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CHARACTERISTICS OF DISTANCE LEARNING IN ACADEMIA, BUSINESS, AND GOVERNMENT

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Distance learning is defined as: any method of presenting training that is interactive and in which the students are physically separate from the instructor. This research effort focused on the impact of distance learning on the curriculum, types of student-instructor interaction, student interaction with the instructional materials, and on the preparation of faculty and staff for conducting distance learning. A primary goal was to determine if there are specific categories of objectives, task characteristics, or instructional strategies which lend themselves to particular distance learning technologies. This report also details the development, composition and distribution of a distance learning survey and summarizes the results associated with the data analysis.

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PREFACE

This study builds upon previous research work in distance learning conducted by the Air Education and Training Command (AETC) to assess the state-of-the-art in distance learning technology with particular emphasis on hardware configurations (AETC, 1991). Using the AETC study as a starting point, the authors surveyed organizations involved in distance learning to determine how far the technology has advanced, and to assess various organizations' experience with distance learning. Of particular interest were lessons learned concerning the impact of distance learning on the quality of the curriculum, student - instructor interaction, student interaction with instructional materials, and on unique approaches to developing instructional materials for distance learning technologies.

When this project began, the Air Force was probably behind the other services in implementing distance learning on a large scale. Since then, initiatives by AETC to link bases command-wide in a distance learning network are under way; the Armstrong Laboratory research into the cost effectiveness and use of multimedia distance learning for Air Force technical training has started; and existing Air Force distance learning programs at the Air Force Institute of Technology (AFIT) are expanding. This research provides a look at what is happening in distance learning in terms of how a variety of academic, business and government organizations have prepared for implementation of distance learning programs and continue to prepare for expansion of their programs.

Special thanks from the entire research team must be extended to Mr. Gary Beitzel and Capt. Bob Green, of Air Education and Training Command, who willingly shared information relevant to this project. Thanks are also due to Dr. Stephen F. Brown of Cognitive Systems Technologies, Inc. who was an invaluable source of distance learning contacts.

SUMMARY

Distance learning programs have been around for more than twenty years, and much research has been conducted regarding distance learning technology. This study collects original data and summarizes much of the research and practical literature, provides a comprehensive view of what is being done via distance learning and how it is done, and suggests topics which may be of interest to research scientists. This research began by conducting a survey of organizations involved in distance learning. A total of 182 organizations were contacted for the survey; of these, 129 responded to the questionnaire. After the initial results were tabulated, the research team visited 18 organizations to further augment these data. This report catalogs distance learning into six topics of interest to Armstrong Laboratory. A summary of these topics--characteristics of distance learning providers, students, instructors, and curricula, problems and future plans-- is provided below.

Characteristics of Providers

According to the survey results, although the majority of distance learning providers are academic institutions, government, military and commercial firms are increasing their involvement in distance learning. Saving costs appears to be a major reason for using the technology. Of those who reported cost as a critical factor it is more important to technical schools, commercial firms, military organizations and government agencies rather than academic institutions. A wide variety of technologies are employed. On average, providers employ six different technologies to deliver instruction to distance students. While military organizations report using paper-based approaches more than others commercial organizations tend to employ modern, high-tech solutions which help reduce costs. It appears that distance learning technologies are used to meet a wide range of training objectives or goals. Approximately 81% of organizations surveyed train five or more skills using distance learning technologies.

Characteristics of Students

Distance learning students are diverse types who are often free to choose between conventional instruction and distance learning. Student interaction or involvement with the curriculum is a critical factor in distance learning. Interestingly, 82% of respondents said that students use at least two or more ways of interacting with instructors. In general, students are able to take distance learning courses almost anywhere from classroom to home or dormitory. In fact, students tend to be more mature, have families and other responsibilities and take courses which enhance their professional skills. Perhaps one of the least developed components of distance learning is student assessment. The most common means of student assessment is a written test, although other conventional means are also used.

Characteristics of Instructors

The majority of respondents indicate that distance learning instructors are recruited from existing faculty. The primary reason given was because of the instructor's experience. Given these facts, it seems logical that the organization provide the faculty some training, and most programs do this. Most respondents indicated that they provide an introduction to distance learning; many programs provide the training in-house.

Characteristics of the Curriculum

In general, the distance learning curriculum tends to be the same as the conventional course or the conventional course is specially adapted for distance learning. Only 37% reported that courses are developed specifically for distance learning. As one would expect, distance learning objectives or learning outcomes are most often identical to conventional course objectives, although occasionally conventional course objectives are adapted for distance learning technologies. Of those who developed special curricula for distance learning courses, most use their own curriculum development process, instructional systems development (ISD), or make minor adjustments to existing curriculum. Military organizations are much more likely to use ISD than either commercial firms or academic organizations. Academic organizations report more minor adjustments than either military organizations or commercial firms. Also they did not report using new instructional design processes compared to non-academic organizations. Some of the most common characteristics of the distance learning curriculum include additional graphic media, increased opportunity for student interaction, and more frequent assessment of student performance. The distance learning curriculum is typically developed by the course instructor. Developing the curriculum and media appear to be among the most time consuming tasks for developing new courses or converting older ones for distance learning. Many organizations report the curriculum development cycle is the same as for a conventional course. Only a few distance learning program representatives indicate that building student interaction into the curriculum or student assessment requires more time to develop.

Problems

Both the questionnaire and site visits suggest that virtually all organizations experience some implementation and maintenance problems: common problems are cost of technology, reluctance of faculty to use technology, availability of trained personnel, and resistance of faculty to the concept of distance learning. Of the several technology-related problems cited, respondents report capacity (i.e., technology couldn't handle what they wanted), quality (i.e., technology not available yet), interoperability (i.e., no standard), and maintainability (i.e., system required intensive maintenance) most frequently. Several reasons cited as causes of some of the problems listed above include inadequate funding, lack of trained personnel, limited or inadequate facilities, lack of interest in distance learning, and technology. Respondents felt problems could be

prevented by additional funding, training for personnel, management support, and public relations. In other words, it appears that providers feel that most distance learning problems can be solved with additional funding or internal support.

Future Plans

Only 4% of all organizations surveyed indicate that they had no new plans for distance learning. Most respondents plan to increase the number of courses offered and to expand the scope of their distance learning programs. The largest proportion cite distance learning course effectiveness, students' preference, and cost savings as reasons for planning more extensive programs.

Distance learning is not a new concept, it has been around for some time in one form or another. Recently, the application of emerging computer and information technologies has increased the power of distance learning to replicate the best qualities of the classroom at remote sites. By capitalizing on these capabilities the Air Force can increase the quality of training while maintaining or reducing costs.

CHARACTERISTICS OF DISTANCE LEARNING IN ACADEMIA, BUSINESS AND GOVERNMENT

I. INTRODUCTION

Although distance learning techniques and methods have been utilized for many years[1], distance learning has recently come under increased scrutiny. From our review of the literature it appears that the bulk of research has focused on the various technologies employed and how organizations have implemented them. Cost is a factor with any modern technology and some recent distance learning technologies have been the subject of intense cost inquiries. In spite of all the reports, few studies have concentrated on student related issues or instructional quality concerns. This report synthesizes much of the excellent research which has already been done, and focuses attention on how students, faculty and staff are involved in distance learning with particular emphasis on the quality of distance learning techniques and methods.

Background

Distance Learning is defined as: *any method of presenting training that is interactive and in which the students are physically separate from the instructor* (AETC, 1991). The training environment in the Air Force is changing. Efforts to decentralize training management and export training through distance learning and other technologies have already begun, and this trend will surely continue. Previous Armstrong Laboratory research in computer-based training revealed that the Air Force had not been thoroughly prepared for implementation of computer-based training (Walsh, Yee, Grozier, Gibson & Young, 1992). This paper reports the results of a study conducted by the authors for the Armstrong Laboratory to determine critical issues which will aid the Air Force in preparing for distance learning implementation.

Selected organizations were contacted to determine how their approach to distance learning influences the preparation and training of their instructional staff, whether they employed any special techniques to select, prepare or modify old instructional materials or create new instructional materials for implementation in distance learning, to assess the effectiveness of their programs, and to gauge the organizational impact of distance learning.

A majority of training which takes place in the Air Force is directly related to maintenance functions. Even training which is not maintenance related is primarily task (skill) oriented. Nearly all of this training requires some kind of hands-on experience with aircraft, weapon systems or equipment. For any technology to have a significant effect on Air Force technical training it must be able to adequately address the requirements of these hands-on components. In our opinion, effective technical training requires sound instructional design strategies as its basis. Therefore,

[1] 39% of respondents to our survey indicated they have had programs for 10 years or longer.

we have sought to identify distance learning programs which have addressed similar training requirements effectively.

One goal of this research was to determine if there are specific categories of objectives, task characteristics, or instructional strategies which lend themselves to particular distance learning technologies. We have attempted to answer Miller's (1990) question: "What can be done better through distance education than in a classroom?" Some emphasis is placed on the use of mediated instruction, i.e., distance learning using computer-assisted instruction, to assess its applicability and effectiveness. While much distance learning tends to consist of video teletraining with an instructor presenting the learning materials to students at remote site(s) over television transmissions, the research team questioned if this method should be the primary strategy for distance learning, and whether it is the best one for hands-on or technical objectives.

II. METHODS

The purpose of this research was to identify and catalog lessons learned about planning for, implementing, operating and maintaining distance learning programs in order to assist the Air Force in bringing and keeping effective distance learning systems on-line. In order to meet this goal, a series of activities were conducted to collect, analyze, and disseminate information about the characteristics of organizations involved in distance learning, distance learning students, instructors, curricula, and to a lesser degree, the technologies themselves.

The project consisted of a series of steps designed to identify the *state-of-the-art* as reported in the professional literature and by organizations actively involved in distance learning. As shown in Figure 1, project analysts conducted a literature review in order to identify important research issues in distance learning. Next, a Distance Learning Questionnaire was developed and administered to a sample of distance learning providers. The resulting data were analyzed for trends and used to target specific organizations for follow-up visits. During the follow-up visits, more detailed information was collected. Finally, all of this information was synthesized and lessons learned were extracted.

Literature Review

During the first phase of research, an extensive literature review was conducted. The purpose of the literature review was to identify current trends in distance learning, to determine potential research issues, and to assess if there had been previous research conducted which might offer solutions to instructional design issues in distance learning. This information was used to facilitate the development of the questionnaire. Appendix C contains an annotated bibliography focusing on sources of distance learning research and knowledge which might be useful to the Laboratory.

Survey Development

The questionnaire was developed based on trends and research issues identified in the literature review. It was intended to be a broad, inclusive tool which would provide a snapshot of

distance learning as it is currently practiced. In discussions with Armstrong Laboratory, the research team identified specific areas of interest and incorporated them into the theoretical framework used to construct the survey. As previously mentioned, researchers also probed the literature on distance learning for past and present trends in distance learning as well as potential research issues. Together these sources were used to construct a framework which explicitly targeted the information sought. Five general classes of information were identified: characteristics of organizations engaged in distance learning (e.g., type of business conducted), distance learning students (e.g., level of education), distance learning instructors (e.g., amount of training provided), curriculum development (e.g., time required to develop courses), and general information about an organization's experience with distance learning (e.g., problems encountered).

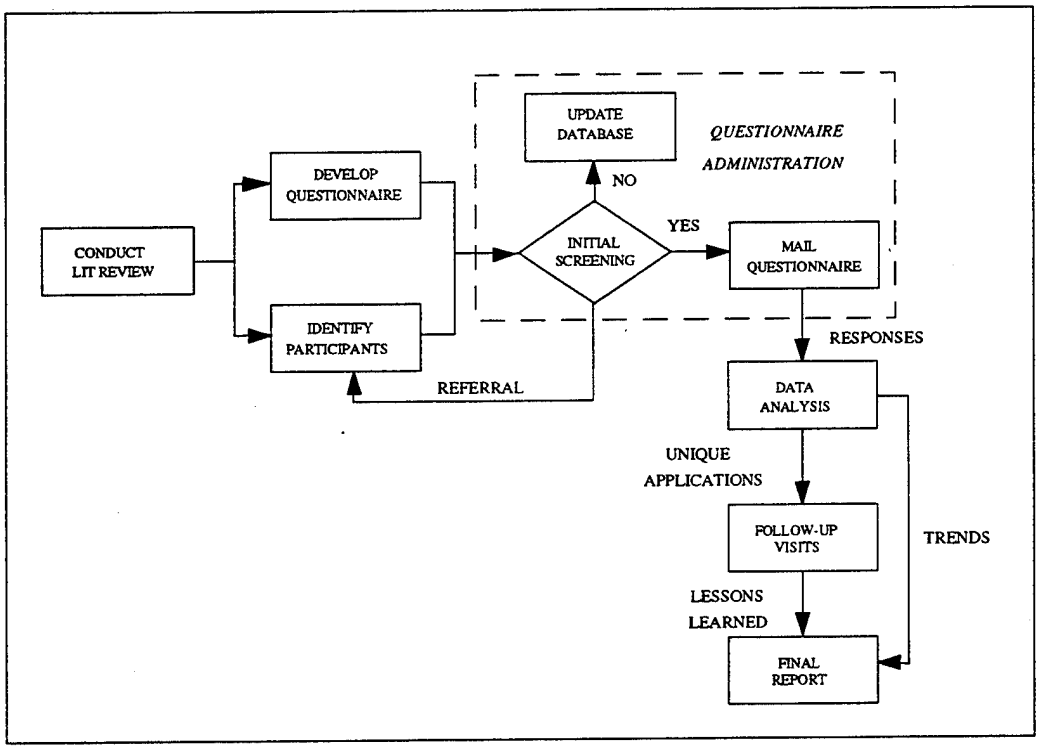


Figure 1. Research Approach

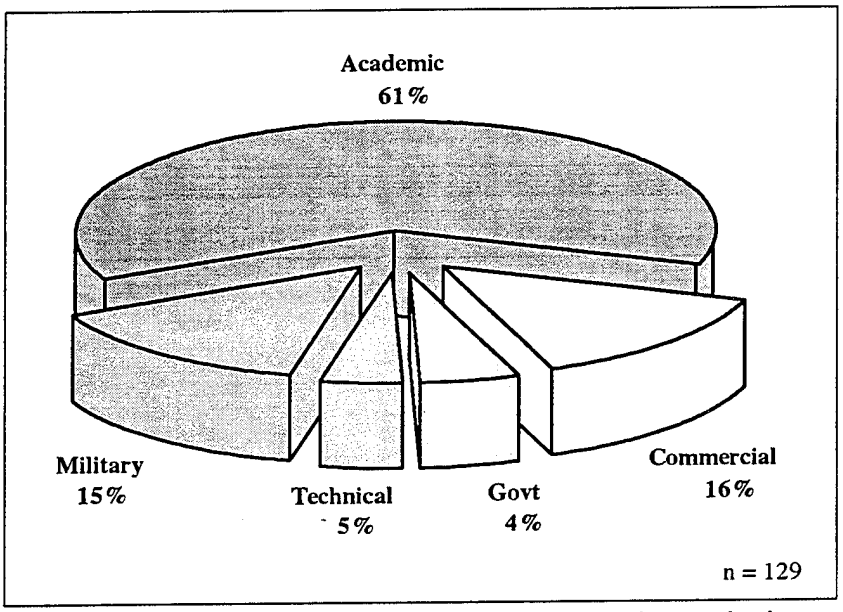
A total of 65 questions was developed to address the need for information in the five general areas. The survey was designed to provide the respondents with a number of choices in each category, yet it did not limit them from providing specific comments to a question if the categories listed did not represent what they were doing. The survey itself is included in Appendix A with data indicating the percentages of respondents who agreed with each possible response alternative.

Survey Sample

The sample consisted of organizations who appeared, at least superficially, to have 1) tailored their curriculum for distance learning; 2) done something specific to prepare their

instructors; or 3) had some other unique aspect to their program. There was no comprehensive or even readily available list of these organizations, so prospects were identified from journal articles, lists of conference attendees, and by word-of-mouth, personal associations, or reputation. As a result, participants were not selected randomly; rather, they were selected systematically. This was done in order to capture the *state-of-the-art* in distance learning. The analysts wanted information that reflected distance learning as it is used today and how it might be used tomorrow, not how it was used in the past. Therefore organizations who were known to use low-tech approaches exclusively were eliminated from consideration.

Once a comprehensive list of prospects was identified, each was contacted. Prospects were asked if they would agree to participate in the survey. If they agreed, they were then asked a set of general background questions. This screening process was used to ensure that the respondents had up-to-date information about distance learning and were willing to share it with the analysts. After the initial phone interview, a more thorough questionnaire was mailed to a Point-of-Contact (POC) at each organization. These POCs were responsible for completing and returning the questionnaire on or before the deadline. During this phase, a database was setup to document organizations who are engaged in distance learning. Key information from the database (e.g., name of the organization, POC, etc.) is presented in the *List of Distance Learning Contacts* found in Appendix B.



Note. Expressed as percentage of respondents who classified their organizations as military, academic, commercial, government, or technical. Percentages do not total 100% due to rounding.

Figure 2. Organizations Who Returned Survey

A total of 301 potential participants was identified and entered into the database. The research team could not locate all of the necessary information for several potential participants identified (e.g., current phone number). As a result, a subset of 224 organizations was included in the sampling frame. After each organization was contacted, those which employed low-tech

solutions (e.g., reliance on paper-based approaches), those which were no longer using distance learning, duplicates (i.e., host and receive sites), or those which chose not to participate were eliminated. The remaining 182 organizations were mailed questionnaires. Of those, 129 returned the survey for an overall response rate of 71% (129/182). Generally, a response rate of this magnitude is considered to be adequate for most purposes (Nachimas & Nachimas, 1987). Figure 2 shows the make-up of this sample by type of organization.

Conduct Survey

The questionnaire was administered over a 3 month period. During this time, the analysts maintained contact with the organizations by phone. If a questionnaire was not received within 1 week of the established deadline, a follow-up call was made to the POC. In most cases the participants indicated at that time the status of the questionnaire and whether or not they would return the questionnaire.

Data Analysis

Data Preparation

Once the questionnaires were returned, they were prepared for data analysis. Data were entered with the SPSS/PC+ (version 4.0) data entry module. Several data-entry approaches were considered. The first required each set of possible responses to receive its own unique code. For example, if a question had 5 response categories, a total of 120 variables (5! or 5 * 4 * 3 * 2 * 1) would be coded making combinatorial explosion a potential problem. A second, more economical approach was adopted. Each response category was coded as a separate variable. A *no* response was coded with a 0, *yes* was coded with a 1. Missing values received a unique code and were excluded from the analyses. While this approach had some drawbacks (e.g., it was more difficult to examine meaningful combinations of answers to a single question), it was the best choice available because it provided the most comprehensive look at the data. Other variables were created by aggregating variables in the database. These variables were used to identify general trends in the data (e.g., the average number of technologies used by an organization).

A total of 572 research variables was defined in this manner. Next, the data were entered into an SPSS data file. A set of rules was created to guide the data entry process and facilitate the reconciliation of any conflicting information. For example, sometimes respondents would check the *other* category and log a response which was already mentioned as an option. In this case, the response was corrected. After all the data were entered, they were completely reviewed for errors and corrections were made. The resulting data set was subjected to analysis.

Analysis

During the initial phase of data analysis, descriptive statistics were calculated for each of the survey variables. Generally, these statistics were raw counts of the number of responses per category and percentages of respondents selecting a particular response option. Percentages were truncated and reported as whole numbers. This was done because whole numbers are easier to

understand. There are also technical problems associated with the use of decimals with relatively small samples--essentially, these numbers are no more accurate than random digits (Wainer, 1992). In some situations (i.e., when a variable's level of measurement permitted) means and correlations were calculated.

During the second phase of the analyses cross-classification tables were constructed in accordance with specific research questions. Normally, these tables would be analyzed using statistical techniques like the chi-square test of association. In this case, chi-squares could not be calculated for a variety of technical reasons including the use of a non-probability sample (Reynolds, 1989), the dependence of observations (Fitz-Gibbons & Morris, 1987), and small cell frequencies (Agresti & Finlay, 1986).

Instead, the cross-classification tables were visually inspected and analyzed for trends. The relative magnitudes of the percentages in each table were evaluated against one another. A 10% difference between two or more response categories was taken as a sign of a potential trend in the data. In other words, when differences were greater than 10% they were flagged as potentially meaningful. This does not imply these findings were statistically significant, rather, this approach was simply used as a heuristic to identify potential trends in the data.

Analysis of *Other* Responses

Many of the survey questions contained an *other* response option. When more than 20% of the respondents indicated *other* for a given question, the responses were analyzed to see if there were any meaningful trends. When trends were discovered, they were used anecdotally.

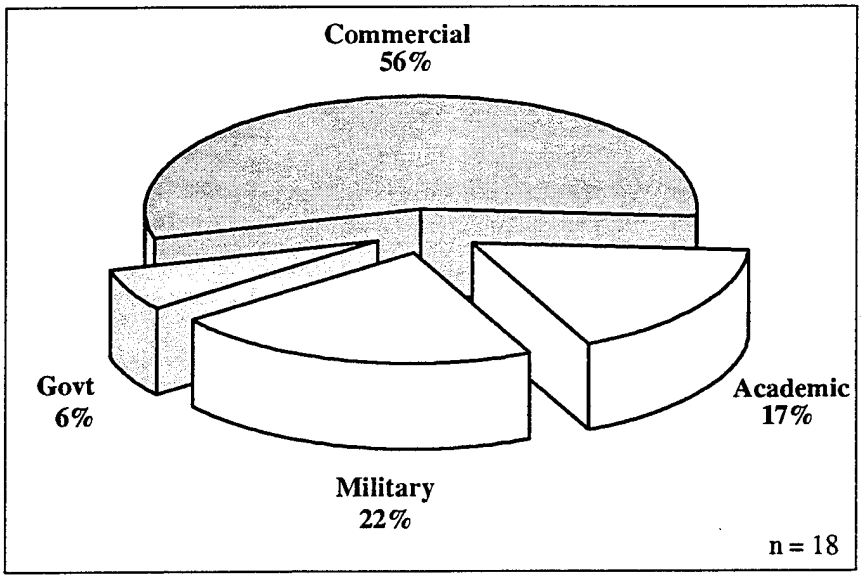
Analysis of Qualitative Responses

Several of the survey questions prompted respondents for some qualitative information about their distance learning program (e.g., *Does your organization have a formula or goal to determine how long it should take to develop (convert) a distance learning course?*). Responses to these questions were tabulated, examined for trends, and used anecdotally.

Follow-up Visits

Follow-up visits were scheduled when an organization's responses to the questionnaire or its reputation suggested that it had useful information to provide to the Air Force. Generally, these sites were identified based on their unique or successful application of distance learning technology to training. Certain sites were targeted for visits simply because they were known to have exceptional distance learning programs or because they were located near other scheduled sites. Others were targeted because of the responses they provided on the written questionnaire (i.e., they indicated that they employed unique approaches). Based on this analysis, 18 sites were targeted for follow-up visits. This list of recommended sites was provided to the Laboratory for review and approval. Upon approval of the list by the Laboratory sponsor, visits were scheduled

to each of the organizations. Figure 3 shows the make-up of the organizations visited.[2] The make-up of these organizations reflects a higher percentage of commercial firms and fewer academic institutions than in the survey sample. This is due to the fact that commercial organizations tended to be doing more technical (job-related) training than the others; something directly related to Air Force training needs.



Note. Expressed as percentage of follow-up visits to each type of organization. Percentages do not total 100% due to rounding.

Figure 3. Organizations Visited

Prior to visiting the selected organizations, the research team developed a set of visit protocols. These protocols consisted of verification of the data provided in the questionnaire, details of specific research questions to be answered, and complete information to be gathered about the program or approach. With this in hand members of the team, usually accompanied by a Laboratory sponsor, visited the selected organizations and conducted the follow-up interviews. Most organizations were eager to demonstrate their programs to the team. These visits provided extremely useful information about distance learning implementation.

Document Research Issues

The ultimate goal of this project was to document research issues in the application of distance learning technologies to real world training situations. Information from the literature review, the survey, and the follow-up visits were summarized in order to assist the Air Force with any plans for implementation of distance learning technology. As a consequence, during the study we documented: 1) instances of successful (or partially successful) application of distance learning; 2) methodological deviations from traditional instructional design and development techniques which may be necessary to take full advantage of the technology; 3) problems

[2] Note that the percentages in Figure 3 differ from those in Figure 2. Figure 3, unlike Figure 2, depicts the organizations visited who reported unique or successful applications of distance learning to training and education.

encountered in applying distance learning to specific types of skills, tasks, or objectives; and 4) specific research issues which should be explored further.

III. RESULTS

The results of this study are derived from three sources: the literature review, survey data and site visits. The structure of the following sections reflect the results from each of these sources.

Literature Review

The purpose of the literature review was to identify current trends in distance learning, to determine what potential research issues might be, and to evaluate the types and locations of well-established distance learning programs for potential follow-up study. The literature was also a source of data regarding approaches, methods, and techniques associated with the relative success or failure of particular distance learning programs. Numerous textbooks, professional journals, technical reports, trade and popular magazines, papers delivered at professional conferences, and articles distributed by distance learning organizations were consulted in addition to literature searches in various library databases. The following sections summarize some of the more relevant topics.

Distance Learning Systems (definitions, technologies, models)

Many definitions of distance learning characteristics and systems were encountered during the literature review. Based on this review, four primary elements of distance learning were defined as: 1) separation of teacher and learner during at least a majority of the instructional process; 2) influence of the educational organization, including the provision of student evaluation; 3) use of educational media to unite teacher and learner, and carry course content; and 4) provision of two-way communication between teacher, tutor, or educational agency and learner (Verduim & Clark, 1991a). Distance learning systems can also be defined as networks that employ video, computer and/or audio to transmit interactive instruction from one location to multiple geographically separate ones (Pease, 1989), although many well established and relatively low-cost self-instruction paper-based correspondence courses have traditionally been considered as an example of distance learning (Davis, 1990, Hesse, 1991). International perspectives on current distance learning technologies and programs are presented in Collis and Levin (1993), Davis and Preece (1990), Goodyear (1989), Granger (1990b), and Yu, Prussakova and Prussakova (1992). The content of most articles appeared to be based on technology rather than instructional or learner issues (Wiesner, 1983).

Three main types of distance learning institutional models were defined by Granger (1988). These include autonomous institutions which provide their own faculty and operate solely at a distance, cooperative institutions, which coordinate distance learning programs using faculty from traditional institutions, and dual-mode institutions which offer traditional and distant classroom instruction taught by resident faculty who develop and deliver instruction in both modes. While these models are academically based, they can easily extend to military training

programs. In fact, numerous examples of education and training models are currently found in a variety of commercial, academic, government, and military contexts.

Many distance learning programs have evolved in response to organizational pressure to manage more students without increasing administrative costs, while reducing travel costs, increasing productivity in the work place, and reaching otherwise inaccessible students (Bates, 1990a, Reveaux, 1993, Verduim & Clark, 1993d). Excellent background resources from an academic perspective are provided by Alexander et al. (1989) and Feasley (1983) who generally discuss actual and potential goals and strategies of distance learning while also addressing particulars of planning, media selection, and student support services. Good service-oriented references and background information are provided in guidelines published by Air Education and Training Command (1991), Navy Personnel Research and Development Center (1991), and Simpson (1990). Additionally, several articles address professional educators' and public concerns about distance learning standards (Carl, 1991; Sammons, 1990; U.S. Congress Office of Technology Assessment, 1989). Concerns include quality control, student and faculty motivation, adequacy of testing, access to resources, contact hours, drop-out rate, and effects on on-campus enrollment.

Instructional Design

Review of the literature indicated that design considerations, like media selection, are especially important in distance learning principally because of the perception of limited human interaction. Instructional designers make use of diverse sources of information and other resources to facilitate a more individualized and active relationship between the student and learning material (Dillion & Kincade, 1990; Dowding, 1991; Dwyer, 1990; Hedberg & McNamara, 1989; Klinger & Connet, 1992; Miller, 1990; Staff, 1993b; Verduim & Clark, 1991e; Wagner, 1990a; Wolcott, 1993, 1991). Beaudoin (1990) describes ways to encourage faculty to think about instructional design for distance learning courses as well as to help them think positively about their role in distance education. General references about instructional systems design (ISD) methods are also available (Lowry AFB, 1991), as well as specific guidelines and checklists for transforming text into distance learning material (Melton, 1990) and preparation of other instructional materials (Howles & Pettingill, 1993; Moller, 1991; Preece & Keller, 1991; Relan, 1991).

Team approaches to instructional development for distance learning have also been documented in a case study (Brinkley, Pvlechko & Thompson, 1991). Other suggestions for improving the approach to instructional design for distance learning include developing an interactive study guide (Cyrs & Smith, 1991) and designing instruction by incorporating affective domain variables (Zvacek, 1991). Some researchers focus on theories that face-to-face and distance education have fundamentally different sets of organizational processes for facilitating learning based on different psychological properties in learners (Cropley & Kahl, 1983). These central behaviors include organizational learning, motivation, learning and communication processes, didactic interactions, evaluation, and feedback.

A methodology for converting traditional live classroom instruction into video teletraining (VTT) was proposed by Simpson (1993). It consists of training and classroom design based on a specific instructional development process, instructor preparation, and ways of promoting student interaction. A detailed evaluation of the development of system design guidelines for development and evaluation is also presented by Simpson, Pugh, and Parchman (1990).

Feedback, defined as information learners and instructors receive about their efforts, is a highly valued instructional design feature that can vary in terms of its specific type, timing, and frequency. Student feedback can range from informal (nonverbal communication) to formal (written comment or grade on an assignment). Feedback in distance learning is often technology delimited, formal, task-oriented, and usually written or text-based (Cropley & Kahl, 1983). The instructional designer or instructor can often obtain data about the effectiveness of the course through formative evaluation during development. In addition, many programs use a knowledge pre-test. Pre-tests allow instructors and designers to determine where students have difficulty understanding concepts, when testing is required, how appropriate media are, and if reading level and other instructional materials are compatible (Montague, 1988). Instructors/designers can also obtain information through student evaluations before, during, or after the course.

Effectiveness of Instruction

Numerous field studies conducted on many different populations of learners have suggested a wide range of results (Verduim & Clark, 1991a, b). For example, some researchers observed that students asked more thoughtful questions in written computer-based learning asynchronous contexts compared to verbal questions in live classrooms (Cheng, Lehman & Reynolds, 1991). Further research showed that a combination of course content, instructor characteristics, and teaching techniques regardless of variations in specific delivery media resulted in high levels of student approval (Ahern & Repman, 1992; Chung, 1991). Cheng, Lehman & Armstrong (1991) compared the academic performance of on-campus, off-campus (computer) and off-campus (correspondence) groups. The latter two groups appeared to spend more time on task than the on-campus group, although they also had higher rates of "incomplete" and course drop-out. A higher level of student interaction with the instructor was found to be associated with a higher rate of course completion and better performance (Allen, 1993; Gibson, 1990).

In several studies, no statistically significant differences were shown in students' academic performance in live classrooms compared to televised courses (Chung, 1991; Griffin & Hodgins; 1991; Haynes & Dillon, 1992; McCleary & Egan, 1989; Minnesota Department of Education, 1990; Rupinski & Stoloff, 1990). Another study also shows that students in distance education courses are more satisfied with them and perform better academically than students who participate in traditional classroom instruction (Martin & Rainey, 1993; Santoro, 1990; Souder, 1993). Students' use of feedback was shown to improve performance of distant students and concept mapping was shown to degrade performance (Bernard & Naidu, 1992). Other studies of psychological and demographic factors, such as field dependence/independence, sensory preference, and gender differences suggest how they might affect a student's performance in distance learning programs (Ehrman, 1990), as do studies of effectiveness which account for the student in his or her social, economic, and psychological context (Granger, 1990a). Several

instruments have been proposed to measure students' attitudes towards distance learning courses. For example, Biner (1993) describes the methods used to develop a customized, empirically based assessment instrument for evaluating instructional, technological, and administrative variables.

Interaction

A major focus in distance learning, teaching, and delivery contexts is interaction (Wagner, 1993). An ideal scenario is to actively involve students and instructors in the instructional process through interactivity which allows two-way communication between instructors and students, between students (within the same classroom or between different classrooms), and between instructors, students, the distance learning system, and materials. Interactive techniques are commonly grouped into two categories: learner control and learner engagement. Learner control techniques, such as self-directed sequencing and help functions, are used mainly during computer-based training, while learner engagement techniques include student participation, simulation, evaluation, demonstration, and feedback.

Baker-Albaugh (1993) proposes a variety of interactive learning models using different technologies. A media selection method called "ACTIONS" using interactivity as a criterion is presented by Bates (1990b); components of this model include access, costs, teaching functions, interaction, organization, novelty, and speed. Another model describes how teaching and learning, and student-instructor interaction are affected by technology (Hodgson, 1989). Krebs and Pease (1993) present concepts of interaction and how to design instruction to take advantage of interactive opportunities based on media and task characteristics, presentation style, and other contextual factors. A large survey of a state-wide public school district evaluating the importance of interaction in teleconferencing showed that it was perceived as being the most critical factor (Kruh & Murphy, 1990). Discussion about the relationship between course materials and students suggests that it heavily influences the student's approach to learning (Hodgson, 1986).

Equipment Performance/Classroom Design

Ho (1991) provides sets of guidelines to use for developing an interactive television program, including details about the kinds of equipment, arrangement of facilities, and teaching support services available. Resource handbooks are also available for specific regions of the United States (Holznagel, 1991). Accessories, such as student response systems, including keypad units have been shown to make teletraining more interactive and participative (Kester & Chute, 1991).

A variety of reports depict advantages and disadvantages of using current technologies. For example, reports describe the use of digital compression (Staff, 1993a), complex networks (Staff, 1992a), and fiber optics for industrial training to portray a more realistic classroom environment (Northern Telecom Education System, 1991a). Other distance learning programs use telephones for instruction in the classroom (Northern Telecom Education System, 1991b).

Problems with audio quality were cited most often (Simpson, Pugh & Parchman, 1991; Wells et. al, 1991). Based on review of the literature, it is more difficult to design classrooms that

provide good quality audio compared to good quality video; audio seemed more critical for learning.

Instructor Characteristics/Preparation

Several *how to* articles have been published including guidelines and technical procedures for developing and delivering distance learning for videoconferencing (Emergy & Schubert, 1993; Nevins & Wright, 1984; Willis, 1990). Distance learning instructors reported that learning how to efficiently prepare for lessons, prepare for emergencies, create and use additional visual materials, and dynamically deliver a lesson as important characteristics for training. According to students, critical instructor skills included elaborating unclear material, answering questions clearly and concisely, summarizing one topic before changing to another, designing evaluation procedures that are consistent with course objectives, maintaining an atmosphere which actively encourages learning, willingness to explore multiple viewpoints, providing timely feedback, and enthusiasm (Chung, 1991).

One survey compared the perceived effectiveness and satisfaction of university faculty teaching traditional and distant courses; instructors were mainly concerned about their reduced involvement with students which also affected their personal satisfaction with distance learning (Kendall & Oaks, 1992). Nevins and Wright (1984) identified good flow of words, timing, voice volume and pitch, verbal emphasis, body movement, using audio-visual aids, outside research people, and good production techniques as critical characteristics for distance learning instructors. In addition, the use of students' first names, expression of confidence in students' abilities, comparisons to the instructor's past experience, and willingness to help students were often rated as highly preferred characteristics (Feasely, 1983). Shaeffer & Farr (1993) emphasized the critical role of formative and summative evaluation as part of a comprehensive faculty development program.

Rupinski's (1991) survey of Navy video teletraining (VTT) instructors included instructors' attitudes about their students, audiovisual aids, and their preferred method of instruction. At the beginning of the study instructors felt that students at remote sites showed less classroom participation than students at the originating site. Through time, however, instructors felt that students at remote sites increased their participation. In addition, Rupinski found that instructors clearly preferred traditional live classroom instruction compared to VTT and also felt that the quality and reliability of audiovisual aids improved over the two-year period of the study.

