in the next 6 months. More than twice as many Whites as African Americans had used the Web in the past week (1.4 million +- 0.5 million African Americans compared to 20.3 million +-1.6 million Whites used the Web in the past week).

With respect to income, for households with incomes under $40,000 Whites were proportionally twice as likely as African Americans to own a home computer and slightly more likely to have computer access at work. For household incomes of $40,000 or more, a slightly greater proportion of African Americans owned a home computer, and a significantly greater proportion had computer access at work.

With respect to education, Whites were significantly more likely to own a home computer than were African Americans regardless of educational level. However, greater education corresponded to an increased likelihood of work computer access, regardless of race.

With respect to students, race almost always matters. Students (including both high school and college students) were more likely than any other income or educational group to have used the Web (presumably students have access to the Web at school, regardless of race). A dramatic difference between White and African American students was in home computer ownership; whereas 73 percent of White students owned a home computer, only 32 percent of African American students owned one. The analysis also showed that White students were significantly more likely than African American students to have used the Web, especially in the past week. There were no differences in use when students had a computer at home. White students lacking a home computer were also more than twice as likely to access the Internet from locations away from home, such as homes of friends, libraries, or community centers than African American students.

Access translates into usage. The authors warn that if a significant segment of our society is denied equal access to the Internet, existing differences and opportunities in employment, housing, racial relations, etc., between Whites and African Americans may be exacerbated, with further negative consequences. They encourage the pursuit of programs that encourage home computer ownership and the adoption of inexpensive devices that enable Internet access through the television.

Keywords: Course Design, Automation, Specialized Literature

31. Howard, F. S. (1997), *Distance Learning Annotated Bibliography*, White Sands Missile Range, Department of the Army, TRAC-WSMR, NM.

In 1997, TRAC-WSMR published a DL annotated bibliography summarizing DL reports in 10 different categories: Evaluation of DL; Guidelines for planning and implementing DL; Computer-based training; Video teletraining (VTT); Professional education; Student interaction with instructors, other students, and technology; Reviews of DL literature; Descriptions of some specific DL programs; Cost effectiveness; and Miscellaneous. The studies reviewed covered the period before 1995. With one exception, all of the 57 evaluation studies surveyed in this report conclude that DL is as effective as traditional instruction. In this and other works covering several hundred studies, this is the only case where DL did not fair at least as well as traditional instruction, which strongly suggests this result is a statistical fluke.

Keywords: Benefits, Costs, Course Design, Instructor, Automation, Specialized Literature

32. (IHETS), I. H. E. T. S. (2000), *Guiding Principles for Faculty in Distance Learning*. Available: http://www.ind.net/learntech/facprinc.html.

A guiding principles subgroup was formed in 2000 with the charter to "craft a set of guidelines which define good practice in DL and give faculty a clear benchmark for designing, developing, delivering, and assessing DL courses and/or programs." Guiding principles and sub-principles were developed in the areas of course design (careful analysis of the target student population lays the groundwork for building an effective DL course), program design (faculty who understand the wider contexts of their DL programs are better prepared to design courses that meet larger program goals), faculty development (faculty need to seek out and take advantage of appropriate professional development opportunities in technology and DL), course evaluation (faculty will develop procedures for the ongoing review of courses for quality, consistency with the curriculum, currency, and advancement of learning outcomes), and assessment of student outcomes (a systematic approach to assessment will be developed, etc.). This article also contains a useful list of other resources with respect to guidelines for distance education.

Keywords: Benefits, Course Design, Instructor, Specialized Literature

33. Jacques, M. M. (1996), *How to Find World Wide Web Distance Education Resources*, University of Wisconsin-Extension.

This article should be very helpful to those planning or designing a DL website. The author provides some indicators for what makes an excellent website, and includes a list of some distance education websites that the author considers to demonstrate the qualities of an excellent DL website.

Keywords: Automation, Specialized Literature

34. Jewett, F. (1999), Evaluating the Benefits and Costs of Mediated Instruction and Distributed Learning, California State University.

This 2-year study funded by the US Department of Education used a set of 8-10 case studies to obtain data on the benefits and costs of specific distributed instructional delivery modes compared to the benefits and costs of regular classroom delivery. Modes studied included interactive computer learning labs and networks, compressed two-way live video and one-way video/two-way audio delivered by instructional television fixed service (ITFS), broadcast, satellite, or cable, and materials delivered via the World Wide Web. Benefit assessment was based on (1) comparisons of educational outcomes between similar courses delivered by different means, (2) the potential to improve course completion rates and student retention rates, (3) the potential to improve student access to instruction, (4) the potential for institutional/curriculum renewal, (5) other benefits identified relative to specific case studies. Cost comparisons were based on estimates of the direct costs (both operating and capital costs) for the delivery of the specific form of instruction in each case study.

The case study project determined that learning outcomes on every measured criterion were at least as good, and sometimes better, than on-campus instruction. Distributed delivery modes also increased access to learning and learning opportunities and opened up new markets for universities. Faculty and students reported favorably to the programs, and in some cases, class sizes could be increased without loss of learning or additional instructor workload, a cost savings. With sufficient enrollments, DL is less expensive than classroom instruction and the same benefits, at least, can be derived at less cost.

Keywords: Benefits, Costs, Specialized Literature

35. Jewett, F. (2000), BRIDGE: A Model for Comparing the Costs of Using Distance Instruction and Classroom Instruction, *The American Journal of Distance Education, 14*(2), 37-47.

BRIDGE is a computerized simulation model designed to estimate the costs of a campus that is offering all, or most, of its instruction using electronics-based distance technology. Because there has been little cost data for campuses in the US where all or a substantial amount of the instruction is provided via distance technology, it is difficult to make cost comparisons between a traditional classroom campus and a campus that offers the majority of its instruction using distance technology. Cost studies suggest that economies of scale can exist at the course level.

The working hypothesis underlying any valid cost comparison is that the benefits of the distance forms of instruction are at least as good as those of classroom instruction. Between 1996 and 1998, the author conducted eight benefit cost case studies on various forms of television and computer-mediated course delivery at university campuses in the US. The case study comparisons found no significant difference between the learning outcomes associated with classroom and mediated delivery. This result is consistent, according to this article, with the findings of Moore and Thompson's 1990 survey, Russell's 1999 bibliography of US literature, and Rumble's 1997 summary of similar research outside the US.

Phipps and Merisotis challenged the findings of no significant difference, who raised questions about the methodologies used in the various studies (What's the Difference?). The Phipps and Merisotis critique has been answered by Brown and Wack (1999) and by Ewell (1999) in an editorial in Change magazine. Ewell points out that critiques of individual studies ignore the fact that all of the studies show no significant difference. The piece of the critique that is missing is a list of studies showing that there is a significant difference and that the difference is in favor of classroom instruction. For purposes of this study, the benefits of mediated instructional modes are considered to be at least as good as those of classroom instruction and that their costs can be legitimately compared with the costs of classroom instruction.

The researchers separated the estimated cost of distance instruction related to preparing and presenting the course materials (course-related costs) from those related to interacting with and evaluating students (student-related costs). For classroom

instruction, the costs of these separate functions are "bundled" as part of the cost of the instructor, who has responsibility for preparing and presenting course materials as well as for student interaction and evaluation. Approximately 97 percent of the direct cost of classroom instruction is the cost of the instructor; the imputed cost of the classroom accounts for the rest. Classroom costs rise in proportion to enrollment. Instructing twice as many students requires doubling the number of course sections, which essentially doubles the direct costs.

The costs of distance instruction show a different pattern. Distance instruction has a substantial start-up, or fixed, cost that is independent of enrollment (studio, communication, materials preparation, and network costs) plus a variable cost that depends on the actual number of students enrolled (primarily interaction and evaluation costs). As a result of the high start-up costs associated with distance instruction, classroom instruction costs less than distance instruction at relatively low levels of course enrollment. However, the total costs of distance education rise more slowly than those of classroom instruction. This is because the incremental costs of adding students to a distance course are less than those of a classroom course, and the two cost functions ultimately converge, and at some level of enrollment, they intersect. This implies that economies of scale do exist for distance instruction; average costs decline as the fixed costs are spread over larger course enrollments. The author points out that most US experience with distance education has been with relatively small projects to date. These smaller distance education programs have been operating at enrollment levels to the left of the crossover point and tend to be more expensive than traditional classroom instruction.

