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Student attitudes, learning effectiveness, and costs/benefits pertaining to military logistics courses offered in the residence, on-site, and satellite television modes of instruction

Raymond C. Fenn
College of William & Mary - School of Education

STUDENT ATTITUDES, LEARNING-EFFECTIVENESS, AND COSTS/BENEFITS PERTAINING TO MILITARY LOGISTICS COURSES OFFERED IN THE RESIDENCE, ON-SITE, AND SATELLITE TELEVISION MODES OF INSTRUCTION.

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Raymond C. Fenn

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Raymond C. Fenn

Approved June 1995 by

James H. Stronge, Ph.D.
Chairperson of Doctoral Committee

George M. Bass, Jr., Ph.D.

Robert J. Hanny, Ph.D.

Dedication

To my wife Martha

For her love and support, and for her steadfast belief in me and in this endeavor during the six and one-half long years from start to finish.

To Theodopolus

Without whom this dissertation would not have come to be.

To The Fellas

For their companionship, good humor, and gentle chiding.

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STUDENT ATTITUDES, LEARNING-EFFECTIVENESS, AND COSTS/BENEFITS PERTAINING TO MILITARY LOGISTICS COURSES OFFERED IN THE RESIDENCE, ON-SITE, AND SATELLITE TELEVISION MODES OF INSTRUCTION.

ABSTRACT

This descriptive study investigated student attitudes, learning-effectiveness, and costs associated with the residence, on-site, and satellite television modes of instruction for three courses offered by the US Army Logistics Management College. Attitudinal data were collected from 465 military and civilian adult learners pertaining to 13 subscales that measured student attitudes about instructor and instructional competencies. Additional data were analyzed for the purpose of clarifying student perspectives pertaining to mode preference, training on the job, and broadcast television. In addition, the relative learning-effectiveness and the costs/benefits pertaining to the three modes of instruction were identified and analyzed.

Student attitudes towards all three modes were positive, however, attitudes towards the television mode were less positive than for the residence and on-site modes. While statistically significant differences were found for the main effects, it was concluded that they may not have been statistically practically significant. In addition, consistent with previous research, it was found that adult attitudes towards instructional modes often

may not matter when course need is strong, because the motivations associated with the higher exigencies of life may subsume modal attitudes.

Equal learning was achieved among the three modes with respect to knowledge, comprehension, and application level objectives. While learning of higher order skills was achieved in all three modes, it was achieved to a significantly lesser degree in the television mode. Insufficient empirical data precluded any conclusions with respect to the costs of course development, however, it was found that over time, the television mode is less costly to implement.

RAYMOND C. FENN
SCHOOL OF EDUCATION
THE COLLEGE OF WILLIAM AND MARY IN VIRGINIA

STUDENT ATTITUDES, LEARNING-EFFECTIVENESS, AND COSTS/BENEFITS PERTAINING TO MILITARY LOGISTICS COURSES OFFERED IN THE RESIDENCE, ON-SITE, AND SATELLITE TELEVISION MODES OF INSTRUCTION.

Chapter 1

The Problem

Fifty-seven million adult Americans completed continuing education or job-related courses designed to increase targeted job skills in 1992, and that number was projected to rise by 5% a year through the foreseeable future (U.S. Bureau of the Census [USBC], 1993, pp. 148-187). The need for adult Americans to upgrade their employee skills through formal training courses at all levels within the American corporate and military communities has become widely accepted. Adams and Hamm (1989) found, for example, that "fifty years ago, just about anybody could take the professional knowledge they learned in school (or skill knowledge they learned on the job) and apply it throughout their professional careers. Now, workers have to be constantly updated" (p. 62). "Even factory workers (at GM for example) now spend more time in instructional situations on the job than they ever did in the public school classroom" (Adams & Hamm, 1989, p. 75).

Although there are millions of adults who need training, and thousands of corporations, community colleges, and universities that have the expertise and the desire to offer appropriate courses, the money needed to pay for hiring teachers, developing courseware, and for bringing adults into conventional residence classrooms has not been available. Accordingly, educators and corporate trainers have mounted a strategic search for a cost-

effective way to increase the availability of adult training programs, while holding costs to a minimum and without sacrificing program quality.

The approach that has been receiving the most serious attention has been to offer courses in teaching modes that deliver instruction in real time directly to large numbers of students located outside of traditional school settings, thus, using economy of scale to hold down costs. This approach, which originated with paper-based correspondence courses over a hundred years ago, has come to be called distance learning. Distance learning has been defined most recently as any and all teaching-learning situations in which teachers and learners are physically separated by geographic distance (Office of Technological Assessment [OTA], 1989). Wagner clarified this definition, emphasizing that distance learning requires teacher-learner interaction, and therefore, "distance education and training consists of the transmission of interactive educational or instructional programming to geographically dispersed individuals and groups" (Wagner, p. 29, 1993c). Both definitions stressed the importance of at least part of the process taking place in real time.

Distance learning technologies. The process of distance learning began to change rapidly with the introduction of electronic means - or modes - of delivery which have been generically classified as Communications Technologies. At least three of these technologies have been applied extensively in distance learning configurations, starting about 25 years ago with audio/audiographic technology such as radio, audio tapes, electronic blackboards, etc., progressing to computer (digital) technology, and most recently to motion video technology such as broadcast television, video disks, and videotapes (Kerka, 1989; Seamons, 1990), however, from among all of the available technologies, the most preferred have come to be full motion analog (Meuter & Wright, 1989) or digital (Ho, 1991) television.

Satellite television. Measured in terms of learning-effectiveness and costs/benefits, full motion television signals offer the most promise for all levels of education - K-12, higher- and adult-education. At this moment there are more than 30 communications satellites in orbit around the Earth with a combined capacity to transmit simultaneously as many as 4,000 digitally-compressed signals to virtually all locations within the Continental United States, and as far as Alaska and Hawaii (Satellite News, 1994). Most importantly to the educational community, the introduction of full motion digital television signals has reduced satellite transponder broadcast fees to a level as low as $150 an hour.[1]

In addition to decreasing transponder fees, digital technology has lowered the costs of television production because digitally-based courseware can be manufactured for less than 10% of the cost of paper- or analog-based courseware (Watkins, 1992, p. 7). This trend toward lower costs, along with the easily accessible availability of communications satellites, terrestrial cable systems, microwave links, and fibre optics networks, have combined to make it possible for anyone, anywhere, to learn from anyone, anywhere, in real time, without teachers or learners having to leave their schools or job-sites, all at a cost which is well below that of attending the same courses in most residence settings.

Distance learning population. With the availability of reliable, affordable, communications technologies, more attention has been devoted to the potential learners. Such learners include those working adults who desire higher education, and the large numbers of fulltime employees who require new content knowledges and skill development in disciplines that employers

[1] Transponders are the amplifiers on a satellite that capture uplink signals and retransmit them to downlinks. Satellites typically carry 12 or 24 transponders. The cost that AT&T charged the Satellite Education Network in 1994 for digital transmission started at $200 an hour, and decreased to $150 an hour as monthly usage increased.

are not qualified to offer, or that require employer-developed formal training that is not available at every location. Carl (1991), referring to this population from the perspective of higher education, determined that while not every course should be taught by technology, "the world of education is changing [and] the very existence of a college or university may rest upon that institution's ability to attract and serve this newly defined and widely geographically distributed population" (p. 67).

Hilliard (1985) identified eight distinct categories of adults, ranging from the homebound to those who have been forced to change occupations due to the changing American economy, for whom distance learning is the best alternative method for learning new skills. To Hilliard's list must be added another category representing the large number of corporate employees who require, for whatever reasons, specialized training to help them stay abreast of changes within their employing organizations. This category includes the nearly 3 million people who work for the Federal Government, of whom approximately 1 million are civilian employees of the Department of Defense (DoD). By itself, this large civilian workforce would make the DoD America's largest civilian employer, yet, the DoD also employs at least 1.5 million men and women in the military services who are stationed in the United States.

Although some facets of the DoD milieu are unique to a military environment - such as military field maneuvers - the need of Defense Department to maintain a well-trained, up-to-date workforce is at least the same, yet, arguably more critical, as that of any corporation which maintains a large, diverse, and geographically dispersed workforce that aspires to remain competitive. In any given recent year the DoD has had the

requirement to provide some form of training to as many as 2.6 million people, or 58.3% of the total Federal workforce (USBC, 1993, p. 350).[2]

In order to maintain the readiness required to meet its many missions, the DoD has developed an extensive education and training system which includes a mix of service schools, colleges, and universities that provide courses in residence and at the employees' installations (i.e., on-site). However, in the past 3 or 4 years, the same general economic circumstances that have so adversely affected funding for American higher education have brought about similar reductions within the DoD educational system.[3] Significant personnel reductions have been made, reducing management's incentive to send fully-engaged employees to residence schools for training. Loss of instructor personnel have made it more difficult to spare instructors for on-site courses. Therefore, as within the private sector, the search for a more cost-effective means for reaching military and civilian employees with timely and effective training has been made a high priority within the DoD (Watkins, 1992). Most recently the search has focused upon "high tech" distance learning, and within that domain, upon using television as the principal mode of instruction (Pisel, 1994).

Satellite television within the DoD. Television instruction has been available within the DoD since the late 1960's, however, it was limited to videotaped lessons until the first "live" broadcasts were made by the Army in the early 1980's, under the aegis of The Army School of the Air[4]. Today, all

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[2] These data account for the members of the Federal workforce who are resident in the United States. Approximately 447,000 military, and an undetermined number of civilians are also stationed at various locations around the world (U.S. Bureau of the Census, 1993, pp. 358).

[3] The Army Training and Doctrine Command, for example, has been forced to make across-the-board cuts resulting in a 10% reduction in training courses at all Army service schools and colleges effective in FY95-96.

three military services - Army, Air Force, and Navy - offer at least a few live courses in the television mode. The Navy, for example, presently offers television courses to a small network of six sites on the East Coast, while the Air Force Institute of Technology, which inaugurated its first broadcasting studio at Wright-Patterson Air Force Base at Dayton, Ohio, in November 1993, now has a network of approximately 15 sites.

The largest and oldest continuous teletraining program in the DoD was established in January 1985, by the United States Army Logistics Management College [ALMC (pronounced 'AL-MAC]) at Fort Lee, Virginia, to broadcast logistics-oriented courses to military and civilian employees of the Army. The network has since been expanded to reach Air Force installations as well as several other DoD agencies. In October 1992 control of the program was transferred to the Army Training Support Center (ATSC), located at Fort Eustis, Virginia, and in January 1993 the Satellite Education Program was renamed the DoD Satellite Education Network (SEN) to reflect its growing diversification. In rounded numbers, since its inception the network has provided courses to 48,000 military and DoD civilian employees enrolled in ALMC courses, and to 7,000 employees from other Federal agencies. At its peak during fiscal year 1992 (FY92) the SEN broadcast 39 courses, ranging from 6 to 90 hours in length, to more than 5,400 students scattered among 102 locations within the continental United States (ALMC Annual Historical Summary [Historical Summary], 1992).

Although the Network experienced steady growth until 1992, a series of circumstances compounded to reduce the number of courses broadcast from

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[4] This researcher was the coordinator for the three pilot courses that were offered by the US Army Quartermaster School, which inaugurated the Army School of the Air in 1983-84. Very few courses were broadcast, and in 1985, the School of the Air ceased operations, to be revived in 1991 in a different format (2way video/2way audio), under a new name, TNET, which is an acronym for TRADOC Teletraining Network. To date, the TNET has been relatively inactive.

39 in FY92, to 13 in FY93, which decreased the number of broadcast course hours by more than 64%. In addition, the growth rate for new downlink locations, which had averaged 11 new sites a year since 1985, dropped to zero. The number of SEN courses and graduates from FY88-93 are shown at Table 1.

Table 1

Use of Television Mode of Instruction During the Past 7 Fiscal Years

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
No. Courses	37	39	38	33	39	13	22
(% Change)		(+5)	(-3)	(-13)	(+18)	(-67)	(+69)
No. TV Hours	1,192	1,476	1,341	1,376	1,270	457	512
(% Change)		(+24)	(-9)	(+3)	(-8)	(-64)	(+12)
No. Graduates	4,032	4,753	4,953	4,457	5,391	2,968	3218
(% Change)		(+18)	(+4)	(-10)	(+21)	(-45)	(+8)

Note. TV hours represent courses broadcast for the College and other users. Televised Town Meetings and other non-educational broadcasts are not included.

After a considerable amount of lobbying, the Network course load for FY94 was increased to 22 courses; however, this still represented only 56% of the number of courses offered during FY92. From a more critical perspective these 22 courses required only 512 broadcast hours, which amounted to only 9% of the basic annual production capacity of the three broadcast television studios operated by the SEN.

Given these circumstances, the SEN staff made a strong effort to persuade the ALMC faculty to schedule additional courses for broadcast in FY95. When compared with alternatives such as seeking courses from other DoD schools or Federal agencies, the strategy of encouraging the ALMC faculty to increase course offerings in the television mode presented three clear advantages: (a) The FY94 ALMC Course Catalog listed 75 courses (out

of 88) that appeared to be viable candidates for broadcast; (b) the television support staff and the instructors who would be needed to reconfigure and to teach these courses for television were already on-hand within the college; and (c) at least 50% of the target population for ALMC courses (which was conservatively estimated to exceed 230,000 Army military and civilian employees), were known to be located at installations which already had SEN downlinks established, so there were a large number of employees with the potential to be enrolled in the televised courses.[5]

Although the ALMC administration strongly urged the faculty to schedule additional courses over the network in FY95, the effort was unsuccessful because the faculty was not persuaded that television offered a viable alternative to face-to-face instruction. Ultimately, the administration was reluctant to force faculty members to choose a mode of instruction that they so clearly opposed. In an effort to bring focus to this opposition, a review of ALMC records dating from 1990 showed that three particular perceptions had been cited frequently by the faculty on end-of-course evaluation documents as their rationale for not selecting the television mode of instruction: (a) The ALMC students do not want to take courses in the television mode, (b) logistics courses are too complex to be taught effectively via television, and (c) the television mode is too expensive when compared with the residence mode. These perceptions were repeated during meetings and personal conversations with the staff of the Satellite Education Network. In addition, the records indicated that many faculty members still harbored a

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[5] This figure was provided in July, 1993, by Mr. Jack McMurchy, C, Training Technology Division, ALMC Directorate of Academic Technology (DAT). Mr. McMurchy cited several sources for this number. Chief among them were the principal administrators who managed the career training programs for Army military and civilian logisticians, and the training managers from other DoD agencies with whom Mr. McMurchy had coordinated planning for future logistics course requirements. Note that these 230,000 potential students served with the Army. When the other Services were accounted for, the number of potential students increased.

strong mistrust of television technology which had originated from a series of technical difficulties that had been encountered during Network startup activities.

Given these circumstances, before asking the ALMC faculty to increase their course offerings on television in FY96, it was necessary to learn more about student attitudes concerning the residence and the television modes of instruction. Further, it was important to investigate the varying degrees of learning-effectiveness and the actual costs associated with developing and implementing instruction in these two modes. The on-site mode of instruction, wherein ALMC instructors travel to the students' installation, was included in this study because for several years, the faculty had annually chosen to teach about as many courses face-to-face with students at their job-sites as were being taught in residence. It appeared, therefore, that the ALMC faculty perceived there was little difference between the residence and the on-site modes.

The College does employ other avenues of instruction; however, only the residence, on-site, and television modes are selected by the instructors themselves on the basis of an annual systematic review of student needs. In addition, these are the only modes that involve ALMC instructors in teacher-student interaction in a real-time, dynamic learning environment, and teacher-student interaction has been theorized to be a powerful influence upon student learning, as well as upon student attitudes concerning the 1way video/2way audio television mode of instruction (where instructors cannot see their students). Finally, these three modes of instruction have been the only course modes that have been systematically evaluated by the College administration for educational effectiveness, and ALMC end-of-course questionnaires collected from FY89 to the present (along with student test

and final course grades) were important sources for gaining effectiveness data that appeared to be pertinent to the purposes of this study.

Theoretical Rationale

Student attitudes. What are attitudes and how can an analysis of student attitudes lead to findings that will be of importance to this study? Gable (1986) described two schools of thought regarding the structural nature of attitudes. Proponents for the first, known as "unidimentionalists" view attitudes from "an *evaluative* (e.g., positive-negative or favorable-unfavorable) perspective" (p. 4). Proponents for the second school of thought, known as "component theorists" view attitudes to be "composed of affective, cognitive, and behavioral components that correspond, respectively, to one's evaluations of, knowledge of, and predisposition to act toward the object of the attitude" (p. 5). The component theorist view was of greater relevance to this study because the "students" in this instance were adult military and civilian employees of the Department of Defense, who appeared to be highly committed to their jobs and to be motivated by a strong sense of duty. Thus, all three components, affective, cognitive, and behavioral, were important dependent variables.

Attitudes influence acceptance and rejection. Krathwohl, Bloom and Masia (1964) found that attitudes, interests, and values are constructs "which emphasize a feeling tone, an emotion, or a degree of acceptance or rejection.... [that] vary from simple attention to selected phenomena to complex but internally consistent qualities of character and conscience" (p. 7). Central to their affective classification scheme was the process in which given attitudes, interests, values, and similar affective constructs, progressed from a level of initial awareness to levels of internalized influence, which

Krathwohl, Bloom and Masia (1964) believed could ultimately become strong enough to control a person's behavior. This process, termed "internalization," refers to the inner growth which the researchers believed would take place as individuals accepted "the attitudes, codes, principles, or sanctions that [would] become a part of themselves in forming value judgments or in determining their conduct" (p. 30).

Attitudes are perceived as reality. Twelve years after the affective taxonomy was published, Bills (1976) theorized that the nature of affect could be shown to stem not from an internalized domain, but rather from perception. He posited that

> the perceptual organization of a person includes all of his perceptions or beliefs about the nature of reality.... Some of [these beliefs] are about what is important, others are beliefs about how we should be prepared to experience people and events, and some are beliefs about who we are and what we are like. These beliefs are called facts, values, attitudes, interests, prejudices, self concept, and the like. They are all beliefs and for the individual they are reality. They are all cognitive perceptual in nature; they are the results of highly selective processes and definitions, and they have all been learned.... Affect develops as a consequence of the interactions of the perceptual field into which they are organized with people, situations, and objects, and thus affect is a relational result. (pp. 21-22)

Attitudes motivate behavior. Payne (1976) reported that affective variables (which he termed to be feelings, whereas Bills had termed them to be "cognitive perceptual in nature") could be expected to motivate behavior. Payne was supported by Beatty (1976) who also emphasized that affect has motivational properties, citing that "research has shown that people move toward or attempt to continue pleasant feelings and people move away from or attempt to stop unpleasant feelings" (p. 121).