Student Characteristics/Perspectives

Authors of several studies point out fundamental differences between behavioral and demographic characteristics of traditional on-campus students and distance learners and show how these differences should affect development of distance learning programs (Kahl & Cropley, 1986). In general, compared to on-campus students, distant learners are more likely to be older, employed, have a family, and be motivated to complete coursework for employment reasons. Another study compared the learning styles of students and instructors participating in an

instructional television course; although preferred styles differed, overall positive student evaluations of instructors were not affected (Silvernail & Johnson, 1992).

A particular study conducted on a satellite delivered foreign language program indicated that motivation seemed to be the most important predictor of success, although learning styles, gender, and learning strategy were also found to be important (Oxford, Park-Oh, Itao & Sumrall, 1993). Other research studies showed that distance learning requires self-motivation and discipline. Therefore, it should be more effective for older compared to younger learners, and for experts taking a review course compared to novices taking an introductory course (Ahern & Repman, 1992; Kahl & Cropley, 1986). Cheng, Lehman and Reynolds (1991) also recommended that computer-based distance education should not be used with introductory or computer courses. They found that with advanced computer-based distance learning courses, an orientation period should be conducted to acquaint learners with hardware and software.

Delivery Media

There is virtually no agreement about *one* right technology for distance learning. A combination of different technologies is usually appropriate although the particular mix depends on the context; in fact, two important technological trends are the integration of communication and computer technologies and the transition from analog to digital transmission (Bates, 1990; Simpson, Pugh & Parchman, 1991). Hedberg and McNamara (1989) provide a timeless recommendation to everyone involved in distance learning that the focus should be on the information delivered rather than on the technology itself.

Distance learning programs often utilize video technologies to support instruction. Video technologies can simulate real world events, equipment, or tasks, and can deliver interactive instruction to learners at the workplace, formal schools, and remote sites; lessons are especially effective when learners need to see people or machines in motion (Simpson, 1993). Other articles discuss options in technical operating strategies and types of interactive opportunities (Allan, 1989; Smith & Ragan, 1992; Verduim & Clark, 1991c; Wagner, 1990b) and performance support, knowledge transfer, and instructional technology models for exploring the range of delivery technologies (Chute, Hancock & Balthazar, 1991). There is also a comprehensive discussion of types of user modes involved in computer media, such as information processing, interaction, communication, and recommended types of software (Chacon, 1992). Many articles include general descriptions of computer conferencing or other computer mediated communication for education and training (Florini, 1990; Heathman & Kleiner, 1991; Junkala, 1991; Kamper, 1991; Lauzon & Moore, 1989; Marshall, 1991; McKenzie & Santoro, 1991; Ross, Smith, Morrison & Erickson, 1989; Wells, 1992). A good summary of the design and implementation of the Combined Arms Staff Trainer (CAST), a computer network that simulates the actions of combat and combat support elements, is presented by the U.S. Marine Corps (1992). Another microcomputer-based simulation program for resolving military crises also illustrates the utility of simulation in distance education (Ranker & McKim, 1993).

A relatively new technology used in Great Britain brings instructors and students together in a virtual world by using a video tunnel; television screens and cameras are arranged at such an

angle to allow users to feel as through they are working side-by-side while also having real-time visual contact and sharing a computer work space (Anderson, 1991). Other researchers discussed the advantages and disadvantages of using computer simulations for management training at a distance; while many motivation, learning and decision-making processes seemed to be enhanced, students and faculty were critical of the simulation models' apparent simplicity and reliance on graphics software for usability (Curry & Moutinho, 1992; Linstead, 1990; McKell, Hardy & Stocks, 1991; Sellars, 1988).

Cooperative/Collaborative Learning

An alternative to individual computer-based instruction (which meets the unique needs of individuals) is a facilitated large-group setting, including the use of computer image projection devices. Such devices open small multimedia windows to large-screen viewing by large numbers of students. Selected articles about interactive group technologies (Goodyear, 1993; Hudspeth, 1992; Lookatch, 1993) include a study of the use of computer-based message systems (Davies, 1988) and a model of workplace and school-based scenarios in which learners can access distant resources through their desktop computers and high bandwidth wide area networks (Dede, 1993). Extensive research on the electronic classroom has been conducted by MacFarland (1990) who showed that this course delivery method was extremely effective, in terms of its class dynamics and interaction, learning behaviors and outcomes, for computer science courses.

New research conducted on computer-based multimedia learning in small groups showed inconsistent results (Lookatch 1993). For example, one set of results showed that while cooperative learners were more efficient, they were outperformed by students who participated in the individual instructional setting, while other studies showed no differences between the performance of individuals and cooperative groups. However, development of social skills seemed to be facilitated and increased in cooperative groups compared to increased achievement. Effectiveness was evaluated for five variables: 1) software and task selection; 2) social context; 3) preparatory activities; 4) accountability structures, and 5) evaluation and group assignments.

Just-in-time Instruction

The just-in-time approach to distance learning attempts to provide delivery of critical information where needed, when needed, and in the right amount (Chute, Hancock & Balthazur, 1991; Tyman, 1993). A just-in-time education (JiTEd) system proposed by Hudspeth (1993) is a networked instructional delivery system-- when needed-- that includes modules of interactive instruction, automatically adjusted to individual perceptual and learning strategy preferences, which provide frequent and useful feedback. This integrated approach could significantly improve access and effectiveness of instruction for distant learners. Hudspeth (1993) lists the delineated processes of feedstock, feedforward, and feedback as being essential elements in the JiTEd system. Feedstock, also known as students, can be improved when thinking and learning skills have already been mastered. Feedforward, characteristics of feedstock before entering the system, include personality, experience, and information processing preferences. Feedback is information based on output to aid error detection and system regulation.

Research and Evaluation

A comprehensive review article about what students and instructors have learned from distance education and industrial training is presented by Chute, Balthazar & Poston (1990). Research areas included instructional effectiveness, cost-benefit analyses, instructional development, media attributes, and suggestions for future systems. A study of the underlying structure of distance learning transactions proposed that issues of control of the learning process included environmental variables of academic and psychosocial support, independence, and competence (Baynton, 1992).

Several studies examined the effectiveness and efficiency of different types of video teletraining and compared them to conventional live classroom instruction. For example, Dickinson and Nichol (1993) compared live classroom instruction to reconfigured (e.g., new curriculum included increased student interaction) live classroom instruction to different distance learning audio and video configurations for an Army battlefield leadership course. The course learning objectives and instructor team were equivalent for all conditions. Pre-test and post-test scores and student/instructor attitude data were collected for the different delivery modes. While the pre-test showed no statistically significant differences between groups, the post-test results showed that students in the video teletraining course with two-way audio and one-way video had higher scores. Instructors reported that distance learning was an effective method, that they preferred it to traditional live classroom instruction, and that they preferred teaching with two-way audio/two-way video.

Various other results have been reported in separate studies. Several studies demonstrated that there were no significant differences in learning effectiveness between conventional live classroom instruction and distance learning (Chung, 1991; Rupinski & Stoloff, 1990; Simpson, Pugh & Parchman, 1992; Simpson, Pugh & Parchman, 1990). Other studies showed that students preferred distance learning and felt that they learned more (Cheng, Lehman & Reynolds, 1991; Chute, Balthazar & Poston, 1990; Phelps, Wells, Ashworth & Hahn, 1991). Another finding indicated that although two-way video systems may facilitate more interaction, there was no empirical evidence that they are essential for effective training (Simpson, Pugh & Parchman, 1991). Many of these investigations suggest possible relationships between student characteristics (e.g., demographic structure, motivation, and personal qualities), student (and instructor) attitudes and learning effectiveness, the critical importance of instructional design, and the appropriate use of media. However, many studies were not supported by a formal experimental design with clearly defined variables and objective assessment.

There has been some discussion about what methods to use for evaluating distance learning programs (Clark, 1989; Hansen, 1990; Harrison et al., 1991; Schiller & Noll, 1991), computer-based training courseware revision (Byrum, 1992) and multimedia technologies (Ives, 1992). An important conclusion is that evaluations should be planned at the beginning of courseware development rather than thought of later in order to ensure obtaining reliable and representative data. In addition to proposing a general and acceptable approach to conducting objective research in distance education, Collins (1992) describes a methodology for carrying out

design experiments which study different ways of introducing and using technology in the classroom.

Theories of communication can be used to evaluate interaction in distance learning; Main (1993) provides a taxonomy which considers six categories of interaction: type, timeliness, amount, method, quality, and spontaneity. Research on instructor attitudes emphasizes the need for administrative and faculty support for successful distance learning programs (Clark, 1993; Marker & Ehman, 1989).

Related Issues (marketing, planning, costs)

A total systems view of distance learning by Moore (1993) presents goals to organize or reorganize educational resources into a total delivery system comprised of a network of knowledge sources, processors, managers, communication media, and learners. To complement this philosophical approach, several articles were found listing resources for professional development and basic skills program planning in the military (Lovell & Robinson, 1989, Montague, 1988; Staff, 1992b) and course conversion for military training (NPRDC, 1991, Phelps, Wells, Ashworth & Hahn, 1991; Pugh, Parchman & Simpson, 1991). Other perspectives are illustrated by Nova University's use of telecommunications as a primary instructional tool (Mizell, Marcus, Hesser and Hogan, 1992), use of other delivery technologies in selected public school systems (EDSAT Institute, 1991; Nelson & Sommer, 1989; Ohler, 1989; Pea & Gomez, 1992; Pease, 1989; Stone, 1990; Wilkinson & Sherman, 1991), and a broad survey of distance learning providers, instructors, and students in industry, academia, government, and military service (Walsh, Gibson, Hsieh and Gettman, 1993).

Several surveys of cost-benefit data have been conducted in the areas of telecommunications in teacher education (Pultorak, Seaman & Smallwood, 1990) and industry training (Reveaux, 1993). Simpson (1990) and Simpson and Pugh (1990) have evaluated a variety of cost effective ways to train personnel based on different technologies such as a computer-based instructional support network, VTT, and simulation network (SIMNET). Further support for the cost effectiveness of VTT in particular training configurations was demonstrated by Stoloff (1991a, b), who proposed using a model and computer program for scheduling classes and conferences on a VTT network.

Distance Learning Questionnaire

Data were collected concerning trends in distance learning -- particularly, unique approaches to curricular materials, novel approaches to instructor-student interaction, successful use of distance learning for hands-on training, and other items which could contribute to preparing the Air Force for use of the technology. This chapter describes findings gathered from the questionnaire and follow-up site visits to key distance learning practitioners. Specific findings include:

- characteristics of distance learning providers
- characteristics of distance learning students

- characteristics of distance learning instructors
- characteristics of distance curriculum and curriculum development
- problems associated with distance learning implementation and maintenance
- future plans for distance learning

Characteristics of Distance Learning Providers

This section describes characteristics of distance learning providers and their programs as measured by the questionnaire. Essentially, these data describe basic distance learning applications. Relevant survey responses were tabulated, crosstabulated, and analyzed in order to furnish information about typical distance learning providers as well as the characteristics of today's virtual classrooms.

Distance Learning Providers

In the beginning, 224 organizations involved in distance learning were contacted. Of those, 182 agreed to participate in the study and 129 returned completed surveys. Figure 2 shows the distribution of organizations which participated in the survey. By far, academic institutions were the most common (n = 79) followed by commercial firms (n = 20), military organizations (n =19), technical schools (n = 6), and government agencies (n = 5).

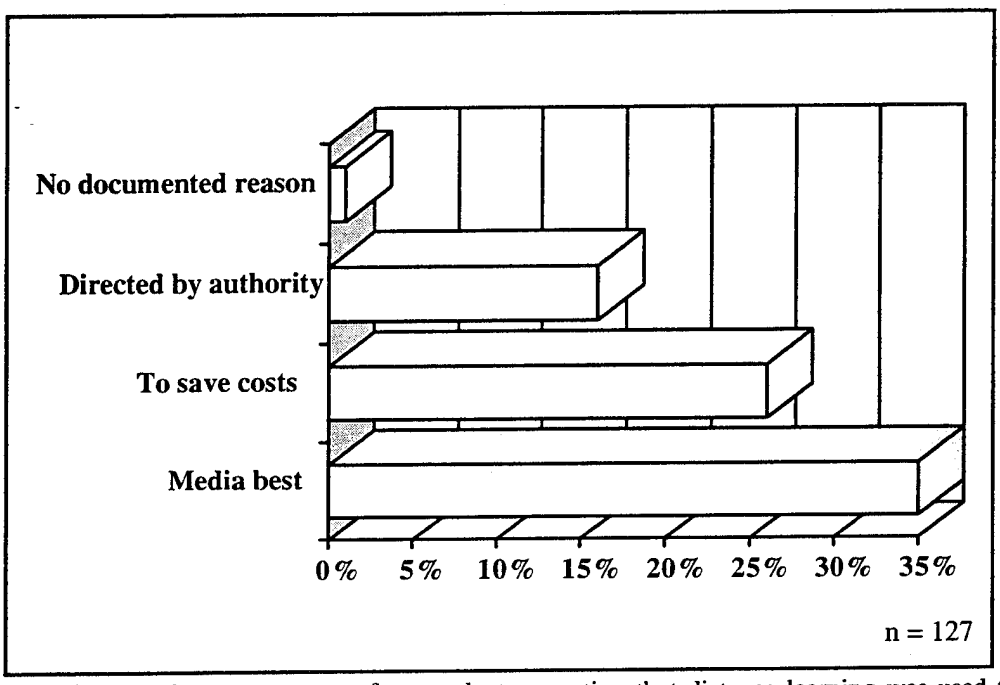
Since a non-probability sample (i.e., non-random) was used, it was not possible to conduct statistical tests on the dataset. Instead, two indirect indicators were considered. Response rates were calculated to determine if large differences in who provides distance learning were due to differences in who returned the questionnaire. These response rates were found to be fairly uniform, i.e., approximately the same proportion of each organization completed and returned the survey. Therefore, the observed differences in who provides distance learning are probably not attributable to differences in who returned the survey.

A second line of evidence also suggests that the distribution shown in Figure 2 is an accurate representation. Every effort was made to ensure that all distance learning providers were identified and contacted. As a result, a comprehensive sampling frame was developed from the general population and used to target potential respondents.

Other explanations still remain plausible, however. The observed differences in distance learning organizations may have been caused by peculiarities in the way potential respondents were identified. For example, if an organization did not publicize its program (e.g., with promotional materials, professional publications, etc.), it may not have been targeted for contact. If many of these organizations were similar (e.g., commercial), then the survey results might have been skewed accordingly. However, it appears that academic institutions do account for the largest percentage of organizations who deliver instruction at a distance.

Reasons for Use of Technology

Previous research suggests that distance learning is used for many different reasons. The distance learning providers queried in this study reported using distance learning for several related reasons. Figure 4 shows the response pattern for survey question 6. The largest percentage of respondents indicated that the *media was best based on analysis* (35%). In other words, over one-third of the respondents based their decision to use distance learning on some kind of up-front analysis (e.g., cost/benefit analysis, needs assessment, task analysis).



Note. Expressed as percentages of respondents reporting that distance learning was used for various reasons. Data were from question 6.

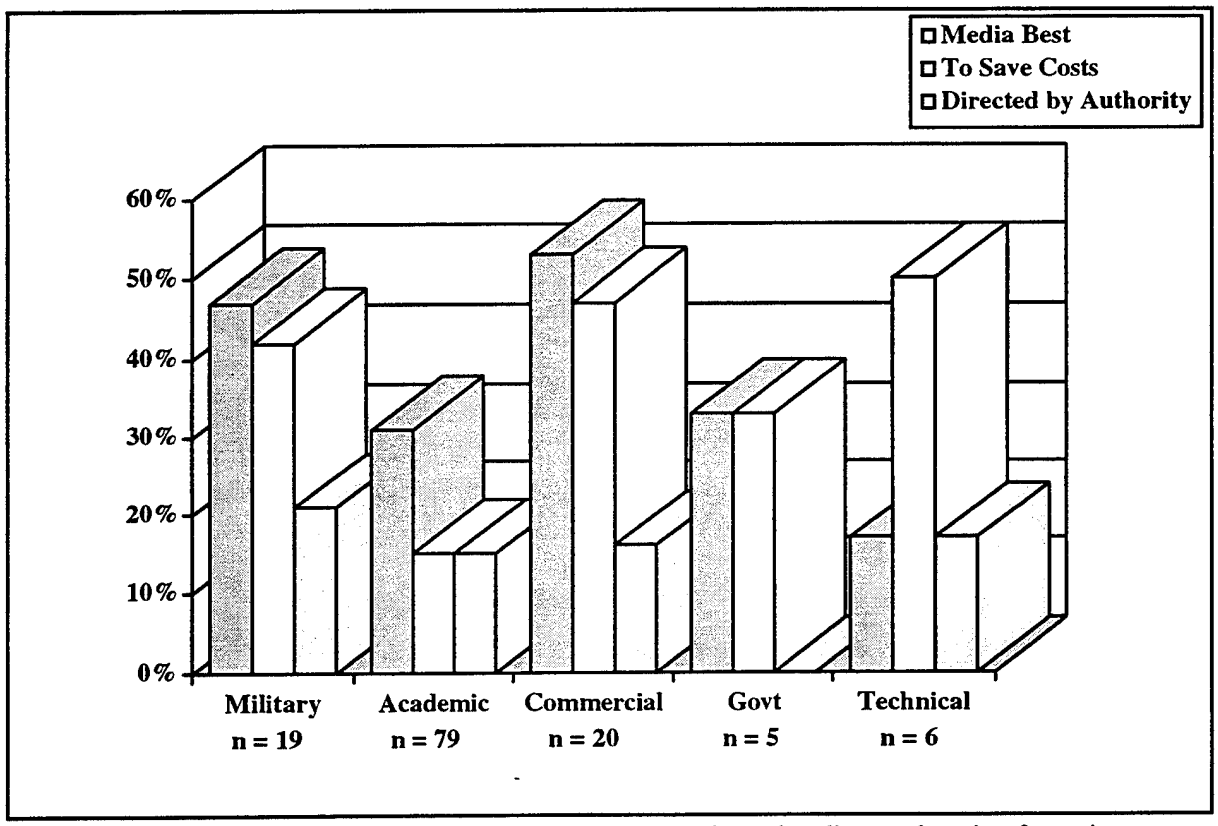
Figure 4. Reasons for Selecting Distance Learning

By way of anecdotal evidence, many organizations who use distance learning do so to save money. 26% of all questionnaire respondents indicated that distance learning techniques were used *to save costs.* This result seems a little low given the large numbers who indicated that distance learning was used to save money both in the literature and the follow-up site visits. It is possible that many of those who said that *media was best based on analysis* were factoring in cost savings as a benefit of distance learning.

Other was selected by 85% of the respondents. Closer examination of these responses suggests that distance learning programs were used to meet the needs of the student population and/or the sponsoring organization (20%) and to satisfy a demand for distance learning services (8%). In other words, organizations appear to use distance learning to meet various needs both inside and outside the organization.

Data were crosstabulated to provide information about whether different organizations reported using distance learning for different reasons. It is important to note that partitioning the sample into sub-samples, as occurs in the crosstabulation of data, can greatly reduce the number of respondents in each category and potentially mislead the reader. As a result, sample sizes are reported with crosstabulated results so that the reader can draw informed inferences from the data.

Three fairly robust trends emerged from these crosstabulations. First, all organizations, regardless of type, appeared to have some reason for choosing distance learning. Only one organization, a commercial firm, reported *no documented reason* for using distance learning. Clearly, distance learning is not something that organizations stumble into; they have specific goals in mind before they consider implementing a distance learning program.



Note. Expressed as percentages of organizations reporting using distance learning for various reasons. Data were from organizational profile on first page of survey and question 6.

Figure 5. Reasons for Using Distance Learning by Type of Organization

Academic institutions, as shown in Figure 5, had a unique profile in terms of reasons for choosing distance learning. Academic institutions reported cost as an important factor less often than did other organizations. Only 15% of the academic organizations (n = 79) surveyed cited cost as the reason for selecting distance learning compared to 50% of technical schools (n = 6), 47% of commercial firms (n = 20), 42% of military organizations (n = 19), and 33% of

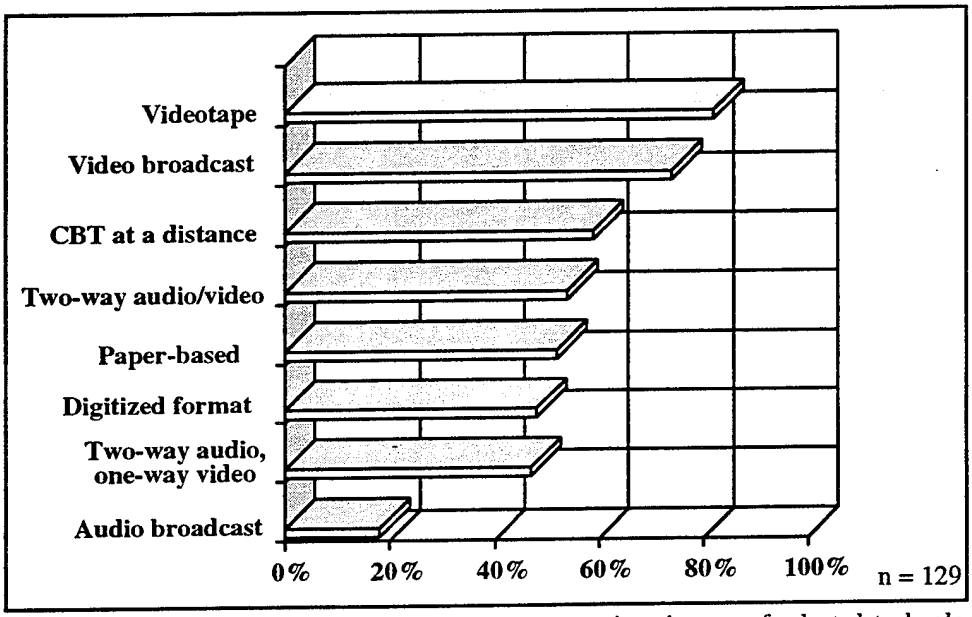
government agencies (n = 5). A possible explanation of this trend lies in the fact that academic institutions, unlike the other organizations, pass the cost of training on to the trainees.

The third trend is also evident in Figure 5. Academic institutions reported *media best based on analysis* less frequently than their commercial, technical, and military counterparts. Both military and commercial organizations appear to be more aware of the importance of front-end analysis in the development and implementation of training systems.

Distance learning providers, it would seem, come from diverse orientations ranging from academia to the military. Despite this fact, most providers seem to be motivated by similar factors, namely, business necessity. Academic organizations, as shown in Figure 5 appear to be less concerned with cost and front-end analyses when compared to other distance learning providers.

Technologies Used

Distance learning programs come in many different configurations. Some programs are small. They offer only a few courses, train a few skills, and use limited technologies to deliver instruction. Other programs offer many courses, train many skills, and use a wide-variety of media to deliver instruction to students. The purpose of the next few sections is to identify some of the general characteristics of distance learning programs.



Note. Expressed as the percentage of respondents reporting the use of selected technologies. Data were from question 1.

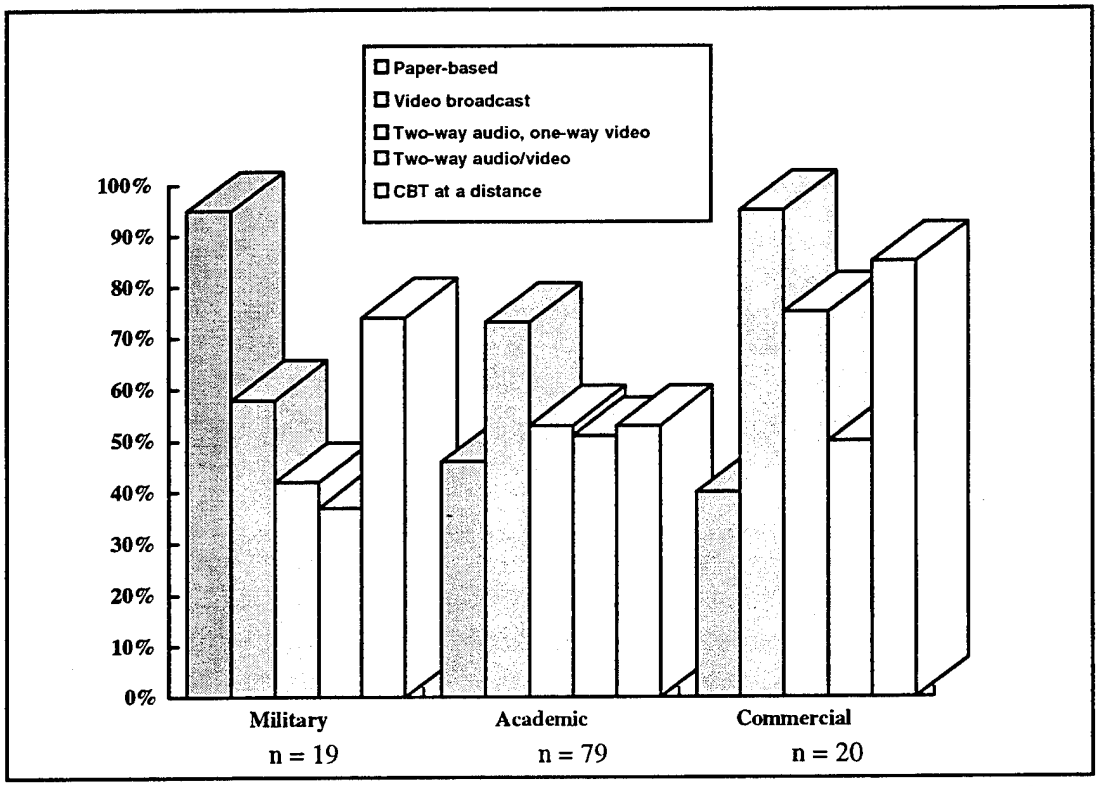
Figure 6. Technologies Used in Distance Learning

A wide-range of technologies are employed to deliver training to distant learners. All of the technologies mentioned in question 1 were used by at least 48% of the organizations except audio broadcast (18%). Videotape was the most frequently mentioned medium (82%) followed

by video broadcast (74%). Two-way audio and video and two-way audio, one-way video were used by 48% and 56% of the sample, respectively. Figure 6 shows the percentage of respondents that reported using selected technologies.

Most organizations used several technologies as a part of their distance learning arsenals. On average, the providers employed approximately six different technologies (e.g., fax, telephone, videotape, video broadcast, audio broadcast, paper, etc.) to deliver instruction to distant learners. In short, it appears that nearly all distance learning providers recognize the importance of multiple channels to support the exchange of information between an instructor and remote students. Data from several questions were crosstabulated in order to examine whether particular groups of providers used different technologies to satisfy their training requirements. Figure 7 shows the profile of selected organizations in terms of their use of various media.

Military organizations were far more likely to use paper-based approaches than other organizations-- a full 95% of the military organizations surveyed (18 of 19) reported using paper-based approaches. In comparison, only 67% of government agencies, 46% of academic institutions, 40% of commercial firms, and 33% of technical schools reported using paper as an instructional medium. Of the organizations profiled in Figure 7, commercial firms and academic institutions used paper media least often while military organizations used it most often.

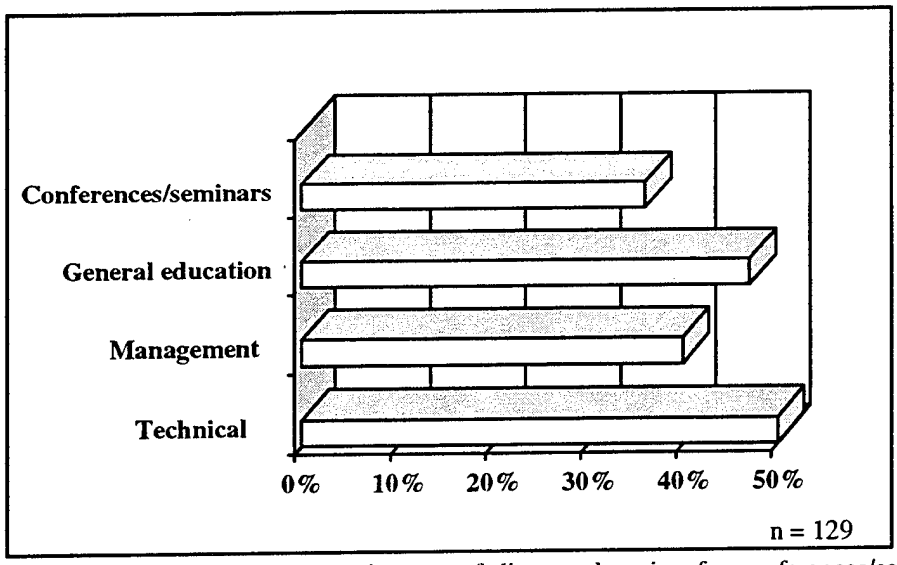


Note. Expressed as percentage reporting use of selected technologies. Data were from organizational profile.

Figure 7. Technologies Used by Type of Organization

Several other trends in the use of specific technologies were also apparent. Commercial firms, for example, used video-based delivery methodologies (e.g., video broadcast, two-way video and one-way audio) more frequently than either military or academic organizations. Military organizations used these same delivery methodologies least frequently of the three. Finally, academic institutions reported using CBT least often; 85% of all commercial firms, on the other hand, reported using CBT at a distance.

Nearly all distance learning providers used more than one mode of delivery and some employed as many as 10 or more. In general, video-based approaches were most common although some segments of the population used paper and audio-based approaches. As shown in Figure 7, military organizations appeared to use technologies which were the least instructor-intensive (e.g., paper-based, CBT). Commercial firms, on the other hand, employed modern, high-tech media which minimized cost (e.g., broadcast, CBT). Overall, it appears that distance learning providers often select delivery tools which afford the greatest *bandwidth* (i.e., support the exchange of large volumes of information).



Note. Expressed as percentage reporting use of distance learning for conferences/seminars, general education, and management and technical training. Data were from question 5.

Figure 8. Courses Offered Via Distance Learning

Courses Offered

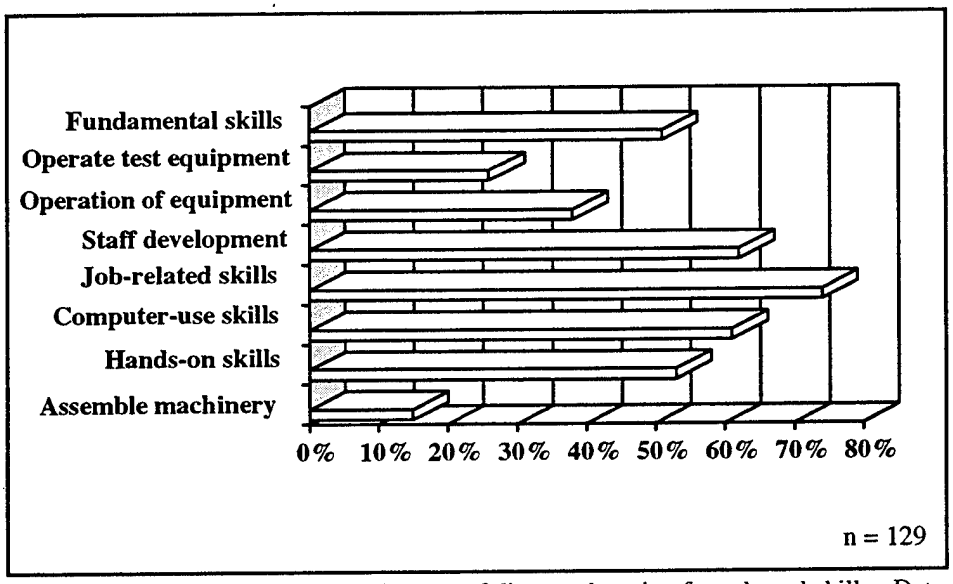
Many different types of courses are offered via distance learning. As shown in Figure 8, *technical training* was the most frequently mentioned response (n = 65) followed by *general education* (n = 61), *management training* (n = 52), and *conferences/seminars* (n = 47). On average, respondents offered two different types of courses using distance learning technologies. It appears that distance learning methodologies are used to meet a wide range of training objectives. In addition, individual organizations seem to use distance learning for more than one

type of course. These two findings suggest that distance learning methodologies may be suitable for a wide range of courses, not only general education courses.

Data were crosstabulated and analyzed to determine if some courses were taught using particular technologies. In general, media applications were similar regardless of the course offered. It appears that, for the most part, particular technologies are not used to teach specific courses. One exception was observed in the data -- general education courses (n = 61) and conferences/seminars (n = 47) were associated with the use of the telephone and fax much more often than technical or management courses.

Skills Trained

Based on the responses to question 5, one would expect respondents to report that distance learning was used for a variety of different skills. Figure 9 shows the relative proportions of respondents who indicated that distance learning was used to train selected skills.



Note. Expressed as percentage reporting use of distance learning for selected skills. Data were from survey question 7.

Figure 9. Selected Skills Trained Via Distance Learning

From Figure 9 it is apparent that many technically-oriented skills (e.g., assembling machinery, operating equipment) were trained less frequently than non-technical skills (e.g., fundamental skills) using distance learning. An anomaly can also be seen, however. Hands-on skills, of which the aforementioned technical skills are a subset, were reportedly trained with distance learning more than the overall average. This raises a definition problem--what exactly is hands-on training? Presumably some respondents used a broader definition of hands-on training than was implied by the question.

Organizations reported training several skills concurrently, similar to the variety of courses offered. Approximately 81% of the organizations surveyed trained five or more skills using

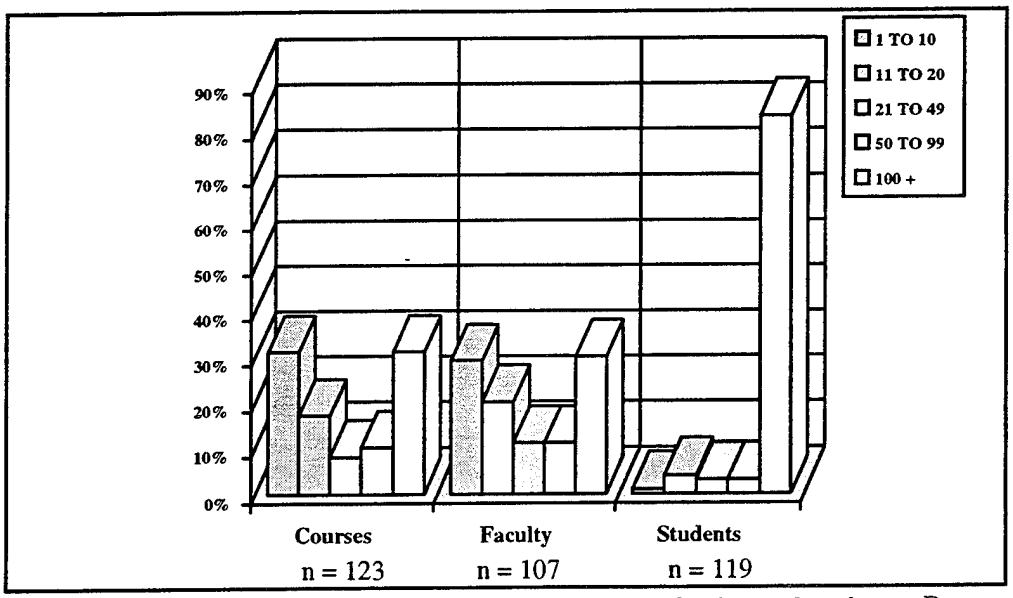
distance learning technologies. On average, organizations trained about eight different skills. Organizations do not use distance learning for a single skill or course; rather, they use distance learning to meet many different training requirements.