The BRIDGE Cost Simulation Model addresses the potential economies of scale by addressing the cost implications for a campus if a substantial amount of its' instruction (25-75 percent) were to be provided using a given type of distance instruction. What combinations of costs and enrollment levels for distance courses are cost competitive with classroom courses when a large percentage of instruction is provided via distance courses?

The BRIDGE model is an on-going project; at this point the model's results should be considered illustrative rather than definitive, cautions the author. Some results to date:

1. Television/broadcast courses can be cost competitive with classroom delivery if annual course enrollments are in the range of 150-300. To accommodate this enrollment, a campus would require full-time access to 15-30 channels; limited supplies of channels can constrain a campus's ability to provide a broad range of instructional programs.

2. Asynchronous network course costs are more complex than simulating the costs of television courses. This type of instruction, in which interactive course materials are resident on a server and are accessible to students anytime and anyplace, is relatively new and cost data are scarcer than for television/broadcast courses. Consequently, the BRIDGE model allows the user to literally design a course by inputting the activities the student is expected to undertake during a typical week, including hours using interactive courseware, e-mail, and chat rooms; working with

other students; interacting with an instructor or tutor; and taking exams, etc. Course production costs are calculated based on faculty and media staff workload and salaries, administrative support, special equipment, communications, and other operating expenses. The BRIDGE model showed the crossover point in the range of 150-300 average annual course enrollments with an assumed course production cost of $200,000, a 5-year useful life for the instructional materials, and interaction/evaluation costs in the range of $150-$250 per student. Doubling course production costs moves the crossover point closer to 400 enrollments.

3. Course sharing, in which two or more campuses share the course production costs and all list the shared course as its own (each campus continues to incur the student interaction and evaluation costs associated with its own students) provides the potential for total course enrollments sufficient to obtain the benefits of economies of scale.

Keywords: Benefits, Costs, Specialized Literature

36. Kashy, E., Thoennessen, M., Tsai, Y., Davis, N. E., and Wolfe, S. L., Using Networked Tools to Enhance Student Success Rates in Large Classes.

This article discusses the use of technology in order to enhance student learning and performance in large classes. The key elements of the 2-year project included implementing an active learning environment, identifying students at risk early, and implementing a program to mentor those students and to assess the impact various program components have had on success rates. The use of technology has permitted a reallocation of instructors' and teaching assistants' time, shifting it from repetitive jobs such as grading and record keeping to tasks more directly related to student achievement.

The results of the research program proved encouraging. Technology can be implemented in such a way as to provide students with the opportunity to excel, by providing immediate feedback, correction of mistakes, and the ability to seek assistance in highly flexible ways.

Keywords: Benefits, Course Design, Specialized Literature

A Carnegie Mellon study reveals negative potential of heavy Internet use on emotional well-being.

37. Kraut, R., Lundmark, V., Patterson, M., Kiesler, S., Mukopadhyay, T., and Scherlis, W. (1998), Internet Paradox: A Social Technology that Reduces Social Involvement and Psychological Well-Being?, *The American Psychologist.*

Published in the September 1998 issue of The American Psychologist, a publication of the American Psychological Association, main author Robert Kraut was surprised to find that what is a social technology has such antisocial consequences. Heavy use of e-mail and other communication services on the Internet was associated with later declines in talking among family members, reductions in the number of friends and

acquaintances they kept up with, and increases in depression and loneliness. Members of the research team are part of Carnegie Mellon's Human-Computer Interaction Institute.

Keywords: Course Design, Recent Trends, Specialized Literature

38. Kulik, J. A. (1994), Meta-analytic Studies of Findings on Computer-based Instruction, In E. L. Baker and F. O'Neil (Eds.), *Technology Assessment in Education and Training* (pp. 9-33), Hillsdale, NJ, Lawrence Erlbaum Associates, Inc.

This report was reviewed in TRAC-WSMR's first annotated bibliography of DL literature and is included here as a representation of a meta-analytic study from the literature that concludes overwhelmingly that computer-based instruction (CBI) is at least as effective, and sometimes more effective, than traditional classroom instruction as measured by student learning outcomes. Students also learned in less time with CBI. The study summarized the major points, mostly favorable, with respect to CBI from 12 separate meta-analyses.

Keywords: Benefits, Specialized Literature

In the 1980s, a number of scientists observed that computers have been growing exponentially in power, regardless of the type of hardware used. In the future, a $1,000 personal computer will match the computing speed and capacity of the human brain by around 2020. Futurist Ray Kurzweil provides a fascinating glimpse into the 21st Century in his book, "The Age of Spiritual Machines."

39. Kurzweil, R. (1999), The Age of Spiritual Machines: When Computers Exceed Human Intelligence, New York, NY, Viking Penguin.

Among the many salient points brought forth in this fascinating look at the 21st century is that the pace of events is increasing dramatically; thus is the nature of exponential growth, that events develop slowly for long periods of time, but as one "glides through the knee of the curve, events erupt at an increasingly furious pace." The exponential growth of computing power is used to illustrate the point. The speed and density of computation have been doubling every 3 years to every 1 year toward the end of the 20th century regardless of the type of hardware used. Computers are about one hundred million times more powerful for the same unit cost than they were a half-century ago. As with any phenomenon of exponential growth, the increases are so slow at first as to be practically unnoticeable. The exponential growth in computational power was barely noticed until the mid-1960s.

Keywords: Benefits, Costs, Recent Trends, Specialized Literature

40. Lauzon, A. C. (2000), Distance Education and Diversity: Are They Compatible?, *The American Journal of Distance Education, 14*(2), 61-70.

Market domination leads to the eclipsing of diversity in education, asserts Lauzon in this thought provoking article. Distance education is in part a result of the influences of

economic globalization. Distance education programs are being increasingly designed to meet not learner needs but market needs. Distance education is an example of a field of inquiry that defines its evolution in terms of technological development. Are distance education programs serving only the interests of those in power? The agenda of the powerful may be obscured by the presentation of technology as value-neutral hardware. Educational institutions see technology as a way of increasing their market share while at the same time realizing efficiencies. If the very function of education is to reduce groups of persons to a single cultural identity, to foster student conformity and to facilitate student adaptation of the dominant ideology, can distance education design be sensitive to diversity and to diverse communities?

Keywords: Recent Trends, Specialized Literature

41. Lee, A. Y., Gillan, D. J., and Harrison, C. L. (1996), Assessing the Effectiveness of a Multimedia-based Lab for Upper Division Psychology Students, *Behavior Research Methods, Instruments, and Computers, 28*(2), 295-299.

This article discusses an experiment designed to test whether a multimedia-based laboratory could increase learning on two different topics, as compared with a recitation-style lecture. Sixty-four undergraduate students at New Mexico State University (NMSU) who were taking an upper division course on learning participated in the experiment.

A within-subjects design was used. For the first half of the semester, half of the students used the operant conditioning software and half listened to a recitation-style lecture on the same topic. In the second half of the semester, the students who heard the recitation in the first half used software on eyewitness memory and those who used operant conditioning software listened to a recitation on eyewitness memory.

Three types of data were collected: pretest and posttest scores and usability questionnaire scores. The students in both conditions (computer and recitation) improved from pretest to posttest. A trend in the data for the operant conditioning portion of the class indicates that for the recitation, the lecture helped the subjects scoring low on the pretest more than those scoring high on the pretest; however, for those using the computer, multimedia helped the subjects equally across the range of pretest scores. This result, according to the authors, may have been due to the large number of conceptual questions on the pre- and posttests.