Thus, it appeared probable that the military and DoD civilian employees who enroll in television courses, will evaluate those courses, form cognitive attitudes about them, and develop a predisposition to act towards

them in a positive or a negative manner. Further, these attitudes can become motivational and can be expected to affect the students' performance, therefore, measuring these attitudes should lead to findings that will help to explain whether or not military and DoD civilian employees want to take courses by television.

Learning-effectiveness. What is learning effectiveness and what is its importance to this study? Learning effectiveness can best be explained in relation to curriculum and instruction. Miller and Seller (1985) defined "curriculum as an intentional set of interactions that facilitate learning and development" (p. 189). To these researchers, one purpose of any curriculum is to provide an overall sense of where the teaching-learning process is leading. To differentiate between curriculum and instruction, they clarified that "in *instruction*, the focus is on the immediate, or a micro set of interactions; the teacher designs an immediate set of learning experiences to achieve specific objectives" (p. 189). In this study, learning-effectiveness can be described as the degree to which the specific objectives are learned as a result of the process of instruction, and the degree to which students come to understand the overall sense of where the teaching-learning process is leading. Learning-effectiveness is an important construct in this study because it is the dependent variable that is probably the most widely used by educators to define student success.

Learning-effectiveness can be assessed. Miller and Seller (1985), discussing the Tyler model of curriculum development, stated that it is possible to determine whether intended instructional purposes are being met by evaluating "the effectiveness of the learning experience against the original objectives" (p. 212). Paraphrasing Tyler, they stated that evaluation

> should focus on changes in student behavior. Thus, pretests should be used, so that teachers can determine whether student performance improves in the designated areas. In the Tyler model, data is collected through tests, observation, interviews, questionnaires, and actual

> student products. Tyler insists that all evaluation procedures must relate to the original objectives. (pp. 212-213)

Learning-effectiveness can be assessed in any mode of instruction. While not specifically relating instruction to learning-effectiveness, Simosko (1988) reported that when learning outcomes and standards are defined by the instructor, "we make it possible to assess individual performance and ability more efficiently and accurately, regardless of when, where, or under what circumstances the learning takes place" (p. 66). In the context of this study, learning-effectiveness can, therefore, be determined regardless of the mode of instruction.

Statement of the Problem

The purpose of this study was to investigate the selection and impact of various modes of instruction on military and civilian employees of the Department of Defense who were enrolled in logistics-oriented, job-enhancement training courses. Specifically, the study sought to determine (a) the attitudes of military and civilian employees (students) about completing logistics courses in each of three modes of instruction (residence, on-site, and satellite television), (b) the relative learning-effectiveness associated with the courses offered in each mode, (c) the relative costs to develop courses for each mode, and (d) the costs, in dollars spent on a per student, per hour basis, to implement each mode.

Research Hypotheses

ALMC faculty members have resisted selecting the television mode of instruction, stating their perceptions that students do not want to take courses by television, that ALMC logistics courses are too complex to be taught effectively over television, and that the television mode is too expensive to

develop and to implement. This research investigated the validity of the above claims by testing the following hypotheses:

1. It is hypothesized that student attitudes toward modes of instructional delivery will be least positive ($p<.05$) towards satellite television when compared with the residence and on-site modes.

2. It is hypothesized that students will not achieve equal learning ($p<.05$) within ALMC courses (A,B,C) as determined by their modes of instructional delivery: residence, on-site, or television.

3. It is hypothesized that courses designed for the television mode of instruction cost more to develop than do the same courses when designed for the residence or on-site modes of instruction.

4. It is hypothesized that, in dollars spent on a per student basis, courses designed for television cost more to implement in the television mode, than do courses designed for the residence and on-site modes when implemented in those modes.

Operational Definitions

The operational definitions given below have been drawn from the distance literature, from the military training community, and from the satellite television technological community. Arranged alphabetically, they are:

1. Course Director. An individual (military or civilian) who is held accountable for the quality and content of a specific training course. At the ALMC, course directors coordinate the development of learning objectives, teaching methodologies, instructional materials and tests; they perform quality assurance functions, assign subject-related teaching areas to course instructors, and evaluate instruction and instructor performance. The ALMC course directors have been hired because of their subject matter expertise

and job experience, and many teach on a limited basis, however, only approximately 10-15% have completed formal courses in education or have had any teaching experience outside of the military.

2. Distance Learning. As defined by Wagner (1993c), "distance education and training consists of the transmission of interactive educational or instructional programming to geographically dispersed individuals and groups.... [in part, in real time]" (p. 29). The most popular modes of instruction used with distance learning include paper-based correspondence courses, computer-assisted instruction, and broadcast television (employing either pre-recorded videotapes or instructors broadcasting live over cable, fibre optic, microwave, or satellite systems).

3. Facilitator. An individual located at a television downlink receiving site who assures that equipment is operating properly prior to the broadcast, who monitors the classroom during a satellite broadcast, and who performs administrative tasks (takes attendance, distributes course materials, facilitates course exercises, mails course examinations and class evaluations back to the course instructor for grading, etc.). In the military, most facilitators are training technologists who work for local installation military or civilian training officers. Facilitators usually are not content experts for the courses they facilitate.

4. Instructor Performance. This pertains to an ALMC faculty member's performance as an instructor in the residence, on-site, and television modes of instruction. Performance encompasses the full range of educational activities such as job and task analysis, instructional design, development, instruction, and evaluation.

5. Instructional Products. Educational products such as lessons completed, paper-based and electronic visuals, tests or practical exercises completed, etc., as defined by Kaufman and Thomas (1980).

6. Instructional Process. Teaching strategies, methodologies, and other instructional activities as defined by Kaufman and Thomas (1980), that are employed by ALMC faculty in residence, on-site, and on television.

7. Satellite Television Course. A credit course that is taught over the Satellite Education Network and officially recognized by award of a Certificate or Diploma.[6]

8. Satellite Education Network (SEN). The television network over which ALMC courses are broadcast. The SEN uses satellites as the means for transmitting both analog and digital television signals to downlink locations across the continental United States. There are currently 102 downlink locations affiliated with the network, of which 72 are located at Army Installations, 15 are located at Air Force Installations, and the remainder are located at various sites operated by the Defense Logistics Agency (supply or maintenance depots, inventory control points, etc.). There are no technical limitations to the number of sites that can become a part of the Network.

9. Instructional Television. The instructional medium that is broadcast over the SEN. It originates in a studio wherein the instructors are assisted by a television director who coordinates their efforts with those of camera, teleprompter, sound console, and video graphics operators. Comprised of 1way video, like that used by the commercial television networks, the medium employs 2way audio, using telephone lines to deliver the return audio signal back to Fort Lee. Students communicate with their instructors by using push-to-talk microphones located at the students' desks. The audio loop is fully interactive, meaning that instructors and students can converse over the network in real-time. In addition, students at any given location can

[6] Many ALMC courses are accredited by the American Council on Education (ACE), which has assigned higher education Quarter Hour credit equivalencies to each approved course.

hear questions and comments from students located anywhere else in the network at the same instant as the instructors.

10. Student. An adult military or civilian employee of the Department of Defense - or another Federal agency - who usually is working in a logistics-oriented job position. A student may be enrolled in a course or workshop taught in residence at the ALMC, on-site at a military installation or a nearby civilian facility (e.g., in a hotel conference room), or over the Satellite Education Network.

11. Television Instructor. An instructor teaching all or a part of a given course in the television mode. All ALMC faculty have completed an ALMC Instructor Development Course prior to teaching their first block of instruction for the College. Approximately 15% of the ALMC faculty have completed the ALMC Advanced Education Technology Course - Television (AETC), which is designed to teach instructors how to develop and implement instruction in the television mode.

12. Training. It has become the custom throughout the Department of Defense (DoD) to use the term training when referring to virtually any kind of educational activity. In this study, references to education generally have been subsumed under the general term, training, because that is the vernacular in which ALMC courses are discussed, and supporting data have been identified, stored, and retrieved as training information. With a few exceptions, no distinction has been made between the differing purposes of training or education as these terms are understood by non-military educators.

Significance of the Study

This investigation of military and DoD civilian employee attitudes about taking courses by television is important to training administrators, to

instructors, and to military and civilian employees throughout the DoD because the learning-effectiveness and costs/benefits pertaining to the courses taught are thought to be closely allied with their modes of instruction. During this period of severe cost reductions throughout the DoD, empirical evidence which documents the relative learning-effectiveness and costs/benefits that can be associated with delivering the subject ALMC training courses in residence, on-site, and by television will be an important tool for the ALMC administration and faculty to use when selecting course modes in the future. Heretofore, as guides for mode selection, the faculty have been relying upon their personal perceptions of the relative attributes of the residence, on-site, and satellite television course modes. New knowledge about student attitudes towards taking courses in residence, on-site and by television will lead to a better understanding of student behaviors pertaining to, and their impact upon, the use of all three modes of instruction.

In addition, what is learned in this study may have implications for educators who manage distance learning programs in the private sector. Although the accessible population for this study consists of DoD and other federal employees, they may be expected to share similar educational needs and experiences with adults from private sector organizations to the extent that findings gained from this study will be relevant to private sector educational administrators.

Limitations of the Study

The study posed the following limitations:

1. Due to the limited number of courses that were offered in the television mode at the time of this research, the courses selected for study may not have been fully representative of the total range of courses offered by the College.

2. Course Directors have the authority to impose their own preferred techniques and methodologies upon instructors with respect to the development and implementation of instruction. Therefore, instructor decisions made in residence may not have represented the instructors' own instructional philosophy or preferred practices. Instructor decisions made on-site - or outside of the purview of the course directors - may have differed in scope from decisions made in residence or in television iterations where instructor activities could be easily overseen by the course directors. Finally, although the instructors who participated in this study were graduates of the Advanced Educational Technology Course - Television, their experience levels with respect to teaching on television varied from those of a second-iteration instructor to those of two instructors who have taught on television 2 or more times a year over the past 5 years. This range may not have been fully representative of the typical range of instructor experience found in ALMC courses offered by the SEN.

3. The SEN broadcast technology employed a studio-supported 1way video/2way audio system that achieved instructor-student real-time interaction through use of push-to-talk microphones located on the students' desks, and study findings pertaining to the satellite television mode might not be apropos to other distance learning teletechnology formats.

4. Course facilitators who assisted students at the downlink locations may not have been trained or experienced as facilitators, and their experience with the SEN or with its technology may have varied widely.

Chapter 2

Review of Related Literature

Within the Department of Defense (DoD), the search for a cost-effective means for reaching widely-dispersed, homogeneous, military and civilian personnel with timely information and effective training has become an undertaking of high priority. Brigadier General John M. Watkins, Jr., Commanding General of the Army Worldwide Information Systems Engineering Command, reported that

> today, the military is faced with a challenge of how to maintain a quality force in an environment characterized by decreasing budgets and increasing expenses. In this situation, the engineering and delivery of the information infrastructure is critical to the success of the Army. We are constantly looking for ways to leverage our efforts to obtain the greatest benefit. (Watkins, 1992, p. 1)

Since the latter part of 1992, the Army leadership's search has been narrowed, focusing first upon the concept of using distance learning as a means for reaching out to its military and civilian personnel, and secondly upon using television as the principal mode of delivery. In 1993, the scope of this effort was expanded to include the other military services. While this approach has generated great interest among higher-level managers, instructors have been skeptical, and student attitudes have remained generally unknown.

To provide an appropriate understanding of the underlying issues, their relevant history, and their relationship to the accepted educational and communications theories and practices followed by the American educational community in general and by the American distance learning community in particular, this chapter will report on research made to investigate (a) the nature and characteristics of distance learning student populations; (b) the andragogical fitness of modern communications technologies and distance learning programs, and their applications in adult education settings; (c) teacher and learner attitudes pertaining to existing adult distance learning programs, including a review of the theorized attributes of attitudes that are relevant to this study; (d) current theories for effective teaching and learning in the television mode of instruction; (e) the learning effectiveness of broadcast instructional television; and (f) the costs of using television as a mode for distance learning.

Research On Distance Learning

Distance Learning Populations

Adult Learner populations. The number of adult Americans with immediate career-related learning requirements currently exceeds 20% of the population of the United States. In 1992, for example, 57 million adult Americans completed education or training courses that were designed to increase targeted career and job skills, and that number was projected to rise by 5% a year through the foreseeable future. (USBC, 1993, pp. 148-187). This large population has been seeking knowledge and skill development through traditional and non-traditional higher, continuing, and employer provided education and training programs.

Since the mid-1980's, adults have been enrolling in higher education courses at an accelerating rate, becoming "the fastest-growing segment of all the population groups in higher education" (Benshoff & Lewis, 1992 p. 1). More than one-half of all graduate students are over the age of 30, and one-third to one-half of all American college students are adults who have returned to school full- or part-time while maintaining responsibilities such as employment and family (Benshoff & Lewis, 1992).

In addition to those with a need for higher education are the millions of American adults who have found they must upgrade their existing job skills or acquire new ones simply to remain competitive in their career fields. Adams and Hamm (1989) reported that "fifty years ago, just about anybody could take the professional knowledge they learned in school (or skill knowledge they learned on the job) and apply it throughout their professional careers. Now, workers have to be constantly updated" (p. 62). "Even factory workers (at GM for example) now spend more time in instructional situations on the job than they ever did in the public school classroom" (Adams & Hamm, 1989, p. 75).

Probably the largest identifiable segment of those who are seeking job-enhancement training may be found among the nearly 2 million active duty military and civilian personnel who work within the Department of Defense (DoD), plus the approximately 1 million individuals who serve part-time in the Military Reserves and the National Guard. As an example, US Army Reserve personnel are assigned to more than 7,000 Reserve Units located at 4,000 sites, (Pisel, 1994), and these personnel require annual training in hundreds of job specialties. While some facets of the DoD milieu are unique to the military such as the need to conduct military field maneuvers, the requirement for the DoD to maintain a well-trained and up-to-date work force

is virtually no different from the needs of any other large corporation with a geographically dispersed workforce that aspire to remain competitive.

Adult distance learner populations. The demand for adult education and training programs recently has reached such a critical level that the traditional providers have become collectively unable to satisfy it through the more traditional channels. Many providers have reached the limit of their capabilities and they do not have the funds to increase the size or scope of their programs. In addition, many do not have the necessary subject matter expertise required to meet the new and unique training needs that are attendant to the rapidly changing labor requirements of American industry. Not satisfied with the programs available through traditional channels, many hundreds-of-thousands of adults have turned to less traditional means for that training. From among these new "distance learning populations," Hilliard (1985) has identified eight large, disparate categories of people who have demonstrated a need for education or training beyond the high school level, but who otherwise have become unable, or unwilling, to attend those courses in the more conventional settings, and have, thus, become distance learners. They include (a) the homebound, (b) those barred from traditional sources for economic or occupational reasons, (c) persons who are isolated or who lack transportation, (d) those who are sociologically or psychologically barred, (e) the aged or retired, (f) students now enrolled in college who benefit from courses not available at their schools, (g) the increasingly expanding number of non-traditional or part-time students who have dropped out of school, and (h) those who have been forced to change occupations due to the changing American economy (See Hilliard, 1991, pp. 27-28).

The rapidity with which modern technologies and global economic forces can impact upon markets, jobs, and careers, has made it highly

probable that Americans increasingly may have to return to school at various stages of their careers in order to remain competitive, and a few researchers have concluded that distance learning will increasingly become the accepted means for providing that schooling. In her research for the Western Cooperative for Educational Telecommunications (WICHE), for example, Wagner (1993a) noted that "higher education must prepare to meet aggressively the challenges posed by rapid changes in the economic structure and character in our society" (p. 7). She reported that to meet these challenges, higher- and continuing-education

> faculty must engage students as active participants in lifelong learning... universities must emphasize a rigorous and integrated curriculum that blends liberal arts with vocational, technical and professional education.... [and] higher education must be responsible to the educational needs of its new clientele: lifelong learners, placebound students, part-time students, working adults, individuals in rural communities, and members of under-represented racial and ethnic groups.... [In addition,] efficient and effective use of technology for instruction, educational delivery, research facilitation and campus management must become a state priority. (Wagner, 1993a, p. 8)

Distance Learning Technologies

The adult populations that have been enrolling in distance learning courses appear to share at least four broad characteristics. Generally, these populations tend to be (a) spread across the United States in need-specific, identifiable population pockets of varying sizes of from one to thousands; (b) in need of the training or education they seek (for many the need is immediate); (c) self-motivated; yet, (d) unable or unwilling to pursue their needs through more traditional channels. Most distance learning providers have successfully catered to these population characteristics, providing distance learning programs that have been readily accepted because they have been perceived by students to be appropriate, convenient, affordable, and demonstrably learning-effective. Research findings have shown that most

distance learning programs have systemic ties to only a few well-engineered electronic telecommunications technologies, and these "telecommunications technologies have been rapidly expanding learning opportunities and access to educational resources beyond those immediately or traditionally available" (*OTA*, 1989, p. 53).

Telecommunications technologies. In the modern context, early distance learning systems employed audio technology such as radio and audio tapes. With the advent of computers - or more precisely, digital technology - electronic blackboards and other audiographic applications were introduced that combined "two-way computer conferencing with audio interaction" (OTA, 1989, p. 61). More recently, the distance learning community has turned to motion video technology such as broadcast television, video disks, and videotapes (Kerka, 1989; Seamons, 1990); and the most preferred systems have come to be full motion analog (Meuter & Wright, 1989) or digital (Ho, 1991) television.

With all telecommunications technologies, transmission of the electromagnetic signals that carry information can be made over coaxial cable, copper wire, fiber optics, by microwave, or by broadcasting the signals to satellite transponders which rebroadcast the signals to earth stations equipped with the terminal equipment required to capture and to transform signals into pictures and textual information (OTA, 1989; Wagner, 1993b). All of these

> transport media require network facilities for switching (where signals are situationally directed from one point to another), multiplexing (where multiple signals carried along a single transport medium are split according to applications requirements) and bridging (where signals are brought together from point-to-point to multi-point, as in the case of conferenced telephone calls. (Wagner, 1993b, p. 5)

No given telecommunications technology has been found to be ideally suited for all distance learning applications, and no given technology has been developed to satisfy requirements that have been specifically associated with distance learning. Consequently, virtually every technology that has been adapted for distance learning has been found to have inherent strengths and weaknesses that can enhance or detract from distance learning programs (OTA, 1989). However, all telecommunications technologies do share certain commonalities. For example, all are regulated by one or more governmental agencies; they all require association or interconnectivity with local infrastructures; and they all carry the risk of becoming outdated in relatively short intervals of time. The newest distance learning systems have become increasingly integrated, more intelligent, and more easily interconnected with other technologies (OTA, 1989). They have also become more transparent, making it possible that in the near future, as predicted by Lowenstein and Barbee (1990), "individuals will interact with systems without being aware that learning is occurring and that their behavior is being modified" (p. 2).