Crosstabulated data were analyzed in order to provide information about whether certain technologies were used to train particular skills. Similar to comparisons between the type of course offered and technologies used, results were largely inconclusive. Several general trends did emerge, however. For every skill mentioned in question 7, videotape was the most commonly cited delivery medium; providers used videotape most often regardless of the skill trained. In most cases, video broadcast was the second most popular choice. It appears, then, that the current practice of distance learning relies heavily on less expensive video-based delivery methods.

In short, it seems that a variety of courses and skills are trained via distance learning. Distance learning providers do not limit themselves to a small range of skills or courses. Rather, they use distance learning in many situations including hands-on training.

Program Size

Figure 10 shows distance learning programs by size; according to the number of courses and faculty, programs tended to be either very large or small. In both cases, the modal category was 100 +. In terms of students, the typical distance learning program reaches more than 100 learners. Nearly four-fifths of all organizations reported that they had 100 or more students enrolled in distance learning courses -- presumably because larger numbers of students are necessary to make distance learning courses cost effective. The modal category for average class size was 11-20 students so the classes themselves were fairly small. It appears that distance learning courses can accommodate many students, but not necessarily all at once.



Note. Expressed as percentage reporting number of courses, faculty, and students. Data were from question 3.

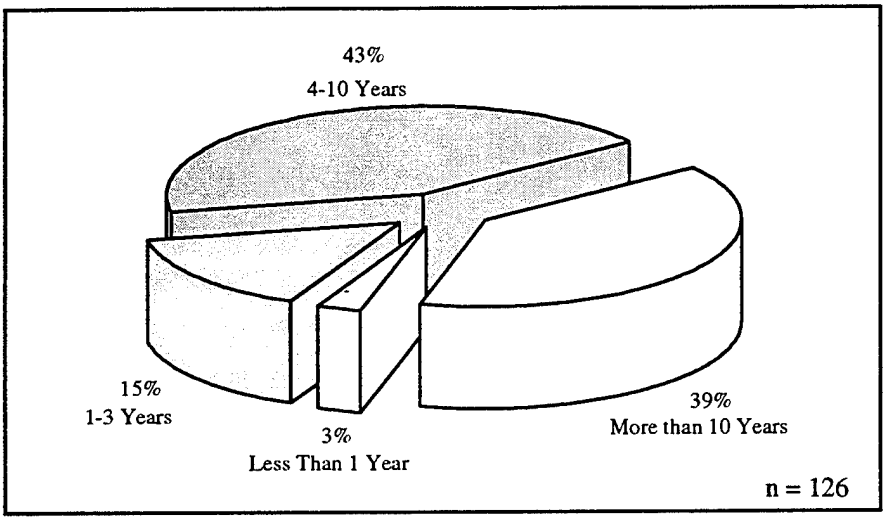
Figure 10. Indices of Program Size

Time in Existence

Distance learning methodologies, in one form or another, have been used for many years. Approximately 82% of the respondents have used distance learning for four or more years. Of those, nearly half reported that they have been involved in distance learning for more than ten years. Only 3% indicated that they had used distance learning for less than one year. Figure 11 shows the number of years that distance learning has been employed.

These results suggest that new organizations are not getting involved in distance learning. This conclusion is doubtful, however. The results are probably due to the fact that it is harder to find organizations who are new to distance learning. They are not mentioned as frequently in professional circles, they have not had time to develop promotional materials or publish papers about their programs. It is possible that organizations who are the very newest to distance learning were not contacted.

The crosstabulation of relevant survey data revealed a few interesting trends about distance learning program time in existence. First, there was a general trend for organizations to employ more delivery options as they aged, although the trend leveled off somewhat after about three years. On average, organizations who employed distance learning for more than a year reported using about two more delivery media than those who employed distance learning for a year or less. In terms of specific technologies, the oldest programs (i.e., more than ten years), reported using paper-based approaches about two to three times more often than newer programs. New programs (i.e., less than one year) were less likely to employ two-way audio and one-way video but they were much more likely to use two-way audio and video. CBT at a distance was more common among organizations that had been around for several years.



Note. Expressed as percentages of responses to the question, "How long has your distance learning program been in existence?" Data were from survey question 4.

Figure 11. Number of Years Distance Learning Used

Summary of Findings

The survey results suggest several characteristics about distance learning providers and their programs. Organizations who use distance learning represent a wide-range of backgrounds and distance learning meets a wide-range of training objectives. Despite this diversity, all organizations appear to have specific reasons for using distance learning. Most organizations reported using distance learning because it was the best available option (i.e., *best media based on analysis*) or *to save costs*. Only about 1% of the respondents indicated that there was *no documented reason* for choosing distance learning. There were some differences in terms of reasons for using distance learning by organization type. Academic institutions were less concerned with saving money or conducting front-end analyses prior to the implementation of distance learning programs. Military and commercial organizations were especially sensitive to these issues.

Most distance learning providers trained multiple skills using more than one delivery medium. There also appeared to be a few noticeable differences in associations between types of providers and technologies used to deliver instruction at a distance. Military organizations, for example, reported using paper-based approaches much more frequently than any other group of respondents. Commercial firms seemed to rely on video-based approaches more than other types of organizations.

In terms of size, distance learning classes seemed to be either small or large. Interestingly, the average size for a distance learning class is similar to traditional classes. It seems that despite the potential for enormous classes, most distance learning providers try to limit class size. Most of the distance learning providers surveyed have used distance learning techniques for several years. Organizations who are new to distance learning do not appear to start with simple technologies; rather, they appear to use advanced technologies immediately. All in all, distance learning appears to be an exceedingly flexible medium which is used to accomplish many training objectives for a wide range of organizations.

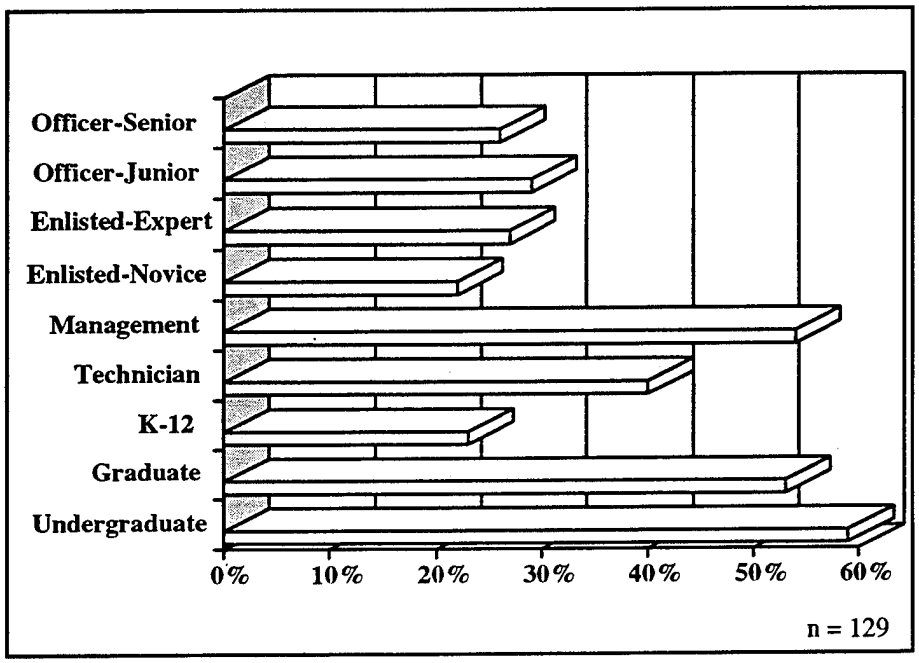
Characteristics of Distant Learning Students

This section describes students who take courses at a distance and a few related topics including course enrollment procedures, class size and length, interaction styles, performance assessment options, and measurement of student attitudes.

Student Population

In general, distance learning student populations were quite diverse as shown in Figure 12. College graduate and undergraduates were among the most commonly cited student populations trained via distance learning. This is not surprising since academic institutions made up the largest portion of the sample. Management trainees were also commonly mentioned distance learning students. About 93% of those surveyed trained at least two different student populations. On average, organizations trained nearly five different types of distance learning students. As suggested by these findings, distance learning providers do not appear to limit themselves to

particular types of students. Distance learning, as it is currently practiced, appears suitable for all types of trainees.



Note. Expressed as percentage reporting use of distance learning for various student populations. Data were from question 11.

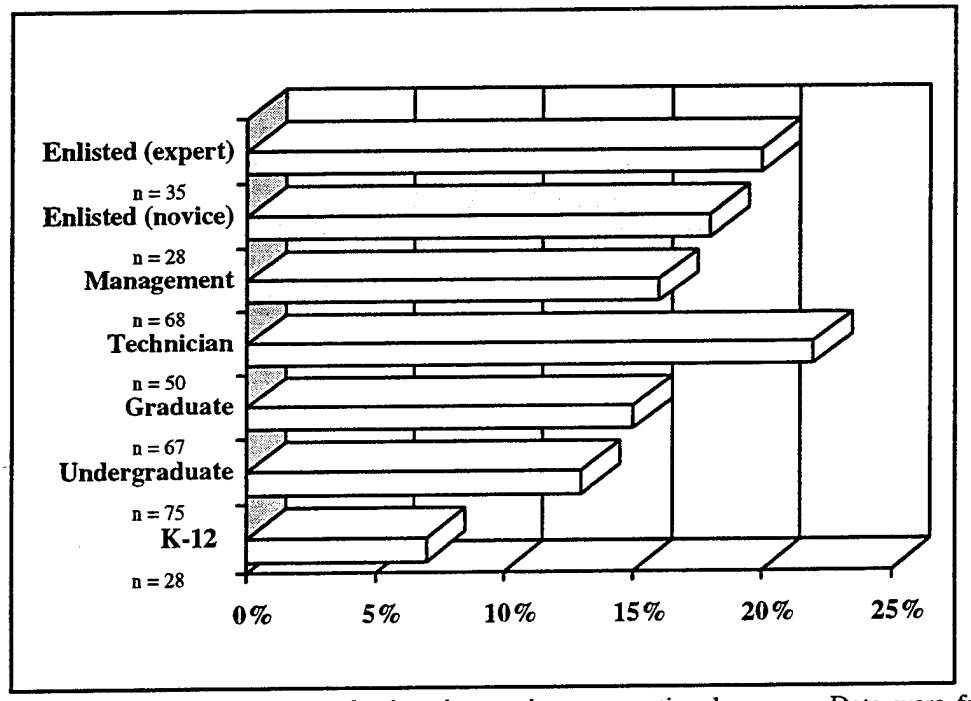
Figure 12. Distance Learning Student Populations

Course Enrollment

In many instances, students were given the option of *selecting a distance learning course over a traditional course* (69%), although 45% of the respondents indicated that distance learning was the *only option* and 16% said that *student enrollment was automatic*. Students, according to distance learning providers, prefer distance learning for reasons of *convenience* (74%), because they *want to try the technology* (23%), and/or *to save money* (21%). 64% of the respondents indicated that students selected distance learning for more than one reason. These results suggest that students are often free to choose between conventional and distance learning courses.

Class Size and Length

Most organizations placed restrictions on the number of students who were allowed to participate in distance learning courses (58%). These limitations were expressed in terms of both minimum and maximum class sizes. Generally it appeared that distance learning providers were willing to deliver distance learning courses to small numbers of students (e.g., one to five). The modal maximum category was 21-50 (17%) although 13% indicated that they frequently provide training to classes with 101 or more students.



Note. Expressed as percentage selecting shorter than conventional course. Data were from questions 11 and 23. *n* varies because data are derived from multiple questions.

Figure 13. Student Populations in Shorter than Conventional Courses

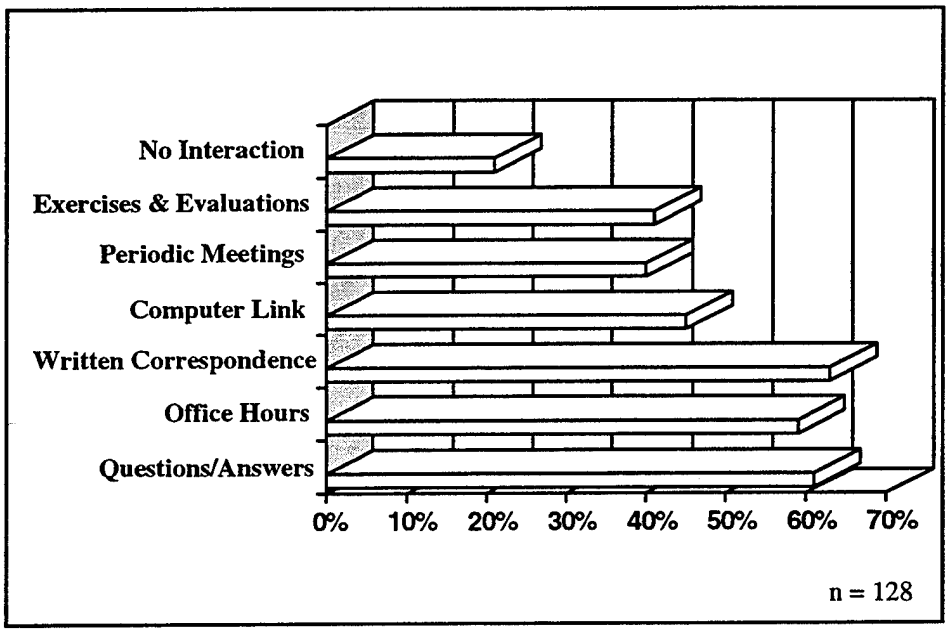
Distance learning classes tend to be of a *fixed length* (54%) which is the *same as conventional courses* (52%). Only 9% indicated that their distance learning course was longer than a conventional course and only 13% indicated that their distance learning course was shorter than a conventional course.

Data from questions 11 and 23 were crosstabulated in order to determine if course length was a function of the student population being trained. For the most part, this was not the case. The only possible exception occurred when *shorter than conventional course* was selected. Figure 13 shows this trend. Technicians, enlisted personnel, and management trainee populations were marginally associated with *shorter than conventional* more often than academic populations. Possibly, this result reflects the application of distance learning to provide just-in-time training.

In size and length, distance learning courses appear to be about the same as conventional courses, although distance learning might afford unique just-in-time training options.

Interaction Styles

Research into instructional effectiveness suggests that interaction with instructional materials, subject-matter experts (e.g., the instructor), and the learner's peers greatly facilitate the learning process. Inherent characteristics of distance learning (e.g., physically-remote instructor) make it necessary to consciously build interaction into distance learning courses. Overall the results indicate that most organizations do provide for interaction in distance learning curriculum. Only about one-fifth of the respondents indicated that there was no interaction.



Note. Expressed as percentage reporting use of various methods of interaction. Data from question 15.

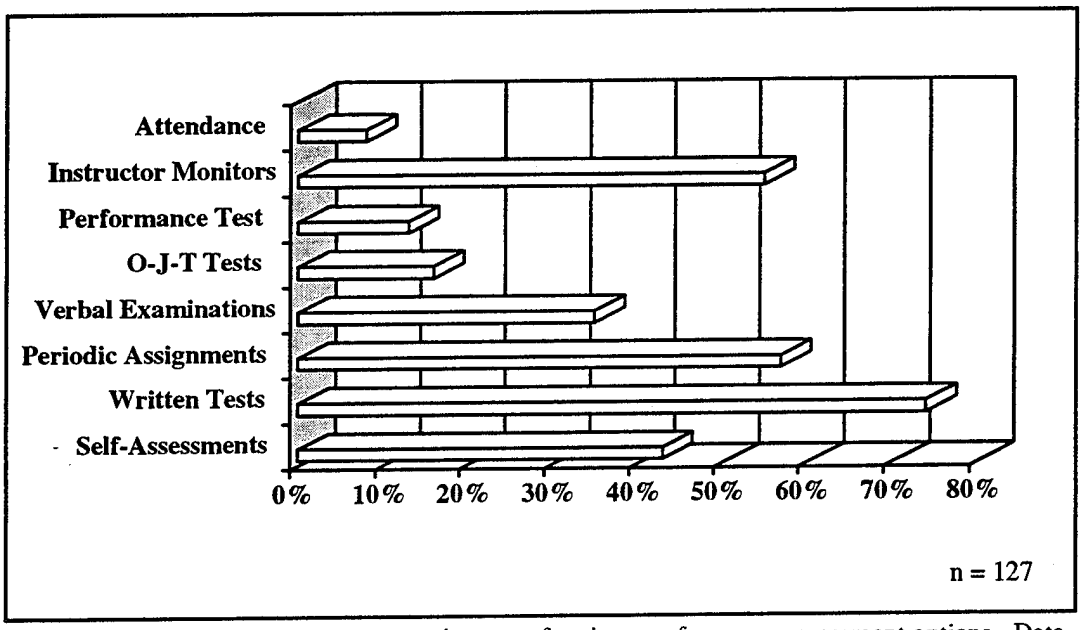
Figure 14. Methods of Interaction

Figure 14 shows the pattern of responses to the question, *how do students interact with the instructor and/or course materials? Written communication, questions and answers*, and *office hours* were the most common responses. Interestingly, 82% of the respondents said that students had at least two or more ways to interact with instructors. On average, distance learning providers indicated that they employed about four different methods of facilitating interaction.

While the interaction intervals may vary from course to course, 44% of the respondents indicated that interaction was frequent, i.e., daily or weekly. Only 21% of the respondents indicated *no interaction.* Of those who indicated that there was no interaction, the largest percentage of them reported using video broadcast (89%), videotape (89%), and CBT (82%). This finding is not surprising since these delivery methodologies are frequently employed in self-study courses.

Distance Learning Classroom

The most common place that students take distance learning courses is *on-the-job* (56%) which fits with one of the natural characteristics/advantages of distance learning--to provide just-in-time training to trainees on-the-job. *In a conventional classroom setting* (45%) and at *home or a dormitory* (37%) were also common choices. Most respondents indicated that there were numerous sites where students could take distance learning courses.



Note. Expressed as percentage reporting use of various performance assessment options. Data were from question 20.

Figure 15. Performance Assessment Options

Performance Assessment Options

By far, the majority of respondents indicated performance assessment was an integral component of the distance learning curriculum. Figure 15 shows the percentages of respondents who selected various performance assessment options. Only 11% of the respondents said that there was *no performance assessment or tests in course*. 76% said there were *written tests*, 57% *periodic work assignments,* and 55% said that *instructor monitors student work*. In other words, it appears that distance learning instructors employ many of the same performance assessment options as their traditional course counterparts. It appears from these results that distance learning instructors either have not yet developed or choose not to use unique techniques for performance assessment at a distance.

The most common reason given for choosing various performance assessment options was because it was *most effective* (66%) or *most efficient* (50%). It appears teachers do not change how they assess performance in distance learning classes. They use many of the same techniques (e.g., written tests) that they use in traditional classroom settings.

Assessing Student Attitudes and Opinions

The majority of respondents indicated that student opinions were solicited at the end of the course (88%). Respondents collected a variety of attitudinal data including *course effectiveness* (88%), *instructor effectiveness* (79%), *use of media* (67%), *comparison of distance learning to conventional instruction* (48%), and *tests* (41%).

Summary of Findings

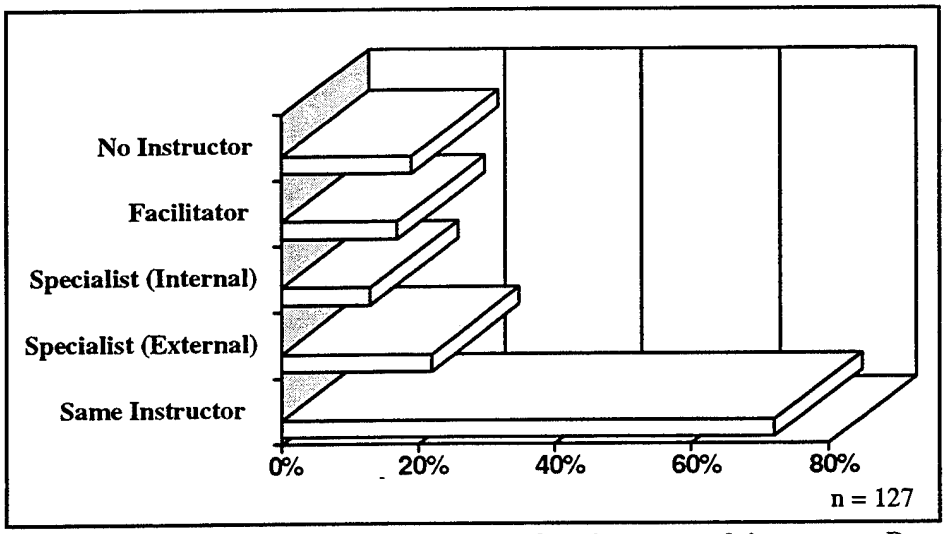
Distance learning, in practice, is used to train a wide range of student populations. Based on the results of the survey, it appears that distance learning is used with virtually all types of student populations. In terms of course size and length, distance learning classes are similar to conventional courses. Additionally, student performance assessment options appear to be identical to those of traditional courses.

Characteristics of Distance Learning Instructors

Undoubtedly, distance learning environments place additional demands on instructors. This section describes some key characteristics of distance learning instructors including instructor background, qualifications, and training.

Background and Qualifications

The vast majority of respondents reported that distance learning instructors were recruited from *existing faculty* (72%). The next most common response was *specialist from outside organization* (22%) followed by *course self-teaching* (19%). Figure 16 shows who the distance learning instructors are.



Note. Expressed as percentage responding to use of various types of instructors. Data were from question 25.

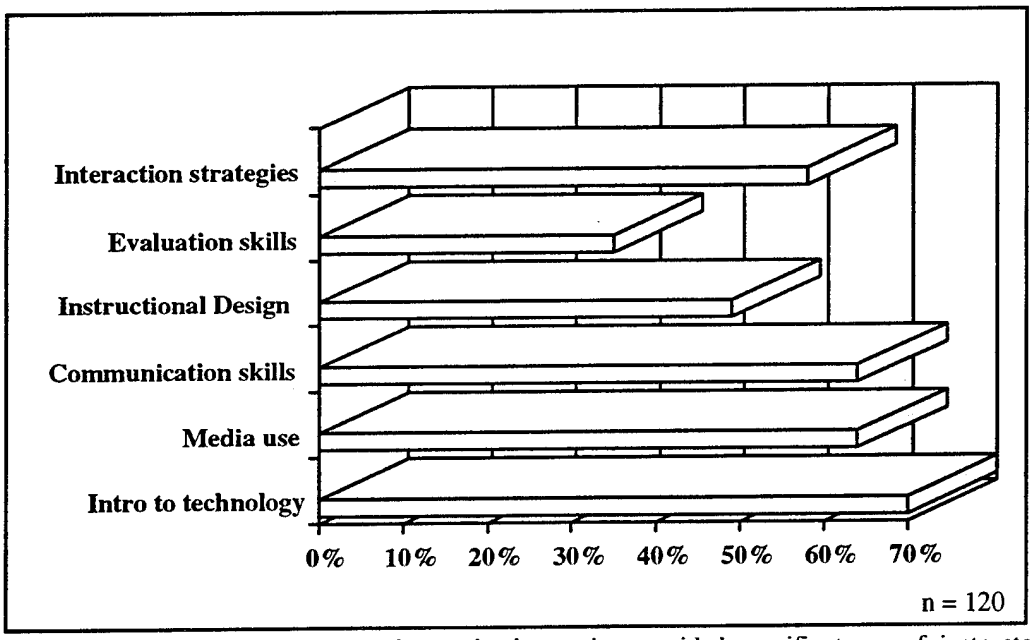
Figure 16. Distance Learning Instructors

The primary reason given for choice of instructor was *teaching experience* (60%). *Experience with media* was also frequently mentioned (37%). Only 3% of the respondents indicated that there was *no documented reason* for choice of instructor. Instructor backgrounds and qualifications varied widely among the providers surveyed. Usually, instructors had *no special background* (49%) followed by *selected from faculty because of exceptional classroom skills* (34%), *instructors with training* (31%) and *senior faculty* (25%).

Distance learning instructors do not necessarily have special qualifications or backgrounds that enable them to teach at a distance. Distance learning providers do not usually use outside consultants or distance learning specialists to teach their courses. Rather, they rely on the talented instructors who are already members of the faculty. These findings would tend to indicate that most instructional organizations contemplating implementation of a distance learning program probably already have a core of potential distance learning instructors on board.

Preparation and Training

Given the fact that organizations appear to use existing faculty to staff distance learning requirements, it seems logical that they provide some sort of instructor training to prepare the uninitiated instructors. In fact, most programs do this. 70% of respondents indicated that they provided an *introduction to distance learning*. Only 11% indicated that no special training was provided. Interestingly, most organizations reported that they provided training *in-house* (41%) while only 12% *consulted with an outside organization.* Figure 17 shows the common elements of instructor training programs. On average, organizations included about five of these elements in their instructor training programs.



Note. Expressed as percentage of organizations who provided specific types of instructor training. Data were from question 29.

Figure 17. Elements of Instructor Training Programs

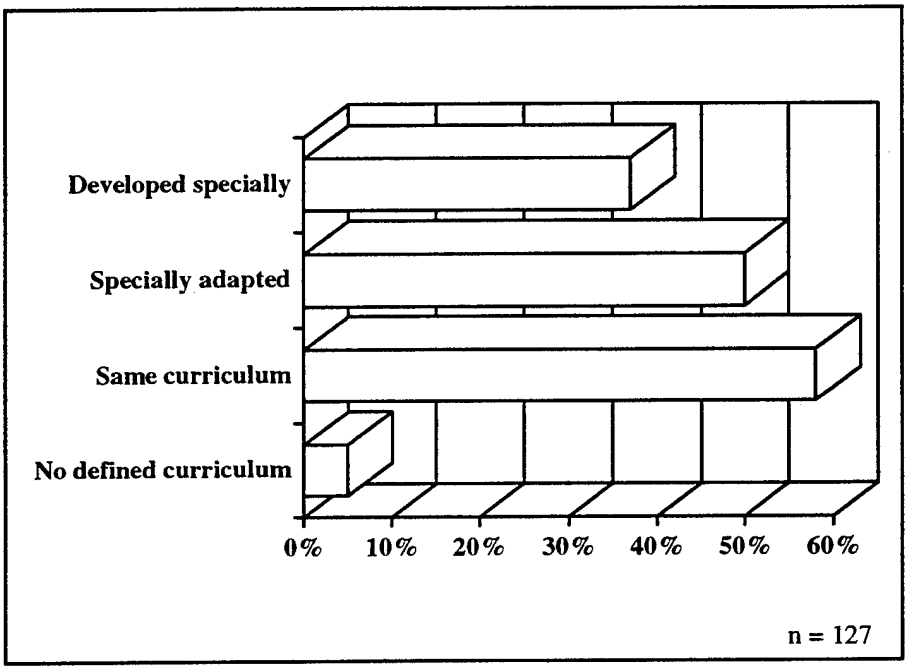
The primary reason for providing training to distance learning instructors was that untrained instructors were relatively ineffective (46%). Trained instructors were *better able to utilize features of distance learning technology* (59%), *made better use of the media* (53%), and *made better use of interaction strategies* (52%).

Summary of Findings

Most organizations recognize the importance of properly trained faculty. They also seem to think that all skills required to be an effective distance learning instructor are trainable. The single most common qualification for distance learning instructors was previous teaching experience.

Characteristics of Distance Learning Curricula

For the most part, researchers have not focused their attention on instructional design issues associated with developing distance learning curricula. This section describes some of the characteristics of distance learning curricula including similarities and differences compared to conventional curricula, distance learning objectives, and characteristics of the conversion and development process (e.g., time to convert, who develops).



Note. Expressed as percentage reporting no defined curriculum, same curriculum, curriculum specially adapted, or course specially developed for distance learning. Data were from question 32.

Figure 18. Characteristics of the Curriculum

Distance Learning Curricula

As shown in Figure 18, only a small proportion of respondents (i.e., 5%) indicated that there was *no defined curriculum.* In other words, about 95% relied on a standardized curriculum to guide distance learning course development. A nearly equal number selected *curriculum same as conventional course* (58%) and *conventional course specially adapted for distance learning* (50%). About 37% reported that the *course was developed specifically for distance learning.*

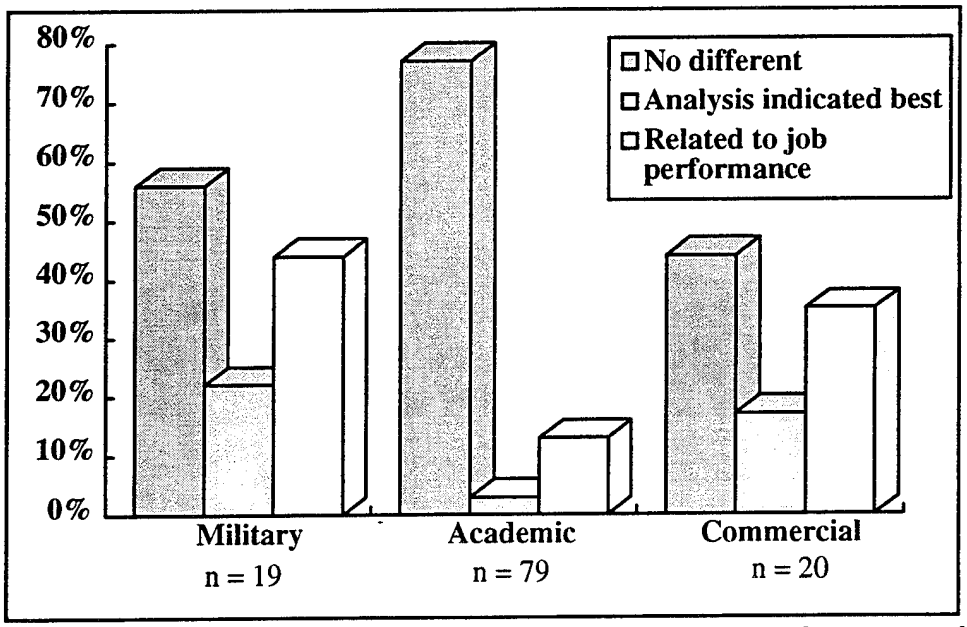
31% indicated that curriculum evolves every time taught while only 13% indicated that *distance learning curriculum very stable.*

Based on these findings, it appears that most distance learning providers utilize a defined distance learning curriculum. Often this curriculum is the same as a conventional course although some providers feel that is necessary to modify the curriculum to exploit the characteristics of distance learning.

Distance Learning Objectives

Distance learning objectives/learning outcomes are most often *identical to conventional course objectives* (69%), although occasionally *conventional course objectives are adapted* for distance learning technologies (33%). Only 24% of the respondents indicated that these *objectives were related to job performance.* Again, this may be an artifact of the large number of academic distance learning providers included in the sample.

When asked why they selected objectives, the vast majority of providers said that they used existing objectives because they were already in place (71%). Only 12% said that *research shows these objectives best for distance learning* and only 2% said that there were *no objectives.*



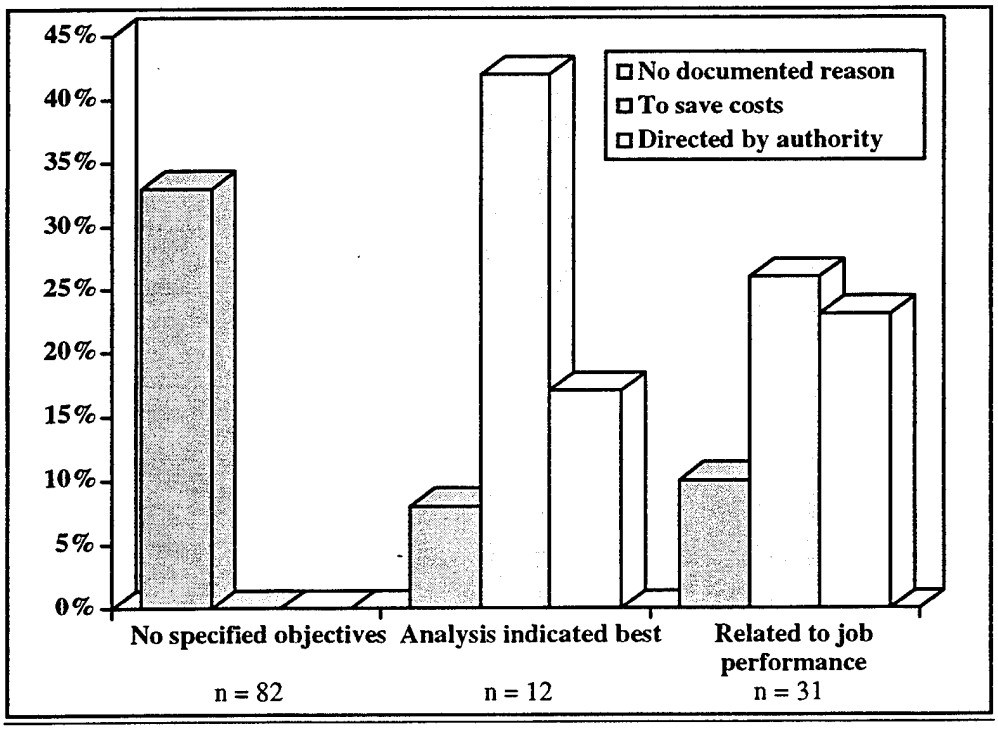
Note. Expressed as percentage reporting objectives related to job performance, analysis indicated best media, and no different. Data were from organizational profile and question 34.

Figure 19. Distance Learning Objectives by Organization

Three separate crosstabulations were performed to further investigate distance learning objectives. The first crosstabulation examined whether different organizations reported using different distance learning objectives. Figure 19 shows how organizations responded to the

question on distance learning objectives. Interestingly, the response patterns are identical for military organizations, academic institutions, and commercial firms. The major differences appear when comparing the proportions of organizations who responded to each of the options. 77% of all academic organizations surveyed, for example, reported that distance learning objectives were *no different.* In comparison, only 56% of military and 45% of commercial firms reported that distance learning objectives were *no different.* Academic institutions were also less likely to cite *analysis indicated distance learning best media* for objectives and *objectives related to job performance.* It appears that military and commercial firms are more closely aligned with each other in terms of distance learning objectives, although each of the organizations exhibited similar patterns of responses (i.e., *no different* was most common and *analysis indicated best media* was least common).

A second crosstabulation was conducted to examine if characteristics of the learning objectives selected were different for different courses. For the most part, objectives were not different for different types of courses. The only exception occurred with regard to *objectives related to job performance.* As expected, those who offered technical training, management training, and conferences via distance learning were more likely to report that *objectives were related to job performance* as opposed to those who offered general education courses.



Note. Expressed as percentage reporting specific reasons for using distance learning objectives. Data were from questions 33 and 34.

Figure 20. Distance Learning Objectives and Reasons

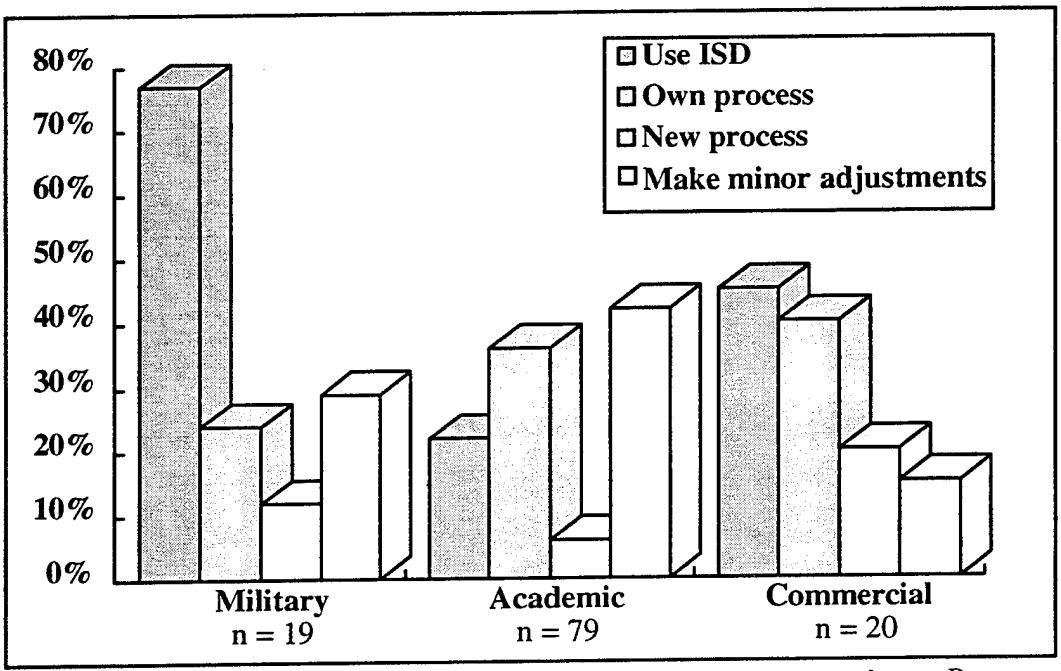
A final crosstabulation was conducted to determine if providers used objectives for specific reasons. In other words, it was of interest to determine if people selected certain types of

objectives for particular reasons. Several interesting trends can be observed in Figure 20. First, more of those who said there were *no specified objectives* also said that there was *no documented reason* for choosing those objectives. Second, of those who said *analysis indicated that objectives were best*, 42% also said that objectives were selected *to save costs*.