For the eyewitness memory portion, the data reveals an opposite result; for those using the computer, the subjects who scored lower on the pretest improved more than did those who scored high on the pretest. For those students in recitation, the students were helped equally across the range of pretest scores. In some cases, replacing recitations with a multimedia lab may benefit students with low initial knowledge, but, in other cases, a recitation may be better. These results imply that each new piece of multimedia software may need its own evaluation in order to determine its effectiveness unless a set of empirically derived multimedia-based training guidelines are developed.

For training students with less initial knowledge in the topic, multimedia training software may need to include more aid, such as goal-directedness, feedback on activities, and connections with previous knowledge. The authors conclude that the area of multimedia would benefit from a set of tested guidelines such as those created for intelligent tutoring systems.

Keywords: Benefits, Course Design, Automation, Specialized Literature

42. Levinson, D. P. (1998), The Book on the Book: A Prognosis for the Page in the Digital Age, *Analog Science Fiction and Fact, Vol. CXVIII*(6), 24-31.

This interesting article addresses the history and future of books; can the book survive the digital revolution and what characteristics of books will help them endure over time?

Keywords: Recent Trends, Popular Literature

43. Lewis, L., Snow, K., Farris, E., Levin, D., and Green, B. (1999), *Distance Education at Postsecondary Education Institutions 1997-98,* Washington, DC, US Department of Education, National Center for Education Statistics (NCES).

In the 1997-1998 academic year, approximately one-third of the 5,000 2- and 4-year postsecondary institutions in the US offered distance education courses, while another fifth planned to do so. Overall, US higher education institutions reported 1,661,100 students enrolled in distance education courses in 1998. The most popular delivery technologies were asynchronous Internet instruction (58 percent), two-way interactive video (54 percent), and one-way prerecorded video (47 percent). While a snapshot in time, these statistics illustrate the rapid expansion of DL in our society.

Keywords: Recent Trends, Specialized Literature

Access to university training during a tour of duty aboard a Navy aircraft carrier is now possible due to a pilot project sponsored by the naval education and training offices in Pensacola, FL.

44. Mendels, P. (1999, January 20, 1999), Distance Learning Even Reaches Ships at Sea, *New York Times.*

A new Navy program, begun in the fall of 1997, allows shipboard officers and enlisted men and women to pursue graduate degrees while on board a nuclear-powered US Navy aircraft carrier now somewhere in the Persian Gulf. The program was introduced as a pilot project, according to Saundra K. Drummer, who directs education and training strategies at the naval education and training offices in Pensacola, FL. Now available on two aircraft carriers, the program eventually could be rolled out to all 12 in the Navy. The program brings university classes from three different southern universities, Georgia College and State University, in Milledgeville, GA, Old Dominion University in Norfolk, VA, and Troy State University in Troy, AL, to Navy personnel on

board ship via computers, satellite transmissions, and video conferencing. Two-way teleconferencing technology beams the voice and moving image of the professor and Milledgeville (for example) students live to the ship-based class. Likewise, the land-based participants can see and hear their Navy counterparts. Outside of class, the Internet provides the mechanism by which assignments, corrections, and revisions are transferred between students and the professor via e-mail. Classmates exchange thoughts through a Web site that posts each student's picture next to his or her comments.

Scheduling the class time becomes a challenge as the Navy ships move and maneuver. The professor in this write-up, Professor Edmonson of Georgia College, is willing to change the hours of the class frequently to ensure that the class reaches his Navy students at 6 am, the time best suited for them, regardless of the ships' position. This means even teaching class at midnight. Technical problems are almost inevitable with ship movements, waves, and bad weather. Also, machinery cannot completely duplicate the spontaneity of real human contact, and conversation is more deliberate and constrained at times, according to Edmonson. On the other hand, the technology requires students to focus more on the matter at hand and may encourage them to be more articulate.

Keywords: Benefits, Popular Literature

45. Metes, G. S., Ph.D., and Thomas, C., Ph.D. (1998), Digital Summer Session: Evaluation Report, *Ed Journal, 12*(6), 21-30.

The California State University (CSU) Digital Summer Session (DSS) featured 43 online courses delivered to 541 students by 11 campuses from June through September 1997. The courses were delivered primarily through electronic publishing, dialogue-support (asynchronous conferencing and real time chat), and e-mail. Some courses were augmented with face-to-face class meetings or labs, videotapes, CD-ROM, and server-based applications. All courses were specifically designed for electronic delivery. A variety on online support processes were instituted, ranging from Web-based course descriptions, online registration, faculty office hours, library support, and course evaluation. The objectives of the DSS evaluation, sponsored by the CSU chancellor's office, were to learn what works and what does not work in online learning environments, and to formally articulate that learning for interested members of the CSU community. Surveys and questionnaires were administered to students, faculty, academic executives, technology support staff, academic support staff, and student services support staff. Evaluation findings included:

Faculty Feedback - The overwhelming majority thought DSS was a good idea.

Concerns expressed included continuity of the program, sources of funding for faculty support to develop online courses, financial aid, transfer of credit, library privileges, and fee structures, particularly with respect to students from one campus taking courses at another. Faculty recommendations included that CSU should invest in a few larger, collaborative multi-year projects to explore DL opportunities, instead of

a lot of small one-shot projects, CSU committees should focus on the most critical policies essential to supporting DL and that student records should not indicate that a course was face-to-face or online.

Student Feedback - Most students, especially adult learners, felt that the Web-based offerings were as good as, or better than, face-to-face course meetings. Many saw distinct advantages to online courses, such as being able to take courses at all, with working full time or not being geographically close to campus.

Evaluators Feedback - Web-based courses are proliferating at all campuses exponentially. This expansion is not (nor should it be) centrally manageable. Some campuses have more expertise in some areas than others and are eager to share that expertise. Whole programs, not just courses, should be candidates for DL delivery. The capability to produce and deliver at campuses is barely an issue now and will not be an issue in about a year or so.

Keywords: Benefits, Course Design, Instructor, Specialized Literature

The Deputy Secretary of Defense tasked the Services on 27 October 1994 to review DL technologies and to submit plans by 31 July 1995 for using them to train their reserve component (RC) personnel. This study provides a review of these Program Decision Memorandum (PDM) directed Service Plans, summarizes the major findings from the review, and offers recommendations based on the findings.

46. Metzko, J., Redding, G. A., and Fletcher, J. D. (1996), *Distance Learning and the Reserve Components*, Washington, DC, Institute for Defense Analyses (IDA).

This report provides a summary of service official plans to adopt DL technologies for training. The report examines the potential of utilizing DL for RC training. Over $55.3 million dollars were spent on travel and per diem in FY95 to support the training of RC students in centralized training facilities. The RC component has a far higher percentage of non-MOS qualified personnel for their duty positions (39 percent) compared to the active Army (AC) (only 4 percent are non-MOS qualified). Only 41 percent of the Army RC personnel who were not MOS qualified were slated to attend resident training in FY95 due to lack of funding. Thus, one of the principle findings of this study was that "the economic value of increased training accessibility and the resulting increased readiness available from more comprehensive use of DL technologies is difficult to estimate, but could be greater than the training cost savings. It may prove to be the primary payoff from systematic adoption of DL technologies for RC training."

Other principle findings from this review of the service DL plans include:

- More than 300 studies have demonstrated the efficacy of DL technologies. DL is as effective as conventional resident instruction in achieving a wide range of instructional objectives.
- DL technology applications could be used to train AC personnel (1.6 million) and Department of Defense (DoD) civilians (900,000) as well as RC personnel.
- DL technology could be used to train the nearly 46,000 Army and Navy RC personnel who required training in FY95, in contrast to the 20,000 RC personnel who attended resident training in that year.
- Many cost savings can be potentially realized from use of DL technologies, including fiscal savings in travel and per diem, reductions in time to train, training material costs, and instructor costs.
- Converting to DL requires sizable up-front investments. Cost estimates to convert conventional schoolhouse instruction to DL courseware vary widely. Service investment cost estimates for RC DL applications are sizable, ranging from about $500 million to $1,800 million.
- Most service expenditures for DL have been in hardware rather than courseware, a practice that limits the utilization of DL systems.
- Data gaps remain in all service plans for using DL in RC training. Service budgets provide no budget line items or budget exhibits under which funding for DL can be uniformly tracked and managed. Service plans do not identify how implementing DL would affect the present schoolhouse infrastructure and costs; marginal costs of the schoolhouse infrastructure (instructors, training developers, training equipment, course maintenance, school operations, etc.) are not available.