Digital Technologies. The newest telecommunications technologies have been built upon the microcomputer (Lowenstein & Barbee, 1990), and Watkins (1992) has reported that digital technology has been quickly and widely employed for distance learning applications because digitally-based courseware can be manufactured for less than 10% of the cost of paper- or analog-based courseware (Watkins, 1992). In addition to being less costly, digital courseware is easily scaleable, it is interactive, and it can be personalized:

> Scalability means that you can display information as multiple types of media, such as pictures, text or video, simultaneously in different areas on the same screen... Live video can be blended with static media and other pre-recorded information to create a wide array of presentation options.... Interactivity means that the user... can have

> direct and immediate control over the full range of informational content.... Personalized not only means that the individual has more control over the 'what and when' of programming, but he or she may have more control over the pace of instruction and even be able to determine an individual pathway to discovery. (Watkins, 1992, pp. 5-6)

Digital technology has other characteristics that have made it advantageous for distance learning applications. Digital signals can be stored without any loss of quality (Wagner, 1993b), which makes a digital system ideal for recording virtually anyone or anything for later use as a learning resource. Digital information can be compressed, which makes it possible to broadcast up to eight compressed digital signals through one television satellite transponder that, heretofore, has been limited to retransmitting only a single analog signal, and this 8:1 ratio - operating on the principle of supply and demand - has had the effect of lowering costs for digital transmissions over satellites by at least 60%[1].

Television technologies. Currently, most television distance learning networks have been broadcasting over satellites, rather than over cable, fibre optics or microwave. In the most typical system, known as a "1way video/2way audio" format (where teachers cannot see learners), digital or analog signals carry an instructor's visual and audio information from a television studio to a transmitter, which broadcasts the signals from an uplink dish to a satellite transponder that receives and rebroadcasts the signals to downlink receiving dishes located at the receiving sites. Technology at the receiving sites routes the signals to classroom television sets (Wagner, 1993b). Return audio signals generated by equipment located in the receiving

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[1] During FY 94, the DoD Satellite Education Network paid an average of $380 per hour to deliver analog signals over three different satellites. The costs for delivering digital signals over a fourth Satellite was as low as $150.

site classrooms carry student generated audio information back to the television network audio bridge via telephone lines. The broadcaster's network bridging system routes the audio signals into the television studio where they can be heard by the instructor.

A variation of the above system has been used by many broadcasters. Known as a "2way video/2way audio" format (where teachers can see learners), a return video signal is combined with the audio signal at the receive site, and both are transmitted by a small uplink dish - - located adjacent to the classroom - - to the satellite transponder, and hence to the television network control center where the video and audio signals are routed directly into the studio (Wagner, 1993b).

The 1way video/2way audio format, which has been in use for at least the past two decades, has been the most popular television format among providers and learners. The 2way video/2way audio format which has been employed since about 1988, was initially limited because it did not provide full motion video. The technology was improved to the state of full motion in 1992, with the result that use of the 2way video/2way audio format has begun to increase.

In a further variation, both formats can be designed to be either instructor-operated or studio-supported. In the former, an instructor teaches the lesson; operates a camera(s) by remote control; presents graphics, either via an electronic device that resembles an overhead projector or via a computer (or both); and, in some applications, controls incoming video, or a mix of video and audio signals, that carry student comments. In a studio-supported format, one or more instructors teach from a studio that is operated by a crew of television technicians. While the instructor-operated system has been less expensive to build and operate, instructors have had to

divide their energy and concentration between teaching and operating the system. By contrast, studio supported systems have been more expensive to build and operate, yet, instructors have been able to devote their full energy and concentration to the teaching and learning process.

Adult Education Distance Learning Programs

Segments of the higher education community have been teaching courses in the television mode for over a decade. Bolduc (1989) reported that as early as 1986, over 500 American colleges were offering televised courses to hundreds of thousands of students, and that increasing pressure on educational institutions to increase productivity and to lower costs had been leading to greater emphasis upon life-long learning using distance learning technologies to reach job sites. An estimated 500,000 adult learners enrolled in higher education television courses in 1990, and by 1991 television had become the most widely used distance learning technology to teach college courses (Brock, 1991).

Many higher education distance learning programs have been developed to absorb increasing enrollments. Moss (1988) reported that Utah was experiencing such skyrocketing enrollments with such limited financial resources that only technology could be expected to play the key role in the reform of state education. He reported that technology - - including satellite television - - had changed "the ways in which teachers teach and students learn in Utah" (p. 25). Brennan (1992) found that Iowa invested $50 million in its statewide telecommunications infrastructure in 1992. Her findings from the national perspective were that "distance education is evident at almost every educational level in almost every sector.... that [at least] 25%... of the nation's students [at all levels] are reached by distance learning technology,

and [that] over 1,500 [K-12] school districts in 47 states are participating in distance education" (Brennan, 1992, p. 2). Similar findings have been reported about the use and impact of distance learning technology on teaching and learning in California (Meuter & Wright, 1989), Louisiana, Maine (Steele, 1993), Maryland (Schiller, 1993), Nebraska (Foster, 1991), Oklahoma, Michigan, Minnesota, Texas (Brennan, 1992), and Virginia, (Gibson, 1992; VSDCC, 1989).

Distance learning programs at all levels, and especially with respect to programming for adults, have been projected to increase. The Federal Communications Commission has projected future growth of educational television systems at 100 per year, and communications experts have concluded that by the year 2000, at least 80% of all off-campus instruction will be delivered by new technologies (Walker & Hackman, 1991). Referring to higher education, Carl (1991) added that not all instruction should be delivered using technology, nevertheless, "the world of education is changing [and] the very existence of a college or university may rest upon that institution's ability to attract and serve this newly defined and widely geographically distributed population" (p. 67).

With respect to adult continuing education and job training, the Federal Government has begun to use television to reach its scattered workforce with knowledge- and skill-sustainment training. Within the DoD, for example, the U.S. Army Logistics Management College, in conjunction with the DoD Satellite Education Network (SEN), has provided televised courses to over 55,000 military and civilian DoD employees since 1985 (ALMC Year-End Reports, FY85-92). The U.S. Air Force has been broadcasting logistics instruction since 1993 from the Air Force Institute of Technology, located at Wright-Patterson Air Force Base in Dayton, Ohio, and in May, 1995, the Air

Force Education and Training Command has been scheduled to begin teaching aircraft maintenance courses over a new distance learning television network that has been established at Sheppard Air Force Base[2].

Distance Learning Vs. Traditional Programs

One outcome of the new expansion of distance learning programs has been a developing awareness among some researchers that very little is known about the differences between distance learning and face-to-face learning programs. Walker and Hackman (1991) analyzed effectiveness data published during the latter half of the 1980s and found that while one review of 100 studies in distance education had "concluded there were no intrinsic differences between traditional and televised modes of instruction," other studies "noted important differences between telecourses and face-to-face instruction.... [even to the extent that] the differences in traditional and telecourses were so dramatic as to make their comparison 'infeasible'" (p. 2). Walker and Hackman reported that none of the studies they had analyzed

> demonstrate conclusively that telecourses are the same as, or exchangeable for, face-to-face instruction. We assume there are important differences between face-to-face and televised instruction that are worthy of investigation. Many of these differences are suggested in the social psychology of telecommunications literature. Taken together, the research suggests that system design affects whether the new media will be adopted; and once adopted, whether users will perceive mediated communication as an adequate substitute for face-to-face engagement.... [To date, however,] systems incorporating two-way communication capabilities and high levels of interactivity have been identified as [the] most effective in meeting instructional needs. (1991, pp. 2-3)

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[2] Communication to the researcher from Mr. Edward Thompson, training coordinator, Sheppard Air Force Base, Texas, 20 January, 1995.

Prompted by reports that face-to-face and mediated distance learning programs may be more different than they are alike, some researchers have begun to look for indicators that demonstrate the degree of effectiveness that can be associated with technology integration in schooling. Hawkins (1992) identified some of these indicators as "emphasis on thinking rather than on memorizing... significant collaborative work, sustained engagement with complex tasks and projects, differentiated roles for teachers, and access to and active integrated use of a wide variety of resources" (p. 3). The implications from these findings could be that distance learning may not be just another mode of instruction. It may be a whole new system for instruction, one in which conventional instructional methodologies may be inappropriate, requiring new techniques for teacher-learner socialization and new methodologies for teaching and learning.

Research On Attitudes

Teacher Attitudes About Technologies

Negative teacher attitudes. Teachers typically have been skeptical about using new technologies in classrooms, and the use of television as a teaching medium or as a mode of instruction has been no exception. Historically, technologies adapted for use in education often have not lived up to their initial promise. Voegel (1986) recounted that as early as 1913, Thomas Edison predicted that schoolbooks would become obsolete in ten years, because it had then become possible to teach every branch of human knowledge by using the motion picture. Since Edison's sweeping assumption, there has been a long list of similar predictions claiming that traditional

classrooms soon would be replaced by new technologies, including replacement by radio in the 1920's, by "talking films" in the 1930's, by television in the 1950's, and by teaching machines in the 1960's. These technologies failed to gain widespread support for many different reasons, and Voegel (1986) appears to have expressed the prevailing attitudes among many teachers about these new technologies when he reported that

> history has shown that technological devices, when introduced into education, have had marginal impact on the overall teaching-learning process. Due to the relative high cost, inconvenience of use, and general lack of adequate teaching materials for these early versions of instructional technology, effective utilization came about very slowly. (pp. 74-75)

In some cases, it has been shown that negative teacher attitudes about particular technologies have been formed with little regard for, or even with little knowledge of, the merits or defects of the technology itself. Adams and Hamm (1987), for example, reported that when a technology has not been well understood by educators, the tendency has been either to dismiss its promise or to enormously exaggerate its possibilities. These researchers concluded that "exaggerations in either direction can kill an instructional tool before it has a chance to develop" (p. 13).

Overall, the tendency of many teachers and other educators has been to disparage the use of technologies, particularly those used with distance learning programs. Kerka (1989), for example, reported that some teachers have been concerned that the new communications technologies "can isolate students, undercut local autonomy and instructor control... and make students passive recipients of overstructured packets of knowledge" (p. 3). Voegel (1986), probably representing the views of many professional educators even today, summarized a somewhat pejorative conceptualization of distance learning in this age of high technology:

> Let us face it: technologically it is possible for faculty to teach and students to learn without ever having to assemble in a particular room at a specified time... Should it happen? Some hold to the opinion that we have no choice, since the technological revolution is well under way, as exemplified by telecourses and other distance learning offerings, and that the deschooling of society has begun. (p.66)

Positive teacher attitudes. Few positive findings have been reported pertaining to teacher attitudes about television, nonetheless, some researchers have found that television has begun to be perceived more positively. Moss (1988) found that technology can be a positive tool in education, adding that "technology is both a far-reaching education reform and a facilitator of other reforms" (p. 26), and despite the wide-spread view among many teachers that television generally has failed to live up to early promises, there is a growing amount of evidence to support the contention that television has been maturing into a useful educational technology. Adams and Hamm (1989), have concluded that

> the process and products of video technology can now rely on equipment that is relatively inexpensive and easier to operate. Money can now go directly to what appears on the screen. To communicate to a target audience requires an understanding of visual esthetics, message design, video technology, and the characteristics of effective instruction. It doesn't require hordes of middlemen or a bureaucratic mentality. (p. 63)

Learner Attitudes About Distance Learning

Negative learner attitudes. The literature is sparse regarding student attitudes pertaining to distance learning. The few findings that have been published tend to show that learner attitudes have been less- focused and more evenly distributed than the attitudes of teachers. Negative student attitudes pertaining to television as a mode of instruction were reported by Howe (1983), particularly with respect to student notetaking. He found that with television

> visual information in particular is difficult to code in note form, particularly since the coding of the overall "meaning" of the total

> experience... is done verbally. In the form of written notes.... most students find it impossible to take notes while viewing, and those that do are usually very dissatisfied with [them]. (p. 61)

Lacina and Book (1991) found in their study comparing residence and television mode instruction of a graduate level Foundations of Education Course at Northwestern State University in Louisiana, that "the most commonly cited drawbacks to the remote classroom included the ease of turning off the instructor and becoming inattentive, difficulty in gaining access to the instructor or in having information repeated, and difficulty in participating in class discussions" (p. 157). However, in this study, residence students were seated in the television studio, causing the instructor to divide his attention between residence and distance learners, thus possibly biasing the experience for both groups.

Positive learner attitudes. Positive learner attitudes were reported by Chung (1991), who found that students in telecourses "rated them significantly higher than conventional courses when the telecourses included well-trained site facilitators, [well-trained] instructors, and well-designed learner materials" (p. 42). In a study conducted for the Office of Technology Assessment, researchers reported that elementary, secondary, and adult learners all held generally positive attitudes towards televised instruction (OTA, 1989).

In industry, Chute and Balthazar (1988), found from a six month study of 329 AT&T employees who were enrolled in 45 residence courses and 590 employees who were enrolled in AT&T teletraining courses, that there were no statistically significant differences in employee attitudes about the two modes of instruction. Reporting on the attitudes of AT&T client employees (employees trained by AT&T for other corporations), these researchers found that aside from the students' concern that broadcast visuals were not always

easy to see on the television screen, their satisfaction with both residence and teletraining courses was reportedly "related to the same three factors: job content, the challenge-level of the instruction, and teacher-student interaction" (Chute & Balthazar, 1988, p. 3).

Extrinsic effects on learner attitudes. There is a growing body of evidence to support the position that adult learner attitudes toward enrolling in television courses may be less important than - or even subsumed by - the more powerful motivations stemming from the life circumstances that have spurred the learners' search for education or training in the first place. For example, Hezel and Dirr (1991) found that higher education students responding from four schools that offer teletraining courses, reported their biggest challenge is not distance, but time, and how to manage it while raising families, going to work, and pursuing other responsibilities. The researchers reported that 84% of these distance learning students listed time constraints as a "very important" barrier to pursuing higher education" (p. 33-34).[3]

Other researchers have reported similar findings pertaining to the effects that time and convenience have had on distance learner attitudes, which has prompted some researchers to look more closely into the strategies employed by distance learning programmers, and the effects these strategies may have had on learner attitudes about distance learning. Holmberg (1989), for example, reported that educators have not yet decided whether distance education is a mode of education in its own right or simply a substitute for face-to-face education. Holmberg found that in the latter view, students have been treated very much as they have been treated in residence

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[3] Governors State University in Illinois, Northern Virginia Community College, Memphis State University, and the University of South Dakota.

courses, with fixed terms of study, vacations, and limited class sizes. To those providers for whom distance education is a true mode, educational activities have been scheduled to meet the time and pacing goals of the students, thus, promoting positive attitudes among the learners. Holmberg found that in these circumstances, for the learners, "their inclinations, work and family conditions are the decisive factors.... The individual student thus decides on goals, pacing the length of study" (p. 128).

Intrinsic effects on learner attitudes. A few researchers have described intrinsic effects that may influence learner attitudes pertaining to distance learning. From research that correlated age, gender, and other demographic data with variation in the performance of 8,431 on- and off-campus engineering graduate students from nine universities, Stone (1989) found that distance students - especially those aged 26 to 35 - performed better in those circumstances where they could control where and when learning occurs. This was true even in circumstances where no immediate, real-time feedback was available from the instructors. Stone attributed this finding to the age of the respondents, "who, during this stage of their personal lives and professional careers, are hard pressed to balance the myriad demands placed on their time" (Stone, 1989, p. 16). In a more recent study, Oliver (1993) found that students who did not have the option to take the same distance courses in other modes perceived their distance courses more favorably than did those who had other options. The implications are that acceptance and rejection of televised distance learning by adult students may be related in some manner to their attitudes about themselves and their circumstances.

Theorized Attitudinal Attributes

Thirty years of research pertaining to the nature and attributes of attitudes have provided ample evidence that people form attitudes, and peoples' attitudes (a) can influence acceptance and rejection, (b) are often perceived as reality, and (c) can motivate behaviors. Gable (1986) described two schools of thought regarding the structural nature of attitudes. Proponents for the first school, known as "unidimentionalists" view attitudes from "an *evaluative* (e.g., positive-negative or favorable-unfavorable) perspective" (p.4). Proponents for the second school, known as "component theorists" view attitudes to be 'composed of affective, cognitive, and behavioral components that correspond, respectively, to one's evaluations of, knowledge of, and predisposition to act toward the object of the attitude'" (p. 5). The component theorist view has been of greater relevance to this study because the "students" in this instance were adult military and civilian employees of the Department of Defense, who tended to be highly committed to their jobs by a sense of duty that appeared to be intensely felt.

Attitudes influence acceptance and rejection. Since the publication of *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain* in 1956, the educational community has generally accepted that educational objectives can be classified in at least three domains: the cognitive, the affective, and the psychomotor. It was not until publication of *Handbook II: Affective Domain* in 1964, however, that a classification scheme for affective objectives was identified. In *Handbook II*, Krathwohl, Bloom and Masia (1964) defined affective objectives as those "which emphasize a feeling tone, an emotion, or a degree of acceptance or rejection....[that] vary from simple attention to selected phenomena to complex but internally consistent qualities of character and conscience" (p. 7). These researchers found that

affective objectives were most often expressed as interests, attitudes, appreciations, values and emotions or biases.

Central to this classification was the process in which given attitudes or values, etc., progressed from a level of initial awareness to levels of internalized influence, which Krathwohl, Bloom and Masia (1964) believed could ultimately become strong enough to control a person's behavior. This process, termed "internalization," referred to the inner growth which the researchers believed would take place as individuals accepted "the attitudes, codes, principles, or sanctions that [would] become a part of themselves in forming value judgments or in determining their conduct" (p. 30). An important aspect of internalization was the position that at some point on the hierarchy of affective behavior, "internalization" might produce powerful beliefs that could supersede external societal controls. Using the military population as an example, when expressed to one extreme, internalization of a belief might cause an individual to reject organizational norms or values - such as patriotism - leading to expulsion from the group. Expressed to the opposite extreme, an individual might so completely internalize organizational norms and values that he or she might commit horrendous acts on behalf of the organization, such as those identified with political terrorism.