Development and Conversion Process

Of those who developed special curricula for distance learning courses, most used their *own curriculum development process* (35%), *instructional systems development* (ISD) (34%), or *make minor adjustments to existing curriculum* (34%). When asked why they chose to use a particular development process, 57% indicated that it takes *distance learning requirements/ capabilities into account*, 50% indicated a *preference among faculty/instructional development staff*, 11% *directed by higher authority*, and 9% *required by regulation*.

Distance learning curriculum development procedures were examined in more detail in order to determine if particular organizations reported using specific techniques. Several trends, shown in Figure 21, were discovered. First, military organizations were much more likely to use ISD than either commercial firms or academic organizations. Academic organizations reported *minor adjustments* more than either military organizations or commercial firms. Also they did not use *new instructional design process* as much as the others.



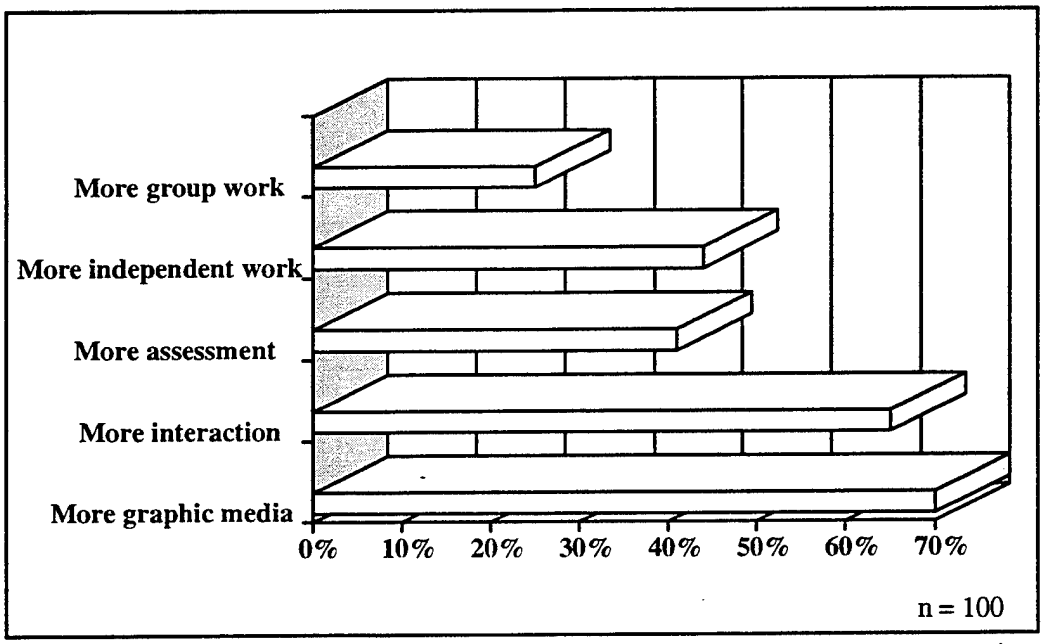
Note. Expressed as percentage reporting use of various development procedures. Data were from organizational profile and question 38.

Figure 21. Development Procedures by Organization

Figure 22 shows some of the characteristics of distance learning curricula. Some of the most common characteristics include *additional graphic media* (70%), *increased opportunity for student interaction* (65%), and *more frequent assessment of student performance* (41%).

Based on the responses to this question, it appears that distance learning developers feel that there is a need to enrich the learning environment by including more interaction and assessment as well as richer media. Group work appears to occur less often than independent student work. This is interesting because one of the potential advantages of distance learning is to facilitate a collaborative environment in which students can interact with the courseware, the instructor, and other students.

Distance learning curriculum, as suggested by responses to question 41, was typically developed by the *course instructor* (74%) although *staff instructional designers with distance learning experience* (38%), *staff designers with no special qualifications* (15%), and *outside consultants* (15%) were also employed. The most commonly cited reason for using these developers was they had *knowledge of distance learning technology* (42%) and they had *knowledge of distance learning concepts* (40%). Most designers had *more than 3 years experience* (52%) followed by *6-18 months experience* (24%), and *19-36 months experience* (21%). Only 9% reported *no experience*.



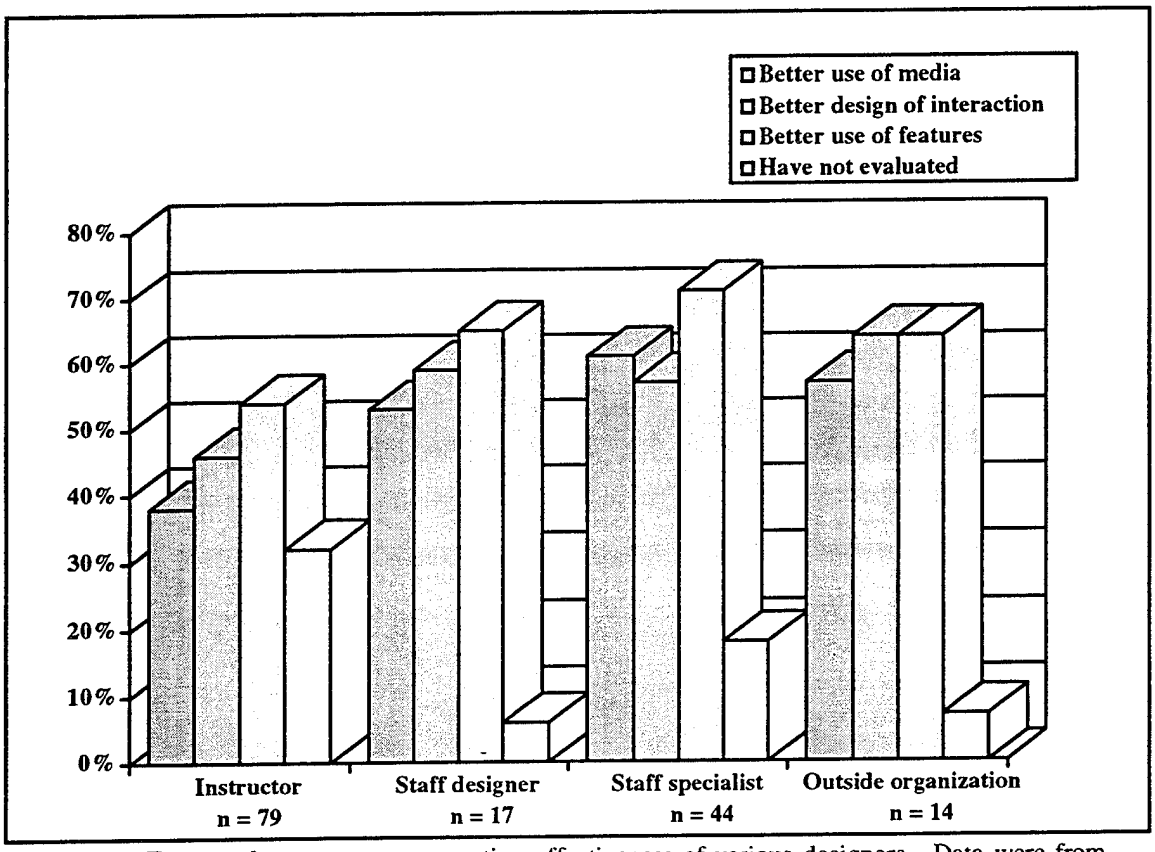
Note. Expressed as percentage of respondents who selected each of the response options. Data were from question 40.

Figure 22. Characteristics of Distance Learning Curricula

Most distance learning developers obtained training *within their own organizations* (69%), although some received training *in college* (47%), from *some other organization* (15%), and from *commercial vendors of distance learning curriculum* (15%). By far, most of the

respondents indicated that the *training was effective*: 54% said developers were *better able to utilize features of the technology*, 49% said developers *better able to design interaction strategies*, and 43% reported that developers *made better use of the media.*

Developer effectiveness was examined as a function of who developed the courseware. Several interesting trends were discovered. First, it appeared that instructor - designers were less effective than their counterparts. Figure 23 illustrates this trend; in each instance non-instructor - designers made *better use of the media, better use of interaction strategies*, and *better use of the features of distance learning*. This is surprising given the fact that course instructors were also the most commonly cited designer of distance learning courseware. To exacerbate the situation, it was also reported that the effectiveness of instructor- designers was evaluated less frequently than other designers. In other words, it appears that a gap exists between what is being done and what should be done.



Note. Expressed as percentage reporting effectiveness of various designers. Data were from questions 41 and 45.

Figure 23. Effectiveness by Developer

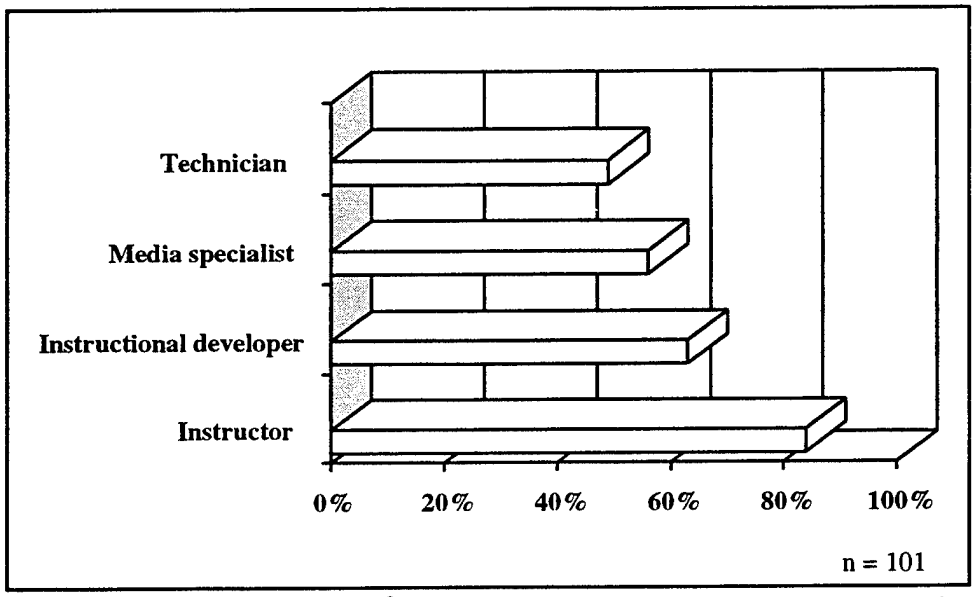
According to those surveyed, it appears that a wide range of professional expertise is required to produce and present a distance learning lesson from start to finish. Figure 24 shows the percentages of respondents who indicated that specific types of professional expertise were required to produce and present a distance learning course. About 84% mentioned *instructor*, 63% mentioned *instructional designer*, 56% said *media specialist*, and 49% said *distance*

learning technician. Once again it appears that distance learning providers value the expertise of qualified instructors the most.

Time to Develop/Convert

The questionnaire asked respondents for several estimates of how long it takes to develop and/or convert courses for distance learning. Unfortunately, few respondents answered these questions. Therefore few meaningful results emerged. It does appear that in both developing and converting courses for distance learning that *developing the curriculum* and *media* are among the most time consuming tasks. Many organizations also reported that the development cycle is the same as for a conventional class (43%). Only a few indicated that building student interaction into the curriculum (23%) requires more time or that student assessment (22%) requires more time to develop.

Crosstabulation tables were constructed and analyzed to probe for trends regarding whether specific characteristics of the curriculum impact how long it takes to develop and/or convert distance learning courses. No trends could be identified.



Note. Expressed as percentage reporting that specific kinds of professional expertise are required. Data were from question 46.

Figure 24. Professional Expertise

Summary of Findings

Most distance learning providers do not drastically alter curricula or objectives for distance learning. Many do make minor modifications like *increased opportunity for interaction* (65%) or use of *more graphic media* (70%) to tailor courses to the technology.

Distance learning providers seem to recognize the importance of training instructional designers just as they place importance on faculty preparation. Many organizations provide distance learning course designers with training. Also, organizations who provide training report that developers make better use of the technology, the media, and handle interactions better than those who do not receive training.

It is less clear whether distance learning providers understand the need to systematically develop and/or convert courseware for distance learning. For example, of the 129 organizations surveyed, only 18 had a formula on how long it should take to develop/convert courses for distance learning.

Problems Associated with Implementation and Maintenance

Implementation and maintenance of distance learning programs can present problems for providers. Not only are the technologies susceptible to problems, but other kinds of problems can also affect the implementation and maintenance of distance learning programs. For example, follow-up site visits revealed that sometimes the organizational climate is not right for the introduction of distance learning. In fact, several of the organizations we visited had major problems convincing management, the training staff, or trainees that distance learning was a viable training solution.

This section describes some specific problems associated with the implementation and maintenance of distance learning systems. In particular, this section discusses the types of problems encountered during the implementation of distance learning, describes technology-related problems, potential solutions, and media limitations.

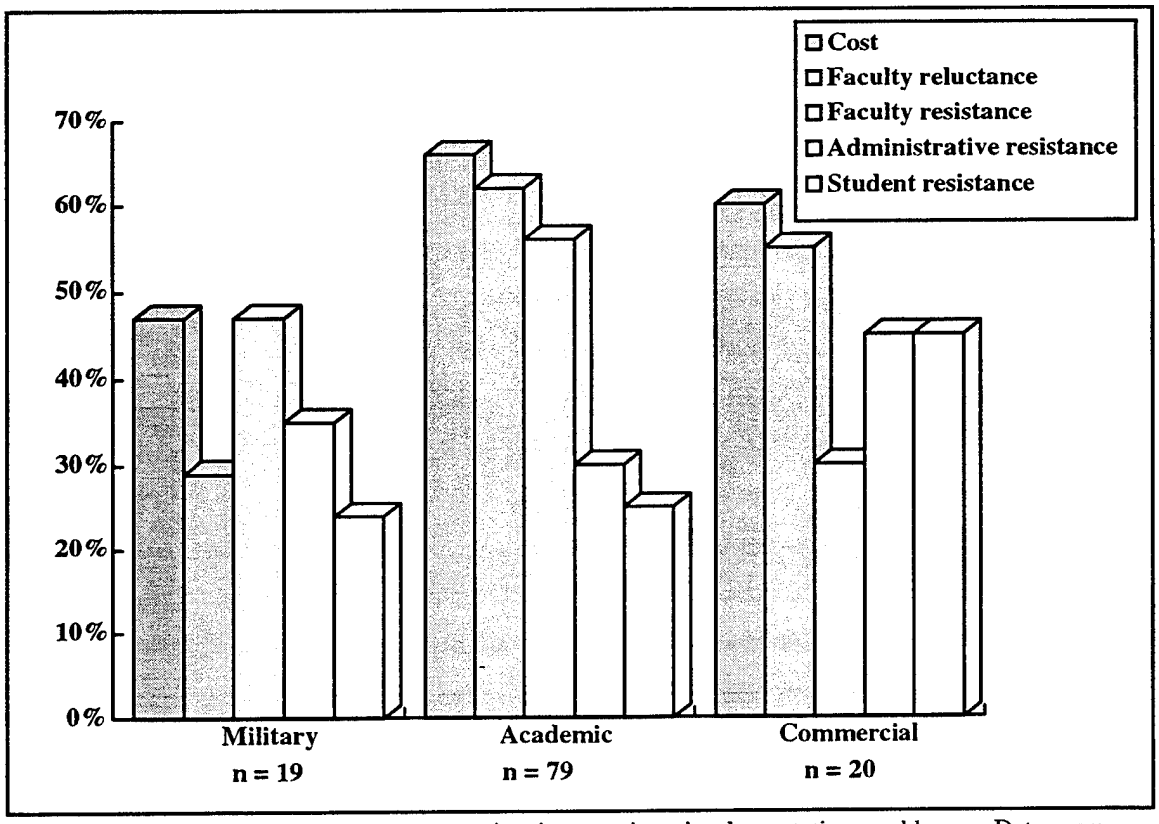
Implementation Problems

The results of both the questionnaire and the follow-up site visits suggest that virtually all organizations experience some implementation and maintenance problems. Only 8% of those surveyed reported *no problems*. Of those, 60% were academic institutions and 30% were military organizations. All commercial firms acknowledged implementation problems. Interestingly, 90% of those reporting *no problems* reported using paper-based approaches, 70% reported using video broadcast, 40% used two-way audio, one-way video or two-way audio and video, and 80% used videotape. Common problems were *cost of technology* (62%), *reluctance of faculty to use technology* (55%), *availability of trained personnel* (49%), and *resistance of faculty to concept of distance learning* (49%).

Data from several questions were crosstabulated in order to determine if there were any systematic differences between the types of problems experienced and relevant research variables. First, responses to question 55 were examined for each type of organization surveyed (e.g., commercial firm). Figure 25 shows how selected types of organizations responded to question 55. Most interestingly, academic faculty were more reluctant to use distance learning technology and more resistant to the concept of distance learning. Their administrators and students were also more resistant to distance learning.

Organizations that reported being in existence for longer periods of time also reported more problems. In other words, newer distance learning programs tended to report fewer problems than older ones. It may be that respondents from older organizations are more realistic than those from newer organizations. Also, perhaps the newer programs haven't been around long enough to experience as many problems. These findings may also reflect a ripening of distance learning technology over the years.

Several technology-related problems were commonly cited. Most commonly, respondents reported *capacity* (i.e., technology couldn't handle what they wanted) 31%, *quality* (i.e., technology not there yet) 31%, *interoperability* (i.e., no standard) 29%, and *maintainability* (i.e., system required frequent maintenance) as common technological problems. Each of the technologies mentioned in question 1 were examined to see if they were associated with specific technology related problems. The results suggested that there were no systematic problems associated with specific technologies.



Note. Expressed as percentage experiencing various implementation problems. Data were from the organizational profile and question 55.

Figure 25. Problems Encountered by Organization

Several common reasons were given for distance learning implementation and maintenance problems including *inadequate funding* (41%), *lack of trained personnel* (33%), *limited/inadequate facilities* (28%), *lack of interest in distance learning* (26%), and

technological problems (25%). Respondents felt these problems could have be prevented or diminished by *additional funding* (47%), *training for personnel* (41%), *management support* (37%), and *public relations* (36%). In other words it appears that most distance learning problems, according to distance learning providers, can be solved with additional funding or internal support.

Media Limitations

Only about one-third of those questioned said that they experienced *no media limitations*. Therefore most providers did experience problems. Most commonly, organizations reported experiencing *audio quality problems* (23%), *ability to transmit in sufficient quantity* (13%), and *video quality* (13%) problems.

Summary of Findings

Problems related to the implementation of distance learning are pervasive. While many of these problems are technical in nature (e.g., media limitations), organizations also experience other types of problems related to attitudes and resources, such as internal resistance to the concept of distance learning and inadequate funding.

Future Plans for Distance Learning

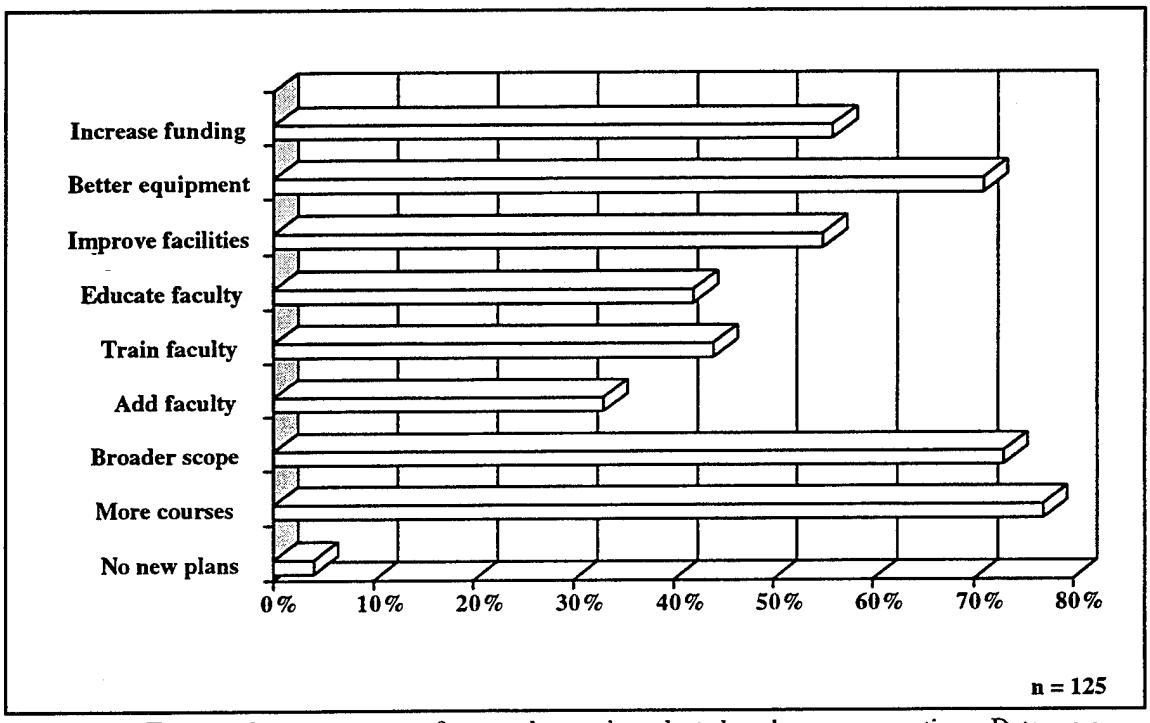
This section describes findings regarding future plans for distance learning among existing distance learning providers. Since all of the organizations surveyed intend to maintain and even expand their programs, this section deals with areas of growth, reasons for future plans, and distance learning research agendas.

Plans for Expansion

Only 4% of all organizations surveyed indicated that they had *no new plans*. 77% of the respondents plan to *increase the number of courses offered* and 73% intend to *increase the scope of the distance learning programs*. As suggested by Figure 26, many distance learning providers have plans to expand distance learning programs. Among the most important changes on the horizon are *investments in better equipment* (71%) and, surprisingly, *more faculty* (33%). 56% of those surveyed indicated that they planned to *increase funding* for distance learning programs.

Of the organizations who planned to make more use of distance learning (93%), the largest proportions cited reasons such as distance learning *course effectiveness* (55%), *students like distance learning* (40%), and *cheaper than conventional course* (27%). Since a common reason that organizations select distance learning is related to its potential for cost savings, it is surprising to see that only 27% of the organization report that it is *cheaper than a conventional course*. Another important finding stems from the fact that only 16% of the respondents indicated that they were planning to make more use of distance learning because the faculty likes it.

No one indicated that they were *planning to eliminate distance learning* outright, although approximately 4% expressed some desire to *reduce the use of distance learning* within their organizations. Of those 4% (n = 5), only one indicated that the plans were due to *students dislike distance learning.*



Note. Expressed as percentage of respondents who selected each response option. Data were from question 61.

Figure 26. Future Plans for Distance Learning

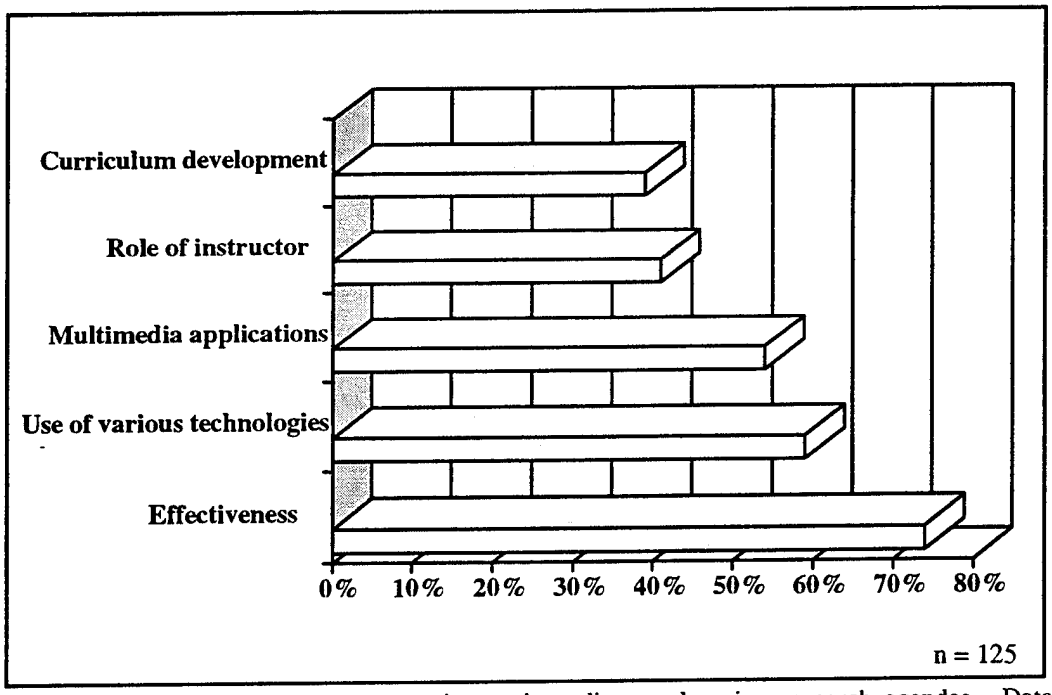
Research Agendas

The majority of distance learning providers are conducting some kind of research in distance learning (74%). Figure 27 shows the types of research that these organizations are conducting.

The most common research focused on instructional effectiveness of distance learning. Most of this research was based on *student opinion questionnaires* (59%), *instructor opinion questionnaires* (39%), *comparative test results* (36%), *retention data* (16%), and *transfer data* (16%).

Summary of Findings

By far, most of the organizations surveyed planned to maintain or increase their distance learning programs. Few organizations planned to reduce their programs and none of the distance learning providers surveyed indicated that they planned to eliminate distance learning from their training arsenals.



Note. Expressed as percentage reporting various distance learning research agendas. Data from question 53.

Figure 27. Areas of Distance Learning Research

Distance Learning Site Visits

Rationale

Eighteen site visits to organizations actively involved in distance learning were conducted. Sites were selected based on the following criteria: 1) a creative use of advanced technology or integration of multiple technologies; 2) a specific example of using distance learning for technical training; or, 3) state-of-the-art instructional design for distance learning technology. Specifically, responses to seven questions (out of the original 65) were examined in 129 questionnaires for relevance to the aforementioned criteria. Occasionally, in conjunction with project trips to distance learning sites which were specific targets for follow-up visits based on the criteria, the team made visits to other organizations nearby which also had distance learning programs.[3] These other visits tended to broaden the team's perspective by providing the point of view of various types of organizations including those starting, expanding or managing their distance learning programs. Unstructured interviews were conducted at each site. Essentially, the interviewers prompted the participants to describe in detail their distance learning program and discuss what they felt were its salient points. Most information from the site visits tended to cluster about several major topic areas which are discussed below in more detail.

[3] In addition, the research team made it a point to visit organizations with distance learning programs within close proximity of Brooks AFB, i.e., the greater San Antonio area, whether or not they met the criteria listed above.

Cost Savings

All sites reported using distance learning to lower training costs (particularly through reduction or elimination of travel and per diem costs) and to increase productivity. A manager at a major automotive manufacturer reported that distance learning was currently being used to provide training to engineers in-plant. Furthermore, he reported plans for using distance learning to train service technicians worldwide. According to him, the anticipated cost savings of the new program will more than offset the cost of the program. Additional cost savings to the company might be sufficient such that purchasers of new vehicles could be offered new features such as free towing to the nearest company facility for breakdowns. At the same time, the distance learning program provides cost and other savings to individual engineers enrolled. Students are saved a hectic rush-hour commute to and from class in an unsafe portion of the city. They also reduced or eliminated time away from their jobs and families.

Based on the organizations visited, only one manager (from a large insurance company), indicated that cost was not an obstacle in operating their distance learning program. He reported being able to obtain all the funding needed to develop the kind of distance learning courses desired by the company. He reported that such expenditures could always be justified on the basis that the company was saving costs and increasing productivity over the long term. Other training managers mentioned that their departments were subject to more stringent material constraints. This was most evident in the realm of acquiring or upgrading computer hardware and software, maintaining equipment, ensuring compatibility with other system components, and finally, having enough equipment available for training development and delivery. Representatives from several organizations, including a large retailer, a large energy corporation, and various military installations reported that they saved money by relying on COTS technology as much as possible, making use of existing instructional design experience, or using distance learning courseware vendors whenever practical.

The technical training manager of a large defense contractor described their cost-saving program of using an intensive schedule for preventive maintenance. An instructor can focus on providing opportunities for learning and interaction only if all equipment is in working order. For example, equipment is routinely checked once a month for a half-day (usually on a Saturday) and equipment is checked 20 minutes every day before being used for teleconferencing or distance learning.

Instructional Design

Most distance learning courses were adapted from conventional instructor-led courses. They were modified to include more independent learning concepts and increased opportunities for interaction. Several participants described reliance on Gagné's theories in developing or revising their curricula for distance learning. One participant reported some courses using two-way video incorporated at least three group activities per session. Distance learning instructors at the organization used three main steps in developing their curriculum: 1) identify target population; 2) identify learning objectives; and 3) identify what else students need to know how to do. Timing was another issue in adapting courses. The training manager found that a course

which might last three to four days in a traditional classroom, took longer at a distance because of coordinating teaching at different time zones, accommodating increased student interaction, and getting used to the time delay involved in responding to students' expressions of thoughts and reactions.

One major automotive manufacturer contracted with a local university to provide training to its engineers. Their approach to course design was systematic and took the features of the distance learning system into account. Major aspects of their instructional design approach can be described as follows:

1) *Course module.* The curriculum was divided up into modules. Each module was aimed at filling a two hour class period. The instructional designer felt that the learning was so intense that any more than two hours would be fatiguing.
2) *Forms of Interaction.* Each lesson was designed so that there was student interaction every 5-8 minutes. Interaction usually took the form of some question regarding an enabling objective, teaching step or learning activity. Three forms of interaction were used: student - instructor, which mirrored the interaction of a conventional classroom; student - student, which was used to encourage team building among the diverse make-up of students in the engineering course (i.e., software developer, electronic engineer, etc.) that could be transferred back to the workplace; and, student - content, which was the focus of the questions used in building many of the interactions.
3) *Message design.* The curriculum was redesigned to produce a highly visual presentation mode. Even textual materials which were used were adapted to a more graphic method of presentation. The basic approach was that if a visual on the screen did not change every 3-5 seconds, students would lose attention. One instructor produced over 2000 transparencies and slides for the first iteration of his course (2 hour class, 14 weeks, 2 meetings/week) via distance learning.
4) *Remote classroom orientation.* If teachers have a live audience, in addition to remote students, they must remember that the live audience represents only a fraction of the class. This means that the teacher must not be distracted by the live audience.
5) *Student guide.* All curricular materials and instructions about how the class would operate were provided to students ahead of the course. This meant that students knew what questions were going to be asked prior to class. Student attention was maintained because in eliciting responses to the questions, sometimes the instructor asked for volunteers from the class, other times he designated specific students to respond. Additionally, if students missed a class session, they were able to study the materials by themselves, answer the questions and be prepared to ask the instructor questions about portions they missed.

Interaction

There appeared to be a shared general awareness about the importance of actively involving students in instruction. For example, at a large telecommunications corporation, many developers and instructors deliberately increased the number of planned student - instructor and student - student interactions by introducing gimmicks such as games and novelties. Interactive

activities ranged from using a site mascot, beginning each session with a crossword puzzle, spinning the *wheel of fortune*, and rewarding active participants with toys and stickers. Another organization, a large insurance company, always began its programs with an attention-getting full motion video introduction. Later, to further encourage student involvement, the instructor used a spin the *wheel of fortune* technique for round robin audience response games; otherwise, the different remote sites would have to compete with each other for attention. Additionally, some students received file folders with photographs and other documentation to supplement what they saw on classroom monitors. In general, identifying particular sites or students by name seemed particularly effective for encouraging interaction. Some instructors felt that their own teaching time was reduced by half, mainly due to increased student interaction.

One organization which linked the instructor with several group configured classrooms, used a special videotape segment to break up training components every 45 minutes to an hour. The tape, used during breaks, counted down the number of minutes remaining; it also presented a review of the elements which were just covered and highlighted elements to be covered later in the lesson. Another organization conducted informal research on class length and found that longer classes were not as effective as classes lasting two hours or less; they suggested 50-60 minutes of instruction with a 10 minute break as a good format. Instructors at a third organization planned 15 minutes of every hour for students to do something other than look at a television monitor. This decision was based on informal field trials which showed that for some students chronic monitor viewing induced motion sickness. Instead, instructors periodically involved students in activities which did not require viewing the screen and they also provided pads of paper with printed doodling patterns to act as a neutral distractor to divert attention away from the monitor.

Three large commercial organizations reported successful use of interactive keypads. Students could use them to respond to instructor questions individually or as a group. Students could also use these devices to signal the instructor if they had a question or problem. In addition, instructors were able to collect and summarize student performance data in real time by building an interactive histogram. Student response units (SRU) were not used by all organizations, due to cost factors. A major insurance company felt that students might not be able to sufficiently express their questions and answers using the SRU; therefore, in their system, student interaction with the instructor, facilitator, and students at other sites was primarily verbal. Findings usually indicate that interactive opportunities which are provided by the student interacting with the keyboard often lead to more productivity.

A large defense contractor conducts a re-certification training program at a distance. Interaction is enhanced by requiring students to demonstrate proficiency during different stages of putting on personal protection equipment while the instructor suggests corrective feedback. The training manager mentioned that they had experienced minor problems with audio and olfactory cues showing correct placement of equipment; these were solved by a remote site facilitator checking for these cues. Another technique used to involve students in discussion during a hazardous waste management course was to encourage students to collectively answer objective test questions by holding up large color-coded answer cards.

Some of these successful techniques for increasing interactivity may not transfer well into other curricula or to other types of learners. For example, the engineering students at a major automotive manufacturer and at a large technological university exhibited little patience with non-essential interaction. A representative of a distance learning provider who specialized in highly technical courses was relatively less concerned about the quality of interaction between instructor and students or between the students. In fact, in many cases students, when given the option, preferred to watch tape-delayed rather than live broadcasts, since interaction did not seem to be an issue even during live classroom experiences with engineering-related subject matter. For these courses students had access to their instructors during specified phone-in times.

Instructors

Several distance learning administrators stressed the importance of selection criteria for instructors (and facilitators of remote classrooms, where appropriate). On the other hand, some organizations offered so many courses that they could not be selective about which instructors were better teaching at a distance. In fact, the most effective distance learning faculty seem to be individuals who are also highly effective in the live classroom as well as being able to develop the right combination of video presence and subject matter expertise. Several large organizations found that television *game-show host* or *news anchor* types of personalities were particularly engaging for distance learning.