The study recommends examining the implementation of DL technologies from a total force context given that, with few exceptions, the course content is the same for AC and RC personnel in the same job occupations. This could make DL technology investment more economically attractive. The report also recommends preparing an action plan to help expeditiously move the plan forward for implementation.

Keywords: Benefits, Costs, Specialized Literature

47. Miller, G. E. (2000, 17-20 September 2000), *Penn State's World Campus: A Case Study in Achieving Cost Efficiencies in ALN.* Paper presented at the ALN Workshop 2000: Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness, Lake George, NY.

The World Campus was inaugurated in 1998 by the Pennsylvania State University as a major initiative to use the Internet and related technologies to extend Pennsylvania State programs to students nationally and internationally. Its 5-year goal is to offer up to 30 certificate and degree programs, comprising up to 300 individual

courses, that will generate 10,000 enrollments per year. While Pennsylvania State is a land grant university, classified as a comprehensive research extensive institution and operates as a nonprofit corporation, the World Campus is expected to generate net income after expenses, and has been charged with the goal of being entirely self-sufficient by the end of its first 5 years of operation. Thus, achieving cost effectiveness and cost efficiencies are high priorities of the World Campus. The World Campus is focusing on three areas for achieving cost efficiencies: scope, scale, and streamlining. With respect to scope, the World Campus is on target toward its 5-year goal of having 30 programs available by 2002-2003. Administrative overhead has been reduced by about 50 percent. With regard to scale, average course enrollments have grown from 14 to 28 in just over 2 years. The goal is for average credit enrollments to increase to around 50 by the end of the first 5 years in operation. Several important efforts have also been made to streamline processes in order to create capacity and reduce the unit cost of a process. Pennsylvania State utilizes the continuous quality improvement (CQI) process to streamline processes.

Keywords: Costs, Specialized Literature

48. Moore, M. G. (2000), Editorial - Technology-Driven Change: Where Does it Leave the Faculty?, *The American Journal of Distance Education, 14*(1), 1-6.

The roles of faculty may soon be changing, driven by economies of large-scale production and division of labor principles. Faculty roles may be split into professions of content development, facilitating, and media design and production. Blending traditional staffing structures and industrial delivery methods is not a likely scenario. However, both can coexist, with some institutions providing the conventional, face-to-face, labor intensive, largely tutorial methods while other institutions specialize in industrial-type distance education. We are entering a critical period, the author states, and it would be unfortunate if faculty were not centrally involved in the decisions that will determine the future direction of higher education.

An interesting observation with respect to this editorial is the discussion centering around the price advantages that accrue to distance education programs that benefit from the economies of large-scale production. According to this article, competition from high-quality, dedicated distance education systems is just around the corner as many universities are jumping in the DL arena. The economies of large-scale production combined with cost savings from travel reduction and less per diem could be substantial for the Army.

Keywords: Costs, Instructor, Specialized Literature

49. Murray, J. H. (1997), *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*, Cambridge, MA, The MIT Press, Massachusetts Institute of Technology.

Multimedia pioneer Janet Murray is a senior research scientist at the Massachusetts Institute of Technology (MIT). She directs MIT's Program in Advanced

Interactive Narrative Technology (PAINT) and teaches a course in interactive narrative. In this interesting book about multimedia tools and techniques, Murray describes the tools that the "cyberbards" of the 21st century will need, as she considers the profound effect of the computer as a medium of presentation. One unexpected but powerful effect is that sound is beginning to supercede the print library as a focus of research, and the resurgence of the importance of storytelling, one of the oldest forms of understanding and transmitting knowledge. Murray's book also offers examples of the kinds of changes that widespread access to broadband digital environments might bring us.

Keywords: Benefits, Recent Trends, Specialized Literature

50. Parchman, S. W., Ellis, J. A., Christinaz, D., and Vogel, M. (2000), An Evaluation of Three Computer-Based Instructional Strategies in Basic Electricity and Electronics Training, *Military Psychology, 12*(1), 73-87.

This study examines whether CBI approaches can be applied to the training of complex technical skills. Performed by the Navy Personnel Research and Development Center in San Diego, the study evaluated four alternative instructional strategies for teaching complex technical skills in basic electronics. The four strategies were: computer-based drill and practice (CBDP), enhanced computer-based instruction (ECBI), a computer-based adventure game (GAME), and the existing classroom instruction (CI). At the completion of instruction, trainees were administered a schoolhouse comprehensive test, a specially designed cognitive skills test, and a motivation questionnaire.

Basic electricity and electronics (BE/E) fundamentals are included in the programs of instruction for many different careers in equipment and systems maintenance. Historically the BE/E material has proved difficult for students to learn and has resulted in high setback and attrition rates. In general, the CBDP and ECBI groups outperformed the CI and GAME groups on all measures.

Keywords: Benefits, Course Design, Specialized Literature

> *The amount of information that now reaches a soldier on the battlefield is staggering compared to even the recent past. The ability to process this information and determine what is actually important to the decision at hand, as well as the ability to operate complex C2 automated systems are two skills the officer in the field must now have. The Marine Corps' Combat Decision Range, a computer simulation program, is designed to train troops to quickly sift through large amounts of data and to make rapid tactical decisions under stress.*

51. Peters, K. M. (1999), Split Decision, *Government Executive*, October 1999, 43-48.

This article examines the impact of new technology and information distribution; while vastly more information reaches the soldier on the battlefield by means of new technologies such as palm top computers, the human thought process remains

unchanged. With the massive amount of data now available to soldiers, the problem facing commanders becomes knowing what to know. The lack of attention to the human side of information processing in favor of focusing on the technologies may have been a factor in the case of Captain Will Rogers of the Navy cruiser USS Vincennes, whose decision in July 1988 to shoot down Iran Air Flight 655, which he mistakenly believed to be an Iranian fighter jet, resulted in the deaths of 290 civilians. Captain Rogers based his decision under pressure on the Iranian jet's course, speed, altitude, and radio broadcasts, just a fraction of the information available to him from the ship's Aegis weapons system. Another captain aboard the USS Sides, operating also in the Gulf at the time, concluded accurately that Flight 655 was a commercial jet. The different conclusions of the two captains points out that the military would do well to learn more about human decision making using the new high-tech tools. With the new battlefield digitization programs, the Army hopes to achieve improved situational awareness thereby accomplishing missions faster with fewer casualties. However, simply getting more data to people is just the beginning. The data must be turned into information which in then interpreted into knowledge. The soldier must be able to interpret data quickly, at a glance.

Since the Army began experimenting with digitization in 1994, researchers from the Central Technical Support Facility (CTSF) at Fort Hood have learned that how information is conveyed is as important as what information is conveyed. Studies revealed that information needed to be displayed on large screens at the battlefield headquarters. Commanders made decisions on visually seeing how things are presented. Second, data from different systems needed to be integrated to make it useful for commanders, e.g., staff officers had to be able to synchronize data arriving through intelligence and logistics channels with data arriving through combat system channels. In addition, soldiers have to develop a higher-than-average level of computer literacy to use and maintain the digitized systems effectively. There is a constant need for training and for maintenance of this highly technical infrastructure.

Like the Army, the Marine Corps has been experimenting with technology to improve situational awareness on the battlefield. Research at the Marine Corps Warfighting Laboratory in Quantico, VA has evolved into the Combat Decision Range, a computer simulation program designed to train troops to quickly sift through large amounts of data and to make rapid tactical decisions under stress. With the simulator, a Marine has to make about 50 to 60 tactical decisions within 30 minutes. Immediately following the range training, Marines are debriefed on the decisions they made, why they made them, and whether they were the right decisions.

Keywords: Benefits, Automation, Practitioner Literature

Critics of DL have identified shortcomings in the DL literature to date, and point out challenges, as well as opportunities, for future research efforts.