The validity of the principle of internalization has been debated by educators and psychologists for several decades. As recently as 1989, for example, major studies were conducted that produced diametric results (see Martin, 1989; and Tittle, Hecht, & Moore, 1989). Of singular importance to this study, however, proponents of both points of view have confirmed, whatever the nature of their origins, that attitudes influence acceptance and rejection. Acton (1984), for example, reported that the "research has

consistently pointed to the importance of the attitudes of those with whom the learner associates inside and outside of the classroom" (p. 64). He concluded that while

> many of our common-sense notions of attitude have been shown to be exceedingly difficult to measure or seem to suffer from a great deal of conceptual overlap, the same research can be interpreted to mean that attitudes are contagious [changing one will affect others], and that the general 'attitude' of students can be influenced from various directions" (p. 71).

Beatty (1976), who also emphasized that affect has motivational properties, took a unidemensionalist (evaluative) approach which differed from the component-theorist views of Acton. Beatty found that "research had shown that people move toward or attempt to continue pleasant feelings and people move away from or attempt to stop unpleasant feelings," (p. 121) causing Beatty to define affect as "the experience of positive or negative feelings, the awareness of pleasantness or unpleasantness" (p. 121). Pertaining to the measurement of attitudes, Beatty reported that for

> measurement purposes we are mainly concerned with feelings.... and it has now become abundantly clear from research and from reason, that how a person feels is more important than what he knows. This seems true because how one feels controls behavior, while what one knows does not. What one knows is used in behavior, to be sure, but the way it is used depends upon positive or negative feelings. (Beatty, 1976, pp. 121-124)

Attitudes are perceived as reality. In their study on affect, Krathwohl, Bloom and Masia (1964) had made a considerable effort to show an interrelationship between the affective domain and the cognitive domain. Twelve years after the affective taxonomy was published, Bills (1976) reported that "this association tended to be positively accepted by those educators and psychologists who were interested in helping people to change or to grow, because they saw affect as a cognitive type of process, while those psychologists who studied affect as a phenomenon saw it as a

biological process" (p. 1). Bills summarized the views of a growing number of researchers when he theorized that the nature of affect could be shown to stem, not from an internalized domain, but rather from perception. Bills (1976) posited that

> the perceptual organization of a person includes all of his perceptions or beliefs about the nature of reality.... Some of [these beliefs] are about what is important, others are beliefs about how we should be prepared to experience people and events, and some are beliefs about who we are and what we are like. These beliefs are called facts, values, attitudes, interests, prejudices, self concept, and the like. They are all beliefs and for the individual they are reality. They are all cognitive perceptual in nature; they are the results of highly selective processes and definitions, and they have all been learned. (pp. 21-22)

Bills felt that his cognitive perceptual point of view explained why researchers had been unable to find common threads in what had operationally been defined as affective variables. He believed that "from a perceptual point of view, the various things which [educators] had called affective variables were not affective but were cognitive-perceptual beliefs" (Bills, 1976, p. 22). Bills divided these beliefs into two meaningful groups, one that he believed was concerned with a so-called real world, and one that was concerned with affect:

> The concern of researchers should be with the experiencing of the organism and with the availability of that experience in awareness and in undistorted fashion to the person as he interacts. It is at this point that our developing concerns for humanistic education, non-cognitive variables, group interaction, individual adjustment, values, and the like can be interrelated and brought into focus. (Bills, 1976, pp. 22-24)

Attitudes can motivate behavior. In the same year that Bills published his findings, Payne (1976) reported that affective variables could be expected to motivate behavior. Payne (1976) found that affective variables influence learning, reporting that, "this postulate has been well documented. The interaction of teachers' and students' affective characteristics influences progress towards the attainment of classroom goals" (p. 66). This is a vital

assertion which indicates, for example, that the interactions of teachers' and students' affective characteristics might be expected to influence student attitudes about taking courses by television.

Acton (1984) asserted that affect is a part of attitude in a hierarchical structure that, in turn, encompasses attitude as a part of motivation. Acton reported that in this hierarchical context, self-esteem has been found to be a strong motivator in learning a language. While careful not to ignore cognitive structuring as a part of his equation, Acton found that

> it has been a 'given' for many that affective variables... were *the* most powerful determinants of success in learning *anything*, not just language.... In understanding and attempting to influence learning, many [researchers] have chosen to address affect first, giving it precedence over cognitive consideration within an overall approach and method. (Acton, 1984, p. 65)

Of importance to this study of student attitudes about instructional delivery, and to the concept that attitudes motivate behavior, is the posit that affective variables gain added impetus when associated with a second characteristic, intensity (Gable, 1986; Payne, 1976). Payne (1976) found that

> two individuals may have favorable attitudes toward the same referent, but vary in the intensity of their feelings. Conversely, they may hold different attitudes with the same degree of intensity. It is probably true that motivational strength is tied to intensity of feeling and, therefore, that the likelihood of certain behavior varies with intensity. Intensity also has implications for instruction. The more intense an attitude, the harder it is to change it. (p. 65)

The evidence that attitudes can reach the degree of intensity required to motivate behavior over long periods of time is both compelling and rife with unexpected outcomes. Owens (1991), for example, reported on the findings of Sergiovanni resulting from his study of teacher prepotency needs, where it first appeared that older teachers (forty-five years or over) had smaller need deficiencies than younger teachers. Sergiovanni concluded,

however, that "older teachers 'are not getting more in terms of need fulfillment as the years go by but, rather, are expecting less. Levels of aspiration seem to drop considerably with age. Teachers become more "realistic" or resigned to things as they are'" (p. 113).

Focusing more precisely upon the researcher's study of adult attitudes pertaining to distance learning, the concept that affect can motivate learning was tested in one recent study by Tittle, Hecht, and Moore (1989). Using mathematics as content, they focused upon the psychological constructs of intentionality or "will" which they referred to as affective beliefs, motivations, and attributions. They found that affective beliefs could be related to four learner characteristics: (a) the perceived value or utility of the activity, (b) interest in the task, (c) confidence in doing the task, and (d) anxiety or concern over performing the task. The researchers further found that learner motivations "include the perceived reasons for approaching the task, whether these originate from the individuals' own needs for learning or from external sources" (p. 8). These findings tend to show that affective characteristics such as the perceived value or utility of a task, as well as interests in the task, can be motivators that are just as influential to students as are self-confidence and anxiety over task performance, and the researchers' findings concerning perceived reasons for approaching a task indicate that students can be motivated by external, as well as internal, factors.

Research On Teaching And Learning By Television

Teacher Preparation

Preparing teachers to teach from a distance has generated very little

attention among researchers, perhaps because so relatively few teachers have chosen to teach distance learning courses. Studies in this area have tended to be descriptive, with emphasis placed upon investigating the teacher's interaction with the technology. In its report to the Congress, the Office of Technology Assessment asserted that

> the key to success in distance learning is the teacher. If the teacher on the system is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actually exacerbated in distance education applications. But when skilled teachers are involved, enthusiasm, expertise, and creative use of the media can enrich students beyond the four walls of their home classroom. (OTA, 1989, p. 87)

The findings have been consistent. To be successful, televised courses have required instructors to learn how to use the technology (Voegel, 1986). Teachers who have taught in the television mode of instruction have reported that their residence teaching experiences have not prepared them to teach in distance learning situations, and it has become advisable for even the most experienced teachers to complete an appropriate training program before teaching via television (OTA, 1989). Finding appropriate training has not been easy. The OTA report concluded, that "few teacher training programs focus on how to incorporate technology into instruction, create new opportunities for [interaction], or how to develop materials and use the media most effectively" (OTA, 1989, p. 87).

Wagner (1992b), one of the more thoughtful researchers in the field of distance learning, reported that some teachers find face-to-face and distance education comparable, while some teachers have trouble adapting to differences that are attributable to geographic separation. From her study of adult distance learning programs, she found that where teachers have been ineffective, the ineffectiveness was related more to their inability to adapt than to the methods of delivery (p. 44). In a later study of distance learning

which included adult learners, Wagner (1993e) found that to be successful in the television mode, teachers needed to be assessed pertaining to their "technological proficiencies, their prerequisite skills, and their motivation to teach [using] technology" (p. 29).

Learner Readiness

The literature reflects a rich and long-standing interest on the part of researchers with respect to learner attitudes about televised distance learning. It has been found, for example, just as for teachers, that learners may have to be prepared for the experience of instructional television, (Zvacek, 1991). Wagner (1993e) found that distance learners have to be assessed with respect to their skills and expectations, and, whether children or adults, they apparently have to learn how to interpret what is presented to them.

Distance learner viewing perspectives. A great amount of research has been undertaken to explain how learners view television. Brown (1991), for example, reported that research in the past decade has tended towards an increasing degree of attention to the viewers of television and away from the creators of programming. Brown's own research led him to conclude that the context in which audiences viewed television, and how, and why, they viewed television, appeared to be more significant with respect to the effects of the viewing than to the effects of the program content.

From an educational perspective, it has been found that learner habits with respect to schooling can affect learning in the distance learning modes. Oliver (1993) reported that students who were unfamiliar with the television mode of instruction - - which often lacks the familiar social norms associated with the residence mode - - often were not prepared to learn independently,

and they required strong and consistent instructor motivation. Oliver reported that in order "to attain [effectiveness in] distance learning, a cooperative relationship among the instructor and all the students must first be established. This cooperation involves multiple dimensions, including bonding emotionally, establishing a shared purpose, and developing common practices of interaction and communication" (Oliver, 1993, p. 49).

Distance learner behaviors. Distance learners have been found to be more assertive, more willing to debate and disagree with instructors and other students, and more apt to cause distractions than their residence counterparts (Foster, 1993). Voegel (1986) reported that "institutions offering telecourses must identify students for whom distance learning is inappropriate and either help them to learn new study techniques or direct them to other, more supportive instructional situations" (p. 10).

Student inability to adapt to the academic climate of a distance learning classroom may have caused some learners to drop out of classes. Carl (1991) has shown that completion rates for higher education distance-learning classes have been lower than for traditional classes in some instances, and in his view there seemed to be a correlation between these completion rates and the types of people taking the courses, leading him to conclude that "distance-learning instructional techniques require that individual students assume greater personal responsibility in the educational process" (Carl, 1991, p. 69).

Ho (1991) found that the educational needs of non-traditional students not only differ from those of traditional students, but that non-traditional "distance learners are likely to be more self-motivated, have a broader base of educational and work experiences, and are better prepared to make decisions about their learning" (p. 92). Others, including Chung (1991), have

reinforced this concept, finding that "telecourses typically have been developed to teach more mature, self-motivated learners" (p. 42), and Willis (1993b) found that "students must take an active role in the distance delivered course by independently taking responsibility for their learning" (p. 3).

Distance learner self-images. Research that has focused upon the influence of self-esteem and learning attitudes with respect to distance learners has shown that factors such as age and self-image can make a difference. Richardson (1981), for example, made a study of adult distance learners whom she categorized according to stereotypical traits. One group was comprised of schooled, active verbal and younger adults whom she termed SAVY, and the second group was comprised of older, not-verbal, unschooled and sedentary adults, whom she termed ONUS. Richardson found that SAVY adults enjoyed greater self-esteem and self-confidence and these traits tended to make them better candidates for distance learning because SAVY adults could work independently and they required less structure from their instructors. The ONUS adults, characterized as having the tendency to hold negative self-images as learners, to have fewer than eight years of education, and to be less apt to seek improvement through education, required greater structure and intervention from their instructors.

Richardson (1981) found that the "individual differences of adult learners tend not only to predict learning and achievement but also the extent to which the learner will have a positive attitude towards the learning experience" (p. 10). Richardson (cautioning that her studies concerned stereotypes) concluded that instructors should provide appropriate learning strategies to the ONUS adults, while encouraging the SAVY adults to fall back on their own acquired strategies. Both groups demonstrated that they

could learn effectively in a television distance mode, yet, enjoyment for each group was keyed to the very opposite strategy from that which had been found to lead to the most learning. The SAVY adults enjoyed "more structure" more so than less structure, and the ONUS adults enjoyed "less structure" more so than more structure, which Richardson concluded was explained by the finding that in distance learning, "adult learners tend to want to achieve the greatest amount with the minimum investment of effort" (Richardson, 1981, p. 11).

Instructional Technology

Researchers have been nearly unanimous in their findings that distance learning courseware should be developed specifically for the medium used for delivery by following a systems approach to courseware design, development, implementation, and evaluation. Willis (1993a) reported that following an instructional development process "is essential in distance education, where the instructor and students may share limited common background and typically have little [or no] face-to-face contact" (p. 1). Brinkley, Pavlechko, and Thompson (1991) found that the television mode of instruction required course materials that have been designed and developed specifically for television, and Ho (1991) reported that the "key to planning an effective course for interactive television is to follow a systematic approach for designing instruction" (p. 91).

In their study of twenty-two education and training organizations identified by a panel of experts as operating the best training facilities in the United States (drawn from industry, higher education, the Federal Government, and private contractors), Knirk and Daniel (1990) reported that most of these organizations used teams to develop instruction, and that

among these schools, television was the "workhorse medium of instruction" (p. 6). Brennan (1991) concurred, reporting that her content analysis of, among other sources, five leading educational technology journals and all of the educational technology documents that had been entered into the ERIC database during the twelve month period following October 31, 1990, revealed that within the American distance learning community, the development of "technology-based teaching/learning products was based largely upon instructional design and development principles.... [she added] that evaluation has taken on greater importance as the concept of performance technology has been further developed" (p. 1).

Hilliard (1985) earlier had found that television courses required instructional designers to ensure that all elements of the course, video and print, were appropriately coordinated and integrated. He reported that the most effective television courses were those that blended together video, print, and other materials that were "appropriate to the subject matter, the type of learners and the instructional design" (p. 117). Willis reported similar findings, emphasizing that distance educators faced a great challenge in creating content examples that were relevant to their students. To ensure that content would be initially relevant, and remain so, he recommended incorporating formative evaluations of the content into both the development and the implementation phases of all courses (Willis, 1993a).

Several courseware development approaches have been found to be appropriate for use with television. They range from systems in which instructors are the chief designers, calling upon instructional technologists and media specialists for assistance, to more comprehensive instructional development systems in which a team of instructional and media specialists design and develop courseware for the instructors. In the latter approach, the

instructors have served primarily as subject matter experts (see Brinkley, Pavlechko, and Thomson, 1991, for a step-by-step explanation of a comprehensive nine step team approach to developing television instruction that is employed at Ball State University).

In the more typical approach, Milheim (1991) reported that "an instructional designer should play a key role in the development of the educational materials, and should be involved in the entire process from needs assessment through the pilot testing and installation of the materials" (p. 52.). He added that subject matter experts, scriptwriters, experts in specific media development, and evaluators are often needed to assist with the development process (Milheim, 1991).

Visualization And Reinforcement.

Nearly 100 years ago, in his personal credo on education, "My Pedagogic Creed," John Dewey made this observation: "I believe that the image is the great instrument of instruction. What a child gets out of any subject presented to him is simply the images which he himself forms with regard to it" (Reprinted in Boydston & Bowers, 1972, p.92).

In Dewey's conceptualization, "the image" is a mental visualization of a knowledge or a pictured comprehension of a construct, an internalized image that can be stored and retrieved at will by the learner. In a similar, but limiting, context, teachers have used pictures to transmit "images" in the mistaken belief that one picture is always worth a thousand words. However, research has shown that what is most critical to the support of learning - especially at a distance - is the ability to motivate learners to see images of the kind that Dewey called the "great instruments of instruction." There is evidence that trained visual specialists, using modern technologies and

working closely with creative teachers, have made great progress towards stimulating learners in the manner expressed by Dewey.

Visualization enhances learning. Adams and Hamm (1989) empirically confirmed that in televised distance learning, visual thinking and visual rehearsal are effective instructional techniques, and that teaching with images can help students to focus on lessons and to retain information. Adams and Hamm reported on research which has shown that children who view illustrations can recall 40 percent more of a story than students who just listen. In addition, the studies conducted by Adams and Hamm have established that appropriate illustrations combined with internal representation improve retention and comprehension.

Joseph and Dwyer (1984) have emphasized that the critical relationship that visuals fulfill in the television mode of instruction requires the skills of visual information specialists who can successfully "determine what kinds and combinations of visualization are most effective in facilitating student achievement of different educational objectives" (p. 110). In their study of the relative values of realistic vs. abstract visualization, these researchers found that the type of visuals that are used to support instruction can affect learning to a statistically significant degree.

Many researchers have concluded that when used appropriately, visualization enhances learning, leading Hilliard (1986) to summarize that "it is now well established that the capacity of the human mind to learn and [to] retain information is greatly enhanced through the use of a combination of sensory inputs, including visual images" (p. 117). Adams and Hamm (1987) carried this outlook even further, concluding that, as with concrete experiences, video enters the senses more directly than other forms of information. This latter concept has been reinforced by recent studies

conducted at the National Center for Supercomputing, located at the University of Illinois. Researchers there, who have been experimenting with virtual reality (the use of computer technology to place a human being into a realistic, believable, computer-generated environment), have reported their belief:

> The eye-brain system is incredibly advanced. Looking at the world, we absorb the equivalent of a billion bits of information per second, as much as the text in 1,000 copies of a magazine. But our mental 'text computer' is limited by the fact that we can read only about 100 bites or characters-per second. (Helsel, 1992, pp. 41-42)

Other researchers who have studied the way children learn, have made similar, if less spectacular, findings. For example, Howe (1983), who was one of the earliest investigators to study the way children learn from television, reported that the children in his study appeared to process information delivered by television predominantly from their visual channel. What the children heard was conclusively secondary. A few years later, Adams and Hamm (1987), reporting about the way adults learn through the use of visual media, concluded that "just because it is image-centered does not mean that electronic media has to be hostile to thought. In one form or another, imagery has always been a key to creative thought" (p. 58). They reported that education has been changing its emphasis by moving from the slow-moving printed word to the use of speed-of-light electronic images, and they concluded that educators "must examine [the] thinking styles and ideologies that accompany the technology " (Adams & Hamm, 1987, p. 58).