One distance learning training manager from a major automotive manufacturer noted that we have to change our paradigm about teaching. In the past, if we had 25 instructors, each knew the subject matter, developed curriculum or lesson plans, produced supporting materials and media, operated classroom support equipment and delivered instruction to the class. The new paradigm parallels the television news industry, where the script is developed by specialists, support materials are generated by graphics and media experts, and special topics are discussed by an outside expert, etc. In other words, the person who reads the news is a *personality*. The new distance learning paradigm calls for a similar approach. Where we had several instructors presenting classes simultaneously, we now have several support personnel providing behind-the-scenes assistance to the distance learning instructor *personality*. This new paradigm allows us to reach more learners with a single class than we used to reach with many classes. It is somewhat akin to the difference in expanse between newspapers and television. Each paper printed usually only reaches one or two readers, while each television broadcast can reach many millions.

A large telecommunications company designed special certification courses for their distance learning instructors. Potential instructors completed coursework as students, worked with the instructor, and taught an experimental class to be certified. One of the major concepts they learned is that the instructor's role is to facilitate the group and to ensure learning is taking place. Another useful distance learning skill taught in class is how to be entertaining and how to maintain attention and enhance motivation. Instructors learned about other aspects of developing and delivering instruction at a distance. For example, they learned how to set up, equip, and decorate their classrooms, how to dress for the camera, how to move while on camera, and when to switch activities and schedule breaks. Instructors need to be particularly well organized to

teach at a distance since much more advance preparation is required.[4] The training focused on helping instructors improve the quality of instruction as well as make better use of their time. The *on camera* atmosphere seems to encourage these behaviors. Instructors of one-way video, two-way audio courses learn to rely on audio cues or on feedback from the remote on-site facilitator compared to visual cues in a conventional classroom.

Training for operation of distance learning equipment was often conducted. A training manager for a large defense contractor mentioned that equipment operation had to be easy for both instructors and students or else the equipment would not be used. In his opinion it is very important for equipment operation to be transparent to the learners during class and that instructors not feel nervous about using it. For example, the visual quality of compressed video is enhanced by limiting motion; therefore, instructors were trained to teach from a relatively confined space rather than walking around.

Many distance learning programs used a remote on-site facilitator or coordinator who handled administrative and logistic details, made sure students understood concepts and completed their class work. Advanced subject matter knowledge is not always required for the facilitator except in the case of highly technical material or hands-on demonstrations of complex procedures or equipment. Training managers in several organizations stressed the importance of using the facilitator to standardize classroom set-up, check transmission capabilities and distribute training materials.

Student Characteristics/Perspectives

Attitudinal challenges were mentioned by a variety of distance education managers at various types of organizations. The challenges included: 1) difficulty in overcoming the cultural stereotype that education *cannot* be individually customized; 2) understanding that distance learning can be an enhancement to education rather than a complete replacement; 3) difficulty in getting cable television viewers to acknowledge that television can be an educational component at home; 4) educating at-home students about using technology such as programming video-cassette recorders, and; 5) realizing that education and training are lifelong processes. The representative of a public education consortium emphasized that it is critical that students develop personal learning skills regardless of delivery media. He stressed that distance learning programs must not ignore this factor in tailoring curricula for their students.

The training manager of a large energy corporation said the department performed an extensive audience analysis before designing a training program. Since there was a concern with literacy level, the course workbook contained a lot of pictures and white space. Convenient reference place holders and checklists were also included. Workbooks frequently incorporated friendly task-relevant cartoon personalities to illustrate examples.

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[4] Generally, instructors and developers reported increased preparation time required for distance learning delivery technology, although the increased preparation time seemed to be associated with better prepared and well integrated instruction overall.

A large telecommunications company provides a five-minute training video for students enrolled in distance learning programs about what to expect and how to behave. For example, students are told that the video camera scans the classroom every ten seconds, and students are expected to appear alert. Students are also told that they are expected to be active participants in the learning process. Training managers observed that it usually took a only a short time for students to adapt to the distance learning context. Adaptations mainly involved learning to use the microphone, taking turns speaking in real time with transmission delays, verbalizing more (always identifying themselves), and getting used to observing movement and reactions in compressed video.

Prior to implementing distance learning at a major automotive manufacturer, the training managers carefully selected the course based on expected characteristics of the students. While no up-front analysis of student characteristics was performed, the managers felt that they wanted to maximize the opportunity for distance learning to succeed at the organization. Consequently, they selected a course for design engineers as their initial attempt at distance learning. In their opinion the students would be more forgiving of any discrepancies encountered in the curriculum materials, flaws in the delivery technology or problems with the instructor's *video presence*. Students were aware that the course was an initial attempt at distance learning which might eventually be of great benefit to them in their workplace. They responded to problems with patience and understanding as expected, and provided valuable critiques to the training managers at the end of the course.

Assessment

During one public education distance learning program, student assessment was conducted via FAX or modem, allowing students to work individually on-line. Performance feedback was immediate. At another commercial organization, instructors (and remote on-site facilitators) would often sit at the same tables and interact with students and materials, encouraging students to demonstrate what they have learned in informal trial sessions. Most testing at another academic institution was conducted on-site because accreditation requires a number of sit-down proctored exams.

The training manager for a large energy company reported that its training programs often utilized a variety of self-assessment instruments. Employees must show that they have completed training and achieved a competency level usually focused on required content areas. Often the self-evaluation is a form to be mailed to the training manager (except in the case of hazardous operations training).

In an engineering course conducted by a university for a major automotive manufacturer, assessment was by means of written examinations for accreditation reasons only. The course developers routinely incorporated assessment questions into the curriculum as a means of encouraging student interaction. Some of the assessments included hands-on devices such as circuit boards, and other electrical or computer components which had to be configured, tested or made to work with specific software, etc., by each individual student. While the course was delivered to each student individually at his/her worksite, collaboration on such activities was not

discouraged. In fact, the company looked at such collaboration as beneficial to corporate team building.

Delivery Media

Distance learning delivery media were highly variable. Depending on the type of organization and training context, courses used technologies ranging from satellite-based live two-way video/two-way audio, training videotapes and workbooks distributed in advance, to on-line electronic classrooms comprised of networked computers in a single location or around the country. We heard very few complaints about technology, except for comments about a lack of standards for equipment and connectivity. There seemed to be more organizations using landline transmission rather than satellite because of relatively lower cost and higher reliability. Most complaints focused on funding issues (equipment, facilities) and technical staff shortages.

One distance learning program configuration was a joint venture between public education, job-training, and a small telecommunications company. Their three-way configuration utilized fiber optics, two-way full motion continuous video, and facilitated interactive networked development and team-teaching between sites. In another arrangement, a large insurance company was very pleased with its one-way video, two-way audio system supplemented by a local area network which provides desktop training for everyone. Computers and computer-based training are used extensively in this organization. Their local area network has a dual purpose-- during the day it is used for corporate training and at night it is used for adult education programs.

The training department of a large energy corporation provided computer training alternatives for most of its interactive computing support training, including videotapes, tutorials on diskette, step-by-step student guides, and self-paced workbooks. The computer-based operational training system was considered to be supplementary, enhancing the corporation's conventional training program when combined with on-the-job training and other location-specific training. Each training module is 1 to 1 1/2 hours and contains text, animation, and graphics. The trainee continuously interacts with the computer and is periodically tested to measure the level of comprehension of presented material; test scores are automatically recorded. In this case, training managers purchased computer-based training from commercial vendors, since their own training department was small and in-house development would not be cost effective. The commercial generic training modules were acceptable, although they needed to be supplemented with site-specific information presented by a human facilitator. Upon completion of the course, trainees extract their scoring data and mail in the results.

The training manager for a large defense contractor recommended against live hands-on distance learning demonstrations. According to him, pre-taping video demonstration lessons involving the manipulation of complex equipment allows shots to be carefully edited. These are used to supplement live instructor demonstrations. Instructors also mail out packets containing detailed drawings of equipment and an outline of complex procedural steps.

One academic organization and distance learning provider required students to come to its campus or another central site for a specified number of live classroom meetings as part of its distance learning graduate degree programs. A graduate program director of this institution also felt strongly about the criticality of using two-way video and two-way audio to deliver instruction. She felt two-way video allows students to be resources for each other and permits the instructor to be both facilitator and sharer of knowledge, an important principle for conventional as well as distance learning classes.

An experienced computer science distance learning instructor described his experiences conducting courses over an on-line e-mail interface. The instructor felt that he became personally familiar with students and that courses were highly interactive. For example, a variety of screen formats were available for presentation of instruction, examples and on-line class discussions. Although concurrent audio support was not available, the instructor was able to gauge how the students were doing by the relative quantity and quality of their responses. The instructor also mentioned how convenient it was for students and himself to participate in class during the evenings or on weekends. Classes could be taught from any location with a portable computer and modem. Class sessions were recorded on file and offered to students for review. Students were expected to complete professionally relevant homework assignments, including reading materials available electronically.

Program Trends

Representatives from 17 of the 18 sites visited reported that their distance learning programs were healthy and growing. Only one site, a large retail corporation, reported major problems with the distance learning program. In this case, 60 computer-based training modules were developed for field use. Each retail store was also capable of receiving satellite-transmitted broadcasts. However, several problems were encountered. Computers at the field training centers were purchased without considering training functions or compatibility issues, and computer-based training modules could not run on them. Another problem concerned the local retail store managers' resistance to training delivered via the corporate network. The company's store managers did not feel they were receiving *real* training because it did not occur in a classroom context. In terms of corporate culture, distance learning had gone from a cost effective training medium to being out of favor.

Several individuals reported that their training departments were relatively new derivatives of the organization's human resources department which determined training requirements, kept records, delivered instruction, and conducted assessment. Such is the case with a large energy corporation involved in transportation of hazardous waste. The company must satisfy numerous training and certification requirements for this highly regulated procedure. Distance learning is found to be a practical solution because of the large numbers of field-based employees involved and their round-the-clock work schedule. Training managers said that other advantages of decentralizing training and developing a greater proportion of self-paced materials is that it helps alleviate a shortage of trainers, and reduces the difficulty and expense of getting people together at a convenient time and place. Training managers from several commercial organizations said they hoped to incorporate interactive multimedia into distance learning in the near future. It has

not happened yet because in many cases employees do not have access to powerful personal computers. Most managers commented on the transitional nature of the technology as a reason to postpone any conversion.

Most distance learning providers have worked to establish an administrative and delivery network infrastructure between industry and the education community. One critical need is providing an educational advisor (either on campus or at the provider organization). All distance learning organizations also provided essential support and marketing services. A current trend by some involves developing distance learning programs for special markets in addition to targeting particular employees or students in academic programs. A few examples include providing accredited instruction for migrant workers' children, courses for inmates at correctional institutions, educational out-reach for home-bound persons, and training programs for airport executives.

Four of the organizations visited were involved in coordinating various aspects of distance learning rather than its development or delivery. These interviews provided a valuable *headquarters* perspective about training philosophies, perceived trends and some important case study data. Several pieces of advice were repeatedly mentioned for potential distance learning providers. They suggested providing a toll-free trouble-shooting and support telephone line for users, and not attempting to schedule classes during the first six months using distance learning technology, i.e., during the technology checkout period.

Effectiveness of Instruction

The training managers at a large insurance organization were very sensitive about potential differences between live and broadcast classroom contexts. Students at the instructional origination site were separated from the instructor, even if instruction originated next door. The class was broadcast simultaneously to all sites in order to ensure equal treatment of participants. This was thought to be extremely important in terms of opportunities for personnel promotions and other professional recognition.

Several distance learning training managers felt that distance learning technology does not appear to be as effective for initial training as conventional live classroom instruction. However, these opinions were based on their own experience, since no formal research was conducted. A training manager at a telecommunications company said that evaluation of their training programs was poor if it was done at all. Programs were rated as successful if the classes were fully enrolled, rather than whether or not employees learned anything or retained what they learned in the course. Current training effectiveness is assessed by asking students and their supervisors if they are applying what they learned, and attempting to determine if training costs are being recovered.

Research and Evaluation

The amount of distance learning-related research conducted by organizations was highly variable. While most organizations were interested in learning effectiveness and obtained student

performance data from a final exam at the end of the course or from an attitude survey, a few, including several academic institutions, performed market analyses on their courses. As a result of these market analyses, courses with high enrollment were offered repeatedly while those with low enrollment were significantly modified or dropped. A few organizations conducted specialized research such as a follow-up with students who inquired about enrolling in distance learning courses but never enrolled. Another organization conducted a major curriculum assessment in terms of course currency, requirements, and what training is appropriate for which technology.

Several distance learning providers conducted specialized studies about student characteristics and when distance learning is most effective. For example, one study examined the effectiveness of continuing education for working engineers by comparing on-campus and distance learners. The distant learners showed superior performance, although the program manager felt that the difference was not entirely due to distance learning technology. Rather, a market analysis showed distance learning students to be generally older, employed, and more individually motivated to do well. What this research, and other similar studies performed by other organizations on relatively mature, employed students did show, however, was that distance learning technology did not seem to interfere with learning and performance. Another major area of study included justifications of cost which amounted to calculating actual or potential savings in travel due to distance learning.

Personal and Professional Enrichment

In addition to providing job-related training during the employees' work day, several organizations reported using distance learning programs, arranged through various colleges, for employees' personal and professional enrichment during evenings or weekends. In addition to contributing to positive employee morale, this encouraged employees to remain at the workplace for longer hours and in the employ of the company for a longer duration overall.

Teacher Certification

The public education consortium we visited and other academic institutions (including major distance learning providers) were concerned about state's rights of certifying teachers and approving courses. According to several distance learning practitioners, states such as Utah and Oregon impose many complicated regulations while New Hampshire does not accept any other states' programs. A program director at one university mentioned that a major faculty management problem concerned certification. There is a trend towards requiring faculty to complete a larger number of teacher certification courses as well as specialized courses. While time-consuming for faculty, many associate job security with such teacher certification.

Certification Training

Several organizations had safety training subject areas mandated by the Occupational Safety and Health Administration or by the Department of Transportation. These regulatory agencies set minimum standards for what content must be covered, who must be trained, and how

frequently training must occur. In a couple of cases, certification requirements largely shaped the training programs. Several industry managers stated that while they feel they should try to reduce the number of certifications and training requirements, most employees want to maintain their numerous certifications. Similar to teachers, these employees perceive that the number of certifications is directly related to their job security or the maintenance of contracts.

Organizational Culture

During several site visits, training managers often made reference to their corporate or organizational culture and the importance of acculturation. The concept of organizational, contrasted to industrial, culture is comprised of whole organizations, work groups, and systems embodied by a specific pattern of norms, attitudes, values, and overt behavior (Schein, 1990) Increasing attention and sensitivity to an organization's culture, particularly its more observable climate, appears to be related to improvements in attitude, performance, and readiness for organizational change. Climate is the observable surface manifestation of the culture; it can include concrete examples of the company's physical layout, dress code, and products as well as basic underlying assumptions about acceptable styles of management and statements of philosophy. However, although these differences are observable, it is difficult to explain why these differences exist or what meaning they have to employees.

The relative success or failure of many distance learning programs appears to be inherently linked to their organization's cultural context. Programs are affected by an organization's cultural conceptions of its: 1) current use of technology; 2) emphasis on innovation, and; 3) acceptance of change. For example, the distance learning coordinator of a large private corporation felt that he had to cultivate a positive organizational attitude by heavily promoting technology, and by involving management in developing and implementing some aspect of distance learning from the beginning. All employees were educated about what technologies were available and what they were being used for. Tours were also conducted and each department was shown how distance learning would benefit it specifically.

Several training managers commented that many employees of several commercial and military organizations apparently reflected a corporate *mind set* in terms of perspectives on how training and travel opportunities were affected by distance learning. For example, in some cases employees felt that traveling for training and its associated *per diem* and other benefits were much more personally and financially rewarding than participating in a distance learning program at the job site. In another case, the distance learning coordinator in a commercial firm noticed that enrollment in certain training programs significantly decreased once catered meals were discontinued. Training in this organization was perceived as entertainment-- usually one week per year was allotted per employee. Many long-term employees who had already completed a lot of training felt that they knew everything, and were only motivated to participate in further training by food rewards, other distractions, or simply if it fit into their schedule. Other employees may have felt that their employer was not investing as much in them if they did not have the opportunity to travel and be away for training.

IV. CONCLUSIONS

Characteristics of Distance Learning Providers

Distance learning programs come in a variety of sizes and types ranging from very large (many courses, students, skills trained and technologies employed) to quite small (few courses, students, and technologies). Academic institutions are the most common type of organization involved in distance learning, although government, business and the military make use of the technology when it suits their needs. A search of the literature revealed that distance learning is used for a number of reasons. Although only 26% of questionnaire respondents indicated that distance learning was used to reduce costs, all organizations visited reported using distance learning for this purpose. Monetary considerations form a part, but not the whole picture as to why organizations use distance learning to meet their needs.

Organizations involved in distance learning tend to use affordable technologies which can be easily used by faculty and staff to deliver instruction at a distance. The research data indicate that nearly all distance learning providers recognize the importance of multiple channels to support the exchange of information between an instructor and remote students. Military organizations are far more likely to use low technology paper-based approaches than other organizations. This is probably due to the military's long-term reliance on *correspondence courses* as a means of providing supplemental training to personnel. As more military functions are computerized one should expect an increasing reliance on computer-based technologies including multimedia distance learning.

Distance learning technologies are used to meet a wide range of training objectives. However, according to the data, many technically-oriented skills were trained less frequently than non-technical skills. Still, some organizations have attempted to use distance learning technologies for hands-on skills. These data indicate that further refinement of distance learning technologies and training approaches are needed prior to wide-scale use of the medium for technical training.

Characteristics of Distance Learning Students

Distance learning student populations are quite diverse with students participating in courses ranging from management and technical training to basic skills. Distance learning, as it is currently practiced, appears suitable for all types of trainees. According to distance learning providers, many students prefer distance learning courses because they are more convenient than conventional courses.

Research suggests that student interaction is linked with instructional effectiveness of distance learning. Most organizations provided opportunities for several modes of student interaction with instructors, curriculum and other students. A few respondents indicated that there was no interaction in their self-study courses.

Most respondents indicated that there were numerous sites where students could take distance learning courses. The most common places that students take distance learning courses are: on-the-job (which fits with a built-in advantage of distance learning--providing just-in-time training), in a conventional classroom, at home or in a dormitory.

Student performance assessment is an integral component of the distance learning curriculum. However, most organizations use written tests, the same performance assessment technique as in traditional courses. The data were not clear as to whether assessment of student performance at a distance is difficult given current technology, or if various certification restrictions force instructors into traditional written tests.

Characteristics of Distance Learning Instructors

Distance learning instructors are usually recruited from existing faculty and are chosen based on teaching experience. Instructor backgrounds and qualifications vary widely. Distance learning instructors do not necessarily have special qualifications or backgrounds that enable them to teach at a distance, nor do providers use outside consultants or specialists to teach their courses. Current members of the faculty who display an aptitude or interest in distance learning are usually selected.

Normally, instructors are provided with some training prior to teaching at a distance. Most organizations recognize that untrained instructors are less effective. The training is normally done in-house and usually consists of familiarization with operating the equipment or platform performance skills appropriate to distance learning. Given the data, it would appear that the Air Force should be able to find sufficient instructors from current staff to handle any new distance learning requirements.

Characteristics of Distance Learning Curricula

From the data it appears that instructional design issues associated with developing distance learning curricula are not considered very different from development of traditional courses. Most distance learning providers utilize curricula, including objectives, which are the same as conventional courses, although some providers modify courses to exploit the characteristics of distance learning. Cost control appears to be a major factor contributing to similarities among curricula.

Distance learning curriculum development appears to follow traditional procedures. Few who indicated that they used their own development methodology were able or willing to provide evidence of a new process. As expected, military organizations are much more likely to use ISD than either commercial firms or academic organizations.

In general, it appears that distance learning curriculum developers feel that there is a need to enrich the learning environment by including more graphic media, student interaction and assessment. Typically, the course instructor is the curriculum developer. In other words, no special curriculum development expertise appears to be needed once an instructor is trained to

take advantage of the features of distance learning technology. While this appears to be the case, data also show that instructors were less effective than specialists in developing distance learning curricula. While instructors may develop curricula without specialized instructional developer support, a wide range of professional expertise is required to produce and present a distance learning lesson from start to finish.

Problems Associated with Implementation and Maintenance

Operational distance learning programs usually have problems. Technology causes some problems for providers, although results suggest that there are no systematic problems associated with specific technologies. In addition, other sorts of problems such as organizational climate can impede the implementation or maintenance of distance learning programs. Commonly reported problems were cost of technology, reluctance of faculty to use technology and availability of trained personnel. In general, most distance learning problems, according to distance learning providers, can be solved with additional funding or internal support.

Future Plans for Distance Learning

Almost all of the organizations surveyed intend to maintain and even expand their distance learning programs. Among the most important changes on the horizon are investments in better equipment, increase in faculty and plans to increase funding. Most organizations plan to make more use of distance learning because of course effectiveness, students acceptance of and preference for the programs, and reduced costs compared to conventional courses. No organizations planned to buck the trend and eliminate or reduce their distance learning programs.

V. FINAL OBSERVATIONS

In addition to being a potential cost saver, distance learning can be at least as effective as conventional courses. Although many distance learning programs currently exist and more are being developed, each program appears to follow an independent path of implementation, i.e., with little consideration of previous experience. While there are numerous lessons to be learned about implementing distance learning, no clear guidance exists for typical Air Force users. The Armstrong Laboratory, in conjunction with Air Education and Training Command is about to initiate research into the comparative effectiveness of conventional instruction, computer-based training, conventional two-way instructional television and multimedia distance learning. This new research program should contribute to closing that gap through the development of guidance for distance learning instructors, procedures for tailoring existing courses or developing new courses to be delivered at a distance and producing model distance learning curricula using multimedia.

Recent discussions with personnel at Headquarters AETC indicate that a one-way video/two-way audio, satellite-based uplink will be installed at Sheppard AFB in 1994, with downlinks installed at the other AETC bases later in the year. Certainly, this initiative provides AETC with one of the basic elements to begin a distance learning program in earnest. It is improbable, however, that one-way video/two-way audio is the most appropriate solution for all

AETC courses. Some skill-based courses such as equipment assembly or repair will require visual feedback from students to the remote instructor while other, more knowledge-based courses may need to allow for an individualized student response capability; still others may need multimedia augmentation, either from the point of origination or independently provided at each downlink site. Distance learning has at its disposal a broad array of technologies that allow it to take on different characteristics and capabilities. Specific learning objectives and instructional strategies should drive decisions concerning appropriate and affordable technology configurations for distance learning.

The Air Force is faced with a highly complex training problem: there are large numbers of people to train, fewer qualified trainers, many different skills to be learned, diverse locations, urgent training requirements and importance that training be effective, among other problems. If distance learning is to be a solution to some of the Air Force training problems, researchers still must clarify such issues as the type of courses for which distance learning can be used effectively and the most appropriate target audience. Target audiences in the Air Force vary. The Air Force Academy closely resembles a typical college; Air Force Materiel Command has a different kind of audience composed of officers, enlisted and civilians, each performing highly technical maintenance, acquisition or logistics functions; and, AETC has a diverse student population composed of initial trainees and job proficient technicians. One likely target audience for distance learning is composed of technicians who have completed initial technical training, have been practicing their occupational skills for some time on-the-job, and now require a skill upgrade due to some specific equipment modification, job re-engineering, or emergency situation, e.g., operation *Desert Storm.* In other words, distance learning appears to be an ideal means of *just-in-time* training. Any Air Force research agenda should address the applicability and appropriateness of distance learning to different audiences and how each affects the instructional development process.

Finally, rapid improvements are being made in technologies that can be employed for distance learning . Costs and system capabilities can change dramatically in a brief period. The Air Force must be prepared to take advantage of the latest technological breakthroughs when implementing new distance learning programs. The pre-configured communications systems do not appear to have the capabilities that would stimulate the kind of rich interaction possible in multimedia distance learning. Two-way satellite systems, while providing high-quality visual communications and capable of managing bi-directional data traffic, are expensive to install and maintain, and inflexible in location. Many satellite and microwave systems use one-way video with telephone-based feedback from remote sites to maintain flexibility and reduce costs. Indeed, multimedia data communications could be implemented along with such systems, however, instructor control and coordination of remote classrooms is limited without visual feedback to the origination site (Wilson, Teasley & Ittelson, 1992) as is instructor and student satisfaction with the learning experience (Dickinson & Nichol, 1993). Microwave and Cable TV (CATV) are less expensive technologies to operate on a daily basis and offer good feedback from remote sites, but they are constrained to relatively small areas. Microwave or CATV links across any substantial distance would quickly become more expensive than two-way satellite. None of these approaches can accommodate just-in-time addition of new sites except one-way satellite.

For all of these reasons, emergent videoconferencing technology that takes advantage of the switched public network may offer a viable solution for the requirements of multimedia distance learning. It is geared towards providing live video and audio. It can be configured to accommodate a digital data stream for multimedia control and coordination. The network infrastructure is already in place and is maintained by the regional Bell operating companies. Therefore, videoconferencing would appear to be a good solution for distance learning. However, the turnkey systems available off-the-shelf from makers like Compression Labs Incorporated, Video Telcom and PictureTel Corporation are geared towards corporate meeting support. They are designed to accommodate communication between peers in decisioning applications, not to emulate the classroom at a distance. However, many of the discrete technologies developed for videoconferencing and broadcast instructional television systems may be judiciously applied to create a multimedia distance learning system that meets the goals of the Air Force in the near term while remaining easily upgradeable to more robust emergent technologies.

Applied practical research in some of these areas is needed to determine the most cost efficient and effective distance learning configuration for Air Force applications. This document describes the status of distance learning today and sets the agenda for future distance learning research.

Annotated Bibliography

Ahern, T.C., & Repman, J. (1992, April). *The effects of technology on on-line education.* Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

This paper examines the effects of two different delivery technologies on the nature of interaction in distance education programs. The first study included a course taught using simultaneous transmissions of two-way/full motion video, simultaneous two-way audio and a graphics channel. The second study used a web software developed by using Apple Computer's HyperCard. The authors found that during two-way full-motion video and synchronous two-way audio, students not only communicated with students at their own site, but frequently interacted with students at other sites. The results also indicated that a combination of course content, instructor, and teaching techniques resulted in high levels of student satisfaction and interaction.

Alexander, J.B., Andrews, A.E., Hamer, N.D., Keller, J.W., & Trainor, M.S. (Eds.). (1989). *Distance Learning Conference Proceedings* (LA-11883-C). Los Alamos, NM: Los Alamos National Laboratory.

This collection of well-organized conference proceedings contains comprehensive reviews of many distance learning topics, including media, instructional strategies, collective learning, interactivity, student performance and evaluation, and implementation. Conference participants representing military/government, industry, and academia explored problems and established priorities for a national distance learning strategy.

Allan, J. (1989). Distance tutoring using digitized voice and data transmission. *Educational and Training Technology International*, 26(4), 399-404.

The objectives of this project were to establish a two-way voice and data link between the schools in London and the U.S., to transmit data between the two locations, and to establish a form of voice mail between the two locations. The technical aspects of the distance tutoring systems included integrating PC systems, Watson Voice Card, PC Anywhere III (HDM) hard disk manager, Watson Voice Mail system, and VAR development system. The article discusses the technical operational strategy and types of the interaction that could occur between Holte School and London.

Allen, F. (1993). Effect of student involvement with their college on telecourse completions. *Education at a Distance*, 7(2), J1-J6.

This study analyzed the effect of students enrolled in community college telecourses on their rate of program completion. The study was based on Tinto's model of academic dropout. The major

finding was that students who had more interaction with their college teacher were more likely to complete the course.

Anderson, A. (1991). Video tunneling to school. *Science*, 253, 1090.

This article discusses a new technology in Great Britain. Open University developed a system that brings users miles apart into a "virtual world" by using a video tunnel. The video tunnel included a pair of television screens and cameras arranged for intimate communication. Users are supposed to feel that they have all the benefits of working side-by-side while also having real-time visual contact.

Baker-Albaugh, P. R. (1993). Definitions of interactive learning: what we see is not what we get. *Journal of Instruction Delivery Systems* (7) 3, 36-39.

This article focuses on: 1) how emerging technologies have helped researchers re-define and understand how to implement interactive technologies; 2) how designers can take advantage of interactive learning technologies; 3) pro-active approaches to the design and implementation of interactive learning technologies, and 4) teachers as a source and audience for interactive design strategies. Several models of interactivity are also presented.

Bates, A.W. (1990a). *Applications of new technologies (including computers) in distance education: Implications for the training of distance educators.* (Report No. IR 015 000). Vancouver, BC: Open Learning Agency. (ERIC Document Reproduction Service No. ED 332 683).

This paper analyzes the impact of technology change on distance education. The author suggests that one of the major areas of job training concerns selection of media and use of technology for instructional purposes, and procedures for decision making. This article cites examples of distance learning programs which can lead to lowered costs of course production, reduced costs of administration, centralized learning centers, and large scale increases in work-based training.

Bates, A.W. (1990b). *Interactivity as a criterion for media selection in distance education.* (Report No. IR 014 904). Vancouver, BC: Open Learning Agency. (ERIC Document Reproduction Service No. ED 329 245).

This report presents a method selection method called "ACTIONS." ACTIONS model components include: 1) access; 2) costs; 3) teaching functions; 4) interaction; 5) organization; 6) novelty; 7) speed. However, this report only goes into an in-depth discussion about interaction as a criterion. The author also discusses various types of technology, such as print, television, computer, and two-way audio and video, and how each affects interaction.

Baynton, M. (1992). Dimensions of "control" in distance education: a factor analysis. *The American Journal of Distance Education*, 6(2), 17-31.

The author proposes that control of the learning process results from a combination of three dimensions-- independence, competence, and support. This study examined whether or not these elements form the underlying structure of the distance learning transaction. Results indicated that the proposed dimensions of independence, competence, and support may be more complex than originally thought because the dimensions may not be homogeneous. There may be at least three dominant factors with three minor factors characterizing the distance learning environment plus additional factors operating within the distance education context. Data from the open ended questions also suggested further breakdown of teacher/tutor support into psycho-social and academic support. Finally, to fully address control of the learning process, environmental factors must be identified.

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

Many individuals view the teacher as the exclusive source of information without understanding the partnership with technology in the teaching-learning process. This article discusses some points that should be considered to change attitudes of faculty toward distance learning. The specific approaches to consider during distance learning course development are: 1) involve faculty in program planning and curriculum development; 2) train faculty to work effectively with adult learners, and; 3) develop an adequate support system and an equitable salary structure for faculty.

Bernard, R.M., & Naidu, S. (1992). Post-questioning, concept mapping and feedback: a distance education field experiment. *British Journal of Educational Technology*, 23(1), 48-60.

This study reports the effects that feedback and concept mapping (a learning strategy in which students identify key concepts and arrange them around a local concept) have on the performance of distance learning students. The results indicated that feedback is an important element in learning success. The results also indicated that there was a large difference between the high persistence concept mapping condition and the post-questioning condition. There was a significant decrement in performance when students used concept mapping, and there were differences between low and high persistence mappers, however, the authors were not sure whether concept mapping itself contributed to better achievement.

Biner, P.M. (1993). The development of an instrument to measure student attitudes toward televised courses. *The American Journal of Distance Education*, 7(1), 62-73.

This article describes the methods used to develop a customized, empirically based attitudinal assessment instrument. Steps include: 1. generate items related to course satisfaction; 2) define dimensions underlying items; 3) select content valid items, and; 4) write and pre-test instrument. Some important dimensions are: instruction/instructor aspects, technological aspects, and course management/coordination aspects.

Brinkley, R., Pavlechko, G., & Thompson, N. (1991). Designing and producing courseware for distance learning instruction in higher education. *Tech Trends*, 36(1), 50-54.

This article presents a nine-step, four element team approach to instructional design. The elements of design and production consisted of: instruction, production, design, and on-air direction. A case study is presented which involves an instructor preparing to teach a course on interactive two-way audio and one-way video; it includes the actual processes beginning with contracting an instructor to the final evaluation phase.

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

This study examines the differential impact of two methods of formative evaluation on the revision of courseware for a computer assisted instruction course. The results of the study indicate that the two methods of formative evaluation (one-on-one vs. group) result in similar products and post-test scores. The results also indicate that either type of formative evaluation (one-on-one or group based) is an effective tool.

Carl, D.L. (1991). Electronic distance learning positives outweigh negatives. *T.H.E Journal*, 18(10), 67-70.

This article presents many concerns expressed by educators, along with answers that support the benefits of electronic distance learning. Major concerns expressed by educators included: 1) introduction of a new approach may be ineffective; 2) selection and approval process for electronically delivered courses will not meet academic standards; 3) overall quality cannot be monitored; 4) locating and selecting qualified instructors will be difficult; 5) on-campus faculty already have a full work load; 6) faculty have no incentive to become part of the development phase of a distance learning course; 7) off-campus students will not have regular personal contact with the instructor; 8) off-campus students will not have regular access to resources; 9) academic dishonesty will increase; 10) accurate testing will be impossible; 11) lack of student interest in the distance learning course; 12) drop-out rate of the off campus students will be higher; 13) distance learning courses will decrease on-campus enrollment; 14) implementing distance learning courses will be too costly; 15) the on-campus experience will be missed, and; 16) we would not know where to start when developing a distance learning course. Each of the concerns was countered by positive aspects of distance learning. The article concludes that positive aspects outweigh the negative ones.

Chacon, F. (1992). A taxonomy of computer media in distance education. *Open Learning*, 7(1), 12-27.

This article discusses three user modes of computer media including information processing, interaction, communication, and the types of software that should be used for each user mode. The overall conclusions of this article are: 1) the quality of service delivered by computers does not depend as much on their technological sophistication as on their relations to users and other media, and; 2) when optimizing the use of computers in a distance education program, a combination of modes rather than a signal overused one is more effective.

Cheng, H.C., Lehman, J., & Armstrong, P. (1991). Comparison of performance and attitude in traditional and computer conferencing classes. *The American Journal of Distance Education*, 5(3), 51-64.

The academic performance of three groups are compared-- on-campus, off-campus (computer) and off-campus (correspondence) groups. There was a statistically significant difference among the groups' scores on the two post-measures of achievement; the computer conferencing and correspondence subjects spent more time-on-task than did the on-campus students. There were two statistically significant differences between on-campus and computer conferencing groups on course content and course attitude scales. However, all subjects had higher scores on attitudes toward the computer at the end of the study compared to the beginning. Finally, the computer conferencing group and correspondence group had higher rates of "incompletes" and dropouts than the on-campus groups.

Cheng, H.C. Lehman, J., & Reynolds, A. (1991). What do we know about asynchronous group computer-based distance learning? *Educational Technology*, 31(11), 16-19.

Basic equipment required for Computer Based Training (CBT) includes: course notes, textbook and conferencing software. The student also needs a computer, modem, telephone line and software. The authors then list several advantages and disadvantages of CBT and recommend that during CBT program development, the developer should consider: 1) a method of orienting learners to the system; 2) which courses and course content are best/worst, and; 3) supplementary materials that could be of use.

Chung, J. (1991). Televised teaching effectiveness: two case studies. *Educational Technology*, 31(1), 41-47.

This study tests the hypothesis that there is no significant difference between student academic performance using classroom studio, and televised delivery methods. The results were not significant. The second case study, conducted at Indiana University, found nine behaviors or

skills that 100% of the respondents felt were important. For example, the results indicated that clarifying material, answering questions clearly and summarizing one topic before moving on to the next was important. At least on-fifth of the respondents felt that getting people to participate was unimportant. The study also includes an interview with the instructors who all agreed that extra preparation was essential.

Chute, A.G., Balthazar, L.B., & Poston, C. (1990). Learning from teletraining: what AT&T research says. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 260-276). New York: Pergamon Press.