52. Phipps, R. A., and Merisotis, J. P. (1999), What's the Difference? A Review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education, Washington, DC, The Institute for Higher Education Policy.

A critical review of distance education studies, this analysis identified some key shortcomings in the DL research to date. Findings: (1) Much of the research does not control for extraneous variables and therefore cannot show cause and effect. (2) Most of the studies do not use randomly selected subjects. (3) The validity and reliability of the instruments used to measure student outcomes and attitudes are questionable., (4) Many studies do not adequately control for the feelings and attitudes of the students and faculty - what the educational research refers to as "reactive effects." (5) The research has tended to emphasize student outcomes for individual courses rather than for a total academic program. (6) The research does not take into account differences among students. (7) The research does not adequately explain why the dropout rates of distance learners are higher. (8) The research does not take into consideration how the different learning styles of students relate to the use of particular technologies. (9) The research does not adequately address the effectiveness of digital libraries, etc.

Phipps and Merisotis conclude that the research on DL and its effectiveness has placed more emphasis on the "utopian" possibilities of the technology and its potential to do as well as CBI than on practical issues. Questions that need to be asked include "What is the quality of the access to learning in the DL context?" "What are the best ways to participate in asynchronous communication?" "Does the student have the necessary skills to use the technology?" Technology, asserts the authors, cannot replace the human touch in education. Technology is not nearly as important in ascertaining student learning outcomes as other factors such as student motivation, the quality of the instructor as well as the course of instruction, and individual learner characteristics.

Keywords: Benefits, Specialized Literature

53. Policy, T. I. f. H. E. (2000), *Quality on the Line: Benchmarks for Success in Internet-Based Distance Education*, The Institute for Higher Education Policy.

This case study project was undertaken to compile a set of benchmarks that could be used consistently to evaluate DL courses and, in particular, Internet-based courses. A comprehensive literature search was conducted to compile benchmarks recommended by other organizations and groups and in various articles and publications. Second, institutions that have substantial experience in distance education were identified. Third, these institutions were visited by institute staff to assess the degree to which the campuses incorporated the benchmarks in their Internet-based DL courses and programs. The six institutions participating in the study were: Brevard Community College, Regents College, the University of Illinois at Urbana-Champaign, the University of Maryland University College, Utah State University, and Weber State University

The final outcome of the study is a list of 24 benchmarks that can be applied to measure the quality of Internet-based distance education. The benchmarks fall into seven categories: institutional support, course development, teaching/learning, course structure, student support, faculty support, and evaluation and assessment benchmarks.

Institutional Support Benchmarks

- A documented technology plan that includes electronic security measures is in place and operational to ensure both quality standards and the integrity and validity of information.
- The reliability of the technology delivery system is as failsafe as possible.
- A centralized system provides support for building and maintaining the distance education infrastructure.

Course Development Benchmarks

- Guidelines regarding minimum standards are used for course development, design, and delivery, while learning outcomes – not the availability of existing technology – determine the technology being used to deliver course content.
- Instructional materials are reviewed periodically to ensure they meet program standards.
- Courses are designed to require students to engage themselves in analysis, synthesis, and evaluation as part of their course and program requirements.

Technology/Learning Benchmarks

- Student interaction with faculty and other students is an essential characteristic and is facilitated through a variety of ways, including voice-mail and/or e-mail.
- Feedback to student assignments and questions is constructive and provided in a timely manner.
- Students are instructed in the proper methods of effective research, including assessment of the validity of resources.

Course Structure Benchmarks

- Before starting an online program, students are advised about the program to determine if they possess the self-motivation and commitment to learn at a distance and that they have access to the minimal technology required by the course design.
- Students are provided with supplemental course information that outlines course objectives, concepts, and ideas, and learning outcomes for each course are summarized in a clearly written statement.
- Students have access to sufficient library resources that may include a "virtual library" accessible through the World Wide Web.
- Faculty and students agree upon expectations regarding times for student assignment completion and faculty response.

Student Support Benchmarks

- Students receive information about programs, including admission requirements, tuition and fees, books and supplies, technical and proctoring requirements, and student support services.
- Students are provided with hands-on-training and information to aid them in securing material through electronic databases, interlibrary loans, government archives, news services, and other sources.
- Throughout the duration of the course/program, students have access to technical assistance, including detailed instructions regarding the electronic media used, practice sessions before to the beginning of the course, and convenient access to technical support staff.
- Questions directed to student service personnel are answered accurately and quickly, with a structured system in place to address student complaints.

Faculty Support Benchmarks

- Technical assistance in course development is available to faculty, who are encouraged to use it.
- Faculty members are assisted in the transition from classroom teaching to online instruction and are assessed during the process.
- Instructor training and assistance, including peer mentoring, continues through the progression of the online course.
- Faculty members are provided with written resources to deal with issues arising from student use of electronically-accessed data.

Evaluation and Assessment Benchmarks

- The program's educational effectiveness and teaching/learning process is assessed through an evaluation process that uses several methods and applies specific standards.
- Data on enrollment, costs, and successful/innovative uses of technology are used to evaluate program effectiveness.
- Intended learning outcomes are reviewed regularly to ensure clarity, utility, and appropriateness.

Keywords: Benefits, Costs, Course Design, Instructor, Recent Trends, Specialized Literature

54. Ragan, L. C. (1998), Good Teaching is Good Teaching: An Emerging Set of Guiding Principles and Practices for the Design and Development of Distance Education, *DEOSNEWS, 8*(12), 8.

A project started in 1995 with a grant from the AT&T Foundation, entitled the Innovations in Distance Education (IDE) Project, led to the development of a set of

guiding principles for the design and development of distance education programs. The resulting principles and practices also apply equally well to the resident instruction as well as the distance education delivery model. "Good teaching is good teaching" and while the techniques may change depending on the constraints of time and place, the desired student goals are basically the same. The principles deal primarily with the design and development stages of the instructional design process.

Keywords: Instructor, Recent Trends, Specialized Literature

55. Raschke, C. (1999), Telecommunications and New Learning Paradigms, *Syllabus, Nov/Dec 1999*, 4 pp.

This article examines paradigms of teaching and learning from a historical perspective in order to provide some clarity to what the terms "teaching" and "learning" mean with respect to the philosophy of education.

The first paradigm of teaching and learning is referred to as mandarin, and goes back to the imperial courts of China. The principle purpose of teaching is viewed as the transmission of ancient cultural norms, practices, and values. Rote instruction, memorization, and mastery of select skills such as reading and calligraphy characterize the mandarin model.

The second paradigm is the academic, derived from the ancient Greek academy in Athens. It is the cornerstone of the modern liberal arts education. It focuses on the self-development of the learner through the challenging and charismatic role model in the person of the teacher. The role of teaching is to produce lifelong learners in the academic model.

The third paradigm is the clerical, which reflects the historical role of religious hierarchies in shaping secular institutions. The goal of instruction in the clerical model is to inculcate in the student the kinds of beliefs, values, and moral practices that will ensure a virtuous and productive life and ultimately eternal salvation.

The fourth paradigm is the industrial model, first developed in Germany and imported to the US in the 1800s. It includes the K-12 schooling, community college systems, and the land grant university. The industrial model was based on the discovery that in a capitalist economy, workers needed to be increasingly equipped with scientific and technical know-how.

The fifth and final paradigm discussed is the transactional model, or informational model. Teaching and learning are no longer separate activities in the generation of knowledge. The transactional paradigm delimits a new "learning space," by which is meant the total context, or set of conditions, within which learning at a particular juncture takes place. With respect to the distributed learning environment, the learning space is considerably different from the traditional learning space of a typical class characterized by a teacher in front of a group of students who listened, took notes, and asked questions. In the distributed learning environment, there is a complex and

constantly shifting set of queries and responses on the part of both instructor and student, rendering the distinction between "educator" and "educated" less significant. With transactional learning, teaching and learning are no longer separate activities. The instructor is no longer the sole originator of all academic content within the learning space. In the learning space of a digital culture, there can be a virtual explosion of "self-crafted, ad hoc, and customized learning modules." The digital learning space is characterized by experimentation and exploratory activity, spurred on by the infinite web of files and hyperlinks that constitute the Internet.