Visualizing lesson contents. Imaging techniques for television must be carefully planned and appropriately interrelated with the other elements of instruction. Howe (1983), for example, reported that

> it became clear in the first few studies that production treatment of a topic, rather than the topic itself, was a more powerful predictor of appeal. High appeal topics could not, in any determinable way, be incorporated into the program without serious consideration of

> appropriate treatment. Likewise, low appeal topics should not be rejected, since much depended on the way in which the topic was posed (p. 36)[4]

Brinkley, Paviechko, and Thompson (1991) found that visual production elements have become more important as distance education has become more widespread (p. 50), in part because inherent in the use of television as a mode for distance learning is the need to hold students' attention. Lacina and Book (1991), who found that a "student's attention with telelearning (viewing material through a television screen) lasts about thirty-five minutes" (p. 157), concluded that there is an inherent standard of excellence or criteria of acceptance that has been instilled in students by the television programs they see every day in their own homes. The researchers reported that commercial programs maintain high production values, and because students today are accustomed to these high values, "the lessons they see on television must be delivered in the same context if they are to hold the viewers' attention" (Lacina & Book, 1991, p. 157).

Visual Images vs. text. From a more profound perspective, researchers have found that the day-to-day entry of television into the typical American home has led to changes in the way Americans think and communicate, gradually replacing the role of text (reading) with visual images. Adams and Hamm (1987) reported that "we are creating a public that views reading as a professional task. The notion that reading is a natural activity of all thinking

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[44] Howe(1985) found that adults learn better by television when events are personalized. Citing the results of a study by Noble, 1975, who discovered that many Germans who said they learned about Nazis and Jews from the television drama, *Holocaust*, also said that they did so because they felt sympathy for the characters encountered on the small screen in their living rooms. Howe concluded that "television works by reducing the scale of big events to one of personal relationships with the people which are seen on the television set" (p. 106). To show this was no isolated instance, Howe cited other examples, including "the volume of medical mail which was [then] addressed to the fictional Marcus Welby MD; no Less than one thousand letters a week" (Howe, 1983, p. 106). This parasocial interaction is termed "an illusion of intimacy," and Howe has concluded that viewers who engage with characters in this manner believe that what they view is reality and not fiction (p. 107).

people is gradually diminishing" (p. 4). In a subsequent study of the role of visualization in classrooms, Adams and Hamm (1989) asked the rhetorical question, "will anything ever replace reading?" (p. 50). Their earlier findings had suggested that an answer had been forming, for there had been -- and remains -- a trend in televised courses to replace text with visual images, and Adams and Hamm had cautioned that this substitution requires not only careful viewing, but a commitment on the part of the producers to truth and honesty:

> There is no need to leave productive creative thought to chance. Video does not automatically stand for lower intellectual standards. It's just harder to tell what's real from what's illusionary. It's little wonder that everything from our religion to our politics has become inseparable from television. (Adams & Hamm, 1987, p. 56)

Visual limitations. With respect to the impact of visual materials, there appears to an "upper-limit threshold" for the use of visualization, beyond which, students may perceive they are being entertained, rather than taught. When encountered, this attitude apparently has not been prompted so much by the media itself, as by the perception of intent. Nevertheless, student reactions in these circumstances have been negative. This upper-limit threshold was addressed by Voegel (1986) who found that "learners in University of Mid-America courses [tend] to react negatively to the aspects of the television programs which they perceive as having exclusively an entertainment function rather than one of instruction" (pp. 8-9).

Interaction And Socialization

Teacher-learner interaction. As in face-to-face learning, teachers in distance learning modes of instruction have had to develop techniques to promote teacher-learner interaction. These techniques have been found to be particularly critical because in most distance learning technologies instructors

cannot see their students. Seamons (1990) reported that continuous, active feedback has been identified as a critical element of the educational process, and that in order to classify the experience as education, it is necessary for instructors and students to maintain an interactive relationship. "At the heart of the educational process is high fidelity communication between instructor and student. The very definition of communication implies two-way interaction - without this, information dissemination is all that is attainable" (Seamons, 1990, p.4).

Wagner (1992a) reported that "when a distance educator talks about interaction, more often than not, the focus of discussion is upon the attributes and outcomes of real-time, two-way exchange of information" (p. 2). She added that there has been a "tendency to equate instructional interaction with systems interactivity, [and] the growing 'folk' acceptance of a causal relationship between system interactivity and instructional interaction has placed an unrealistic expectation upon interactive technologies to ensure that instructional interactions do occur" (Wagner, 1992a, p. 4). Wagner and others have made it clear that instructor-student interaction has to be initiated by the instructor and maintained in a proactive manner throughout the course of instruction.

Teacher feedback and evaluation. Researchers have found interaction to be an important distance learning activity for two primary reasons. First, it is the channel for formative evaluation and instructor feedback. In addition to providing the instructor with a means for seeking knowledge of results, this feedback channel is often used to provide motivation to students. Wagner (1992a) found that interaction influences the motivated construct of "continuing motivation," which she has identified as "the intrinsic motivation most directly concerned with education [because] it reflects an individual's

willingness to learn" (p. 3). Zvacek (1991) reported a similar finding from a different perspective, stating that "the standard motivating forces active in 'traditional' classrooms such as group pressure, a familiar learning situation, and social factors, are often absent in distance education settings. Without these characteristics as givens, planners of distance education programs must build their awareness of motivational strategies [into their lessons] and purposefully integrate methods to enhance learner motivation" (p 40).

Learners' nexus of control. The second reason why interaction has been found to be an important distance learning activity is that it provides learners with a sense of control over the pace and sequence of the instruction. As it is for seeking knowledge of results, this pacing control factor must also be intentionally planned for throughout the instructional process, beginning with the initial analysis of the learners, and it must be designed into the instruction early in the development process (Wagner, 1992a). In one study, Wagner (1992a) reported that "students who were given control over the receipt of feedback during instruction experienced significantly greater decreases in anxiety than those routinely provided with feedback. Students provided with no feedback continued to exhibit high levels of anxiety throughout the instruction" (p. 10).

Teacher-learner social presence. One important construct that has been studied by a few researchers who have compared face-to-face learning with distance learning is social presence, identified by Walker and Hackman (1991) as "the ability of the media and participants to approximate the characteristics of face-to-face interaction" (p. 3). In this context, the goal has been to approximate face-to-face instruction so closely that the media become completely transparent. Of particular importance to establishing social presence are certain instructor verbal and non-verbal immediacy

behaviors that have been shown to "significantly impact learning, and to enhance closeness in the teacher-student relationship in traditional... [and] non-traditional mediated classrooms" (p. 5). In a later study, Oliver (1993) reported finding "a positive correlation between perceived immediacy... and behavioral learning, however, [he found no] relationship between immediacy and cognitive learning" (pp. 63-64).

Walker and Hackman (1991) determined that the technical medium used for instruction influences social presence. The results of their analysis led them to conclude that

> the important potential differences between televised and face-to-face instruction appear to be based in the technical capabilities of the media and the users' ability to convey presence. It was our belief that in the tele-educational context, differences in system design and instructor behavior combine to impact perceptions of mediated educational experiences. (p.4)

Other researchers have arrived at similar conclusions, which has brought increasing attention to the theory that interaction and social presence factors, when skillfully applied through mediated distance learning programs, may be made to substitute for face-to-face instruction. In one assessment Lowenstein and Barbee (1990) reported that distance learning technologies were reaching a state of sophistication that might soon make them virtually transparent, allowing students to interact with systems without even being aware that learning is taking place. These researchers reported that "use of well-designed technological solutions results in improved learning outcomes in shorter time [and that] workers acquire competencies that carry over into improved job performance and productivity" (Lowenstein & Barbee, 1990, p. 7).

On-Site Facilitation

It has become accepted practice to provide a classroom facilitator to represent the teacher in a mediated, distance learning classroom. Although no research was found that pertained exclusively to facilitators, the few studies in which facilitation was addressed reported consistent findings. In general, facilitators are needed in every television mode classroom before, during, and following every broadcast. Facilitators assure that the classrooms are appropriately configured, and that lights, heat, and air conditioning are in working order. In addition, facilitators operate the equipment, take attendance, hand out course materials, and administer examinations and student evaluations. Researchers have found that facilitators are the liaison between teachers and learners (Ho, 1991), and appropriately trained facilitators are essential to the success of television distance learning programs (Wagner, 1993e).

Reporting on focus group discussions that were conducted by the Western Cooperative for Educational Telecommunications concerning the issues that most affect teachers in distance learning programs, Wagner (1993e) reported that the role of facilitators was one of the four major topics of discussion. The focus groups, comprised of experienced television teachers, believed that facilitators "keep faculty aware of student perspectives, manage the distance environment to maximize learning effectiveness, and troubleshoot equipment" (p. 31). The focus groups emphasized that facilitators must be appropriately trained and given clear directions in order to be successful.

Researchers have indicated, however, that facilitators generally have not been provided with adequate training. For example, Gibson (1992) reported that in the Virginia Satellite Education Network, 40% of the

facilitators had no training with the equipment and 45% had no training with respect even to their basic duties and responsibilities. The small amount of information available on this matter has suggested that this finding may well have identified the status of facilitator training in many higher and continuing education distance learning programs across the country.

Research on Television Learning-Effectiveness

Learning-Effectiveness For Adult Learners

In relation to all teletraining programs nationally, but with an emphasis throughout on the television mode, the Office of Technology Assessment reported that "the effectiveness literature has been quite consistent: when used in business, military training, and adult learning, there is no significant difference in effectiveness between distance learning and traditional instructional methods, and student attitudes are generally positive about the experience" (OTA, 1989, p. 44).

Similar findings have been reported by several researchers, including Howe (1983), who found that the dominant generalization to be drawn from analyzing [several] outstanding programs is that viewers can and do learn from educational television. Pease and Kitchen (1987) reported there was no significant difference between students' performance in the interactive satellite-based television classroom and the live face-to-face teacher-mediated classroom, and Chung (1991) found that with respect to teaching a research course in Health, Physical Education, and Recreation at the University of Indiana, "there were no significant differences in post-test scores of students in an off-campus telecourse and students in an on-campus traditional course" (p. 43).

Pertaining to industry, Chute (1986) found that AT&T employees learned just as well from teletraining as from face-to-face training, and Bolduc (1989), citing television instruction as an excellent tool for reaching adult learners reported that, "in general, little difference exists between student achievement from televised instruction and face-to-face lecture" (p. 6). Elsewhere, Lacina and Book (1991) reported that "research indicates that higher education students using distance education resources find the courses as informative and effective as those taught in the classroom" (p. 156), while Carl (1991) found that faculty and students "with experience in electronically delivered courses indicated that the quantity and quality of communication was comparable to that which was customarily available on campus" (p. 68). In a later study, Wagner (1992b) found that when teachers have been taught how to use the technology, distance education is "just as effective as is traditional education. In many cases it may actually be more effective, since more time and care may be taken to develop materials for delivery..... [where distance education is not as effective,] this is due more to faulty instructional practice than it is to distance education *per se*" (p 44.).

These positive findings on the learning-effectiveness of broadcast television have been reinforced by Chute and Balthazar (1988), Titsworth (1993), and most extensively, by Russell (1993). Russell analyzed more than 170 television mode distance learning studies over a period of several years, all of which he found to be positive with respect to the learning-effectiveness of broadcast television. In a report that presaged the publication of his findings, Russell (1992) concluded

> the fact is that the findings of comparative studies are absolutely conclusive; one can bank on them. No matter how it is produced, how it is delivered, whether or not it is interactive, low-tech or high-tech, students learn equally well with each technology and learn as well as

> their on-campus, face-to-face counterparts, even though students would rather be on campus with the instructor if that were a real choice. (P. 2)

Learning Effectiveness For Military Training

Extensive research has shown that distance learning has been just as effective for the military as it has been for business and industry (OTA, 1989). Within the military logistics community, for example, ongoing comparisons of the final grades of civilian and military employees of the DoD who completed televised courses between 1985-89, with the final grades of DoD employees who completed the same courses in residence or on-site during the same period, "showed no significant difference between remote and on-site instruction[5]" (OTA, 1989, pp. 148-149).

An evaluation of the U.S. Army Logistics Management College Satellite Education Network (SEN) that was conducted by the U.S. Navy Personnel Research and Development Center in 1989, reported that "scores on examinations did not differ significantly from those of equivalent resident courses" (NPRDC, 1989, p. 5), and an analysis of courses televised by the Commander Training Atlantic Electronic Schoolhouse Network, operated by the U.S. Navy, that was performed by the Center for Naval Analyses, found that "differences between final grades of students at remote and originating sites are not 'practically significant'" (NPRDC, 1989, p. 7). More recently, in a study of three Acquisition Management Courses taught over the SEN in 1990-91, the U.S. Army Materiel Systems Analysis Activity (AMSAA) concluded

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[5] The reported studies were undertaken by the ALMC Director of Education Technology, who, in 1987 and 1988, reviewed the final grades that had been reported for more than a thousand ALMC course graduates who had completed televised courses, and the grades of more than a thousand graduates who had completed the same ALMC courses in the on-site and residence modes during the same period of time. The data generated from that study no longer exists.

that there were no significant differences in the grades of students who completed the three courses offered by television from the grades of students (all from the same population) who completed the same courses in residence.[6]

Research on the Costs of Instructional Television

Research on the costs of using television as a mode of instruction has shown that communications technologies have been changing rapidly, and with each new generation of equipment, the costs have tended to decrease and the equipment capability has tended to increase. As reported earlier, the overall industry shift to digital technology during the past few years has brought about lowered costs, primarily because digitally-based courseware can be manufactured for less than 10% of the cost of paper- or analog-based courseware (Watkins, 1992, p. 7).

Another factor that has contributed to the overall drop in communications technology pricing has been the capability to compress digital information, which now makes it possible to broadcast up to eight compressed digital signals through one television satellite transponder that, heretofore, had been limited to retransmitting only a single analog signal. This 8:1 ratio, operating on the principle of supply and demand, has had the effect of lowering costs for digital transmissions to a range of from $150 to $200 per broadcast hour, while analog Ku-Band signal transmissions generally have cost from $380 to $530 per broadcast hour, and C-Band,

[6] Letter, dated June 12, 1991, from Ms. Lisa Collidge, who was the lead analyst on the AMSAA study team. The original documentation remains with AMSAA, but a copy of the AMSAA findings has been reviewed by the researcher.

transmission costs have been higher still, in part, because there are fewer C-Band transponders on satellites. (Satellite News, Oct 94)[7].

The technology and operational costs associated with using television for distance learning can be categorized under the headings of (a) equipment, (b) facilities, (c) maintenance, (d) operations personnel, (e) satellite transponder rental fees, and (f) telephone WATTS line lease fees. The costs for television broadcast equipment and facilities have tended to vary widely from area to area, and they are so dependent upon the format of the given network that no estimates can be made that would be meaningful beyond observing that a typical digital uplink system presently costs in excess of $1.1 million (AT&T Contract, 1994); and digital downlink systems most recently have cost the SEN $7,406 per location (AT&T Contract, 1994). A representation of the components that comprise a SEN downlink system are shown at Appendix A.

The DoD Satellite Education Network at Fort, Lee, Virginia, can be used as a model for estimating costs pertaining to television studio operations and maintenance fees required to support a 1way video/2way audio satellite television distance learning network. All operations and maintenance personnel, studio supplies, and equipment replacement parts are covered under a 12 month contract that also provides for services that are not attributable to the television operations. After deducting the costs for those services, the price to the government for SEN studio operations and maintenance amounts to $402,355 (ONIS, 1994). Additional costs under a

[7] The commercial cable and broadcast networks use C-Band technology, which has made C-Band costs especially subject to the pressures of commercial market supply and demand. For example, during the hours when the O.J. Simpson Murder Trail has been broadcast, C-Band satellite transponders have been virtually unavailable, but on the few occasions when one can be rented, the rental cost has increased by as much as 100%.

different contract for uplink and downlink maintenance amount to $80,232 (AT&T, 1994). A breakout of these costs, by personnel and activity, are shown at Table 2.

Table 2

Costs For SEN Operations And Maintenance (1994)

Costing Category	Amount
Studio Operations & Maintenance	$402,355
Uplink System Maintenance	24,000
Downlink Maintenance	56,232
Total Annual Fixed Fees	$482,587
Digital Signal Transponder Fees	$ 150-200[a]
AT&T Telephone WATTS Service	$ 13[b]

[a] Based upon the number of broadcast hours per month.
[b] Per hour, per site, during broadcast.

The SEN facilities include two 1600 square foot studios, one 400 square foot studio, and one 320 square foot studio, each with separate control rooms; an editing suite; two graphics generator suites; a maintenance shop; a telephone bridge room; transmitter area; dressing room; and ancillary spaces that house equipment. In addition, the SEN has a dish farm that houses an analog uplink, a digital uplink, a digital uplink/downlink, and four downlink dishes. These facilities and equipment give the SEN the capability to broadcast from three studios simultaneously, using any combination of up to two analog and two digital signals. The personnel accounted for in Table 2 can operate one full studio and provide a director for a second studio. When a second studio is in operation, three additional crew members are required at an additional cost to the government of approximately $200 per crew member, per day.

Summary of Literature Review

Research on Distance Learning

In 1992, 20% of the American population (57 million adults) completed continuing education or job-related courses designed to increase targeted job skills, and adults have become "the fastest-growing segment of all the population groups in higher education" (Benshoff & Lewis, 1992 p. 1). Probably the largest group requiring specialized training to stay abreast of changes within their employing organizations are the nearly two million active duty military and civilian personnel who work within the Department of Defense.

Educators and corporate trainers have begun to reach these large populations with distance learning programs transmitted by communications technologies such as computers and television. Digital technology has become the technology of choice because it is far less expensive to build than other technologies, and digital signals can be used with multimedia formats. The most popular distance learning programs employ a 1way video/2way audio broadcast television format.

By 1986, over 500 American colleges were offering televised courses to hundreds of thousands of students, (Bolduc, 1989), and today, nearly every state has invested in distance learning for students from K-12 to continuing- and higher education. In addition, many large corporations now train their employees through distance learning. Within the Department of Defense (DoD), broadcast television courses have generated great interest among higher-level managers; however, instructors have been skeptical, and student attitudes have remained generally unknown. In fact, there are many differences between distance learning and face-to-face learning programs,

even to the extent that "the differences in traditional and telecourses were so dramatic as to make their comparison 'infeasible" (Walker & Hackman, 1991, p. 2).