This chapter is a five-year history of learning from teletraining, specifically what students have learned and what the distance educators have learned from the design and management of teletraining systems. The primary focus of AT&T's research at the National Teletraining Center (NTC) has been to improve the effectiveness of teletraining systems through research. Research areas included instructional effectiveness, cost-benefit analyses, course and curriculum development, media attributes, system implementation, and directions for future system implementation. The results of each area are summarized. These areas represent a sample of the types of problems the NTC investigated on an ongoing basis to improve their understanding of teletraining potential.

Chute, A.G., Hancock, B.W. & Balthazar, L.B. (1991). Distance education futures: information needs & technology options. *Performance & Instruction*, 30(10), 1-5.

This article presents three models for exploring the range of delivery technologies. The models, performance support, knowledge transfer, and instructional technology, provide a framework for describing the range of delivery technologies available that are consistent with the goals of present and future training organizations. The Performance Support Model represents a strategy for applying instructional and technological solutions to performance problems. The Knowledge Transfer Model shows how several types of communication media can be combined in various ways. Finally, the Instructional Technology Model presents options ranging from traditional courses to artificial intelligence.

Clark, R.E. (1989). *Evaluating distance learning technologies*. (Report No. IR 014 687). Office of Technology Assessment. (ERIC Document Reproduction Service No. ED 325 097).

Distance learning evaluations are usually conducted as an after thought and rely on reaction questionnaires which are often unreliable and not representative of the participants involved. The author feels that more robust evaluation plans for distance learning should be adopted and recommends three features: 1) evaluation should begin at the start of the program; 2) a multi-level plan should be used, and; 3) evaluations of delivery and instructional should be separate, and

goals should also be assessed. The author outlines features contributing to a strong distance learning program.

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

This study examines the receptivity to college-credit distance education of faculty members in two and four year higher education institutions since teaching innovations cannot succeed without the support of faculty and administration. Research questions focused on receptivity to distance education, the relationship between professional characteristics and attitude toward distance education, the connection between previous distance education experiences, familiarity and receptivity, and on attitudes toward different distance education media and methods. Results suggest that there is support for greater access to distance learning, although this was mixed with concern about quality, particularly with regard to interaction and appropriate use of media, ensuring technical and administrative support, as well as professional rewards for the distance learning instructor.

Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea, (Eds.), *New directions in educational technology* (pp. 15-22) New York: Springer-Verlag.

This article describes the researcher's attempts to synthesize research on technological innovation, and to develop a methodology for carrying out design experiments which study different ways of introducing and using technology in the classroom. The author also criticizes the design of many current distance learning experiments, and instead suggests a variety of innovative methods for testing how different instructional designs or learning environments contribute to increased learning, cooperation, and motivation. A design theory is proposed which could potentially identify all variables that affect the success or failure of any technological innovation and specify critical values or combinations of values. The author also emphasizes that it is important for comparative distance learning studies to be conducted by objective research/teacher teams.

Collis, B and Levin, J. (1993, November) *Research on telecommunications and learning: an international perspective*. Paper presented at Tel Ed '93: global connections, Dallas, TX.

This paper reviews what kind of research is being conducted, methods used, and results of telecommunications technology studies throughout the world. It suggests that most recent analyses of the literature relating to telecommunications in secondary education are based on descriptive, single-case research studies rather than comparative or controlled studies. Efforts to synthesize these findings include observations that: 1) comparative empirical evidence does not always support the notion that the quality and quantity of communication occurring during distance learning courses are significantly different from those occurring in face-to-face environments; 2) most people involved in telecommunications projects are positive about their experiences and potential of the domain, although this attitude does not usually seem to diffuse to

teachers and administrators outside such projects; 3) increased attention to teacher training and support strategies for support and shaping of effective communication and cooperative work are required for most programs. Authors conclude that it would be very useful to develop a valid and insightful research base and methodology for investigating and improving the impact of telecommunications in education.

Cropley, A.J., & Kahl, T.N. (1983). Distance education and distance learning: Some psychological considerations. *Distance Education*, 4(1), 27-39.

According to this article, face-to-face education and distance education have different sets of organizational provisions for facilitating learning and emphasizing different kinds of learning processes dependent upon different psychological properties in learners. The core dimensions of teaching and learning are discussed. These dimensions are: organizational learning, motivation, learning processes, communication processes, didactic activities and materials, and evaluation and feedback. The author also discusses the differences between face-to-face and distance learning among each of the core dimensions.

Curry, B., & Moutinho, L. (1992). Using computer simulations in management education. *Management Education and Development*, 23(2), 155-167.

This article discusses using computer simulation for management training. The advantages of computer simulation include: 1) increased experience in long and short term decision making activities; 2) increased active learning, increase experience with corporate decision making, introduction of uncertainty; 3) increased motivation through competition; 4) use of computers for decision support; 5) more effective learning, and; 6) facilitation of distance learning. Disadvantages include: 1) misleading impressions of precision and certainty; 2) use of convenient, rather than realistic models and techniques; 3) models may appear to be artificial or excessively elaborate; 4) there may be excessive attention to appearance, such as graphics. Software choices are spread-sheet models, business games, CBT/CAL software, expert systems and intelligent tutoring systems.

Cyrs, T.M., & Smith, F.A. (1991). Designing interactive study guides. *Tech Trends*, 36(1), 37-39.

Educators observe that students in teleclasses spend much of their time trying to keep up with the instructor on the television monitor. Therefore, in order to achieve the proper balance between providing information and requiring students' involvement with the learning materials, the author suggests using interactive study guides. This article discussed the steps for developing an interactive study guide utilizing word pictures; steps include design, production, and application.

Davies, D. (1988). Computer-supported co-operative learning systems: interactive group technologies and open learning. *Journal of the Association for Programmed Learning*, 25(3), 205-215.

This article tries to disprove the hypothesis that the learning process is linear. The author points out that learners actively construct their knowledge and that social exchange is very important. The author believes that the arrival of computer-based message systems can accommodate the requirements of social exchange and active learning. The article also provides guidelines for designing an active learning distance education program.

Davis, D.J. (1990). Text comprehension: implications for the design of self-instructional materials. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 243-259). New York: Pergamon Press.

Despite the increased availability of high quality video audio and computer materials, most distance learning courses still make use of self-instruction print materials. This chapter examines recent research and theories of text design and also suggests how research can be applied. For example, the developers can include vocabulary appropriate to the audience, use syntactic structure and relationships, identify important ideas, organize the text so that it is easy to follow, and include activities that assist the reader in assimilating new ideas from the text.

Davis, G., & Preece, J. (1990). Home computing as an integral part of distance learning. *Education and Computing*, 6, 153-159.

This article discusses distance learning in the United Kingdom. The author recommends a method for developing a home computing course, including: 1) use a clear well organized teaching plan; 2) provide support for students (both initially and during the course); 3) provide flexible teaching materials, and; 4) integrate the different media into a coherent learning structure.

Dede, C. (1993). Beyond distributed multimedia: a virtual forum for learning. *ED Education at a Distance* 7(9), 14-18.

This article compares workplace and school-based teaching-learning and presents future of educational scenarios in which learners can access distant resources via desktop computers and high-bandwidth, wide-area networks. The author suggests developing a virtual forum enabling collaborative interactive learning across school and workplace settings which could potentially provide a conduit for continually updating the curriculum. This would be an alternative to conventional school-based distance learning curricula which cannot easily accommodate learning-on-demand, just-in-time requirements of the rapidly evolving workplace. An idealized model of workplace learning is described for a case-based architectural design tool and a SimNet-type training system.

Dickinson, T., & Nichol, P. (1993, October). *The development of leadership skills through video training: some lessons learned.* Paper presented at the meeting of Advancements in Integrated Delivery Technologies, Denver, CO.

The authors conducted an experiment comparing course effectiveness measures of conventional live classroom instruction to reconfigured live classroom (e.g., increased opportunities for interaction) to different distance learning audio and video configurations for an Army battlefield leadership course. The course learning objectives and instructor team were the same for all conditions. Pre-test and post-test knowledge scores and student and instructor perceptions data were collected for the different delivery modes. While the pre-test showed no statistically significant differences between instructional groups, the post-test results showed that students in the video teletraining course with two-way audio and one-way video had higher scores. Instructors reported that distance learning was an effective method, that they preferred it to traditional live classroom instruction, and that they preferred teaching with two-way audio/two-way video.

Dillion, C.L., & Kincade, K.M. (1990). Interaction, technology, and the adult basic education student. *Adult Literacy*, 14(3), 184-197.

This article presents the basic concepts of Adult Basic Education (ABE) programs. The key to using technology in the ABE setting lies in designing programs which meet the individual's needs. This article discusses the different types of technologies (video-based, computer-based, and interactive video) and how the design of technology can provide for the interaction necessary for individualization.

Dowding, T. (1991). Managing chaos (or how to survive the instructional development process). *Educational Technology*, 31(1), 26-31.

This article provides advice on the instructional development process for designing a computer-based training (CBT) course. The author recommends using the Dick and Carey Model--modified to include formative evaluation-- rather than the traditional instructional systems design (ISD) model because the ISD model does not allow for feedback in intermediate steps.

Dwyer, F.M. (1990). Enhancing the effectiveness of distance education: A proposed Research Agenda. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 221-230). New York: Pergamon Press.

The author offers advice on the instructional development process and recommends that developers take into account learning mechanisms and also look at the relationship between these mechanisms and visualized instruction. He also discusses the findings of other studies that used a software development process called the Program of Systematic Evaluation (PSE). Finally, the

author recommends that if the objective is to maximize the responsiveness of the audience, instructional designers need to ask questions such as what types of educational objectives are to be achieved by the learners as a result of instruction they receive.

EDSAT Institute (1991). *Analysis of a Proposal for an Education Satellite.* (Report No. IR 014 964). Washington, DC. (ERIC Document Reproduction Service No. ED 331 479).

This study analyzes the governance, management, technical, and fiscal issues associated with the creation and maintenance of an education satellite telecommunications system that would be most cost effective. This report also includes discussion of: 1) problems encountered during satellite use; 2) background information on the study, including working groups, technical expertise, and conceptual issues; 3) technical issues, including alternative delivery systems, education satellite market, program providers, assessment of existing station, space segment configurations, technologies for transmission and reception, and financial considerations; 4) government and management issues; 5) fiscal issues; 6) general observations.

Ehrman, M. (1990). Psychological factors & distance education. *The American Journal of Distance Education*, 4(1), 10-24.

This article defines many psychological factors, such as field dependence/independence, active experimentation, reflective observation, hemisphericity, sensory preferences and those used in the Jungian Approach (Myers Briggs Type Indictor). The article also describes other factors such as age, sex differences, affective variables, and personality variables that should be considered when developing a distance learning course. The author explains how these factors could affect the program.

Emergy, M. & Schubert, M. (1993). A trainer's guide to videoconferencing. *Training*, 30(6), 59-63.

This is a "how to" guide to videoconferencing. The first half of the article offers guidelines for getting started, including technical procedures for operating the system, conducting introductory training sessions, and providing on-going support. The second half of this article lists guidelines for effective training: 1). designate and prepare a remote site co-trainer; 2) separate the learning objectives into education (knowledge) and training (skill development) components 3) develop new or revised outlines and descriptions of existing programs; 4) dry run, practice, then rehearse; 5) develop contingency plans. This article also includes guidelines for using visual aids.

Feasley, C.E. (1983). *Serving learners at a distance: a guide to program practices.* Washington, D.C.. Washington, D.C.: Association for the Study of Higher Education: ERIC document Reproduction Service No. 5.

This excellent background resources inquires and attempts to answer the following questions: 1) who learns at a distance; 2) what is the role of distance learning faculty; 3) how important are support services for students; 4) can all curricula be learned at a distance; 5) how should distance education be organized; 6) how important are planning, management, and education; 7) how should distance education units be funded, 8) which media are appropriate for distance learning; and; 9) what are the implications and potential impact of distance learning programs?

Florini, B.M. (1990). Delivery systems for distance education: focus on computer conferencing. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 277-289). New York: Pergamon Press.

This chapter presents a comprehensive description of computer conferencing and also discusses the strengths and weaknesses of computer conferencing for educational purposes. It also considers such issues as whether or not organizations should consider training for both instructors and students when developing distance learning programs. Finally, the author considers research questions such as, "are there learners or instructors for whom the medium would not be appropriate or desirable?" and "is distance learning appropriate for all subject matter?"

Gibson, C. (1990). Learners and learning: A discussion of selected research. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 121-135). New York: Pergamon Press.

This is a literature review about personal factors and environmental factors that can affect a distance learning program. For example, one study examined the effects telephone contact had on student grades. Students who contacted their teacher performed better than those who did not. Other studies concerned face-to-face tutorials, peer tutoring, use of mail, and audio tapes. Results indicated that there was a significant difference between those who requested the audio tapes and those who did not.

Goodyear, P. (1993, October) *Asynchronous peer interaction in distance education: the evolution of goals, practices and technology.* Paper presented at the meeting of Advancements in Integrated Delivery Technologies, Denver, CO.

This paper examines ways in which computer-mediated communications technology can be used to facilitate peer-interaction in distance learning settings. The author provides an example of the management of complex evolutionary educational research and development projects, which includes models of the electronic seminar, self-help group, and directed project team.

Goodyear, P. (1989). Development of learning technology at the European level: The DELTA programme. *ETTI*, 26(4), 335-341.

This article describes the Development of European Learning through Technological Advance (DELTA) program. The key goal of DELTA is to provide a top-down movement towards standardization for all DELTA developed tools and systems.

Granger, D. (1990a). Bridging distances to the individual learner. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 163-171). New York: Pergamon Press.

There has been a shift in educators' focus on learning, from a fixed or absolute body of knowledge which the learner must master to the relationship between that knowledge and the knower. The author recommends that in order for distance educators to develop programs to serve individuals effectively, the individual must be understood in his or her social, economic, and psychological context. This chapter also explains who the distance learner is, how to use the learner profile when developing a distance learning program, and issues pertaining to course and program design.

Granger, D. (1990b). Open universities: Closing the distance to learning. *Change*, 22(4), 44-50.

This article discusses the effectiveness of the British Open University (BOU). The cost per student was approximately half that of conventional education. The BOU depended on print-based material, but also incorporates a video component. Recommendations included: 1) actively engage students in the discourses of learning; 2) establish connections between learning and the students' experiences, and; 3) provide students with a range of learning modes.

Granger, D. (1988). U.S. higher education and international distance learning. *The American Journal of Distance Education*, 2(3), 80-88.

This article describes the Open University (OU) of Britain and dual mode universities. Dual mode universities develop programs based on the resources of conventional and distance courses. Two examples, of dual mode universities are Deakin University, Australia and Laurentian University, Ontario, Canada. Distance educators there were concerned about increasing students' active involvement and establishing clear linkages between students' learning and their context. One method used by these universities was the interchange between student and tutor. Some of the interchange characteristics were: 1) readily accessible presentations of subject matter; 2) supportive advice on what to do and avoid; 3) invitation to an exchange of views and questions, and 4. attempts to involve students emotionally by reference to and inclusion of applications linked to the student's own context.

Griffin, G.R., & Hodgins, M.M. (1991). VTT in Navy: Training now and for the future. *T.H.E. Journal*, 12(1), 65-67.

This study was conducted to determine the effectiveness of video teletraining (VTT) in the Navy. The study found that VTT was more interactive than instructional television. Results showed that there were no significant differences between the final course grades for VTT and the control group. The study also found that students preferred the traditional classroom setting to VTT. However, the Navy identified three deficiencies in the VTT program, including video and audio quality, and quality of interaction between instructor and students. The author feels that video and audio quality problems can be corrected while interactive distance learning requires further study.

Hansen, E. (1990). The role of interactive video technology in higher education: case study and a proposed framework. *Educational Technology*, 30(9), 13-21.

This article describes the observation exercise (OBEX) used by graduate students in school psychology to learn interviewing skills. This system allows students to observe an interview, then to define and describe the important segments; the program could also present other students' analyses. The article discusses the advantages and disadvantages of this system, specifically a problem regarding the curriculum of a course which was not re-structured for distance learning.

Harrison, P.J., Seeman, B.J., Behn, R., Saba, F., Molise, G. & Williams, M.D. (1991). Development of a distance education assessment instrument. *Educational Technology Research and Development*, 39(4), 65-77.

This study was conducted to develop an assessment procedure using a systems approach, and to present the results of a questionnaire validation study based on the proposed model. The authors found that there was a relatively strong positive correlation between items and scale and sub-scale reliability for opinion items. All items except four were of high importance; importance items were also highly reliable for each scale and sub-scale. There was also a moderate correlation between the opinion and importance scale.

Haynes, K.J.M., & Dillion, C. (1992). Distance education: Learning outcomes, interaction, and attitudes. *Journal of Education for Library and Information Science*, 33(1), 35-45.

This study examines the impact of telecommunications upon learning outcomes. Course objectives were identified using the ISD model. A non-equivalent control group design was used to measure the differences in the learning outcomes between traditional and distance learning students. Results showed that there were no statistically significant differences between the two groups, although students in the distant course expressed their views on problem areas such as audio quality, availability of resources, and advisement.

Heathman, D.J., & Kleiner, B.H. (1991). Training + technology: the future is now. *Training and Development*, 45(9), 49-52.

Companies seem to be moving away from traditional classroom training because of fast paced change, increased need for training, and current economics. Future applications for distance learning technology include electronic mail, electronic classrooms, artificial intelligence and soft skills training (communication and team work). The barriers to acceptance of CBT appear to be development time, cost and reduced interaction.

Hedberg, J.G., & McNamara, S.E. (1989). The human-technology interface: Designing for open and distance learning. *Educational Media International*, 26(2), 73-81.

This article discusses technology in relation to the management of open learning, specifically the characteristics, expertise and experience of the instructional developer and the learner. The author recommends design considerations for technology based delivery systems for adults using a conceptual organization based upon four principles: 1) the main consideration in the human technology interface is the learner; 2) human concerns determine the direction and the success of technology used for learning; 3) technology alone will not improve the quality of learning; 4) focus on the information being delivered rather than on the technology itself.

Hesse, C.W. (1991). The future of distance education for the military. *Proceedings of the 33rd Annual Military Testing Association*, 716-721.

This article compares paper-based correspondence courses with computer assisted instruction (CAI) and video formatted instruction. Paper-based correspondence courses were used by the military for training because of several factors: 1) portability; 2) minimal cost; 3) currency, and; 4) facilitated communication. CAI allowed on-line student interaction, instant feedback, and still/motion graphics. Reproduction and distribution costs were estimated to be 10% that of paper-based course costs.

Ho, C.P. (1991). Instructional strategies for interactive television. *Journal of Special Education Technology*, 11(2), 91-98.

This article discusses strategies for teaching and designing instruction for interactive television. The article also presents factors that should be considered when selecting an interactive system such as costs, subject matter, teaching styles, learning styles, teaching support services and compatibility. Finally the article discusses the nine steps of the Gagne's instructional model.

Hodgson, V. (1989). Open learning and technology-based learning materials. *Distance Education*, 10(1), 119-126.

This article considers the possible consequences of learning materials becoming more technology-based including their effects on student-teacher interaction. The author recommends a new model

of teaching and learning, that teaching skills should change and that students should be trained to use the technology.

Hodgson, V. (1986). The interrelationship between support and learning materials. *Programmed Learning and Educational Technology*, 23(1), 56-61.

This article looks at the relationship between a distance learning course's support system, its learning materials, and the influence this relationship has on students. Research findings indicate that the interrelationship between the support systems and learning materials are important and can be very influential to the student's approaches to learning. However, some negative experiences are also described.

Holznagel, D.C. (1991). *Distance education handbook for the northwest states*. (Report No. IR 015 376). Washington, DC. Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 341 376).

This report lists live television and non-television options for distance learning programs. Each option provides the name and address of a contract person, access requirements, costs, course availability, schedule, and instructors. The report also includes a section on planning, decision making, and evaluation including advice on staff, environment, support, and evaluation areas such as objectives, content, instructional design, and instructional materials.

Howles, L. & Pettengill, C. (1993). Designing instructional multimedia presentations: a seven step process. *T.H.E. Journal*, 20, 58-61.

This article lists seven steps for instructional design: 1) select potential lessons; 2) describe learning outcomes; 3) create outline of lesson content; 4) identify equipment; 5) explore multimedia techniques; 6) develop lesson storyboard; 7) produce using multimedia authoring software.

Hudspeth, D. (1993, October) *Just -in-time education*. Paper presented at the meeting of Advancements in Integrated Delivery Technologies, Denver, CO.

An integrated delivery technology is outlined that builds on existing components. Specifically, just-in-time education is a *system* which electronically provides modules of instruction, whenever needed, at a prescribed level, and with materials best suited for each individual in order to significantly improve access and effectiveness of instruction for distant learners. The author's discussion about designing an integrated delivery system includes concepts of feedforward, feedstock, and feedback which work to provide the best fit between learner characteristics and instructional strategies by measuring input and having the system branch to differentially designed material based on input variations. Another facet of on-demand instruction is using random

access networks with instructional computers to create electronic learning teams for problem-solving and evaluation.

Hudspeth, D. (1992). *The potential of electronic teams for distance education.* (Final Report for Summer Research Program, Armstrong Laboratory, Brooks AFB, TX). Austin: University of Texas, College of Education.

The author proposes to study the effects that teams or groups, working together, have on distance learning. The technology that will be used in this study is computer-based e-mail. Generally, research with tele-communications technology indicates positive contributions from teams and work groups. Research indicates that e-teams provide greater contributions, turn out better products, are better coordinated, hold fewer meetings, and cross more organizational barriers than the teams who rely on face-to-face meetings.

Ives, W. (1992). Evaluating new multimedia technologies for self-paced instruction. *Evaluation and Program Planning*, 15, 287-296.

This article provides background information about new technologies such as CD-ROM. Several techniques for using and evaluating multimedia technologies are offered. The pros and cons of equipment are also discussed. When using computer-controlled audio/video feedback a model of instruction and evaluation can be used. The author recommends that the components of instruction be made up of parts that contain seeing, doing, and listening procedures.

Junkala, J. (1991). Creating CAI courseware for college-level instruction: almost anyone can do it. *Educational Technology*, 31(1), 15-20.

This article summarizes the major points of two computer programs or authoring systems--course builder and hypercard. Course builder was used as a tutorial for writing objectives and goals for pre-service teachers. Students were required to interact with the computer by answering multiple choice questions and by typing correctly stated objectives right onto the screen. Course builder was also used to administer self-pacing quizzes. A controlled study was performed; there were no significant pre-test or post-test differences between the two groups (CAI vs. lecture). Hypercard was used to construct a drill and practice program for the Peabody Individual Achievement Test (PIAT).

Kahl, T.N., & Cropley, A.J. (1986). Face-to-face versus distance learning: psychological consequences and practical implications. *Distance Education*, 7(1), 38-48.

The purpose of this study was to summarize the differences between distance learners and traditional students, and to indicate the importance of understanding these differences during distance learning program development. The results indicated that demographic data between the

two groups were different. The majority of face-to-face students were aged between 25-34. The distant learners were more likely to have acquired a job and had a family. About 2/3 of the distance learners reported that they were in a distance learning course in order to receive a diploma, while, 55% of the face-to-face students were simply interested in participation.

Kamper, R.J. (1991). Computer-mediated communication: conquest of time and space or just another technological seduction? *Educational Technology*, 31(11), 20-30.

This article discusses the aspects of computer-mediated communication (CMC) as a technological innovation as well as the psychological impacts (time and information processing pressures; the absence of regulating feedback, and the lack of status and position questions) of CMC. Finally, the use of CMC in instructional settings show that CMC facilitates the longevity and stability of communications, and multiple threads of discussion.

Kendall, J.R., & Oaks, M. (1992). Evaluation of perceived teaching effectiveness: course delivery via interactive video technology versus traditional classroom methods. *The Journal of Continuing Higher Education*, 40(3), 2-12.

This study compares the perceived effectiveness and satisfaction of university faculty teaching traditional and distance education courses. The majority of the faculty perceived lecture, question and answer, and case studies as more or equally effective using interactive video; group discussion and seminars were rated less effective by a majority of faculty. The faculty's major concern was reduced involvement with students compared to their experience in a traditional classroom. Data collected in 1989 suggest this concern affected their personal satisfaction with teaching over a distance. However, in 1990 most faculty (89%) were equally or more satisfied with teaching over a distance.

Kester, B., & Chute, A.G. (1991). Student response systems improve teletraining. *International Teleconferencing Association Yearbook*, (1991).

The authors consider questions such as, "Will students exposed to frequent, high-order student response system questions receive higher scores?" The study found that the answer to this question was "yes." Teletraining that is more interactive and participative is more appealing. This article also offers guidelines for making teletraining more appealing, and guidelines for decisions about equipment and student/instructor training.

Klinger, T.H., & Connet, M.R. (1992). Designing distance learning courses for critical thinking. *T.H.E. Journal*, 20(3), 87-90.

Telecourse students tend to be over 26 years of age, highly motivated, goal oriented, and for whatever reason, unable to attend the traditional classroom setting. This article asks the question,

"how critical thinking skills can be taught to this newly identified group of learners?" A case study described a traditional psychology course that was transformed into a telecourse. The results of the study indicated that the distance learning students' performances were equal or superior to traditional peers. Telecourses apparently need to include a strong element of interaction to be truly effective as a learning method.

Krebs, A., & Pease, P. (1993). Dimensions of interactivity. *Education at a Distance*, 7(1), J9-J11.

This article presents concepts of interaction and how to design instruction to take advantage of interactive opportunities. The authors recommend that the user of any type of technology understand the biases each medium has in order to analyze the interactivity . For example, to analyze interactivity one must examine each tool with regard to having particular advantages and disadvantages, fostering different types of skills, and engaging the student in different modes of perception and interaction. The dimensions of interactivity included media characteristics, task characteristics, presentation style, and contextual factors.

Kruh, J.J., & Murphy, K.L. (1990, October). *Interaction in teleconferencing: the key to quality instruction.* Paper presented at the Annual Rural and Small Schools Conference, Manhattan, KS. (ERIC Document Reproduction Service No. ED 329 418)

This report examines classroom strategies for distance learning and emphasizes the importance of interaction via teleconferencing. The 1989-90 survey of superintendents in 415 California School districts emphasized the importance of interaction. Another survey conducted at California Sate Polytechnic University found that the ability to talk to the instructor during the televised course was the attribute most important in distance learning. The report also gives examples of situations in which interaction occurred via teleconferencing.

Lauzon, A.C., & Moore, G.A.B. (1989). A fourth generation distance education system: Integrating computer-assisted learning and computer conferencing. *The American Journal of Distance Education*, 3(1), 38-49.

This article reviews literature pertaining to the personalized system of instruction (PSI), computer-assisted learning (CAL), computer conferencing (CC), and other forms of instruction, then discusses how they can be integrated into a delivery system to enhance distance learning. The author also identifies four generations of technological delivery systems in distance education. Each generation was analyzed in terms of the following dimensions: mode, delivery system,. method of instruction, and mode of delivery.

Linstead, S. (1990). Developing management meta-competence: Can distance learning help? *Journal of European Industrial Training*, 14(6), 17-27.

This article discusses the use of simulation for management training. In the simulation, participants form boards of directors and manage small manufacturing companies. The end recommendation was that distance learning technologies may not be very appropriate for management training. However, this program was in its first phase and an overall evaluation had not yet been conducted.

Lookatch, R. P. (1993). Cooperative learning: dollars and sense in the multimedia lab. *Journal of Instruction Delivery Systems*. (7) 3, 28-30.

This article reviews the latest research on computer-based learning as it relates to individual versus cooperative and small group use. It also discusses the attributes, limitations, and alternatives of small group learning in computer lab environments. The primary components for effective use are: software and task selection, social atmosphere, preparatory activities, accountability structures, and group assignment.

Lovell, J., & Robinson, L.F. (1989). Professional development in the military: planning a continuing education program for the National Guard. *Adult Learning*, 2(7), 23-25.

Emporia State University (ESU) and the Kansas National Guard developed a state wide continuing education program that offers lessons to those planning similar programs. This article summarizes the planning process for continuing education courses. The summary includes needs assessment course delivery options, and schedule options. The article also includes a list of eight limitations. However, this article did not discuss the evaluation of the effectiveness of the program.

Lowry Air Force Base, 3400 Technical Training Wing (1991). *Interactive courseware handbook.* Lowry AFB, CO.

This is a handbook about instructional development for designing computer based training (CBT). It describes the ISD method, including analysis, design, development, authoring , and evaluation phases. The report also presents an in-depth account of front-end analysis which consists of analyzing the problem, analyzing the job, analyzing the task, planning the project and conducting a cost analysis. Finally, the report discusses the human brain, memory, and techniques that can be used by the students to improve learning and memory.

MacFarland, T.W. (1990 Sept.). *Computer-based distance education in real time: the electronic classroom.* Nova University. Fort Lauderdale, FL.

This study was conducted at Nova University to evaluate the effectiveness of the Electronic Classroom (ECR). Findings indicated that the students viewed ECR as being superior to traditional instruction in view of access to the instructor and equivalent to traditional instruction in

view of learning behaviors and outcomes. ECR and traditional lecture were also viewed as near equals regarding class dynamics and interaction, free exchange of ideas, instruction of technical materials, enjoyment, and student preparation for class.

Main, R.G. (1993, October). *A taxonomy for evaluating interaction in distance learning*. Paper presented at the meeting of Advancements in Integrated Delivery Technologies, Denver, CO.

The author suggests using communication theory as an approach to the study of distance learning, including interpersonal communication theory and Claude Shannon's media model, as well as provides a taxonomy for evaluating interaction in distance learning. The taxonomy organizes interactivity into six categories: type, timeliness, amount, method, spontaneity, and quality. The author also discusses other factors involved in distance learning that affect interactivity dimensions including course variables and communication technology. Course variables include subject matter, class size, student characteristics, instructional strategies and activities, media used, and instructor characteristics while communication technology variables include one-way audio and video, two-way audio and one-way video, and two-way audio and video. It also includes the newer digital multimedia using integrated data, audio, and video transmissions.

Marker, G., & Ehman, L. (1989). Linking teachers to the world of technology. *Educational Technology*, 26-30.

This article points out technological issues and lessons learned from work conducted in thirteen Indiana schools, as well as Indiana University. Recommendations from the long distance learning network project (LDLN) were: 1) do not begin using complex technology in an unrealistically short time period; 2) incorporate local support people to lead teachers; 3) anticipate major distracters or competitors that impinge on teachers' time and effort; 4) complex technologies require a high task structure for teachers; 5) teachers must believe in the potential benefits of the technology; 6) the project proved to add more value than the cost in time, money, and effort; 7) educational technologies must be tools, not objects of study. Guidelines presented for teachers include not overselling technology, allowing for twice the anticipated planning time, and training for evolution, not revolution.

Marshall, B. (1991). A training success story. *Training and Development*, 45(9), 63-65.

The emergency education network (EENET) is used to provide training and education to state and local government emergency-management personnel all over the world. This article discusses the procedure for developing such a program.

Martin, E.D., & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. *The American Journal of Distance Education*, 7(1), 54-61.

This study was conducted to determine the educational effectiveness of interactive satellite delivery as compared to the effectiveness of traditional classroom instruction in anatomy and physiology courses, and to compare the attitude toward anatomy and physiology of distance students and classroom students. The advantages of distance learning were that students became more responsible for their work, time was used wisely, and students were able to meet and talk with new people. The disadvantages of distance learning were that students: had no direct eye contact with the instructor, found it difficult to keep attention on the television, and found it difficult to call their teacher. Overall, findings showed that students who enrolled in the satellite-delivered course scored significantly higher than the students enrolled in the traditional course. The findings also indicated that the attitudes of students receiving distance instruction were not significantly different from attitudes of students in the traditional course.

McCleary, I.D., & Egan, M.W. (1989). Program design and evaluation: two-way interactive television. *The American Journal of Distance Education*, 3(1), 50-60.

This article evaluates the effectiveness of a course delivered via two-way interactive television. The authors found that televised instruction was neither superior nor inferior, to traditional classroom presentation. This study provides evidence that course design elements are critical to the success of instruction using this technology. The study also suggests using an on-site facilitator responsible for the technical aspects of transmission and reception, and for having knowledge of course materials.

McKell, L.J., Hardy, J.W., & Stocks, K.D. (1992). The IBM CENET system: continuing education for management. *T.H.E. Journal*, 20(4), 93-97.

The article describes an example of how IBM used one-way video and two-way audio. Personal computers were also used which allowed the instructor to transmit lecture notes (using storyboard software). The electronic video writer allowed video input from any selected media and superimposed the light pen's image over them. They used tough screen monitors to control student microphones and activate student-response units. Each unit had a question button that the student could activate to get the instructors attention; it also contained a microphone and a row of five buttons for response to multiple choice questions.

McKenzie, R., & Santoro, G.M. (1991). A guide to establishing mainframe computer-mediated communication between a host and a remote site. *T.H.E Journal*, 18(10), 63-66.

This article describes the use of computer-mediated communication (CMC) between a "home" site, the Pennsylvania State University (PSU), and a remote site, Sussex University in England. The article provides a practical guide for establishing and coordinating CMC between a remote location and a home location. Major problems that the program encountered were with the capabilities of the technology chosen. The advantages of using such a program included increased time and cost efficiency, ease of data transportability, and user-friendliness of the system.

Melton, R.F. (1990). Transferring text for distance learning. *British Journal of Educational Technology*, 21(3), 183-195.

This article contains guidelines and checklists for transforming existing text into teaching material used in distance learning. These include methods for actual transformation, identifying the appropriate teaching techniques, and identifying appropriate strategies for the layout and presentation of written material. Finally, the author presents several examples of transformed material.

Miller, G.E. (1990). Distance education and the curriculum: Dredging a new mainstream. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 211-220). New York: Pergamon Press.

This chapter discusses the instructional development process and issues of curriculum reform. The author recommends that developers evaluate curricula by asking questions such as, "what can be accomplished through distance education that is not able to be done otherwise?" He also recommends that other factors such as gender and age of the distant learner be considered during program development.

Minnesota Department of Education Instructional Design Section. (1990). *Distance education for all ages in Minnesota: the K-12 perspective.* St. Paul, MN.

The purpose of this report is to show how two-way interactive television is being used by Minnesota's K-12 schools and the potential two-way interactive television systems have for education in the future. Courses that work well are low incident elective courses. These courses are tools used for providing other types of information and programming for elementary students, community and school staff. The 1986 technical demonstration site evaluator said that students appeared to learn equally well in distance and conventional courses.

Mizell, A.P., Marcus, D., Hesser, L.A., & Hogan, R. (1992). Distance teacher education: parts equal more than the whole. *Technology and Teacher Education Annual*, 498-502.

This article discusses Nova University's use of telecommunications as a primary instructional tool. The authors note that critical questions involving using a new technology include an evaluation of priorities, the overall quality of the system, and whether or not the program will be cost effective.

Moller, L. (1991). Planning programs for distance learning using the ASSURE model. *TECH Trends*, 36(1), 55-57.

This author recommends using the ASSURE model for developing a distance learning course. The model consists of six steps: 1) analyze the learner; 2) state the objective; 3) select media and materials; 4) utilize the materials; 5) specify learner performance, and; 6) evaluate and revise. This article discusses specific factors to help ensure effective learning.

Montague, W.E. (1988). *What works: summary of research findings with implications for Navy instruction and learning.* Pensacola, FL: Navy Personnel Research and Development Center.

The author of this report gives advice on the instructional development process, instructor preparation, costs, interactions, and types of equipment when using computer based training, videotapes, and simulators for mostly lecture-based instruction. Research findings about instruction and learning were included into different sections for training executive instructors and training specialists. Recommendations included emphasizing frequent testing, improving instructor training, using tryouts during development, insuring transfer of training, using systematic approaches to training design, and having students learn more by doing things themselves.

Moore, M.G. (1993). Is teaching like flying? A total systems view of distance education (Editorial). *The American Journal of Distance Education*, 7(1), 1-10.