Keywords: Course Design, Instructor, Recent Trends, Practitioner Literature

A recent Army training experiment involved integrating the computer training on the Army Battle Command System (ABCS) with existing tactics courses at CGSC to provide field grade officers with needed digital systems training using the same amount of time previously devoted only to tactics training.

56. Ross, K., G., Ph.D., and Yoder, M. K. R. (1999), *Producing Computer Literacy for the Digitized Battlespace of the Future.* Paper presented at the Interservice/Industry Training, Simulation and Education Conference, Orlando, FL.

Computer literacy is a decisive future battlefield skill. The goal of a recent Army training experiment at the US Army Command and General Staff College (CGSC) was to integrate tactics education with training on the Army Battle Command System (ABCS) in a brigade operations course to produce both computer performance skills and tactical competency using the same amount of time previously devoted to tactics training alone. The methodology consisted of the radical redesign of an existing tactics course, including the integration of a previously separate 40-hour computer operator course. The new course design was based on the constructivist approach to instruction which places the learner in an active role, not just a passive receiver of information, but engaging, seeking to make sense of things, interpreting experiences, and constructing guides to how knowledge can be used. The instructor intervenes only when the students reach a point of no progress. The after action review (AAR) is a key component of the approach. Instructors must be thoroughly versed on the learning objectives as well as the enabling tasks that the students must perform to meet those objectives and must be skilled facilitators in both providing feedback and in conducting the AARs. Instructors must also be thoroughly proficient on all the tools, including tactical computers. The classroom environment must be as close to the environment that the task must be transferred to as is practical.

Results of the experiment were uniformly positive. The students consistently achieved all learning objectives, and with no additional training time, learned to operate and apply the digital systems. Students that were assigned to jobs where they use the MCS reported high retention of the skills learned in the classes. Researchers assigned this largely to the contextual basis of the original learning. The results indicated that even students who came to the course with minimal understanding of tactics and/or the

digitized tactics systems could produce high quality operational products using digitized systems from the 147 hours of training.

Keywords: Course Design, Automation, Specialized Literature

57. Russell, T. L. (1999), *The No Significant Difference Phenomenon*, Chapel Hill, NC, Office of Instructional Telecommunications, North Carolina University.

In this book, Russell offers evidence to support the position that distance education programs match conventional courses in rigor and quality of outcomes. The evidence comes in the form of brief annotations of over 200 citations illustrating the "no significant difference" phenomenon. There is a Web site at the University of New Brunswick to provide current updates of citations and readers can submit their entries for posting: http://tenb.mta.ca/phenom/.

Keywords: Benefits, Specialized Literature

58. Sachs, D. D. (2000, 17-20 September 2000), *Pace University NACTEL Program.* Paper presented at the ALN Workshop 2000: Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness, Lake George, NY.

Keywords: Costs, Specialized Literature

The NACTEL program consists of an Associates of Science Degree (AS) in Telecommunications that is provided 100 percent over the Internet to individuals who are currently employed by telecommunications companies such as Bell Atlantic and General Telephone and Electronics (GTE), and/or who belong to two telecommunications unions. The NACTEL Program is administered by Pace University, a private university located in the NY metropolitan area. The full program was made available in fall 1999 and consists of 16 courses, half of which are in general education and half of which are in electronics and telecommunications. The program is focused on providing more network technicians to the companies, and most individuals work full-time while obtaining their education. Often their tuition and fees are reimbursed by the companies. The average tuition cost per course is $500, considerably less than the tuition charged to the traditional students attending this private NY state university.

Currently, the NACTEL project expenses and revenue are just about even. Start-up costs for this program were $500,000, which was provided by the Alfred P. Sloan Foundation. Of the initial $500,000, half went to course development and half went to overall management and organization expenses. Faculty members develop the course content, select the textbooks, and create videotapes with technical support from the School of Computer Science and Information Systems at Pace University. The budget for online course development is $15,000 per course. There were many unanticipated expenses when the program first began, and for the first year, revenue and expenses were at a slightly less than break-even point. At the anticipated student enrollment

levels for the 2000-2001 year (240 students times 5 enrollment sessions), revenue and expenses are expected to break-even. The program is expected to generate profits in the short term.

The benefits of the NACTEL program include a wider student base to include adults that work full-time in 37 different states who would otherwise not be able to attend school. Statistics from the first year of the program indicate that students are succeeding in the ALN classes they are taking. The program has also introduced a large number of faculty members to online education technology and has provided faculty with leading edge hardware and software that is shared with other university members. The program has led to the development of several other online initiatives, which are already profitable because they charge full tuition. Overall, the benefits have surpassed the costs.

The Department of Energy began sponsoring a DL project in the early 1990s to expand the work-pool of trained waste-management workers for environmental clean-up projects.

59. Stapp, M. (1999), New Mexico State University (NMSU) and the Waste-management Education and Research Consortium (WERC), Personal Interview, Las Cruces, NM.

NMSU and WERC have produced interactive television (ITV) courses between the Consortium members and transmitted ITV courses across the state and nation, including some internationally transmitted courses, since 1990. WERC was established through a Department of Energy sponsorship to expand the work-pool for waste management cleanup.

Professors often must transfer hand written notes to PowerPoint presentations for the televised media. Chalkboards are also passe, as they are hard to read for the distant students. The preparation time is a good 4-6 times that of a traditional class, according to the production staff on campus. They try to get the professors up to speed as early as possible on the specifics of televised teaching, the cameras, sound, student interactions, etc. Motivation is key: the professor must want to teach a televised course in order for it to be a positive experience for all participants. Student feedback is used for course evaluation; if the students have negative feedback, then that professor is generally not invited back to teach again. Some professors have a difficult time in front of the television and others are naturals. Two-way interactive video is also used for some courses, and Web-based courses are being developed. Many professors are designing Web-components for assignments, and interaction with the students to augment the televised courses. Professors that teach the WERC courses are compensated an additional $1,000 per semester and are provided $2,500 to hire graduate assistants to help them with the course load. They are also provided with a $200 copy budget. Courier services are used to get handouts to the distant students. A site facilitator is responsible for getting the handouts to the students. Facilitators also open up the classroom, start up the equipment, etc. The lag time for the distant student to receive and then send homework assignments makes scheduling a crucial factor. A

tape library is available for students to check out tapes at the library and at the production facilities on campus.

Keywords: Benefits, Instructor, Specialized Literature

60. Tapscott, D. (1999), *Growing Up Digital: The Rise of the Net Generation*, McGraw-Hill Professional Publishing.

Growing Up Digital explores the differences evident between the net generation, born since 1977, and the baby boomer generation, those born between 1946 and 1964. The emphasis is on the impact of the Internet and the new interactive technologies on our children. Despite fears that the computer is making kids more antisocial, the author indicates that kids are using the computer to play, build relationships, and explore the world.

One section of the book explores the "New Teacher" as the digital media enter the schools. According to Tapscott, teachers need to become more youth workers, not merely transmitters of information. Teachers can help students navigate through all the information and provide crucial guidance and support regarding how to learn. The teacher mediates the students' engagement with the Internet, ensuring the Internet to be stimulating and intelligent. To do this, teachers must become as fluent in new media as their students. Teachers are becoming facilitators in creating citizens in a global society. Students are becoming in charge of their own learning; only they can decide to do something and what they decide to do will be far more creative than you can imagine.

Keywords: Benefits, Instructor, Specialized Literature

61. Tapscott, D. and Caston, A. (1993), *Paradigm Shift: The New Promise of Information Technology*, NY, McGraw-Hill, Inc.

The information age is evolving into a second era, driven by profound changes in the nature of computers and by the demands of competitive business. A paradigm shift in information technology is creating a new business environment. A number of recurring business themes are emerging as companies reengineer themselves for the new environment: productivity of knowledge and service workers, quality, responsiveness, globalization, outsourcing, and partnering.