Research On Attitudes

Many teachers have been skeptical about using television as a mode of instruction, citing fears such as television "can isolate students, undercut local autonomy and instructor control...and make students passive recipients of overstructured packets of knowledge" (Kerka, 1989, p. 3). Researchers, however, have reported that technology can be a positive tool in education, becoming, for example, "both a far-reaching education reform and a facilitator of other reforms" (Moss, 1988, p. 26), and when the instruction has been appropriately designed and implemented, television has been found to be an effective mode for teaching adult learners.

Typical of the negative learner attitudes that have been reported, Lacina and Book (1991) found that "the most commonly cited drawbacks to the remote classroom included the ease of turning off the instructor and becoming inattentive, difficulty in gaining access to the instructor or in having information repeated, and difficulty in participating in class discussions" (p. 157). Many continuing- and higher education students, however, have "rated [telecourses] significantly higher than conventional courses when the telecourses included well-trained site facilitators, [well-trained] instructors, and well-designed learner materials" (Chung, 19991, p. 42), and similar findings have been made with respect to industrial training courses (Chute & Balthazar, 1988).

Teacher and learner attitudes about distance learning in general, can influence the perceived and demonstrated effects of distance learning

courses. Attitudes can "emphasize a feeling tone, an emotion, or a degree of acceptance or rejection" (Krathwohl, Bloom and Masia, 1964); attitudes can be perceived as reality, because they "are all beliefs and for the individual they are reality" (Bills, 1976, p. 21); and attitudes can be expected to motivate behavior (Payne, 1976), in part, because "people move toward or attempt to continue pleasant feelings and people move away from or attempt to stop unpleasant feelings" (Beatty, 1976, p. 121).

Research on Teaching and Learning in the Television Mode of Instruction

It has been found that conventional classroom experience does not, in itself, prepare a teacher to teach in the television mode because of differences between teaching learners face-to-face and teaching learners from a distance. Teacher preparation, therefore, usually begins with training on how to develop and teach a course on television. From the learners' perspective, students must learn how to interpret what is presented, and they may have to be taught how to view television for educational purposes. In addition, it has been found that distance learning course development activities benefit from the assistance of Instructional technologists, such as subject matter experts, scriptwriters, experts in specific media development, and evaluators (Milheim, 1991), who ensure that all elements of the course are appropriately coordinated and integrated (Hilliard, 1985).

Distance learning courses work best when they employ instructional strategies that facilitate teaching and learning activities that are appropriate for use in situations where teachers cannot see their students. For example, the instruction should provide integrated visualization and reinforcement, and stimulate visual thinking and visual rehearsal, all of which can help students to focus on lessons and to retain information (Adams & Hamm, 1989).

Television teachers should introduce tactics to encourage or to generate instructor-student interaction, because interaction provides a channel for formative evaluation and instructor feedback, and it provides students with a sense of control over the pace and sequence of the instruction which can be motivating and reassuring (Wagner, 1992a).

One relatively new approach in distance learning has been to employ strategies that facilitate social presence, which has been defined as "the ability of the media and participants to approximate the characteristics of face-to-face interaction" (Walker & Hackman, 1991, p. 3). A high degree of social presence has been shown to "significantly impact learning and to enhance closeness in the teacher-student relationship in traditional... [and] non-traditional mediated classrooms" (Walker & Hackman, 1991, p. 5). Successful strategies have included using on-site facilitators in every television mode classroom because they "keep faculty aware of student perspectives, manage the distance environment to maximize learning effectiveness, and troubleshoot equipment" (Wagner, 1993e, p. 31).

Research on Learning-Effectiveness Using the Television Mode of Instruction.

Researchers have been nearly unanimous in their findings that the instructional mode of television has been shown to be learning-effective. Typical of the findings, the Office of Technology Assessment reported that "the effectiveness literature has been quite consistent: when used in business, military training, and adult learning, there is no significant difference in effectiveness between distance learning and traditional instructional methods" (OTA, 1989, p. 44). Within the military logistics community, studies of courses broadcast by the DoD Satellite Education

Network (SEN) have shown that television can be an effective medium for teaching military logistics courses.

Research on the Costs of Television As A Mode of Instruction

Research on the costs of using television as a mode of instruction has shown that communications technologies have been changing rapidly, and with each new generation, costs have tended to decrease. Television distance learning budgets have accounted for: facilities, equipment, uplinks and downlinks, instructional developers, operations and maintenance personnel, satellite transponder fees, and telephone WATTS service to accommodate real-time student interaction with their teachers.

Chapter 3

Procedures

For many years, the faculty of the U.S. Army Logistics Management College (ALMC) have had the annual responsibility for selecting the modes of instruction in which their courses would be taught. Historically, the residence and on-site modes have been selected the most frequently. In FY93, for example, 50% of the ALMC course iterations were taught in residence and 47.6% were taught on-site at various military installations across the country. A third mode, satellite television, accounted for only 2.2% of the course offerings during FY93, yet, even with this large disparity of use, nearly as many students (28%) were reached via television as were reached in residence (33%) and on-site (39%).

Even with this well-documented capability to reach large numbers of students, the ALMC faculty have steadfastly refused to select the television mode, primarily because of their perceptions that (a) ALMC students do not want to take courses by television, (b) that logistics courses are too complex to be taught effectively via television, and (c) that it is too expensive to develop and to implement courses in the television mode of instruction. Because of the apparent unanimity of these perceptions among the faculty, the ALMC administration has been reluctant to force instructors to teach in a mode that they so clearly oppose.

The procedures followed in this study were to measure and to analyze student attitudes, learning-effectiveness, and costs, as they pertained to three military logistics courses, each taught in the residence, on-site, and television modes of instruction by faculty members of the U.S. Army Logistics Management College, Fort Lee, Virginia. To gain knowledge about three important intervening variables that impacted upon student attitudes pertaining to the on-site and television modes of instruction, the study measured and analyzed students': (a) perceived need to attend the sampled courses, (b) overall feelings about taking courses at the job site, i.e., on-site or by television, and (c) feelings about working on the job immediately before or after attending class sessions. As an aid to analyzing student attitude or learning effects that might be associated with the technology of broadcast television, student attitudes pertaining to the quality of the televised video and audio signals were measured. In addition, the televised courses were videotaped during their broadcasts, the technical clarity of the video and audio signals were reviewed, and distractions were noted.

Null Hypotheses

This research investigated DoD military and civilian student attitudes, the learning-effectiveness, and the costs/benefits pertaining to three modes of instruction: residence, on-site, and satellite television, through a study that combined descriptive and causal-comparative techniques to test the following null hypotheses:

1. H_o^1 stated: It is hypothesized that student attitudes toward modes of instructional delivery will be equally positive ($p<.05$) towards satellite television when compared with the residence and on-site modes.

2. H_o^2 stated: It is hypothesized that students will achieve equal learning ($p<.05$) within selected ALMC courses (A,B,C) regardless of their modes of instructional delivery: residence, on-site, or television.

3. H_o^3 stated: It is hypothesized that courses designed for the television mode of instruction cost the same to develop as do the same courses when designed for the residence or on-site modes of instruction.

4. H_o^4 stated: It is hypothesized that, in dollars spent on a per pupil basis, courses designed for television cost the same to implement in the television mode, as do courses designed for the residence and on-site modes when implemented in those modes.

Target Population, Accessible Population, and Sample

The target population was that group of military and civilian employees of the Department of Defense (DoD) who met the prerequisites established by the ALMC for the subject courses. The accessible population was that group who enrolled in ALMC courses during the 4th Quarter, FY94, and the 1st Quarter, FY95. The students sampled were those students from the accessible population who enrolled in the courses studied. Due to the limitations imposed by the relatively low number of courses available for study during those 2 quarters, all students were asked to participate. It was assumed that the students met the published prerequisites for the courses.

Fewer than one-third of the courses offered in the television mode during FY94 were broadcast in August or September, and only two courses were broadcast during the 1st Quarter of FY95 (October through December). Three courses were offered in all three modes of instruction during the time-frame for the study, and all three courses were selected. After the study had commenced, the residence iteration of one subject course was postponed until May 1995, therefore, attitude, learning-effectiveness, and cost data were not available for that particular residence iteration. However, learning and cost data were available from the most immediate prior residence iteration of the course, and these data were judged to be appropriate for comparison with the learning and cost data collected from the on-site and televised iterations because: (a) the students who had attended the earlier residence iteration were members of the same target population that had been defined for the study; (b) the instructors, teaching materials, quizzes, and examinations were the same as those used for the on-site and television iterations; and (c) the cost data pertaining to the development and implementation of the earlier residence iteration were wholly compatible with the cost data pertaining to the on-site and television modes.

The decision to incorporate learning and cost data from the earlier residence iteration into this research was strongly influenced by the circumstance that, of the three courses studied, this particular course was norm-referenced, while the other two were criterion-referenced, mastery learning courses. The need to sample learning from both norm-referenced and criterion-referenced courses was of paramount importance to the overall balance of the study because both approaches are employed by the College. In addition, the norm-referenced course consisted of a higher number of

higher-order learning objectives, which might have had important implications pertaining to the modes of instruction in which they were taught.

Because no attitudinal data were available for the residence iteration of the norm-referenced course, results of the cross-modal attitude survey were analyzed only for the two mastery learning courses. The attitudinal data that were collected from students enrolled in the on-site and television iterations of the norm-referenced course were analyzed in order to identify any trends that might differ from those found in the other courses.

Generalizability

Findings from this study which pertain specifically to student attitudes and to learning-effectiveness are generalizable to other logistics and environmental courses taught by the Department of Defense in residence, on-site, and via 1way video/2way audio, studio-supported, satellite television. These findings may be generalizable to adult settings outside of the DoD, and to a lesser degree, to continuing and higher education student settings. Results pertaining to the relative costs/benefits associated with each mode of delivery may not be generalizable because government training costs and costing methodologies may differ from agency-to-agency within the government, and because they almost certainly do differ from those encountered outside of the government; however, findings and conclusions pertaining to costs/benefits should be useful to administrators in governmental and private sector training organizations that have a need to investigate alternative modes of instruction.

Instrumentation

An instrument was required for collecting data needed to test H_o^1 (student attitudes). Instruments were not required for measuring data relevant to H_o^2 (learning-effectiveness) or to H_o^3 and H_o^4 (costs/benefits) because descriptive data generated by the College during the routine course of business were used in testing these hypotheses.

Measuring Student Attitudes H_o^1

Student attitudes pertaining to the three modes of instruction: residence, on-site, and television, were measured to determine (a) student levels of satisfaction with each mode independent of the other two, (b) student attitudes concerning all three modes from a comparative perspective, and (c) student levels of satisfaction with instructor processes and instructional products such as those described by Kaufman and Thomas (1980) as being essential to successful teaching and learning.

Independent review of conceptual definitions. Using the knowledge gained during the literature review, and following recommendations made by Gable (1986), the researcher developed conceptual definitions of the posited affective characteristics that were to be measured by the survey instrument. These definitions, or constructs, were independently reviewed by two military and two civilian ALMC staff and faculty members for the purpose of confirming or rejecting the suitability of the constructs for reflecting attitudes that would be expected to be held and understood by the target population. These four individuals were members of the target population, who had attained a minimum of 14 years of job experience in military logistics

positions, and they all had completed more than one ALMC Course during their careers prior to joining the College Staff and Faculty.

Two additional staff members, one military with 19 years of service in a military logistics branch of the Army, and the second, a civilian administrator with more than 35 years of service at the College, both with earned doctorates in education, reviewed the constructs for the purpose of accepting or rejecting their suitability for reflecting educational values that could be appropriately applied to military, logistics, training programs.

These six individuals independently discarded inappropriate constructs and recommended clarifications for others which they considered were appropriate to the purpose of the study. As a result of their review, 13 constructs were identified that were judged to be valid instrument subscales that would be understood by the target population and would appropriately focus their attitudinal responses into relevant categories for analysis.

Designing the survey instrument. An analysis of several data collection instruments that were available through the more customary sources, such as *Mental Measurements Yearbook*, had failed to locate any one instrument that accommodated all of the 13 constructs that had been judged to be valid instrument subscales pertaining to this study. In addition, no instruments were discovered that had been shown to be valid and reliable for collecting data in the residence, on-site, and television modes of instruction. Procedures were undertaken, therefore, that had been recommended by Gable (1986) for designing an affective instrument, and those procedures provided a sound general order for the design of the survey that was administered for this study.

In an early step, it was necessary to select a scaling technique for the data collection instrument that would provide the researcher with valid, reliable measurements of target population attitudes. The Likert Summated Rating Scale was ultimately selected for this purpose because Gable (1986) had reported that it would provide for the most meaningful measure of the responses obtained from an adult target population. As the most efficient, effective, and widely used scale for collecting responses concerning attitudes (Dwyer, 1993; Gable, 1986), the Likert scale requires statements that can be easily judged by respondents to be either favorable (i.e., positive) or unfavorable (i.e., negative) in direction (neutral statements do not fit the Likert technique). Called a summated rating scale because scores are obtained by summing subject responses to each item, the summated scores can be viewed as representing degrees "of favorable and unfavorable attitude toward the objects under consideration" (Dwyer, 1993, p. 13).

Adapting Published Operational Statements. Although no single instrument was found that would be entirely suitable for this study, the researcher located two published affective instruments and one published menu of 21 affective subscales with 200 operational statements, from which 60 operational statements were selected that would collectively measure attitudes pertaining to 11 of the 13 constructs that the researcher's group of experts had approved for incorporation into the survey instrument. In addition to their relevance pertaining to the attitudes that would be measured, each of these sources employed the same Likert Scale five-factor response system (strongly agree through strongly disagree) for measuring student responses, which strengthened the suitability of the operational statements for their use with the researcher's instrument. Many of the statements were modified by

the researcher to make them more suitable for the target population and the ALMC setting. Specifically:

1. With the permission of the publisher, 15 operational statements that had been developed and validated by the National Study of School Evaluation (NSSE) for use in its Student Opinion Inventory (revised edition)[1] were ultimately used as written or with slight modifications to accommodate the adult target population and the ALMC setting as contrasted with a high school population and a high school setting. An example of the type of changes made is: "Teachers usually provide all the help I need with assignments" which was changed to read, "The instructors usually provide all the help I need with assignments." The revised edition of the NSSE Student Opinion Inventory was field tested in three schools widely separated geographically. It was reported that 261 students were involved, and that from their responses "item scores were correlated with total scores and with each other [and] these data were used as a basis for selecting, revising and ordering inventory items" (NSSE, 1988, p. 3). Coefficient alpha was reported to be .94 for full scale reliability, and the median reliability for subscales was .83 with none below .72 (NSSE, 1988).

2. Eleven operational statements that had been developed and validated by the Purdue Research Foundation and incorporated into the Purdue Cafeteria Course and Instructor Appraisal System(CCIAS)[2] were used

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with the permission of the copyright holder. The CAFETERIA Item Catalog is a collection of 21 subscales, with a collective total of 200 operational statements that provide Purdue University faculty with a "structured, computer-assisted method for generating and scoring questionnaires to collect student opinions about their instruction" (CAFETERIA, 1993, p. 1). Reliability and validity information were not reported. With the permission of the copyright holder, minor modifications were made to the wording of all 11 statements to accommodate the adult target population and the ALMC setting.

3. Ten operational statements that were developed by the Center for Instructional Services (CFIS), Purdue University, in conjunction with the Potter Engineering Center, Continuing Engineering Education, Purdue University,[3] were ultimately incorporated into the researcher's instrument. Although these statements had not been tested for reliability, they had been routinely used for several years by the Potter Engineering Center to collect attitude data from the students enrolled in continuing and higher education courses offered by Purdue University through the Center. With the permission of the copyright holder, modifications were made to the wording of all 10 items to accommodate the adult target population and the ALMC setting.

In addition to the operational statements that were drawn and modified from the three sources cited above, 12 items that were incorporated into the evaluation instrument were developed by the researcher. In all, 49

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operational statements were ultimately adopted or developed for use in three forms of the survey instrument, one form for each mode of instruction.

Operational statement content validation. With respect to following the final step recommended by Gable (1986) for designing and developing survey instruments, the researcher selected a total of 72 operational statements from among the three sources and the self-developed statements that were discussed in the previous section, which appeared to be suitable measures for the 13 constructs (subscales) that were to be measured by the attitude survey instrument. Fifty-one of these operational statements were identified as "more probable for inclusion," and 21 were identified as "less probable for inclusion," the latter constituting an item bank from which to draw statements if needed at a later date. All 72 modified and self-developed operational statements were reviewed by six content experts to rate the extent to which the statements reflected the stated conceptual definitions that were going to be measured by the instrument, and to confirm that the statements were positive or negative in nature to an extent suitable for use in eliciting suitable judgmental responses from the respondents. Four panelists were faculty members from the School of Education at The College of William & Mary, with expertise in educational research, one panelist was a faculty member from the Operations Research and Analysis Course at the Army Logistics Management College, who had taught the target population for 10 years, and the sixth panelist was the Director, DoD Satellite Education Network, who had 7 years of experience in developing the distance learning programs offered by the College.

Each panelist independently reviewed the 72 operational statements and labeled each statement as: (R) retain, (D) delete, or (U) unsure whether

to retain or to delete. The researcher collected the recommendations from each panelist, and developed a matrix showing the Retention, Deletion, and Unsure recommendations for each operational statement. Following a researcher-modified set of criteria that had been recommended by Gable (1986) as a guide for the final retention or deletion of response items, statements with unanimous retention designations were tentatively retained; statements that had been identified for deletion by at least one panelist were tentatively discarded; and statements labeled "undecided" by two or more panelists were identified for more intensive review.

The researcher and the two ALMC panelists reviewed and discussed the operational statements, their degree of positive or negative direction, their appropriate locations in the instrument, and their perceived potential to measure military and civilian employee (student) attitudes pertaining to the subscales which they measured. In addition to recommending retentions and deletions, the ALMC panelists recommended changes to the wording for several statements.

The above procedures were repeated with the William & Mary panelists, adding to the agenda a discussion of the statement word changes recommended by the ALMC panel members. From among the 51 more probable statements reviewed, the panel retained 40 without additional change, recommended another 6 for retention following changes to the wording, and selected 1 from the item bank to replace a deleted statement. A copy of the approved survey instrument is provided at Appendix A, in each of three forms: residence, on-site, and television. The number of operational statements that were ultimately selected for incorporation into the survey instrument, along with their sources, are shown in Table 3.