This editorial describes general beliefs about the effectiveness of distance learning and teaching that are shared by most distance educators. However, there are different opinions about how resources should be organized to realize these benefits. The goal is to organize or re-organize educational resources into a total delivery system comprised of a network of knowledge sources, processors, managers, communication media, and learners. The author supports his view by citing an imaginary example of a successful program from higher education.

Navy Personnel Research and Development Center (NPRDC) (1991). *Guidelines for transportable education and training (GTET): GTET system development and system handbook* (Submitted by QuesTech Research Division under Contract No. F33615-87-D-0661). San Diego, CA.

This is an integrated set of materials (including software and a cost analysis system) designed to provide guidelines to managers who are converting existing resident courses into transportable versions. The training manager selects and adjusts the components of the process. GTET consists of three components: 1) the GTET model provides a structured process to transport a resident course, including a breakdown of different phases, tasks, and critical decision points; 2) the GTET management information support system (GMISS) assists the training manager to construct and update project schedules, and; 3) the GTET computer-aided cost analysis support system (GCASS) helps the training manager obtain cost estimates and compare alternative strategies for transporting resident courses.

Nelson, S., & Sommer, A. (1989). *Idaho survey of the educational application. of communication technology: an analysis.* (Report No. IR 014 943). Portland, OR.: Northwest Regional Lab. (ERIC Documentation Reproduction Service No. ED 330 324).

This report provides a framework for planning and policy making. The three objectives were: 1) determine the current level of communication technology in Idaho elementary and secondary schools; 2) establish the potential for communication capability across Idaho schools; 3) identify specific priorities for communication technology applications in administration, staff development, and student instruction. Major findings include information on computer use in education, delivery systems, and course offerings at rural schools.

Nevins, C. L., & Wright, L. J. (1984). Teaching over television. A handbook for ITFS teachers. California State University, Chico, CA.

This useful handbook, produced by the California State University, Chico Instructional Media Center, provides suggestions and recommendations for procedures and production techniques for successful interactive educational television. Guidelines for effective on-camera techniques, timing, volume, body movement, ways of promoting student interaction, use of resource people, use of media, and a list of references are also presented.

Northern Telecom Education Systems (1991a) *Distance learning using digital fiber optics: applications, technologies, and benefits.* Publication No. ES 9101. Ottawa, Ontario, Canada.

This document recommends using fiber optics because it more realistically portrays a normal classroom environment. Fiber optics has high picture quality and it can act as a multiplexor. The document also describes how the Oklahoma Panhandle and Mississippi 2000 program used this technology and discusses the technical aspects of the connection between the schools and the telephone company.

Northern Telecom Education Systems (1991b). *Using the telephone to expand the classroom: a guide to teacher and classroom telephony.* Publication No. ES 9102. Ottawa, Ontario, Canada.

This report discusses the advantages of using telephones in a classroom setting. Advantages include saving time and money, and improving relationships. The disadvantage of using telephones for instruction was phone abuse. The report lists voice applications, such as voice messaging and mail, and applications related to telephones, such as bulletin board access, electronic mail and integrated services digital network (ISDN). Finally, the report describes the technical aspects of the telephone system.

Ohler, J. (1989). *Distance education and the transformation of schooling: living and learning in the information age*. University of Alaska Southeast, Juneau AK. (PB90-125253).

This report defines distance learners as those who: 1) are geographically isolated; 2) want to avoid or reinforce a particular content; 3) are incarcerated; 4) want to avoid social influences; 5) may be disabled; 6) want to avoid a schedule conflict, etc. The report also discusses problems that arise when using distance learning. For example, there may be less interaction between student-instructor, or between students. Finally, the report discusses the future directions of distance learning in terms of student population, finance, organizational structure, and media and other topics.

Oxford, R., Park-Oh, T., Ito, S., & Sumrall, M. (1993). Factors affecting achievements in a satellite delivered Japanese language program. *The American Journal of Distance Education*, 7(1), 11-25.

This article reviews previous research for a study relating six factors relevant to learning a new language. The six factors are: motivation, learning styles, language, language learning strategies, gender, course level, and previous experience in learning a foreign language. The factor of motivation appears to be the single most important predictor of success, although learning styles, gender, and learning strategy are also influential.

Pea, R.D., & Gomez, L.M. (1992). *Distributed multimedia learning environments: Why and how?* (Tech. Rep. No 25). Evanston, IL: Northwestern University: the Institute for the Learning Sciences.

This report discusses the future use of multimedia technology in K-12 schools. The major emphasis is on communication and involvement of active learners. Technology is not the central issue, rather it is the kinds of activities involving technology that is important.

Pease, P.S. (1989). Strategies for implementing distance learning technologies: why when and how. *School Business Affairs*, 55(10), 15-18.

The article discusses a set of guidelines that can be used to select a distance learning system (DLS). The first three steps critical to the selection process are to: 1) evaluate the instructional needs of the school; 2) determine the amount of funds available; 3) identify and compare DLS that meet the identified needs. Other guidelines are used when buying services and equipment from a provider including selection of a reliable and viable DLS provider, ensure a good match your instructional need with the programs offered by DLS, and evaluation of the offerings based on the desired level of interaction, effectiveness of technology, quality of the instructors and level of support provided by the DLS provider.

Phelps, R.H., Wells, R.A., Ashworth, R.L., & Hahn, H.A. (1991). Effectiveness and costs of distance education using computer-mediated communication. *The American Journal of Distance Education*, 5(3), 7-9.

This study summarizes an investigation exploring both the cost and effectiveness of computer-mediated communication (CMC) as a way for meeting the educational requirement of the U.S. Army's Reserve Component. The investigators studied engineering and leadership courses. Results indicated that the CMC group had significantly greater gains in their perceived amount of learning when taking the engineering course and the individuals taking the leadership course had significantly high test scores. The authors stated that the total estimated time for converting the existing course to CMC is 4,249 hours, costing approximately $152,300.

Preece, J., & Keller, L. (1991). Teaching the practitioners: developing a distance learning post-graduate HCI course. *Interacting with Computers*, 3(1), 92-118.

This report describes the development of human computer interaction (HCI) courses particularly for professional engineers, scientists, and mangers, using distance teaching. The report lists each phase of the curriculum development process. The authors state that what is essential in preparing distance learning material is always to remember that a tutor is not immediately available to answer questions. In this case, particular care and experience are necessary to anticipate student problems in advance.

Pugh, H.L., Parchman, S.W., & Simpson, H. (1991). *Field survey of videoteletraining systems in public education, industry and the military.* (TR-91-7). San Diego, CA: Navy Personnel Research and Development Center.

This report discusses the different organizations that are using the video teletraining (VTT) system and the arrangements of the rooms used. Some of the organizations mentioned were Westcott Communications, Satellite Education Network, University of Wisconsin and San Diego State University. Survey results indicate that there is little research effort directed toward evaluating VTT. Students and instructors wanted more interactivity although students did not rate interactivity as important. Finally, survey results indicate academic and corporate respondents planned to increase the number of programs offered.

Pultorak, E., Seaman, V., & Smallwood, J. (1990). *Telecommunications in teacher education. Closing the gap between university and extension programs.* (Report No. SP 032 132). Las Vegas, NE. Paper Presented at the Annual Meeting of the Association of Teacher Educators. (ERIC Document Reproduction Service No. ED 319 678).

The survey results consist of two areas, current use and equipment/delivery. The results indicated that: most institutions (46%) offer a small number of extension programs. The amount of enrollment varied greatly among participants. For instance, one institution enrolled few students

(10-24) while another offered the same type of program to 48,000 students per year. The institutions that responded to the costs questions referred to the costs per student for postage, materials, and indirect costs. Seventy five percent of the participants indicated that they only offered one-way video and 64% did not provide classroom facilitators. Participants using multimedia equipment deliver the messages from one location to the distance site via satellite, VCRs, computer terminals and TV monitors. The four problem areas mentioned were: interaction, distant site logistics, technical problems, and administrative concerns.

Ranker, R.A., & McKim, M.L.(1993, February) . Happy CAMPEXers: results of the beta test of a microcomputer-based simulation CAMPEX (campaign planning exercise) in a distance education environment. *Proceedings from the annual conference of the Society for Applied Learning Technology*, 109-115.

This article discusses the Crisis Handling Exercise (CHEX) used to simulate the U.S. political, economic and military options for resolving a water and mineral rights dispute between two fictional African Nations. Before the student makes any decision feedback is provided. There were five types of feedback: 1) map; 2) a list of actions taken in the last period; 3) a list of actions taken by the third parties; 4) confidence indicators; 5) current status. The Air War College conducted a study to determine whether there were favorable reactions to the system and to evaluate which parts needed changes. The results indicated that the students reactions were favorable and that the students felt there needed to be more options, better access to information, and increased plausibility of Kirmizi responses.

Relan, A. (1991). The desktop environment in computer based instruction: cognitive foundations and implications for instructional design. *Educational Technology*, 31(1), 7-14.

This report discusses the instructional development process for computer-based training (CBT). The author suggests that instructional designers consider environmental issues during development. Environmental issues include interactivity, learner control, and visuals. The article also offers helpful guidelines to follow when the instruction demands a high amount of learner control, for creating extensive databases, developing content presentations, developing interactive drills, developing student generated content and developing content requiring multi-model presentations.

Reveaux, T. (1993). Learning goes the distance. *New Media*, 3(7), 42-43.

This article discusses the benefit of cost reduction for many companies using teleconferencing, video conferencing, and satellite technologies. Distance learning was shown to reduce travel costs, avoid duplication of resources, and reduce demand on specialized instructors.

Reynolds, H.T. (1989). *Analysis of Nominal Data* (5th ed.). Sage University Paper Series on Quantitative Methods in the Social Sciences, 07-007. Beverly Hills: Sage Publications.

This monograph discusses some of the more common methods of analyzing categorical data. It begins by discussing the advantages and disadvantages of several different measures of association for 2 X 2 and I X J contingency tables. Next, the book details the specific issues involved in multivariate nominal data analysis. These issues include problems associated with analysis of nominal data, approaches to analysis of contingency tables, test factor stratification, and various statistical models of multivariate nominal data (e.g., log-linear model).

Ross, S.M., Smith, L., Morrison, G., & Erickson, A. (1989). An apple a day and night: a distance tutoring program for at-risk students. *Educational Technology*, 29(8), 23-28.

This article summarizes the Apple Classroom of Tomorrow (ACOT) project which was a collaborative effort between Apple Computer Inc., the Memphis City Schools, and Memphis State University. Their research showed that the overall use of E-Mail was extensive, and the tutors' overall attitudes were positive. However, students and tutors expressed some dissatisfactions when the single line connection was busy. The article also reports the results of a small experiment in which ACOT children's' writing skills were compared to those working in a traditional setting. The results indicated that the distance learning students performed better grammatically and structurally across the two writing samples.

Rupinski, T.E. (1991). *Analyses of video teletraining: utilization, effectiveness, and acceptance.* Report No. CRM 91-159), Alexandria, VA. Center for Naval Analyses.

This report evaluates the Navy's video teletraining (VTT) system in terms of system utilization, training effectiveness, student and instructor attitudes. The author found relatively low rates of system utilization in large part due to scheduling problems. While no significant differences were found between students' test scores at the origination and remote sites, instructors preferred traditional live classroom instruction. Data are also presented on students' and instructors' perceptions about audiovisual quality and reliability.

Rupinski, T.E., & Stoloff, P.H. (1990). *An evaluation of Navy video teletraining (VTT).* (CRM 90-36). Virginia: Center for Naval Analyses.

This report discusses the effect of video teletraining (VTT) on course grades, student attitudes, downtime and cost. Students' grades in the traditional courses were lower, on average, than the scores obtained from the remote students. However, the difference was not statistically significant. Students in the VTT course rated the instructor significantly lower than students in the conventional course. Students also identified three main areas of deficiency in the VTT method: the quality of video, the level of instructor-student interaction and the quality of audio.

The authors conclude that the cost effectiveness of VTT depends upon the extent to which the system is utilized.

Sammons, M. (1990). An epistemological justification for the role of teaching in distance education. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 151-162). New York: Pergamon Press.

This chapter examines the ideas of those who advocate learner independence, and shows that there is little substantive information available on how teaching works in the context of distance education. The author also discusses the theory of learner independence by Hugh Petrie. The author concludes that independent learning and teaching activities in distance education are compatible.

Santoro, G.M. (1990). Solving a problem-solving Problem via CMC. In M.G. Moore, P. Cookson, J. Donaldson & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 290-297). New York: Pergamon Press.

Three evaluations were conducted. First, a panel of three faculty (who taught similar traditional courses) evaluated the final product of the computer mediated communication (CMC) group. They all judged the products to be generally better than those they had seen in the traditional courses. Second, a two-year evaluation was conducted to correlate the ranks of group final projects against ranking of group CMC system use. Results for both years indicated that there were high correlations between CMC system use and quality of group final projects. Third, 81% of the students rated the course better than others they had taken and 10% rated it about the same. Seventy five percent stated that the computer use was a significant factor in their overall rating, 81% stated they would take another similar course, and 91% stated that the course was a rewarding experience.

Schein, E. H. (1990). Organizational culture. *American Psychologist* 45(2), 109-119.

This review article presents the author's view of how culture should be defined and analyzed if it is to be useful to the field of organizational psychology. Other organizational concepts are reviewed and a brief history of organizational culture is provided. Two case studies are presented to illustrate how the author analyzes culture and thinks about culture change.

Schiller, S.S., & Noll, B.J. (1991). Utilizing distance learning in a large urban school system. *Tech Trends*, 36(1), 23-27.

Prince George's County Public Schools in Maryland are using a distance learning program characterized by full two-way audio, video, and computer interaction in both urban and suburban settings. Price George's County Public Schools launched this innovative interactive television

program in September 1989 with eight sites linked by a network. Their recommendations include providing: 1) staff training (for both instructors and facilitators); 2) implementation guides; 3) guidelines on finance, and 4) guidelines on evaluation.

Sellars, S. (1988). Distance learning: course innovations make study easier for both the individuals and companies. *Production Engineer*, 67(7), 30-31.

This article describes using multimedia techniques in production management training. The course was divided into four sections, including production sources, production systems and strategies, production management in action, and production management in context. The benefits of using multimedia for management training are that they allow the participants to study at his/her own pace. Additionally, courses could be incorporated into company training programs since the learning objectives were highly relevant to the work situation.

Shaeffer, J.M., & Farr, C.W. (1993). Evaluation: a key piece in the distance education puzzle. *T.H.E. Journal*, 20(9), 79-82.

This article discusses the issues of faculty development, training, and evaluation. The faculty development program at the University of Wyoming includes: recruitment and pre-course discussions with faculty, pre-semester seminars/workshops, and on-going coaching. The article also recommends the use of formative and summative evaluations during development phases.

Silvernail, D.L., & Johnson, J.L. (1992). The impact of interactive televised instruction on student evaluations of their instructors. *Education Technology,* 32(6), 47-50.

This study examines the relationship between students' perceptions of instructional television and evaluation of their instructors. The results indicated that faculty preferred different instructional styles. The students learning style preferences seemed to be more compatible with instructors who encouraged competition, involved logical and mathematical content, emphasized lecturing, and placed primary responsibility for learning on the students. The study provides evidence that student evaluation of instructors are not affected adversely by their satisfaction levels with the interactive instructional television system.

Simpson, H. (1993). *Conversion of live instruction for video teletraining: training and classroom design considerations.* (NPRDC-TN-93-4). San Diego, CA: Navy Personnel Research and Development Center.

This report discusses the instructional development process, instructor preparation, classroom physical arrangement, and ways to increase interactions when using a video teletraining to deliver technical training, lecture based, and lecture/demonstration based instruction. The author

recommends using a conversion methodology consisting of preparation, data collection, analysis, VTT training design, VTT classroom design and implementation and refinement. This report considers three different classroom designs: lecture based, lecture demonstration, and group processes and suggests instructor training programs.

Simpson, H. (1990). *The evolution of communication technology: implications for remote-site training in the Navy.* (NPRDC-TN-90-22). San Diego, CA: Navy Personnel Research and Development Center.

The report proposes to find more cost effective ways to train personnel and describes technologies such as computer networking and conferencing, artificial intelligence, simulation network (SIMNET), computer-based instruction (CBI), video teletraining and video teleconferencing. The report also discusses the work station of the future that integrates a computer, television display, fax machine, and telephone and how video teletraining may be more cost effective than individual training with work stations.

Simpson, H., & Pugh, H.L. (1990). *A Computer-based instructional support network: design, development, and evaluation.* (NPRDC-TR-90-6). San Diego, CA: Navy Personnel Research and Development Center.

The primary objective of this report was to find more cost effective technology, such as computer-based instruction (CBI), to train personnel. Results showed that students were able to easily operate the equipment. The results also showed that 72.9% of the messages sent were administrative, 17.5% were technical and 9.8% were motivational. ISN problems identified by the tutors were slow student progress with lessons, lack of communication by students, host computer problems, DDN problems, and inability of the tutor to diagnose the cause of student non-communication.

Simpson, H., Pugh, H., & Parchman, S. (1992). *The use of video teletraining to deliver hands-on training: concept test and evaluation.* (NPRDC-TN-92-14). San Diego, CA: Navy Personnel Research and Development Center.

This is a study on the use of video teletraining (VTT) for hands-on training. Two different strategies for handling remote laboratories were compared: 1) students viewed a videotape instead of participating in the actual laboratory; 2) a facilitator conducted the laboratory off-line. Students who only viewed the videotape took longer to perform on all performance tasks and performed less accurately on two out of three tasks. The authors conclude that VTT can be effective for hands-on training in some circumstances but that decisions must be made for each specific situation.

Simpson, H., Pugh, H., & Parchman, S. (1991). *Empirical comparison of alternative videoteletraining technologies.* (NPRDC-TR-92-3). San Diego, CA: Navy Personnel Research and Development Center.

This study explores cost-effective ways to train personnel. The study compares training effectiveness and user acceptance of live instruction and six different alternative video teletraining (VTT) technologies. The difference between live and all VTT was small but statistically significant. The difference between one-way video and two-way video was small but statistically significant. The difference between single-channel two-way video and multiple-channel two-way video was not statistically significant. This report also presents results on students attitudes.

Simpson, H., Pugh, H., & Parchman, S. (1991). An experimental two-way video teletraining system: design, development and evaluation. *Distance Education*, 12(2), 209-231.

This report provides useful information about hardware and physical arrangements necessary for Video Teletraining (VTT). The study used two administration and operations maintenance record keeping courses and one safety petty officer class to assess the effectiveness of VTT on: 1) performance; 2) student/instructor attitudes; 3) cost-effectiveness; 4) support requirements, and; 5) technical problems. The findings of this study included: student performance scores indicated no statistically significant differences; students were concerned with audio and video issues. For example, 11% of remote site students felt they had fewer opportunities to interact with the instructor; additionally, they were more concerned or conscious of the medium than those in the originating course. Finally, the analysis indicated that conducting training with a two-way VTT system is more costly than sending an instructor to a remote site, although it can be less costly than paying for students travel to the instructor.

Simpson, H., Pugh, H., & Parchman, S. (1990). *A two-point video teletraining system: design, development, and evaluation.* (NPRDC-TR-90-5). San Diego, CA: Navy Personnel Research and Development Center.

This empirical study focused on areas such as: 1) instructional development; 2) effectiveness of distance learning; 3) instructor preparation; 4) cost; 5) classroom physical arrangement; 6) interactions; 7) system disruptions, breakdowns, or failures. It also presents a detailed evaluation of the development of system design guidelines, definition of personnel, training and logistics requirements, systems design and development, and system evaluation. The VTT field test found that there was no statistically significant difference between student test scores at traditional or remote sites.

Smith, P.L. & Ragan, T.J. (1992). *A review of the literature investigating the learning benefit of education that is presented in a multimedia, individualized format.* University of Oklahoma Technical Report I: Instructional Technology Effectiveness Study.

This summarizes three technical reports on multimedia concerning areas of individualized, group-based, and individualized modular formats. The authors recommend analyzing the requirements of the instructional task, the characteristics of the learners, and the demands of the instructional context.

Souder, W.E. (1993). The effectiveness of traditional vs. satellite delivery in three management of technology master's degree programs. *The American Journal of Distance Education*, 7(1), 37-53.

This article examines the relative effectiveness of distance education in a "natural experiment" that allowed comparisons between traditional and distance teaching in three master's degree programs. The three groups were from the Georgia Institute of Technology (GATECH), The University of Alabama, Huntsville (UAH), and National Technological University (NTU). The results indicated that the distance learners performed better than the traditional learners on exams, term papers, and case write-ups. The student evaluations also showed that courses were generally viewed by all three student groups as a success. However, while NTU's students did not agree that face-to-face instruction was vital; GATECH and UAH did believe in the superiority of traditional learning.

Staff. (1993a) Digital compression primed to fuel the explosion in distance education. *T.H.E. Journal*, 20(8), 57-58.

This article is about digital compression. National Technological University was one of the first institutions to start using digital compression. This type of technology not only saves then money but also enables equity in education. Kentucky is also cited as an example because many of Kentucky's school districts cannot afford to pay qualified teachers in all subject areas.

Staff. (1993b). Training the best on demand. *Education at a distance*, 7(1), 6-7.

This article describes the use of the Teletraining Network (TNET) for language training tailored specifically to a new operation. The training also utilized individual self study phrase books and audio tapes. TNET was put into place very quickly to meet the needs of the Army. Since August 1990, TNET has grown to be the world's largest fully interactive two-way audio, two-way video training network.

Staff. (1992a). High-tech distance learning facility bridges time and space. *T.H.E. Journal*, 20(3), 52-56.

This article discusses the types of equipment that Greenville Technical College (GTC) has on site. GTC designed a 50,000 square foot Technical Resource Center (TRC) to provide the mix of information, programming and instruction. This was accomplished through a web of networks

and systems that connect the college to the entire community. The article discusses the technical aspects of the TRC.

Staff. (1992b). Satellite learning system targets 50 million schools. *Signal*, 46(12), 58-61.

This article presents a proposal to improve the National Guard and Reserve skills proficiencies. The proposed system would bring federal and state joint services to individual citizens by using a satellite video conferencing system

Stoloff, P.H. (1991a). *Cost effectiveness of U.S. Navy video teletraining system alternatives.* (CRM 91-165). Virginia: Center for Naval Analyses Information.

This report examines the cost-effectiveness of the video teletraining (VTT) system used by the U.S. Navy. Their findings were that VTT was cost effective and that the expansion of the current VTT network should be done, although, the amount of savings depended on the configuration adopted. The study also found that it would not be as cost effective to implement an incremental expansion. The study found that is more cost effective to concentrate student loads in a few remote classrooms as possible (the author recommends 20 students per classroom). However, excess capacity could be used for conferences. VTT was shown to be more cost effective than exporting instructors.

Stoloff, P.H. (1991b). *Video teletraining network scheduling model.* (CRM 91-76). Virginia: Center for Naval Analyses Information.

This study assessed the cost effectiveness of the Navy's interim video teletraining (VTT) system. The research memorandum described VTTSCHED, a model and computer program for scheduling classes and conferences on a VTT network, and used this model to focus on different network configurations and placement of sites. This program can serve as an analysis tool to evaluate the costs and benefits associated with alternative configurations and schedule events.

Stone, H.R. (1990). Economic development and technology transfer: implications of video-based distance education. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education* (pp. 231-242). New York: Pergamon Press.

This chapter discusses the advantages of instructional television (ITV) based on the results of a study that was conducted at the University of Massachusetts, Amherst. There was a significant difference between students who participated in classes on and off campus. However, the question of whether or not interactivity provides a better "educational pipeline" over simple videotape systems to remains unresolved."

Tyman, D. (1993). Multimedia goes on the job just-in-time. *New Media*, 3(7), 39-46.

This article describes interactive learning applications (CD-ROM) and some of the new trends in multimedia including: 1) a shift away from expensive, single function training toward low-cost, multipurpose multimedia desktop systems; 2) a majority of new courses being pressed on CD-ROM; 3) instructional materials accessible on demand-just-in-time at the job site. The article also discusses the different experiences of organizations such as New England Life Insurance, technical training for Xerox Corporation, Federal Express, and Alyeska. The biggest barriers of multimedia were lack of standardization, the relative non-intuitivity of the program, and other miscellaneous psychological factors.

U.S. Air Force, Headquarters, Air Education and Training Command, Training Technology Applications Program, HQ AETC/XPCRT (1991). *Distance learning final report* (Submitted by D.P. Associates Inc. under Contract No. F41689-89-D-0252). Randolph AFB, TX.

U.S. Congress, Office of Technology Assessment, Congressional Board of the 101st Congress. *Linking for learning: A new course for education.* OTA-SET-430 (Washington, DC: US Government Printing Office, November 1989).

This book concerns distance learning for grades K-12. It also defines distance learning (standardization), and describes characteristics of effective teaching, transmission technologies (advantages, disadvantages and trends), cost factors, instructor preparations, and state and federal issues concerning distance learning.

U.S. Marine Corps (1992) Combined Arms Staff Trainer (CAST): executive summary MD: U.S. Marine Corps Device 16N8.

This executive summary discusses the capabilities and limitations of the Combined Arms Staff Trainer (CAST) device which is a computer network that simulates the actions of combat and combat support elements. The report also discusses characteristics of the training participants, instructors, and methods used for developing exercises.

Verduim, J.R., & Clark, T.A. (1991a). Academic achievement in distance and higher education. In A.B. Knox (Ed.), *Distance education: the foundations of effective practice* (pp. 213-239). San Francisco, CA. Jossey-Bass.

This chapter cites several studies from literature reviews that compare conventional education with television, computer-based, video disc, and correspondence study. The general conclusion

was that distance educational methods achieve similar results when compared with the conventional methods.

Verduim, J.R., & Clark, T.A. (1991b). Assessing program quality and effectiveness. In A.B. Knox (Ed.), *Distance education: the foundations of effective practice* (pp. 87-118). San Francisco: Jossey-Bass.

This chapter presents an overview of factors related to the effectiveness of distance education within the U.S. including learner outcomes (cognitive skills, psychomotor skills, affective skills, and drop-out rate), access, quality, effectiveness and efficiency, and impact. The authors conclude that these cognitive outcomes were equivalent to those achieved by the more traditional methods.

Verduim, J.R., & Clark, T.A. (1991c). Opportunities and challenges for the future. In A.B. Knox (Ed.), *Distance education: the foundations of effective practice* (pp. 197-211). San Francisco: Jossey-Bass.

This chapter describes possible future directions of distance learning technologies and design of instructional programs. The main idea is that technologies used in distance learning will continue to develop because of the fast growing jobs in executive, managerial, professional and technical fields which all require higher levels of skills.

Verduim, J.R., & Clark, T.A. (1991d). Program foundations. In A.B. Knox (Ed.). *Distance education: the foundations of effective practice* (pp. 121-139). San Francisco: Jossey-Bass.

This chapter discuses a general theory of distance learning. The authors elaborate on Moore's definition and theories.

Verduim, J.R., & Clark, T.A. (1991e). Teaching and learning. In A.B. Knox (Ed.), *Distance education: the foundations of effective practice* (pp. 140-165). San Francisco: Jossey-Bass.

The instructional delivery system used five factors, including: 1) assess entering behavior- determine the background of the learner (values, needs, attitudes, and self-experience), 2) specify the objectives- what the learner can do after the course; 3) design the learning unit- select the content, materials and interactive media needed for the design; 4) present and perform- involving, interaction, facilitation and teaching; 5) assess performance- provide feedback (formative vs. summative).

Verduim, J.R., & Clark, T.A. (1991f). The idea and evolution of distance education. In A.B. Knox (Ed.), *Distance education: the foundations of effective practice* (pp. 3-20). San Francisco: Jossey-Bass.

This chapter considers the evolving definition of distance learning. The areas of distance learning most used by adult learners are basic education, career education, leisure, and enrichment. The authors conclude by discussing the current status of distance education.

Wagner, E.D. (1993). Functional and philosophical perspectives of interaction. *Education at a Distance*, 7(2), J7-J8.

This article simply defines interaction. The author feels that having a common operational definition will provide benchmarks to develop effective distant teaching and learning strategies, for assessing instructional efficiency of distance learning interventions, and for establishing standards for evaluation.

Wagner, E.D. (1990a). Instructional design and development: contingency management for distance education. In M.G. Moore, P. Cookson, J. Donaldson, & B.A. Quigley (Eds.), *Contemporary issues in American distance education.* (pp. 298-312). New York: Pergamon Press.

The author recommends that media selection should occur only after the designer has looked at issues related to the instruction itself, along with audience characteristics, desired performance, means of assessment, and instructional strategies appropriate to elicit the desired response. The author explains the Dick and Carey model of instructional design and presents a brief summary of the distance education literature.

Wagner, E.D. (1990b). Looking at distance education through an educational technologist's eyes. *The American Journal of Distance Education*, 4(1), 53-68.

This article examines the relationship that exists between the fields of distance education and educational technology (a discipline focused on performance). It discusses the historical background of educational technology and its methods of instructional design and development. The author recommends closely considering the relationship between distance education and educational technology because both support each another.

Wainer, H. (1992). Understanding graphs and tables. *Educational Researcher*, 21(1), 14-23.

Wainer presents a historical look at the use and misuse of data displays. He notes that the proper use of data displays has led to important scientific discoveries. Similarly, the misuse of data displays has hindered scientific progress. Wainer also discusses the need for a theory of data

displays and data presentation in general. Finally, the article provides a set of prescriptions for improving the quality of tabular presentations of data.

Walsh, W.J., Gibson, E.G., Hsieh, P.Y., and Gettman, D. J. (1993). *Instructional design issues in distance learning*. Paper presented at the Interservice/Industry Training Systems and Education Conference, Orlando, FL

The researchers evaluate instructional design issues pertaining to distance learning and focus on the delivery of hands-on technical training via distance learning technologies. Data, obtained through a broad survey of academic, government, military, and industrial organizations, are presented on the effects of distance learning curricula, types of student-instructor interaction, student interaction with instructional materials, and the preparation of faculty and staff for distance learning.

Wells, A.D., Anttila, T., Wilheth, R., Gove, T.P., Howes, K.J.P., Hill, G., & Portway, P.S. (1991). *TELE Conference: The Business Communication Magazine*, 10(2).

This entire journal issue presents telecommunication trends occurring throughout the U.S. Government and internationally. Each article is basically "show-and-tell," including descriptions of Training and Doctrine Command (TRADOC), the second annual conference on teleconferencing, the defense commercial telecommunications network (DCTN), CCITT H.261--the world standard for encoders and decoders (codecs)-- and ways to improve audio quality through echo control.

Wells, R. (1992). *Computer-mediated communication for distance education: an international review of design, teaching, and instructional issues* (Research Monograph No. 6). State College, PA: The Pennsylvania State University, American Center for the Study of Distance Education.

This report discusses the instructional development process, instructor preparation, cost, and other factors when using computer mediated communication in terms of design, teaching, and instruction. The author also discusses the issues of interaction, teaching style, feedback, and other instructional techniques, in addition to how administrative policies affects factors such as access and cost.

Wiesner, P. (1983). Some observations on telecourse research and practice. *Adult Education Quarterly*, 33(4), 215-221.

This is a literature review encompassing areas of instructional development, effectiveness of distance learning, and interactions during two-way communication. The author concludes that there are not enough useful case studies and controlled experimental studies to examine the variables affecting student success in distance learning. The author feels that more attention has

been paid to technology rather than to learners. The author also concludes that few guidelines exist for developers of distance learning programs.

Wilkinson, T.W., & Sherman, T.M. (1991). Telecommunications based distance education: who's doing what? *Educational Technology*, 31(11), 54-59.

This article describes the trends of distance learning in educational settings. According to this survey, the average distance education program is: located in a community college that primarily serves an urban community; it is six to ten years old, offers one to five courses, and has one to three student full time equivalent (FTE) staff members working on the program. Most programs offer undergraduate courses only, and students are given the term to complete the course. Most programs use primarily video-based technology and print for student/faculty interaction.

Willis, B. (1990). Faculty development programs: maximizing the potential. *Educational Technology*, 30(9), 35,42.

This article suggests 16 points to consider when developing an instructor training program. For example, it should include hands-on experience (role playing techniques), and a description of technical systems in a language familiar to the user.

Wilson, A.S., Teasley, J.C., & Ittleson, J.C. (1992). *Multimedia distance learning and the appropriateness of instructional media.* Paper presented at the Integrated Services Digital Network in Education Conference, Boone, NC.

This paper describes the methods used and effectiveness of instructional media developed by the California State University at Chico to support multimedia distance learning trials recently sponsored by Pacific Bell and AT&T. Results demonstrated the effectiveness of the distance learning platform to instruct and motivate, although they also suggested that the basic configuration of the multimedia distance learning platform may not be equally appropriate in all learning situations. The authors also discuss how much instructor involvement with supportive media is necessary to create effective, motivational instruction.

Wolcott, L.L. (1991). A qualitative study of teachers' planning of instruction for adult learners in a telecommunications-based distance education environment. *Proceedings of Presentations at the Annual Convention of the Association for Educational Communications and Technology* (Report No. IR 015 190). (ERIC Document Reproduction Service No. ED 335 023).

This study describes the instructional planning method for faculty teaching adult learners at a distance. The method includes: 1) nature of planning; 2) instructional considerations; 3) time and media constraint factors, and; 4) rules of action. The author reports five important dimensions of the medium-- lack of visual communication, physical separation, technical obstacles, presence of

on-site students, and time. The author also uses four rules of actions: cover all material, maintain control, go with the flow, and provide an equitable learning experience. The approach to instruction was equivalent for distant and conventional courses. The only difference was the planning document which incorporated the extended syllabus.

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

The purpose of this study was to describe instructional planning by faculty teaching adult learners via interactive telecommunications and to identify their overall concerns when designing distance instruction. Qualitative methods were used to collect and analyze data on planning by eleven full-time faculty members. Their instructional planning process included three features: 1) whole-term rather than day-to-day planning (instructors would plan holistically); 2) primary emphasis on content rather than process; consideration of other factors such as student characteristics, the context in which instruction takes place, optimal instructional strategies, and the intended outcomes by comparison received little attention), and; 3) reliance on the syllabus as the focal point of planning.

Yu, A., Prussakova, U., & Prussakova, A. (1992). The international telecommunications project in the schools of Moscow and New York state. *Educational Technology Research and Development*, 40(4), 111-118.

This article describes the results of a pilot study conducted on the use of telecommunication in education in Russia. Students of Moscow and New York state schools worked in collaboration using E-Mail on a regular basis during two school years. The overall goals of this project were to test different designs of the educational environment in order to study which would contribute most to the effective use of telecommunication, and to present models to be implemented in future research. The results indicated that the model used for introducing computer communication to the schools could be successful. The researchers also became aware of how important it was to provide support for both schools involved.

Zvacek, S.M. (1991). Effective affective design for distance education. *Tech Trends*, 36(1), 40-43.

When designing instruction for a distance learning course, attention is often focused on the cognitive domain. while affective domain considerations are often ignored. This article discusses the importance of considering the affective issues of attention, relevance, confidence, satisfaction, communication patterns, and ethical issues when designing instruction for a distance learning program.

APPENDIX A: QUESTIONNAIRE

DISTANCE LEARNING QUESTIONNAIRE

General Instructions

You have indicated that your organization is willing to participate in a distance learning survey being conducted by Mei Technology on behalf of the U.S. Air Force, Armstrong Laboratory. All responses will be kept confidential.

Please review the Organizational Profile and preliminary information to ensure that the information you provided over the phone is accurate. Please correct any inaccuracies by crossing out then writing in the correct information.

In completing the rest of the questionnaire make sure that you answer each question completely. Leave NO BLANKS. If you are unsure of an answer please take the time to explain your uncertainty or exception.