Keywords: Benefits, Recent Trends, Specialized Literature

62. Throne, M. H., and Lickteig, C. W. (1997), *Training Computer Skills for the Future Battlefield: A Review and Annotated Bibliography* (Research Product 97-15), Alexandria, VA, US Army Research Institute for the Behavioral and Social Sciences.

The Army conducted several AWEs in the 1990s to test the networked digital information systems and corresponding battlefield scenarios for the digital battlefield. One of the first AWEs, Desert Hammer VI, concluded that the computer-based

information systems could not replace fundamental combat skills. Rather, a three-phase hierarchical approach to training was recommended: fundamental combat skills, computer skills, and finally, the integration of combat and computer skills in a warfighting environment. Follow-on AWEs found that digital skills are also highly perishable.

This report contains an annotated bibliography of 76 articles on programming, software, simulations, and gaming skill acquisition, retention, and transfer. General findings for skill acquisition include: procedural job skills should be acquired before supporting computer skills, novices apply their mental models to computer skills sometimes erroneously, guided exploration improves computer skill acquisition more than just reading a manual, active participation increases learning, novices may acquire skills faster with direct manipulation or windows-based applications than with command-based systems, and advance organizers may improve computer skill acquisition.

With respect to retention, over-practice increases retention of computer skills, problem-solving strategies may slow acquisition but increase retention, process knowledge about how an application operates is retained better than the interface-based operating procedures, and commands with more specific names are retained better than commands with more generic names. Computer-assisted instruction (CAI) may actually lead to greater transfer of computer skills than actual system training and is often cheaper than simulation.

Keywords: Benefits, Automation, Specialized Literature

63. Wentling, T. L. (2000, 17-20 September 2000), *Cost Efficiency of Online Instruction in a Research One University: A Case Study of a Department's Efforts.* Paper presented at the ALN Workshop 2000: Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness, Lake George, NY.

This article describes the online Masters program entitled "Global Human Resource Development" offered by the University of Illinois beginning in the fall of 1998. The same degree is also offered in the traditional campus. The target audience for the program includes individuals who are working in the private sector or government sector in such positions as instructional designer, trainer, training evaluator, performance consultants, etc. The nine-course degree program can be completed by students who hold full-time jobs in 3 years, at one course per semester. The program relies primarily on Internet-based technologies that are augmented with CD-ROM and telephone in some courses.

The Human Resources Department, which initiated this program, has a fairly sophisticated faculty in terms of technology use, with faculty using Web support for most on-campus courses. The Sloan Foundation support has been a major driver of technology infusion in course delivery at the University of Illinois. All online students are charged the in-state tuition rate regardless of residence, which translates to quite a bargain.

Program start-up costs were quite high. The university provided $180,000 for the nine-course program and the department invested another $76,000. The university plans to run three groups with an average of 30 students each simultaneously at all times. A study of learning outcomes and satisfaction was completed during the first year of the program that confirmed comparable learning with on-campus instruction (Aragon et al., in press).

The advent of online Masters' programs has resulted in changes in the university budgeting process. The departments have some latitude with respect to online tuition decisions and also can negotiate the return of the majority of the online revenue back to the department developing the program, as opposed to the university overall. This decentralization provides financial incentives for program success. The university is also conducting studies on faculty compensation issues.

This online program has also developed an evaluation system to continuously monitor the health of the online program using six vital signs: program demand, student satisfaction, faculty satisfaction, retention, student learning, and financial efficiency. If a substandard reading is obtained for any vital sign, an in-depth analysis is conducted, and a plan of action for correcting the problem is generated. Cost drivers for the online program include fixed costs such as administrative time, secretarial support, equipment, facility, server support, network support, and office communication costs. Variable costs include faculty salary, technology support staff, teaching assistant salary, course materials, and mailing costs. The program achieved break-even status even with less than the targeted 30 students per course. However, the cost analysis results emphasize the importance of recruiting students and maintaining enrollments in courses. A loss of three students can mean a loss in revenue of $2,700. Currently studies are underway to determine the optimal enrollment level, and the optimal level of teaching and research assistant support necessary to support the courses.

Keywords: Costs, Specialized Literature

64. West, F. J. (1999, August 1999), Information Technology: Advice from Silicon Valley CEOs, *Marine Corps Gazette.*

During a recent Marine Corps AWE, a strategic wargame was conducted at Stanford Business College that paired 10 generals and 5 admirals with 15 top business CEOs from Silicon Valley. The primary purpose of the wargame was for the military to obtain the advice and business perspective of the leading commercial IT corporations with respect to information technology investments. Advice from the business executives included reexamining the disparity between IT investment in garrison (41 percent of total budget) versus the tactical level (17 percent) and investing more into internal Marine training to advance computer literacy, adding that they believed the military should establish the goal of ensuring that the entire force be computer literate by 2010. The CEOs suggested that the Marines put investment money into two common infrastructures: wire systems for garrison and wireless systems for expeditionary warfare. It is premature to select any one system and deploy it across the force, advised the executive officers, who urged that the Marines not wait for one model to fit all; that

path will always put the military behind. After introducing different types of field devices and prototype systems, the military should let change happen, according to the CEOs, adding that this is the way that industry approaches decisions.

Keywords: Automation, Practitioner Literature

65. Westfall, P. J. L. (1998, 21-22 January 1998), *Distance Learning: A Strategic Learning Initiative for the Air Force,* Paper presented at the Government Learning Technology Symposium.

This DL overview by the creator of the Center for Distance Education for the Air Force Institute of Technology covers a number of topics pertinent to the development of DL programs, from the need to understand the technologies to the factors likely to impact learning outcomes. Dr. Westfall points out that there is no significant difference in learning outcomes if appropriate media are used. He cautions that one should be skeptical of claims that students learn 50 or 60 percent more with one medium than with another. The outcome of the learning is largely based on prior knowledge and intrinsic motivation. Research conducted by the author has shown a .78 correlation with these two variables with the ability to learn. Do not expect dramatic improvements in learning outcomes because of the media chosen to deliver the training. Media choices can affect the time the learning takes, however. For example, CBI allows the student to go right to the material he or she needs to learn, which can shorten learning time.

Keywords: Benefits, Specialized Literature

> *Currently, the Army operates an extensive infrastructure of training institutions that utilize considerable manpower, equipment, and facilities. These US Army schools have faced especially intense budget pressure in the decade of the 90s. To cope with these challenges, the Army is devising new training strategies that could achieve similar effectiveness to that of current methods but with substantial resource savings.*

66. Winkler, J. D., Kirin, S. J., and Uebersax, J. S. (1992), *Linking Future Training Concepts to Army Individual Training Programs* (R-4228-A), Santa Monica, CA, RAND.

A RAND study performed in the early 1990s identified potential MOSs in which traditional methods of individual training, with special attention to training conducted in residence at Army schools, could be exchanged for alternative training strategies, including DL, training devices, and civilian training of military skills. The research approach was to identify first those MOSs in which substantial resources could be saved by implementing new training concepts for initial, entry-level training of enlisted personnel. Training-related characteristics of entry-level enlisted MOSs were summarized by a small number of general dimensions, the most important of which were ability requirements, civilian exchangeability, dominant tasks, and cost to train. Ability requirements indicate the degree to which the MOSs requires general

intelligence, specific vocational aptitude, and pre-service education. Civilian exchangeability indicates the similarity between Army MOSs and civilian jobs and training programs. Dominant tasks indicate whether the duties of the MOSs emphasize cognitive or informational tasks, as opposed to procedural or manipulative tasks. The cost dimension indicates the MOSs with significantly higher training costs.

The study then provides an analytic framework for using the analysis of training-related characteristics of Army MOS to identify specific MOS in which significant cost savings might be achieved by implementing one of three alternative training concepts: (1) distributed training, which is the applied use of DL technologies to support training outside the schoolhouse, at home-stations, regional training centers, and other selected sites, (2) training devices, simulators, and simulations, and (3) substitution of civilian training or job experience.