Table 3

Attitude Survey Instrument Subscales and Sources for Operational Statements

SUBSCALES	NSSE	CCIAS	CFIS	SELF	Total
Core To All Three Forms:					
Instructor Caring And Helpful	3	-	1	-	4
Educational Facilities/Ambiance	1	1	-	-	2
Instructional Competency	4	3	1	-	8
Instructional Methodologies	3	-	-	-	3
Instructor-Student Interaction	-	2	-	3	5
Learning Effectiveness	2	-	1	1	3
Need To Take The Course	2	1	1	1	5
Instructor Presentation Skills	-	3	-	1	4
Added To On-Site & TV:					
Instructional Mode Preference	-	-	-	2	2
Training While On The Job	-	-	-	2	2
Added To TV:					
Broadcast Quality	-	-	2	1	3
Facilitators	-	-	1	1	2
Visual Support	-	-	3	-	3
Totals:	15	10	10	12	47

Note. Three forms of the survey were developed: Residence, On-Site, and Television.

Survey instrument discrimination. Dwyer (1993) reported that

> one test of the validity of a particular item is the discriminating quality of the item. A positively written item is valid only if those individuals with a generally positive attitude toward the attitudinal object agree or strongly agree with the item and if those with a generally negative attitude disagree or strongly disagree with the item. (P. 16)

Dwyer (1993) suggested using student t-scores to test the discriminating quality of the items by "establishing positive and negative criterion groups composed of subjects having the highest and lowest 27% of scores within the overall group being considered, [then] comparing the mean score for each criterion group" (p. 16). The student mean scores computed

for each of the seven COR Course iterations and for each of the ten DHM Course iterations were rank ordered, and positive and negative criterion groups were determined for each iteration by assigning the highest 27% of scores to a positive criterion group and the lowest 27% of scores to a negative criterion group. Paired two-sample for means t-scores were then calculated for each iteration. The tests of significance demonstrated that all three forms of the survey were valid with respect to their capability to discriminate between positive and negative responses. All but one location tested to a significance of at least ($p \geq .001$), and 9 of the 17 locations tested to a significance of ($p. \geq .0001$). The results of the t-tests for all modes and locations pertaining to both courses are provided at Table 4 (see following page).

Measuring Learning-Effectiveness H_o^2

Summative test content validity. Because the learning-effectiveness for each mode of instruction was determined, in part, by analyzing end-of-course grades, it was first necessary to examine the test instruments that were used in each course to determine their suitability to provide valid and reliable measurements of student learning. Internal consistency could not be determined because the researcher did not have access to student test scores; however, content validity was analyzed by comparing the content of the test items with the content of the course learning objectives. A Table of Specifications for each test instrument was prepared that quantified these relationships in a matrix format (See Specifications Tables at Appendix B).

Contracting Officer's Representative Course test content validity. The comparison of summative test items with the objectives for the COR Course

Table 4

t-Test: Paired Two Sample for Means for COR and DHM Courses, All Modes and Locations

Course/Mode	Obs	Means High	Means Low	df	Two-Tail t-stat	Two-Tail Crit t	Prob	Pearson Correlation
COR /OS	9	4.44	3.50	8	53.214	2.306	.0000	.77
COR/RES	7	4.39	3.63	6	10.353	2.446	.0000	.72
COR/TV (1)	5	4.33	3.25	4	7.667	2.776	.001	.76
(2)	5	4.34	3.52	4	21.996	2.776	.0000	.92
(3)	5	4.39	3.26	4	6.190	2.776	.003	.73
(4)	10	4.14	3.23	9	15.590	2.262	.0000	.80
(5)	14	4.35	3.22	13	33.393	2.160	.0000	.88
DHM/OS	5	4.55	3.91	4	34.501	2.776	.0000	.95
DHM/RES	9	4.72	3.76	8	6.836	2.306	.0001	.83
DHM/TV (1)	4	4.61	3.70	3	11.904	3.182	.001	.72
(2)	3	4.18	3.07	2	9.339	4.302	.01	.97
(3)	6	4.22	3.30	5	7.557	2.570	.001	.59
(4)	5	4.16	3.21	4	11.926	2.776	.001	.83
(5)	9	4.40	3.26	8	12.542	2.306	.0000	.88
(6)	5	4.48	3.40	4	28.015	2.776	.0000	.98
(7)	6	4.15	3.00	5	6.293	2.570	.001	.73
(8)	6	4.05	3.21	5	14.750	2.570	.0000	.93

Note. Alpha = .05

showed that 69% of the course objectives were tested. Learning objectives were written at the knowledge, comprehension, and application levels, with the highest number of objectives taught and tested falling under the comprehension level. Five objectives were tested more than one time, however, the application level objective was not tested. Table 5 shows a summary of the findings pertaining to the COR Course test.

Table 5

Number & Percent of Objectives Taught & Tested in COR Course

	Cognitive Level of Objectives			
	Know	Comp	Apply	Total
No. of objs taught	14	21	1	36
% of objs taught	38.8%	58.3%	2.7%	100%
No. of objs tested	11	14	0	25
% of objs tested	44%	56%	0%	100%
Objs tested as % of all objs taught	30.5%	38.8%	0%	69.3%
% of objs tested for each level	78.5%	66.6%	0%	
No. of objs tested: 1 time	9	11	0	
2 times	2	3	0	

Note. 30 item multiple choice test.

Defense Hazardous Materials Waste Handling Course content test validity. The comparison of summative test items with the objectives for the DHM Course showed that 42.5% of the course objectives were tested. Course objectives were written at the knowledge, comprehension, and application levels, with the highest number of objectives taught and tested falling under the knowledge level. However, only 31% of the knowledge items were tested, while 61% of the comprehension and 67% of the application items were tested, which placed an incrementally greater emphasis upon testing higher order skills. Five objectives were tested more than one time. Prior to the summative test, nearly 100% of the learning objectives were tested by three ungraded formative quizzes. In addition, the DHM Course learning objectives were reviewed by the instructors and tested in student self-tests at the end of each block of instruction. The formative quiz scores were not available for analysis. Table 6 (see following page) shows a summary of the findings pertaining to the DHM Course test.

Table 6

Number & Percent of Objectives Taught & Tested in DHM Course

	Cognitive Level of Objectives			
	Know	Comp	Apply	Total
No. of objs taught	26	5	9	40
% of objs taught	65%	12.5%	22.5%	100%
No. of objs tested	8	3	6	17
% of objs tested	47.1%	17.6%	35.3%	100%
Objs tested as % of all objs taught	20 %	7.5%	15 %	42.5%
% of objs tested for each level	30.7%	60 %	66.6%	
No. of objs tested: 1 time	6	3	2	
2 times	0	0	2	
3 times	2	0	1	
6 times	0	0	1	

Note. 30 item multiple choice test.

Defense Distribution Management Course test content validity. The comparison of summative test items with the learning objectives for the DDM Course showed that 71% of the course objectives were tested (by two 25 item tests). Course objectives were written at the knowledge, comprehension, and application levels, with the highest number of objectives taught falling under the knowledge level, and the highest number tested falling under the comprehension level. Although 56.5% of the knowledge items were tested, 81% of the comprehension and 100% of the application items were tested, which placed an incrementally greater emphasis upon testing higher order skills. Eleven objectives were tested more than one time. During the course, all 48 learning objectives were tested by a combination of the two summative tests, a class presentation (residence and on-site modes), a practical exercise, and a comprehensive computer-assisted simulation. In addition, the learning objectives were reviewed by the instructors and were tested in student self-tests at the end of each block of instruction. Obtained student

scores for each of these assessment activities were made available for analysis. Table 7 shows a summary of the findings pertaining to the DHM Course test.

Table 7
Number & Percent of Objectives Taught & Tested in DDM Course

	Cognitive Level of Objectives			
	Know	Comp	Apply	Total
No. of objs taught	23	21	4	48
% of all objs taught	47.9%	43.8%	8.3%	100%
No. of objs tested	13	17	4	34
% of all objs tested	38.2	50%	11.8	100%
Objs tested as % of all objs taught	27%	35.4%	8.3%	70.7%
% of objs tested for each level	56.5%	80.9%	100%	
No. of objs tested: 1 time	10	11	1	
2 times	2	3	3	
3 times	1	3	0	

Note. Two 25 item multiple choice tests

Appropriateness of evaluative measures to determine learning-effectiveness. Although the percentage of learning objectives that were tested by the COR Course summative test was not high, the percentages tested by the DHM and the DDM Courses were moderately high, and it appeared that the summative tests for all three courses measured the learning objectives that were given the most emphasis by the instruction. These more critical objectives were tested by approximately 90% of the test items. It is further probable that, due to the job- and task-specific nature of the learning objectives taught in these courses, that the learning reflected by the completed tests could be explained only to a small degree by student entry behaviors. While it might be argued that all course objectives should have been tested, or that unnecessary objectives might have been taught, the

criterion-referenced summative test results from the COR and the DHM Courses provided scores that could be appropriately analyzed across all three modes of instruction in these two courses with respect to learning-effectiveness.

The DDM Course tested students on a formative test, an oral presentation (residence and on-site), a practical exercise, and by an extensive, computer-assisted simulation. Although, the pass-fail course grades associated with the two mastery learning courses did not lend themselves to comparison with the normative grading scheme employed in the DDM Course, the DDM Course evaluation instruments provided measurements and evaluations that could be analyzed across all three modes of instruction in that course with respect to learning-effectiveness.

Measuring Costs/Benefits

Cost data were obtained and analyzed in the following cost-programming categories: (a) instructor costs (instructor salaries and benefits); (b) travel (faculty and student air fare, automobile rental, private vehicle mileage); (c) per diem (instructor and student fixed allowances for lodging and meals); (d) ALMC overhead (clerical support, supplies, printing, graphics, shipping, mailing, etc.); and (e) the television costs category included cost data pertaining to operations, maintenance, television satellite transponder user fees, and telephone WATTS lines user fees.

Data Collection Procedures

Administration of Student Attitude Survey

Data concerning student attitudes towards taking courses by television were collected from the student sample using the three forms (Residence, On-Site, and Television) of the instrument described above. Each instrument was accompanied by a letter from the ALMC Commandant encouraging students to exercise full candor, and reassuring them that their responses would remain completely anonymous. In addition, the letter explained that participation was voluntary, and students could elect not to participate.

The form of the attitude evaluation instrument that was administered to students in the residence mode contained 29 core items that were also administered to students in the on-site and television modes. The on-site form contained an additional six items that pertained to the non-residence modes, and the television form contained an additional eight items that pertained only to the television mode. The residence form therefore contained a total of 29 operational statements, the on-site form contained 35 statements, and the television form contained 47 statements. All three forms contained an additional four response items that measured student mode-selection preferences by rank order, and eight demographic response items that identified respondents': gender; age; military or civilian service affiliation; pay grade (rank); and the number of years respondents had spent, respectively, in the federal service, in their current job series, in their current organization, and in their current position.

The instruments were administered by the instructors in the residence and the on-site modes, and by the classroom facilitators in the television

mode. In each mode, one student in each class was designated by the instructor or the facilitator to collect the completed surveys, place them in an envelope, and seal it. The sealed envelops were delivered by the instructors to the researcher on the day of collection (residence mode) or upon the day the instructor returned to the ALMC (on-site mode). In the television mode, the facilitators collected the envelops and mailed them to the researcher in preaddressed U.S. Postal Service Document Mailers that had been franked for priority mailing. All of the mailers arrived in the researcher's office during the third or fourth duty day following the administration of the instruments except for one (pertaining to the COR Course), which was lost in the mail and never recovered.

Learning-Effectiveness Data Collection

Summative test scores and final grades for each course, by mode of instruction, were provided by the ALMC Registrar's Office. Results of within-course tests, simulations, and other course activities that were used to help ascertain learning effectiveness were provided by the course instructors.

Costs/Benefits Data Collection

The ALMC Budget and Programs Administrator provided the cost-basis model and pro-rata information used to project the costs for developing and implementing ALMC courses in each of the three modes studied. Additional costs for the budget categories pertaining to the television mode were provided by the Director of the Satellite Education Network.

Data Analysis

The investigation was designed to be a descriptive study, which is defined by Borg and Gall (1987) as a study that is "primarily concerned with finding out 'what is'" (p. 331). H_o^1 and H_o^2 were tested at the .05 level of significance. Specifically:

H_o^1 (Which stated: It is hypothesized that student attitudes toward modes of instructional delivery will be equally positive ($p<.05$) towards satellite television when compared with the residence and on-site modes, was tested using one-way analysis of variance (ANOVA). Post Hoc tests of significance following ANOVA were performed using the contrast method of multiple comparisons.

H_o^2 (Which stated: It is hypothesized that students will achieve equal learning ($p<.05$) within ALMC courses regardless of their modes of instructional delivery: residence, on-site, or television), was tested by analyzing the dependent variables (student end-of-course grades, within course tests, etc.) using the technique of one-way analysis of variance. Post Hoc tests of significance following ANOVA were performed using the Kramer modification of the Studentized range statistic, q, method of multiple comparisons.

H_o^3 (Which stated: It is hypothesized that courses designed for the television mode of instruction cost the same to develop as do the same courses when designed for the residence or on-site modes of instruction), was tested by performing an analysis of the engineered standards (and their applications) that were in effect for developing course materials at the time of the study.

H_o^4 (Which stated: It is hypothesized that, in dollars spent on a per pupil basis, courses designed for television cost the same to implement in the television mode, as do courses designed for the residence and on-site modes when implemented in those modes) was tested by performing a straight dollar analysis of the cost data pertaining to the implementation of each mode and course. Costs/Benefits were then computed by correlating these costs to the learning-effectiveness achievement levels found for the modes and courses while testing for H_o^2.

Ethical Safeguards and Considerations

Because the attitude surveys were completed anonymously, the names of respondents were not known. Although student names were not requested with respect to test scores, the ALMC registrar and faculty provided some data pertaining to learning-effectiveness that contained student names. The data (without names) that were required for this study were copied from the original documents, which were then sealed or returned to the issuers.

The names of the courses have been identified with the permission of the ALMC Commandant and the course instructors. The names of the ALMC faculty members who participated in this study have been kept confidential. Course dates and locations have been omitted to help assure instructor and student anonymity.

This research was conducted following acceptable research practices as determined and approved by the Human Subjects Review Committee, for the School of Education, The College of William and Mary, Williamsburg, Virginia.

Chapter 4

Analysis of Results

This chapter presents an analysis of the attitudinal and learning-effectiveness data pertaining to a student population of military and civilian employees of the Department of Defense (DoD) who were enrolled in three logistics courses taught by the U.S. Army Logistics Management College (ALMC) faculty between August and December 1994. Each course was offered in the residence, on-site, and satellite television modes of instruction. Attitudinal data were collected and analyzed with respect to 13 dependent variable subscales that measured student attitudes pertaining to instructional climate and instructor competencies within each mode of instruction. Additional attitudinal data were collected and analyzed for the purpose of identifying the effects of selected independent variables upon the dependent variable subscale measures, and for the purpose of clarifying student perspectives pertaining to mode preference, training on the job, and three other qualitative modal-use factors associated with broadcast television. In addition to analyzing student attitudes, the relative learning-effectiveness and the costs/benefits pertaining to each of the three modes of instruction were identified and analyzed.

The Setting

Courses And Modes Sampled

Two courses, the Contracting Officer's Representative (COR) Course and the Defense Hazardous Materials/Waste Handling (DHM) Course were criterion-referenced courses, and one, the Defense Distribution Management Course (DDM), was norm-referenced. One iteration of each sampled course was taught in residence at the ALMC, on-site at or near a DoD installation, and by 1way video/2way audio satellite television which was broadcast live by the Satellite Education Network (SEN) from the ALMC to a combined total of 13 DoD installations. After the study had begun, the scheduled residence iteration of the DDM Course was postponed due to low student enrollment, and as a result, the DDM Course was omitted from the study of student attitudes. However, learning-effectiveness and cost data from an earlier residence iteration of the DDM Course were analyzed and incorporated into the research where appropriate.

Course Instructors

The eight members of the ALMC faculty who participated in the study were experienced logistics instructors with at least 10 years of residence and on-site teaching experience. With the exception of one instructor who was teaching in her second iteration, the instructors had at least 5 years of teaching experience in the satellite television mode. All of the television instructors were graduates of the ALMC Advanced Educational Technology Course - Television (AETC), a 2 week performance-intensive course offered by the staff of the Satellite Education Network, that taught instructors how to

develop instruction, how to teach, and how to evaluate student performance, in the television mode of instruction.

Television Mode Facilitators

Facilitators who were supervised by their local installation training officers monitored the installation training classrooms used for the television courses. The facilitators who assisted with the COR and the DHM Courses were not content knowledgeable. The DDM Course facilitators were subject matter experts, and they were graduates of a 3 day Facilitator Course presented at the College during the quarter prior to the one in which the DDM Course was broadcast.

Data Analysis And Findings

Sample

Survey response. Because the military logistics milieu is somewhat different from that of the more familiar continuing- and higher education communities, the demographic data that were collected as a part of the attitude survey are provided separately from the attitudinal data so that the military logistics population sample might be more clearly understood before findings are presented. All military and civilian employees who were enrolled in the three courses sampled for this study were given an opportunity to participate in the survey of student attitudes. A letter from the ALMC Commandant which explained the nature and purpose of the study was distributed with the survey instruments, and while the Commandant's letter

encouraged participation, it was made clear that there was no penalty for opting out (See Appendix C for a copy of the Commandant's letter).

Of the 546 students enrolled in the eight classes sampled, 465 (85%) chose to respond. As a percentage of all students responding, 44% were enrolled in the COR Course, 48% in the DHM Course, and 8% in the DDM Course. The number and percentage of respondents from each mode are shown at Table 8[1].

Table 8

Number Of Students Enrolled & Responding To Survey

	COR Course				DHM Course				DDM Course			
	OS	RES	TV	Total	OS	RES	TV	Total	OS	RES	TV	Total
Enrolled	34	27	188	249	21	38	194	253	18	[a]	26	44
Respond	33	26	144	203	20	35	168	223	16	[a]	25	39
% Resp	97%	96%	77%	82%	95%	92%	87%	88%	89%	[a]	88%	89%

Note. Total Response for the three Courses: 85% (546 enrolled with 465 responses)
[a] DDM Course residence mode was postponed, and no surveys were made.

Sampled demographic attributes. A description of the sampled population was formed by measuring and analyzing eight demographic attributes:

1. age
2. grade (rank)
3. gender
4. Military/civilian status
5. time in Federal Service
6. time in current job series
7. time in current organization
8. time in current position

[1] The DDM Course data were reported to this point to show response statistics from the sampled population. The DDM Course data are not reported from this point forward because the residence mode for that course was not included in the attitude survey.