Please complete the questionnaire by June 14, 1993 and return it to:

Dr. Elizabeth G. Gibson
Mei Technology Corporation
8930 Fourwinds Drive, Suite 450
San Antonio, TX 78239

PART I: ORGANIZATIONAL PROFILE

Name of organization: _____

_____

Address:

_____

_____

_____

Type [check ones which apply]: **(n = 129)**

- ❑ Military **15%**
- ❑ Academic Institution **61%**
- ❑ Commercial Firm **16%**
- ❑ Government **5%**
- ❑ Technical School **5%**

Primary contact name: _____

Title: _____

Phone: (_____) _____-_____ Fax: (_____) _____-_____

Instructions: Verify Information

You provided preliminary information to us over the phone: Please verify that it is correct, make changes as necessary, and then answer the follow-up questions. If you need additional space to write in an answer, use the back of the questionnaire and indicate the question number next to the remarks. If at any time you have questions about completing the questionnaire, please contact:

Dr. Elizabeth G. Gibson
(210)655-8911

1. What kind of distance learning technologies does your organization use?
[Check all that apply:] **(n = 129)**

- ❑ Paper-based **52%**
- ❑ Facsimile machine **64%**
- ❑ Telephone **73%**
- ❑ Audio broadcast, e.g., radio **18%** ❑ Live **14%** ❑ Taped **12%**
- ❑ Video broadcast, e.g., TV **74%** ❑ Live **63%** ❑ Taped **52%**
- ❑ Two way audio & one way video **56%** ❑ Live **53%** ❑ Taped **26%**
- ❑ Two way audio and video **48%** ❑ Live **45%** ❑ Taped **12%**
- ❑ Videotape **82%**
- ❑ Digitized format **48%**
- ❑ Computer-based training **59%**
- ❑ Other **57%**

2. If you use computer-based training materials, how are they distributed to the users?
[Check all that apply:] **(n = 128)**

- ❑ Not used **40%**
- ❑ Floppy diskette(s) mailed to students **34%**
- ❑ Direct connection to host computer **26%**
- ❑ Satellite transmission of courseware **10%**
- ❑ Other **40%**

3. What is the size of your distance learning program?
[Check all that apply:]

Between:	*1-10*	*11-20*	*21-49*	*50-99*	*100+*
No. of Courses (n = 123)	❑ 30%	❑ 18%	❑ 9%	❑ 11%	❑ 32%
Faculty (n = 107)	❑ 28%	❑ 19%	❑ 11%	❑ 12%	❑ 30%
Students (n = 119)	❑ 1%	❑ 4%	❑ 3%	❑ 3%	❑ 89%
Avg. per course (n = 101)	❑ 20%	❑ 42%	❑ 16%	❑ 8%	❑ 15%

4. How long has your distance learning program been in existence?
[Check one unless media has changed (explain):] (n = 126)
- ❑ Less than 1 year 3%
- ❑ 1-3 years 15%
- ❑ 4-10 years 43%
- ❑ Greater than 10 years 39%

5. What kind of courses are offered via distance learning?
[Check all that apply:] (n = 129)
- ❑ Technical training 50%
- ❑ General education 47%
- ❑ Other 73%
- ❑ Management training 40%
- ❑ Conferences/Seminars 36%

6. Why did you select this kind of course to be offered via distance learning?
[Check all that apply indicate type checked in 5 above:] (n = 127)
- ❑ No documented reason 1%
- ❑ To save costs 26%
- ❑ Media best for this kind of course based on analysis 35%
- ❑ Directed by higher authority 16%
- ❑ Other 86%

7. What kind of skills are trained? Please describe subject matter skills, if appropriate. [Check all that apply:] **(n = 129)**

- ❑ Safety **40%**
- ❑ Foreign Language **37%**
- ❑ Medical **43%**
- ❑ Engineering **54%**
- ❑ Maintenance/repair of equipment **30%**
- ❑ Assemble machinery **15%**
- ❑ Fundamental skills **51%**
- ❑ Problem solving skills **74%**
- ❑ Hands-on skills **53%**
- ❑ Computer use skills **61%**
- ❑ Job-related skills **74%**
- ❑ Other **54%**
- ❑ Security **23%**
- ❑ Communications **67%**
- ❑ Accounting **40%**
- ❑ Staff Development **62%**
- ❑ Operation of equipment **38%**
- ❑ Operate test equipment **26%**

8. Why did you select these kinds of skills to be trained via distance learning? [Check all that apply:] **(n = 128)**

- ❑ No documented reason **2%**
- ❑ To save costs **23%**
- ❑ Best media for these kinds of skills based on analysis **28%**
- ❑ Directed by higher authority **13%**
- ❑ Other **91%**

9. If your organization is involved in both distance learning and conventional training, is the courseware used in distance learning the same as conventional course(s)? [Check all that apply:] **(n = 122)**

- ❑ No (Answer below & 10a) **59%**
  - ❑ There is no parallel conventional course **7%**
  - ❑ Courses are specially designed for distance learning **17%**
  - ❑ Conventional courses are adapted/changed for distance learning **40%**
  - ❑ Portions are the same, but the distance learning segments are unique **9%**
- ❑ Yes (Answer below & 10b) **62%**
  - ❑ Parallel course(s) taught in residence and via distance technology **52%**
  - ❑ There is no need to modify the approach for distance learning **8%**
- ❑ Other **11%**

10a. *If you answered "NO" to 9.*
Why is the distance learning course not the same as the conventional course?
[Check all that apply:] **(n = 69)**

- ❑ No documented reason **3%**
- ❑ Extensive modification of curriculum for distance learning **17%**
- ❑ Can't present lessons same way as conventional course **33%**
- ❑ Directed by higher authority **4%**
- ❑ Other **70%**

10b. *If you answered "YES" to 9.*
Why is the distance learning course the same as the conventional course?
[Check all that apply:] **(n = 78)**

- ❑ No documented reason **3%**
- ❑ To save costs **18%**
- ❑ To save time, i.e., get the course on-line in time **14%**
- ❑ Directed by higher authority **3%**
- ❑ Other **86%**

Instructions

When you answer the following questions, try to be as specific as possible for each course. If necessary, make additional copies of the following pages and complete a set for each different course.

PART II: STUDENT INFORMATION

The following questions concern your student population. Please describe your distance learning students as well as you can by answering the questions in this section. Feel free to add information wherever you think it is applicable by writing it in next to the question to which it pertains.

11. What kind of students participate in the distance learning programs?
[Check all that apply:] **(n = 129)**

- ❑ Civilian **57%**
- ❑ K-12 **23%**
- ❑ College (undergraduate) **59%**
- ❑ College (graduate level) **53%**
- ❑ Technician **40%**
- ❑ Management **54%**
- ❑ Other **16%**
- ❑ Government (civilian) **42%**
- ❑ Enlisted (novice level) **22%**
- ❑ Enlisted (expert level) **27%**
- ❑ Officer (junior) **29%**
- ❑ Officer (senior) **26%**

12. How are students enrolled in the distance learning course?
[Check all that apply:] **(n = 128)**

- ❑ Automatic; student has no choice **16%**
- ❑ Student selects distance learning course or conventional course **69%**
- ❑ Course available via distance learning only **45%**
- ❑ Course assigned based on location of student **23%**
- ❑ Other **17%**

13. If students are able to select courses, why do they select distance learning rather than conventional courses?

[Check all that apply:] **(n = 123)**

- ❑ Students have no choice of courses **25%**
- ❑ No documented reasons **6%**
- ❑ To save themselves money **21%**
- ❑ Distance learning course more convenient **77%**
- ❑ Distance learning course is easier **2%**
- ❑ Students like distance learning better than conventional course **15%**
- ❑ Students feel they get more attention in distance learning course **6%**
- ❑ Students want to "try the technology" **24%**
- ❑ Other **28%**

14. What is the minimum or maximum number of students allowed in a distance learning course?

[Check all that apply:] **(n = 129)**

- ❑ There aren't any limitations **39%**
- ❑ There are limitations as indicated below: **54%**

Minimum # **(n = 114)**		*Maximum #* **(n = 114)**	
❑ 1	**13%**	❑ 10 or less	**1%**
❑ 2-5	**13%**	❑ 11-20	**14%**
❑ 6-10	**11%**	❑ 21-50	**17%**
❑ 10-20	**11%**	❑ 51-100	**5%**
❑ 21+	**3%**	❑ 101+	**13%**
❑ Other	**18%**		

15. How do the student(s) interact with the instructor and/or course materials?

[Check all that apply:] **(n = 128)**

- ❑ No interaction with instructor; course materials are self-teaching **21%**
- ❑ Distant classroom (questions/answers) **61%**
- ❑ Telephone during conference hours **59%**
- ❑ Written correspondence, e.g., homework, tests, exercises, etc. **63%**
- ❑ Computer link, e.g., via modem **45%**
- ❑ Periodic meetings, e.g., beginning/end of course/semester **40%**
- ❑ Exercises & evaluation of performance during each class **41%**
- ❑ Other **28%**

16. How frequent do the interactions between student and instructor occur (if course is self-teaching, how frequent is interaction with course materials, e.g., student does some exercise or activity)?

[Check one which applies:] **(n = 123)**

- ❑ No interaction with instructor **7%**
- ❑ Once per course **2%**
- ❑ A few times (2-4) during the course **17%**
- ❑ Only as necessary **15%**
- ❑ Frequently **47%**
  - ❑ Daily **24%**
  - ❑ Once a week **19%**
  - ❑ Once a month **2%**
- ❑ Other **33%**

17. What special kind of equipment does a student need to take a distance learning course, e.g., computer terminal, VCR, etc.?

[Check all that apply:] **(n = 127)**

- ❑ No special equipment is necessary **23%**
- ❑ The student must have special equipment such as: **83%**
  - ❑ Computer **44%**
  - ❑ Modem **30%**
  - ❑ Telephone **45%**
  - ❑ Television **50%**
  - ❑ Radio **2%**
  - ❑ VCR **50%**
  - ❑ CD-ROM **9%**
  - ❑ IVD **7%**
  - ❑ Fax machine **23%**
  - ❑ Other **34%**

If special equipment is needed, who provides it?: **(n = 113)**

- ❑ We provide the equipment **53%**
- ❑ Students must provide their own equipment **41%**

18. Where do students take the distance learning course?
[Check all that apply:] **(n = 128)**

- ❑ In a conventional classroom setting **45%**
- ❑ In a media center **29%**
- ❑ In a laboratory **11%**
- ❑ On-the-job, e.g., at their worksite **56%**
- ❑ At home or in a dormitory room **37%**
- ❑ Other **23%**

19. In addition to your central site, how many sites are there where students can take distance learning courses?
[Check One that applies:] **(n = 128)**

- ❑ Only 1 **8%**
- ❑ 2-4 **6%**
- ❑ 5-10 **13%**
- ❑ 10+ **18%**
- ❑ Unlimited **38%**
- ❑ Other **17%**

20. How do you assess a student's performance in the course?
[Check all that apply:] **(n = 127)**

- ❑ No performance assessment or tests in course **11%**
- ❑ Course materials include self-assessments **43%**
- ❑ Written test(s) **76%**
- ❑ Periodic work assignments **57%**
- ❑ Verbal examination of knowledge **34%**
- ❑ Performance test administered on-the-job **16%**
- ❑ Performance test administered **13%**
- ❑ Instructor monitors student's work **55%**
- ❑ Attendance (only) **8%**
- ❑ Other **20%**

21. Why is the performance assessment conducted this way?
[Check all that apply:] (n = 125)

- ❑ No documented reason **10%**
- ❑ To save costs **7%**
- ❑ Most effective way to assess student performance **66%**
- ❑ Most efficient way to assess student performance **50%**
- ❑ Directed by higher authority **14%**
- ❑ Other **27%**

22. What kind of attitude measures are obtained through student end-of-course critique?
[Check all that apply:] (n = 125)

- ❑ No student critique is administered **10%**
- ❑ Student input is solicited in the following areas: **90%**
    - ❑ Course effectiveness **87%**
    - ❑ Instructor effectiveness **83%**
    - ❑ Use of media **70%**
    - ❑ Comparison of distance learning to conventional instruction **48%**
    - ❑ Tests **44%**
    - ❑ Other **11%**

23. How long do students take to finish distance learning course(s)?
[Check all that apply:] (n = 127)

- ❑ Course is a fixed length **54%**
- ❑ Longer than conventional course **9%**
- ❑ Shorter than conventional course **13%**
- ❑ Same as conventional course **52%**
- ❑ No documentation **6%**
- ❑ Other **21%**

24. Why do students take more/less time to finish the distance learning course?
[Check all that apply:] **(n = 90)**

- ❑ No corresponding conventional course **13%**
- ❑ Students take the same time in either course **48%**
- ❑ Distance learning course has fewer objectives **2%**
- ❑ Distance learning course has more objectives **3%**
- ❑ Distance learning technology compresses course length **17%**
- ❑ Distance learning technology problems caused course to be longer **4%**
- ❑ Instructor takes more time to cover material than conventional course **2%**
- ❑ Instructor can cover course material faster than conventional course **10%**
- ❑ Other **29%**

PART III: FACULTY INFORMATION

The following questions concern your faculty. Please describe your distance learning instructors as well as you can by answering the questions in this section. Feel free to add information wherever you think it is applicable by writing it in next to the question to which it pertains.

25. Who is the distance learning course instructor, i.e., the person who delivers the instruction via distance learning technology?
[Check all that apply:] **(n = 127)**

- ❑ No instructors; the course is self-teaching **19%**
- ❑ Same instructors as other conventional courses **72%**
- ❑ Special group of instructors (own staff) just for distance learning courses **13%**
- ❑ Specialist(s) from outside the organization **22%**
- ❑ Facilitator used at other training locations **17%**
- ❑ Fully qualified instructors used at other training locations **13%**
- ❑ No fully qualified instructors at other training locations **3%**
- ❑ No facilitators at other training locations **2%**
- ❑ Other **9%**

26. Why did you choose these instructors?
[Check all that apply:] **(n = 124)**

- ❑ No instructors; the course is self-teaching **16%**
- ❑ No documented reason **3%**
- ❑ Teaching experience **60%**
- ❑ Experience with media **37%**
- ❑ Directed by higher authority **14%**
- ❑ Other **39%**

27. What kind of background do the distance learning instructors have?
[Check all that apply; if there is more than one instructor in each group, please indicate how many after each item:] **(n = 121)**

- ❑ No special background; they are selected from available faculty **49%**
- ❑ Master instructors (senior faculty) **25%; median number =10.0 (n = 12)**
- ❑ Instructors with training/education..... **31%; median number = 8.0; (n = 17)**
- ❑ Selected from faculty because of..... **34%; median number = 7.0; (n = 12)**
- ❑ Faculty with technical expertise.....**22%; median number = 4.0; (n = 10)**
- ❑ Instructional design experience/expertise **21%; median number = 5.0; (n = 9)**
- ❑ Instructional media experience/expertise **14%; median number = 10.0; (n = 8)**
- ❑ Other **17%**

28. What special training do distance learning instructors receive?
[Check all that apply:] **(n = 121)**

- ❑ No special training is provided **12%**
- ❑ Some training provided, e.g., brief introduction to media **55%**
- ❑ Special in-service training provided (several days or longer) **41%**
- ❑ Special training provided by outside organization **12%**
- ❑ College course(s) **5%**
- ❑ Some on-the-job training and practice **48%**
- ❑ Other **15%**

29. What is included in your instructor preparation for distance learning courses?
[Check all that apply:] **(n = 120)**

- ❑ No special training is provided **11%**
- ❑ Introduction to distance learning technology **70%**
- ❑ How to make use of media in distance learning environment **64%**
- ❑ Communications skills necessary for distance learning environment **64%**
- ❑ Instructional development skills for distance learning **49%**
- ❑ How to operate distance learning equipment **53%**
- ❑ How to evaluate distance learning students **35%**
- ❑ How to deliver subject matter via distance learning **61%**
- ❑ How to promote distance learning student interaction **58%**
- ❑ Other **13%**

30. Why did you feel it necessary to train distance learning instructors?
[Check all that apply:] **(n = 121)**

- ❑ No training provided **14%**
- ❑ No documented reason **7%**
- ❑ Untrained instructors were not effective **46%**
- ❑ Required by regulation **3%**
- ❑ Directed by higher authority **3%**
- ❑ Other **43%**

31. Was the training provided effective?
[Check all that apply:] **(n = 120)**

- ❑ No training provided **12%**
- ❑ Instructors made better use of media **53%**
- ❑ Instructors made better use of interaction strategies **52%**
- ❑ Instructors better able to utilize features of distance learning technology **59%**
- ❑ Have not evaluated effectiveness **14%**
- ❑ Other **15%**

PART IV: INSTRUCTIONAL DESIGN

The following questions concern your curriculum. Please describe your distance learning curriculum as well as you can by answering the questions in this section. Feel free to add information wherever you think it is applicable by writing it next to the question to which it pertains.

32. How would you describe the curriculum for distance learning course(s)?
[Check all that apply:] **(n = 127)**

- ❑ No defined curriculum exists for course, i.e., whatever instructor teaches **5%**
- ❑ Same curriculum as conventional course(s) **58%**
- ❑ Conventional course curriculum specially adapted for distance learning **50%**
- ❑ Course developed specifically for distance learning **37%**
- ❑ Distance learning curriculum evolves every time taught **31%**
- ❑ Distance learning curriculum very stable **13%**
- ❑ Other **5%**

33. How would you characterize the objectives/learning outcomes of your distance learning course(s)?
[Check all that apply:] (n = 126)

- ❑ No specified objectives/learning outcomes **2%**
- ❑ No different than conventional course objectives **69%**
- ❑ Analysis indicated distance learning best media for objectives **10%**
- ❑ Objectives developed especially for distance learning **14%**
- ❑ Objectives related to job performance **24%**
- ❑ Certain category of objectives best for distance learning **12%**
- ❑ Simplified version of conventional course objectives **2%**
- ❑ Conventional course objectives adapted for distance learning technology **33%**
- ❑ Other **5%**

34. Why did you select these objectives for distance learning?
[Check all that apply:] (n = 121)

- ❑ No specified objectives/learning outcomes **2%**
- ❑ No documented reason **7%**
- ❑ Used objectives from existing course **71%**
- ❑ To save costs **11%**
- ❑ Best media based on analysis **17%**
- ❑ Research shows these objectives best for distance learning **12%**
- ❑ Previous model, case or example **12%**
- ❑ Directed by higher authority **12%**
- ❑ Other **13%**

35. If you use computer-based training in your distance learning program, how does it fit into the curriculum?
[Check all that apply:] (n = 125)

- ❑ Not used **43%**
- ❑ Primary method for delivery of instruction **18%**
- ❑ Provides support and reinforcement for instructor **24%**
- ❑ Provides practice solving problems **29%**
- ❑ Provides simulation of equipment and procedures **24%**
- ❑ Substitute for hands-on practice with equipment **17%**
- ❑ Other **14%**

36. If you use computer-based training, has it been an effective distance learning tool? [Check the ones that apply:] **(n = 121)**

- ❑ Not used (Check "Not used" in 37a or 37b) **49%**
- ❑ No (Answer below & 37b) **2%**
  - ❑ Not as effective as conventional course **1%**
  - ❑ Distance learning more effective without CBT **2%**
- ❑ Yes (Answer below & 37a) **40%**
  - ❑ More effective than conventional course **7%**
  - ❑ Distance learning more effective with computer-based training **27%**
- ❑ Other **15%**

37a. *If you answered "YES" to 36.*
Why is computer-based training an effective distance learning tool? [Check all that apply:] **(n = 99)**

- ❑ Not used **55%**
- ❑ Effective substitute for instructor **14%**
- ❑ Effective supplement to instructor **27%**
- ❑ Provides practice necessary to learn course objective(s) **30%**
- ❑ Works well with advanced students **28%**
- ❑ Works well with beginning/novice students **24%**
- ❑ Helps "slow" students perform better **20%**
- ❑ Helps "fast" students perform better **18%**
- ❑ Other **11%**

37b. *If you answered "NO" to 36.*
Why isn't computer-based training an effective distance learning tool? [Check all that apply:] **(n = 60)**

- ❑ Not used **88%**
- ❑ Students must interact with instructor **2%**
- ❑ Can't provide the level of explanation necessary **3%**
- ❑ Can't provide the graphic detail necessary **3%**
- ❑ Other **2%**

38. If you develop special curriculum for distance learning or convert existing courseware for use in distance learning, how do you do it?

[Check all that apply:] **(n = 114)**

- ❑ Use instructional systems development (ISD) process **34%**
- ❑ Our own curriculum development process **35%**
- ❑ Previous model, case or example **9%**
- ❑ Use a new instructional design process **9%**
- ❑ Just make minor adjustments to existing curriculum **34%**
- ❑ Other **11%**

39. Why do you use this curriculum development process?

[Check all that apply:] **(n = 109)**

- ❑ Required by regulation **9%**
- ❑ Preference for it among faculty/instructional development staff **50%**
- ❑ Takes distance learning requirements/capabilities into account **57%**
- ❑ Directed by higher authority **11%**
- ❑ Other **18%**

40. If you develop special curriculum for distance learning what are some of its characteristics?

[Check all that apply:] **(n = 100)**

- ❑ Complete new design for distance learning **26%**
- ❑ Additional graphic media included **70%**
- ❑ Increased opportunity for student interaction **65%**
- ❑ Sequence of instruction reorganized **30%**
- ❑ Some materials provided to student in advance **62%**
- ❑ More independent student work **44%**
- ❑ More students working in groups **25%**
- ❑ Objectives broken down into simpler, discrete steps **33%**
- ❑ Objectives broader and more comprehensive **8%**
- ❑ More frequent assessment of student performance **41%**
- ❑ Less frequent assessment of student performance **3%**
- ❑ Other **13%**

41. Who develops your distance learning curriculum?
[Check all that apply:] **(n = 125)**

- ❑ Course instructor **74%**
- ❑ Staff instructional designer(s) (no special qualifications) **15%**
- ❑ Staff instructional designer(s) specially trained in distance learning **38%**
- ❑ Distance learning curriculum is developed by an outside organization **13%**
- ❑ Distance learning curriculum is developed by consultant/contractor **15%**
- ❑ Other **14%**

42. Why did you choose these instructional designers?
[Check all that apply:] **(n = 112)**

- ❑ No documented reason **14%**
- ❑ They were the only ones available **18%**
- ❑ They had knowledge of distance learning technology **42%**
- ❑ They had knowledge of distance learning concepts **40%**
- ❑ They had been trained **25%**
- ❑ They volunteered **12%**
- ❑ They have a knack for technology **10%**
- ❑ Directed by higher authority **11%**
- ❑ Other **21%**

43. How much distance learning curriculum development experience does your staff have?
[Check all that apply; if there is more than one developer in each group, please indicate how many after each item:] **(n = 124)**

- ❑ None **9%; median = 10.0; (n = 1)**
- ❑ Less than 6 months **10%; median = 2.5; (n = 4)**
- ❑ 6 to 18 months **24%; median = 3.0; (n = 14)**
- ❑ 19 to 36 months **21%; median = 5.0; (n = 15)**
- ❑ More than 3 years **52%; median = 3.0; (n = 21)**
- ❑ Other **12%**

44. If your instructional developers have special training or qualifications for developing distance learning curriculum, where did they get their training?

[Check all that apply; if there is more than one developer who was trained that way, please indicate how many after each item:] **(n = 115)**

- ❑ Within our own organization **69%; median = 5.0; (n = 15)**
- ❑ Some other organization (Government/Military) **17%; median = 13.0; (n = 5)**
- ❑ Commercial vendor of distance learning curriculum **15%; median = 8.0; (n = 3)**
- ❑ College/University course(s) **47%; median = 3.0; (n = 13)**
- ❑ Manufacturer of distance learning technology **10%; median = 5.0; (n = 3)**
- ❑ Other **12%**

45. Was the training provided effective?

[Check all that apply:] **(n = 109)**

- ❑ No training provided **11%**
- ❑ Developers made better use of media **43%**
- ❑ Developers better able to design interaction strategies **49%**
- ❑ Developers better able to utilize features of distance learning technology **54%**
- ❑ Have not evaluated effectiveness **25%**
- ❑ Other **5%**

46. What types of professional expertise is required to develop, produce and present your distance learning lessons from start to finish? Please describe below for each category involved: **(n = 101)**

- ❑ Instructor **84%**_____
_____
- ❑ Instructional Developer **63%** _____
_____
- ❑ Media specialist **56%** _____
_____
- ❑ Distance Learning Technician **49%**_____
_____
- ❑ Other (specify) **23%** _____
_____

47. What is the length of your distance learning training day, i.e., how many hours do students spend in class or laboratory each day?
[Check one that applies:] **(n = 120)**

- ❑ Course meets every day: **44%**
  - ❑ Varies from day to day **20%**
  - ❑ Less than 4 hours **13%**
  - ❑ 5-6 hours **9%**
  - ❑ 7-8 hours **6%**
  - ❑ 8+ hours **2%**
- ❑ Classes don't meet every day: **54%**

Training Day	*Class Frequency*
❑ 1 hour **14%**	❑ Once per week **19%**
❑ 2 hours **17%**	❑ Twice per week **18%**
❑ 3 hours **16%**	❑ 3 x per week **13%**
❑ 4+ hours **10%**	❑ 4+ x per week **4%**

- ❑ Other **9%**

48. How long does it normally take to develop a new distance learning course?
[Check all that apply:] **(n = 110)**

- ❑ We don't develop new distance learning courses **26%**
- ❑ We buy developed courses from a vendor **8%**

Course Length	*Time to Develop (hours)*					
	Under 40	*41-80*	*81-160*	*161-400*	*401-1000*	*1001+*
❑ 1-4 hours	❑ 5%	❑ 5%	❑ 4%	❑ 4%	❑ 1.0%	❑ 2.0%
❑ 5-8 hours	❑ 1%	❑ 3%	❑ 4%	❑ 5%	❑ 1%	❑ 3%
❑ 9-24 hours	❑ 2%	❑ 3%	❑ 2%	❑ 1%	❑ 2%	❑ 3%
❑ 25-40 hours	❑ 0%	❑ 4%	❑ 3%	❑ 3%	❑ 1%	❑ 3%
❑ 41-80 hours	❑ 4%	❑ 1%	❑ 5%	❑ 11%	❑ 4%	❑ 2%
❑ 81-160 hours	❑ 0%	❑ 2%	❑ 1%	❑ 5%	❑ 1%	❑ 2%
❑ 161+ hours	❑ 2%	❑ 0%	❑ 0%	❑ 4%	❑ 2%	❑ 6%

49. How long does it take to convert all or part of an existing course to distance learning format?

[Check all that apply:] (n = 104)

- ❑ We don't convert existing courses to distance learning 32%
- ❑ We buy developed courses from a vendor 7%

Length of Distance Learning	*Time to Develop (hours)*					
	Under 40	*41-80*	*81-160*	*161-400*	*401-1000*	*1001+*
❑ 1-4 hours	❑ 7%	❑ 3%	❑ 2%	❑ 2%	❑ 0%	❑ 0%
❑ 5-8 hours	❑ 4%	❑ 1%	❑ 3%	❑ 4%	❑ 1%	❑ 1%
❑ 9-24 hours	❑ 4%	❑ 1%	❑ 3%	❑ 3%	❑ 0%	❑ 0%
❑ 25-40 hours	❑ 2%	❑ 7%	❑ 1%	❑ 5%	❑ 0%	❑ 1%
❑ 41-80 hours	❑ 4%	❑ 3%	❑ 7%	❑ 6%	❑ 2%	❑ 2%
❑ 81-160 hours	❑ 3%	❑ 1%	❑ 1%	❑ 3%	❑ 0%	❑ 0%
❑ 161+ hours	❑ 1%	❑ 2%	❑ 0%	❑ 2%	❑ 1%	❑ 2%

50. Why does it take this long to develop/convert courses for distance learning?

[Check all that apply:] (n = 104)

- ❑ Same as conventional course(s) 43%
- ❑ Difficulty working with technology 15%
- ❑ Inexperienced instructional developers 15%
- ❑ Media preparation 55%
- ❑ Student assessment requires more time 16%
- ❑ Student interaction requires more time 22%
- ❑ Other 23%

51. If you had to allocate the time spent developing or converting courses for distance learning, how much time would be spent on these activities?

[Record the percent of time spent on each. If you don't do the activity record 0 :]

Developing	*Converting* (Expressed as mean percentages.)	
11%	7%	Analyzing job/task requirements (n = 40, 44)
10%	6%	Designing course objectives (n = 40, 44)
12%	14%	Planning course (n = 40, 43)
20%	22%	Developing curriculum materials (n = 40, 43)
6%	7%	Writing curriculum documentation (n = 39, 42)
7%	6%	Developing tests (n = 39, 42)
13%	24%	Developing media (n = 39, 43)
5%	4%	Writing scripts for instructors (n = 39, 45)
6%	5%	Other (n = 41, 45)

Columns do not total 100% because averages are used.

52. Does your organization have a formula or goal to determine how long it should take to develop (convert) a distance learning course? Please describe it, e.g., *each hour of a distance learning course takes 200 hours of staff time to develop (includes analysis of training requirement, design of course objectives/learning outcomes, development of curriculum and associated media).*

Of the 129 organizations surveyed, only 18 indicated that they had a formula or goal to determine how long it should take to develop (convert) a distance learning course.

PART V: GENERAL INFORMATION

The following questions concern specific aspects of distance learning. Please describe your distance learning activities by answering the questions in this section. Feel free to add information wherever you think it is applicable by writing it in next to the question to which it pertains.

53. What research in distance learning is your organization conducting?
[Check all that apply:] **(n = 125)**

- ❑ We are not conducting distance learning research **27%**
- ❑ We are conducting distance learning research in the following areas: **74%**
  - ❑ Effectiveness of distance learning **59%**
  - ❑ Use of various distance learning technologies **54%**
  - ❑ Distance learning multimedia applications **41%**
  - ❑ Role of the instructor in distance learning **39%**
  - ❑ Curriculum development for distance learning **37%**
  - ❑ Other **18%**

54. If your organization is conducting (has conducted) research comparing the training effectiveness of distance learning with conventional instruction, what kind of data is available?
[Check all that apply:] **(n = 121)**

- ❑ We are not conducting research in distance learning **31%**
- ❑ Comparative test results of students **36%**
- ❑ Student opinion questionnaires **59%**
- ❑ Instructor opinion questionnaires **39%**
- ❑ Job performance data **11%**
- ❑ Data indicating learning retention **16%**
- ❑ Data indicating learning transfer **16%**
- ❑ Other **24%**

55. What problems did your organization encounter in implementing distance learning? [Check all that apply:] **(n = 125)**

- ❑ No problems encountered **8%**
- ❑ Cost of technology **62%**
- ❑ Availability of trained/experienced personnel **49%**
  - ❑ To conduct the training **28%**
  - ❑ To use/maintain the equipment **29%**
  - ❑ To develop the curriculum **33%**
  - ❑ Other **3%**
- ❑ Reluctance of faculty to use technology **55%**
- ❑ Resistance of faculty to concept of distance learning **49%**
- ❑ Resistance by administration/management to distance learning **32%**
- ❑ Student resistance to/dislike of distance learning **27%**
- ❑ Knowledge of technology **31%**
- ❑ Regulatory issues **20%**
- ❑ Certification issues **12%**
- ❑ Other **14%**

56. If you have had technology related problems, how could they best be described? [Check all that apply:] **(n = 85)**

- ❑ Capacity; technology couldn't handle what we wanted to do **31%**
- ❑ Interoperability; no standard **29%**
- ❑ Maintainability; system required frequent maintenance **26%**
- ❑ Reliability; excessive system "down time" **24%**
- ❑ Availability; couldn't get components or we had to wait for them **14%**
- ❑ Quality; technology "not there yet" **31%**
- ❑ Other **32%**

57. What is the reason for the problems your organization encountered?
[Check all that apply:] **(n = 11)**

- ❑ No problems **19%**
- ❑ Inadequate funding **41%**
- ❑ Inadequate time to plan & prepare **25%**
- ❑ Lack of experienced/trained personnel **33%**
- ❑ Limited/inadequate facilities **28%**
- ❑ Technological problems **25%**
- ❑ Lack of interest in distance learning **26%**
- ❑ Lack of information about distance learning **23%**
- ❑ Poor management **15%**
- ❑ Other **11%**

58. What solutions could have prevented/diminished the impact of the problem(s)?
[Check all that apply:] **(n = 120)**

- ❑ No problems **14%**
- ❑ Additional funding **47%**
- ❑ Training for personnel **41%**
- ❑ Knowledge of technology **34%**
- ❑ Public relations to overcome biases **36%**
- ❑ Management support **37%**
- ❑ Additional time **28%**
- ❑ Better facilities **26%**
- ❑ Other **10%**

59. What are the limitations on the media that you are using in distance learning?
[Check all that apply:] **(n = 120)**

- ❑ No limitations **31%**
- ❑ Audio quality **23%**
- ❑ Video quality **13%**
- ❑ Graphics quality **9%**
- ❑ Ability to transmit in sufficient quantity **13%**
- ❑ Ability to receive input in sufficient quantity **4%**
- ❑ Ability to store and retrieve data generated during lesson **12%**
- ❑ Other **33%**

60. What is the reason for the limitations cited above (item 59)?
[Check all that apply:] **(n = 113)**

- ❑ No limitations **32%**
- ❑ Technology "not there yet" **33%**
- ❑ Faculty doesn't know how to use distance learning properly **12%**
- ❑ Instructional development does not take full advantage of media **13%**
- ❑ Other **31%**

61. What are your future plans for distance learning in your organization?
[Check all that apply:] **(n = 125)**

- ❑ No new plans **4%**
- ❑ Increase number of courses **77%**
- ❑ Increase scope of distance learning programs **73%**
- ❑ Add faculty **33%**
- ❑ Train faculty in distance learning technology **44%**
- ❑ Educate faculty on benefits of distance learning **42%**
- ❑ Improve distance learning facilities **55%**
- ❑ Add or improve distance learning equipment **71%**
- ❑ Increase funding for distance learning **56%**
- ❑ Eliminate or reduce distance learning **0%**
- ❑ Other **9%**

62. If you are planning to make more use of distance learning in your organization, what are the reasons?
[Check all that apply:] **(n = 124)**

- q No such plans **7%**
- q Cheaper than conventional course **27%**
- q Distance learning course effectiveness **55%**
- q Faculty likes distance learning **16%**
- q Students like distance learning **40%**
- q Experimenting with distance learning technology **24%**
- q Other **40%**

63. If you are planning to reduce or eliminate distance learning courses, what are the reasons?
[Check all that apply:] **(n = 108)**

- ❑ No such plans **96%**
- ❑ Conventional course cheaper than distance learning **0%**
- ❑ Conventional course more effective than distance learning **0%**
- ❑ Faculty dislikes distance learning **0%**
- ❑ Students dislike distance learning **1.0%**
- ❑ Experimenting with distance learning technology **0%**
- ❑ Other **3%**

64. From the identification of the requirement, how long does it take your organization to respond to a training need with a distance learning course?
[Check all that apply:] **(n = 120)**

- ❑ Long term planning is necessary (approximately 1 year) **26%**
- ❑ Between 6-12 months **31%**
- ❑ Within 3-6 months **22%**
- ❑ Less than 3 months **20%**
- ❑ Within a few weeks **10%**
- ❑ Within a few days **9%**
- ❑ Other **12%**

65. If there are things which you have learned about distance learning at your organization which might be of benefit to the Air Force in implementing distance learning technology, please describe them in your own words:

Thank you!

Thank you for completing this questionnaire. Please take a few minutes now to review it and make sure that you have answered all the questions. While the results of this research will be published by the Air Force, neither Mei Technology Corporation nor the Air Force will reveal any specific information which you provided or your name to anyone without your consent. If you are interested in finding out more about the results of this research, please indicate below:

❑ I would like to receive a copy of the results of this research

Once you have finished reviewing the completed questionnaire, please place it in the envelope provided and return it to:

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APPENDIX B: DISTANCE LEARNING CONTACTS

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