Keywords: Benefits, Costs, Automation, Specialized Literature

67. Wisher, R. A., Champagne, M. V., Pauluk, J. L., Eaton, A., Thornton, D. M., and Curnow, C. K. (1999), *Training Through Distance Learning: An Assessment of Research Findings* (Technical Report 1095), US Army Research Institute for the Behavioral and Social Sciences.

This review of the DL literature was conducted to support the ARI TRAINTODAY project, the goal of which is to determine whether it is better to train up-front in the classroom or just in time in the field. Searches on relevant research databases resulted in 2000 entries, largely related to education. Of these, 43 research reports were considered most relevant to the subjects of experimental design, course conversion, or training applications. The studies analyzed in this review, with a combined sample size of 5,438 students, presented a generally positive view of the effectiveness of DL for training applications. However, when the authors tried to determine why DL was effective, they found that 40 percent of the reports included in this summary did not mention course conversion or redesign, 25 percent did not mention instructional techniques, and 50 percent of reports did not fully describe the method of technology employed. Video teletraining was the dominant technology reported. Comparison groups were available only one-third of the time. Thus, some of the findings from the reports reviewed were not supported by a strong experimental design.

Keywords: Benefits, Specialized Literature

68. Wisher, R. A., and Priest, A. N. (1998), Cost-effectiveness of Audio Teletraining for the US Army National Guard, *The American Journal of Distance Education, 12*(1).

This article summarizes a cost-effectiveness analysis of training Army National Guard soldiers by audio teletraining technology. Two hundred and twenty-five soldiers attending the Unit Clerk Course in 1996 were divided into two groups; 107 soldiers participated in the resident classroom version of the Unit Clerk Course while 118 participated in the audio teletraining version. The resident course is conducted at

Camp Robinson, AR and required that soldiers travel to Camp Robinson, be billeted, and provided meals. Both groups used the same student workbooks, job aids, and tests. The audio teletraining version required no additional development costs to reconfigure this course to a DL format. The audio teletraining format lacks the face-to-face delivery that other more technologically sophisticated distance learning methods such as CD-ROM, videoconferencing, and multimedia packages can offer, but is felt can be well suited for instruction in which static visual information can be provided to students in advance and for training tasks in which the student follows directions from an instructor, such as procedural tasks.

The authors emphasize the importance of understanding the task at hand and then choosing the best tool for it. Acknowledging that there are more expensive ways to accomplish this training, they make a case for the learning effectiveness of audio teletraining in comparison to face-to-face instruction before turning to its cost-effectiveness.

Keywords: Costs, Specialized Literature

The role of DL for purposes of keeping military skills sharp by providing refresher training delivered to soldiers in the field, as well as providing training to national guard and reserve soldiers has enormous potential. The following report provides a summary of the studies performed on military skill retention.

69. Wisher, R. A., and Sabol, M. A. (1999), *Staying Sharp: Retention of Military Knowledge and Skills* (Special Report 39), US Army Research Institute.

This report summarizes research performed over the past 25 years on the topic of skill retention, with an emphasis on research performed by ARI, but also including relevant research by other military and academic laboratories.

The Different Kinds of Skills. Knowledge, decision, and execution are three skills present in most tasks. In procedural tasks, the crucial recall required is memory for the steps to be performed in a given procedure. In many military tasks, knowledge retrieval predominates. The second ability, sometimes called cognitive processing, dominates in tasks such as decision-making by officers and troubleshooting of faulty equipment. In perceptual-motor tasks, precise execution of well-practiced actions is the crucial aspect.

Recent work in the neuroscience of human memory indicates that these three types of abilities are located and controlled in different regions of the brain, thus, it is not surprising that studies have shown a different pattern of forgetting for each type. Research on memory for cognitive tasks, such as problem solving, judgment, and analysis leading to a decision, shows a moderate rate of decay; forgetting occurs but is relatively small for up to a year after learning. A summary of more than 20 studies, including two studies of military tasks found an average retention loss of 20 percent 13 weeks after training. Memory for job knowledge, facts and ideas that a soldier must remember in order to perform successfully, is sometimes referred to as school

knowledge. Studies of memory for knowledge learned in school have sometimes found remarkable resistance to forgetting for years after learning. However, there is a critical distinction between recognition memory and recall memory. Recognition memory involves choosing among provided alternatives and is usually tested with multiple choice, matching, or true-false test items. Recall memory requires the learner to produce information without being presented with alternatives and is usually tested with short-answer, fill-in, or essay test items. In general, recognition memory is superior to recall memory. Data from 40 studies of memory for school knowledge indicate that recall memory retention is only around 55 percent 26 weeks after training compared to recognition memory retention of close to 80 percent 26 weeks after training.

Keywords: Benefits, Automation, Recent Trends, Specialized Literature

70. Young, J. R. (2001), Four Universities Create an Alliance Against Onslaught of Technology Vendors, *Chronicle of Higher Education* (Daily News 1/23/2001), 3.

Four universities, University of California Berkeley extension program, Pennsylvania State University's World Campus, the University of Washington, and the University of Wisconsin's Learning Innovations program, have formed an alliance to share information and make joint technology purchases.

The four universities have much in common when it comes to distance education, each offering more than 100 online courses, and all being active in earlier forms of distance education, like correspondence courses. The alliance will meet two or three times a year and participate in periodic conference calls. The agenda will focus on four key areas -- marketing, technical issues, student services, and faculty relations.

Keywords: Benefits, Practitioner Literature

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Acronyms

A	
AAHE	American Association for Higher Education
AAR	after action review
ABCS	Army Battle Command System
AC	active Army
ACTIONS	access, costs, teaching and learning, interactivity and user friendliness, organizational issues, novelty, and speed
ADEC	Association of Distance Education Colleges
ALN	asynchronous learning network
ALS	adult learning service
ARI	Army Research Institute
AS	associates of science
AWE	advanced warfighting experiment
B	
BBC	British Broadcasting Company
BE/E	basic electricity and electronics
C	
C2	command and control
CAI	computer-assisted instruction
CBDP	computer-based drill and practice
CBI	computer-based instruction
CD-ROM	compact disk-read only memory
CEO	chief executive officer
CETI	California Educational Technology Initiative
CGSC	Command and General Staff College
CI	classroom instruction
CQI	continuous quality improvement
CSU	California State University
CTEHP	Committee on Techniques for the Enhancement of Human Performance
CTSF	central technical support facility
D	
DL	distance learning
DoD	Department of Defense
DSS	digital summer session
DTIC	Defense Technical Information Center
E	
ECBI	enhanced computer-based instruction
ERIC	Educational Resources Information Center
F	
FY	fiscal year

	G
GTE	General Telephone and Electronics
	I
IDA	Institute for Defense Analysis
IDE	innovations in distance education
IDS	Internet Demographic Study
IHETS	Indiana Higher Education Telecommunication System
IMI	interactive multimedia instruction
IT	information technology
ITFS	Instructional Television Fixed Service
ITV	interactive television
	M
MBA	master of business administration
MCS	Maneuver Control System
MIT	Massachusetts Institute of Technology
MOS	military occupational specialty
MS	master of science
MSIS	master of science in information systems
	N
NCES	National Center for Educations Statistics
NMSU	New Mexico State University
NSF	National Science Foundation
	P
PAINT	Program in Advanced Interactive Narrative Technology
PBS	Public Broadcasting System
PC	personal computer
PDM	Program Decision Memorandum
	R
RC	reserve component
RIT	Rochester Institute of Technology
	S
SFA	sales and field force automation
	T
TIFHE	The Institute for Higher Education
TRAC-WSMR	TRADOC Analysis Center-White Sands Missile Range
TRADAM	Training Delivery Assessment Model
TRADOC	Training and Doctrine Command
TV	television

	U
UMUC	University of Maryland University College
US	United States
USDLA	United States Distance Learning Association
USS	United States Ship
	V
VTT	video teletraining
	W
WERC	Waste-management Education and Research Consortium
WMD	Weapons of Mass Destruction
www	World Wide Web

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