Student age data were collected in five categories: (a) under 30; (b) 31-40; (c) 41-50; (d) 51-60; and (e) over 60. Grade data, which identified military by rank and civilians by pay grade, were collected in five categories that combined military ranks and civilian pay grades that were judged, in part, to be equivalent with respect to the logistics knowledge and job skills that would characterize the military and civilian personnel holding these ranks or grades in a peacetime, military logistics environment. More specifically, these five categories reflected approximate equivalencies pertaining to (a) the levels of education or training required for initial entry into logistics duty positions accommodated by each category, (b) the logistics knowledge and job skills expected to be held by the incumbents in each category, (c) the range of incumbent salaries and fringe benefits associated with each category, and (d) the organizational level of responsibility associated with each category. The five grade categories respectively collected data from the personnel identified below:

Category 1 - Civilian wage grade and enlisted personnel.

Category 2 - Wage grade supervisors, general schedule (GS) 1-6 technicians, and non-commissioned officers (NCO) with fewer than 16 years of service.

Category 3 - GS 7-10, NCO with more than 16 years of service, and Warrant Officers (WO) with fewer than 16 years.

Category 4 - GS 11-12 professionals or middle-managers, WO with more than 16 years of service, and Officers with fewer than 16 years.

Category 5 - GS 13-15 senior managers, and Officers with more than 16 years of service.

Respondents were asked to identify the number of years they had spent in the Federal Service, the job series in which their work was performed, their current organization, and the position in which their job was performed. Responses were categorized by years, as (a) less than 1; (b) 1-5; (c) 6-15; (d) 16-25; and (e) more than 25.

Sample Description

Gender and military/civilian status. The majority of respondents were civilian (72%) and male (79%), and these characteristics were fairly constant across the on-site, residence, and television modes of instruction. Further analysis showed, however, that 75% of the military respondents were enrolled in the DHM Course, and 73% of the female respondents were enrolled in the COR Course. Cross-modal military/civilian status and gender distributions are shown in Table 9 (see following page). A different view of the same data are shown for the COR and the DHM Courses in Table 10 (see following page), where the distributions have been shown for the three modes of instruction within each course.

Age and grade. Overall, the respondents tended to be younger, with 55% found to be under the age of 40, 33% aged 41 to 50, with only 13% over the age of 50. Of all respondents, 37% were in the two lowest grade categories, 18% were in the middle grade category, and 45% were in the two highest grade categories. However, with respect to the two courses surveyed, the grade distributions were widely divergent, with a respective 7% and 65% of the respondents in the COR and DHM Courses found to be in the two lowest grades. Conversely, a respective 75% and 17% of the respondents in

Table 9

Number & Percent of Military & Civilians By Gender In On-Site, Residence, & Television Modes

	OS		RES		TV		All Modes	
	n	%	n	%	n	%	n	%
Military								
Male	16	30%	11	20%	75	25%	102	25%
Female	3	6%	0	0%	10	3%	13	3%
Civilian								
Male	31	58%	33	59%	159	52%	223	54%
Female	3	6%	12	21%	61	20%	76	18%
Totals By Mode	53	100%	56	100%	305	100%	414	100%

Note. Does not total 465. The DDM Course was not included, and some respondents did not provide responses for military/civilian status or gender.

Table 10

Number Of Military & Civilians, By Gender, In COR & DHM Courses, By Modes Of Instruction

	COR				DHM				
	OS	RES	TV	All COR	OS	RES	TV	All DHM	Total
Military									
Male	0	7	15	22	16	4	60	80	102
Female	0	0	5	5	3	0	5	8	13
Civilian									
Male	30	9	82	121	1	24	77	102	123
Female	3	8	41	52	0	4	20	24	76
Crse/Mode Tot	33	24	143	200	20	32	162	214	414

Note. Does not total 465. The DDM Course was not included, and some respondents did not provide responses for gender.

the COR and DHM Courses were found to be higher grade personnel. Tables 11 and 12 show cross-modal age and grade distributions in the COR and DHM Courses.

Table 11

Sample Population Age Distributions By Courses & Modes

	COR				DHM				
Age	OS	RES	TV	All COR	OS	RES	TV	All DHM	Total
-30	0	1	12	13	8	0	43	51	64
31-40	10	15	61	86	12	11	56	79	165
41-50	19	5	38	62	0	19	61	80	142
51-60	4	3	23	30	0	3	11	14	44
60+	0	0	7	7	0	0	2	2	9
Total	33	24	141	198	20	33	173	226	424

Note. Does not total 465. The DDM Course is not included, and some respondents did not provide responses for age.

Table 12

Sample Population Grade Distributions By Courses & Modes

	COR				DHM				
Category	OS	RES	TV	All COR	OS	RES	TV	All DHM	Total
One	0	1	2	3	11	10	74	95	98
Two	0	1	9	10	4	4	35	43	53
Three	0	8	28	36	5	7	27	39	75
Four	6	9	73	88	0	9	22	31	119
Five	27	5	29	61	0	0	4	4	65
Total	33	24	141	198	20	30	162	212	410

Note. Does not total 465. The DDM Course is not included, and some respondents did not provide responses for grade.

Job Experience. It was found that time spent in the Federal Service did not equate with time spent in current positions. While 83% of the respondents had been in the Federal Service for more than 5 years, 72% had been in their present positions for fewer than 5 years. Altogether, therefore, the sampled population tended to be younger, higher grade, personnel with more than 5 years in the Federal Service and less than 5 years in their current

positions. The relationships of time in service and time in position are juxtaposed with age and grade relationships in Table 13.

Table 13

Sample Population Age, Grade, Time in Service, and Time in Position Distributions By Modes

	OS		RES		TV		All Modes	
	n	%	n	%	n	%	n	%
Age								
Under Age 40	30	57%	27	47%	172	57%	229	55%
Over Age 40	23	43%	30	53%	132	43%	185	45%
Grade								
Lowest 2 Categories	15	28%	16	30%	120	40%	151	37%
Highest 3 Categories	38	72%	38	70%	183	60%	183	63%
Time in Service								
Lowest 2 Categories	6	12%	3	5%	62	20%	71	17%
Highest 3 Categories	46	88%	54	95%	243	80%	343	83%
Time In Position								
Lowest 2 Categories	40	75%	41	72%	220	72%	301	72%
Highest 3 Categories	13	25%	16	28%	86	28%	115	28%

Note. Does not total 465. The DDM Course was not included, and some respondents did not provide responses for time in service or position.

Student Attitudes

H_o^1 stated: It is hypothesized that student attitudes toward modes of instructional delivery will be equally positive ($p<.05$) towards satellite television when compared with the residence and on-site modes. The data were tested by one-way analysis of variance. Because the null hypothesis was directional, Post Hoc testing was conducted using the contrasts method of multiple comparisons.

Tests pertaining to attitude subscales. Student responses to 29 operational statements, scaled from 1 (strongly disagree) to 5 (strongly

agree), that measured positive and negative attitudes pertaining to 8 dependent variable subscales were collected, of which six related to instructor characteristics and instructional processes, one related to the students' perceived need to take the courses, and one related to the students' perception of their physical environment. The means compiled for these eight instructional climate subscales were analyzed to determine the effects of whether student attitudes were positive or negative towards each mode of instruction. Table 14 shows the means compiled for the instructional climate dependent subscales in each of the three modes of instruction.

Table 14

Combined Modal Means for 8 Subscales Measured by Student Attitude Survey

	OS	RES	TV
Subscale	*m*	*m*	*m*
Academic Facilities & Ambiance	3.83	4.40	3.96
Caring & Helpful Instructors	4.23	4.25	3.92
Instructional Methodology	4.16	4.11	3.87
Instructor Competence	4.39	4.26	3.96
Instructor-Learner Interaction	4.52	4.34	3.74
Instructor Presentation	4.43	4.19	3.99
Learning-Effectiveness	3.83	3.85	3.79
Need For Course	4.16	4.10	3.95
Mean of Means	4.19	4.18	3.90

Note. n = 53 (OS); 61 (RES); & 367 (TV).

The means for each subscale were combined by mode of instruction to identify cross-modal means for the residence, on-site, and television modes across courses. The cross-course modal combined mean of means were 4.19 (OS), 4.18 (RES), and 3.90 (TV). A one-way analysis of variance, with an alpha = .05, performed to test for main effects determined that there was a

across courses. The cross-course modal combined mean of means were 4.19 (OS), 4.18 (RES), and 3.90 (TV). A one-way analysis of variance, with an alpha = .05, performed to test for main effects determined that there was a statistically significant difference in the student attitudes pertaining to the modes of instruction with $p. = .006$. Because student attitudes were least positive towards the television mode of instruction to a statistically significant degree, $p < .05$, H_o^1 was rejected. The results of the analysis of variance are presented in Table 15. The means and standard deviations found for the eight dependent subscales, by course and by mode of instruction, are provided at Appendix E.

Table 15

ANOVA: Attitudinal Differences Toward On-site, Residence, and Television Modes of Instruction

SOURCE	*DF*	*SS*	*MS*	*F*	*P*
Mode	2	.9129	.4565	5.79	.006
Error	45	3.5500	.0789		
Total	47	4.4629			

Note. Alpha level = .05.

Post Hoc testing using the contrasts method of multiple comparisons, with an aplha = .05, produced more conservative effects, with a *t*-value of -2.92 and a critical *t*-value of 2.86 when testing for the differences between on-site and television. When testing for the differences between the combined residence and on-site means and the television means, the *t*-value decreased to 1.63 with a critical *t*-value of 3.44.

Testing for category effects. Because H_o^1 was rejected, additional testing was undertaken to determine if factors such as age, gender, grade,

instruction. To accomplish this testing with respect to the independent variable, Time in Position, for example, the subscale scores were regrouped by each of the five time categories established for Time in Position (less than 1 year; 1-5 years; 6-15 years; 16-25 years; and more than 25 years). In this procedure, the eight instructional subscale scores of the respondents who reported they had been in their positions for less than 1 year were averaged together, and the same procedure was followed pertaining to the other four Time in Position categories. These procedures, in turn, were followed with respect to the various categories established for the remaining independent variables: age, gender, grade, military/civilian status, time in organization, time in series, and time in service. One-way analysis of variance, with alpha = .05, revealed no statistically significant differences with respect to any series of independent variable categories.

Effects pertaining to job experience. A one-way analysis of variance, with an alpha level = .05, did reveal, however, that student attitudes across all time categories towards the three modes of instruction were effected to a statistically significant degree by grade, time in position, time in series, and time in service. Table 16 (see following page) presents the results of the analysis of variance pertaining to these 4 independent variables. The degrees of freedom differed among these 4 variables because students provided no responses to some categories.

Post Hoc testing of the respective sets of means that were tested by the ANOVA pertaining to time in position, time in series, and time in service, was performed to determine the relative strengths of the differences in student attitudes with respect to the three modes of instruction. Due to unequal sample sizes, the Kramer variation of the Studentized Range

Table 16

ANOVA: Effects of 4 Demographic Independent Variables on the 8 Instructional Attitude Subscales

Demographic Variable	*DF*	*F*	*F* crit	*P*-value
Time in Position	12	7.2963	4.1028	.011
Time in Series	13	8.9766	3.9823	.005
Time in Service	13	9.3431	3.9823	.004
Grade (rank)	14	4.3988	3.8852	.034

Note. Alpha = .05

Statistic , *q* multiple comparison method, was used for post hoc testing. Pertaining to time spent in the Federal Service, relatively strong effects were found when testing for attitudinal differences between the OS and TV modes with a *t*-value of 5.97 and a critical *t*-value of 3.82 (.95, q 11,3); insignificant effects with a *t*-value of 3.47 were found when testing for differences between the RES and TV modes. Slightly less significant results were found pertaining to time spent in the job series, with a *t*-value of 5.67 and a critical *t*-value of 3.82 (.95, q 11,3) when testing for attitudinal differences between the OS and TV modes; and less significant effects, with a *t*-value of 4.33 were found when testing for attitudinal differences between the RES and TV modes. Although significant, the effects found pertaining to time in position were more conservative, with a *t*-value of 4.63 and a critical *t*-value of 3.88 (.95, q 10,3) when testing for attitudinal differences between the OS and TV modes, and a *t*-value of 4.44 when testing for differences between the RES and TV modes.

Across the three modes of instruction, the respondents who had been in their present positions for fewer than 5 years were distributed as follows:

10,3) when testing for attitudinal differences between the OS and TV modes, and a *t*-value of 4.44 when testing for differences between the RES and TV modes.

Across the three modes of instruction, the respondents who had been in their present positions for fewer than 5 years were distributed as follows: OS, 75%; RES, 72%; and TV, 72%. In contrast, only 12%, 5%, and 20% of these respondents reported they had been in the Federal Service for fewer than 5 years, while 46%, 40%, and 36%, respectively, reported they had been in the Federal Service for more than 16 years. Table 17 shows that the respondents in all three modes were relatively recent entrants into their job series, more recent entrants into their organizations, and even more recent entrants into their positions.

Table 17

Demographic Distributions: Sample Population Job Experience

	OS		RES		TV		All Modes	
	n	%	n	%	n	%	n	%
Time in Service								
Lowest Two Cat	6	12%	3	5%	62	20%	71	17%
Highest Two Cat	24	46%	23	40%	111	36%	158	38%
Time in Job Series								
Lowest Two Cat	26	49%	25	44%	168	55%	219	53%
Highest Two Cat	5	9%	9	16%	32	10%	46	11%
Time in Organization								
Lowest Two Cat	26	50%	33	58%	190	62%	249	60%
Highest Two Cat	13	25%	6	11%	8	3%	27	7%
Time In Position								
Lowest Two Cat	40	75%	41	72%	220	72%	301	72%
Highest Two Cat	1	2%	3	5%	8	3%	12	3%

Note. Middle category not included.

Effects attributable to pay grade or rank. Post Hoc testing of the means pertaining to grade (see Table 16 above) using the more conservative contrasts method of multiple comparisons, revealed insignificant effects with a *t*-value of 2.75 and a critical *t*-value of 3.08 when testing for attitudinal differences between the OS and TV modes, and a *t*-value of 1.81 and a critical *t*-value of 3.77 when testing for differences between the RES and TV modes. The sample population distributions by mode across courses were such, however, that of the 151 respondents who were in the two lowest grade categories, the distributions were as follows: OS, 10%; RES, 11%; and TV, 79%. Taken further, 91% of these lower grade respondents attended the DHM Course; therefore, it was no surprise to find that low grade distributions within the DHM Course were: OS, 11%; RES, 10%; and TV, 79%. Respondents from the DHM Course compiled the following mean ratings for the eight instructor climate subscales: 4.44 (OS), 4.38 (RES), and 3.84 (TV). Conversely, the mean ratings for these same subscales from the COR Course respondents, 75% of whom were in the highest two grades, were 3.95 (OS), 3.99 (RES), and 3.87 (TV).

Training on the job site. One subscale, Training on the Job, which pertained to the respondents' attitudes about having to take a course and then return to work on the same day was incorporated into the on-site and television forms of the survey. The means compiled for this subscale indicated that the respondents in the OS mode ($m = 2.90$) were slightly less positive about training on the job than were the students in the TV mode ($m = 3.02$). An analysis of variance with an alpha = .05, showed there were no significant effects when testing for differences pertaining to the respondents' attitudes about having to take a course and then return to work on the same

day. An analysis of the combined OS and TV mode subscale means compiled for the operational statements representing this independent variable indicated that the respondents in both modes of instruction were less concerned that working on the job each day might interfere with their performance in the course (m = 3.14) than they were about the unfairness of that proposition (m = 2.79).

Television mode subscales. Three subscales were incorporated into the Television Survey Form that were not relevant to the OS or RES modes. The means computed for these subscales, Broadcast Quality (3.52), Facilitator Support (3.84), and Visual Support (3.87), were somewhat below the average of the mean of means (3.90) that was found for the TV mode for the eight instructional climate subscales that were used as measures of student attitudes which pertained to all modes of instruction.

An analysis of the responses provided for each of the operational statements that comprised the Broadcast Quality subscale, revealed that respondents rated video quality (m = 4.03) higher than audio quality (m = 3.59), and their ratings were lowest (m = 2.94) for the operational statement, "Students from other sites can be clearly understood when asking questions." An analysis of the responses provided for the operational statements that comprised the subscale, Facilitator Support, revealed that respondents rated their facilitators' overall knowledge (m = 4.08) higher than their timeliness in providing support (m = 3.66). Finally, with respect to the subscale, Visual Support, the respondents rated the instructors' use of visual materials (m = 3.98) and the television directors' use of the television camera (m = 3.96) about the same, while rating the ability to easily read visual text the lowest (m = 3.66).

Effects of mode preference. The final subscale that was measured only in the OS and TV modes was designed to focus student attention specifically upon mode preference. Students provided subscale ratings for the modes of instruction in which they were enrolled, by comparing their mode with the RES mode, thus, the lower the means, the less positive the respondents were towards the mode of instruction in which they were enrolled when compared with the RES mode. The modal means for this subscale were 3.19 (OS), and 2.91 (TV). By course, the means for Mode Preference were the lowest reported for any subscale in the COR Course (OS, 2.95; TV, 2.88) and the lowest reported for the DHM Course TV mode (OS, 3.43; TV, 2.93), indicating that the COR Course students reported borderline-negative attitudes towards both modes of instruction, while the DHM Course students reported borderline-negative attitudes towards only the TV mode. A one-way analysis of variance was performed to determine the effects of the demographic independent variables on the Mode Preference subscale. Four demographic independent variables, age, grade, time in service and time in job series, were found to effect the subscale Mode Preference with an alpha = .05. The critical statistics for Mode Preference pertaining to each statistically significant effect are shown in Table 18 (see following page).

Learning Effectiveness

$\mathbf{H_o}^2$ stated: It is hypothesized that students will achieve equal learning ($p<.05$) within selected ALMC courses (A,B,C) regardless of their modes of instructional delivery: residence, on-site, or television.

Table 18

ANOVA: Effects of 4 Demographic Independent Variables on Subscale, Mode Preference

Demographic Variable	*DF*	*F*	*F* crit	*P*-value
Age	8	6.8169	5.5914	.034
Grade	9	6.2565	5.3176	.036
Time in Service	9	10.6116	5.3176	.011
Time in Series	8	19.0943	5.5914	.003

Note. Alpha = .05

Tests for learning-effectiveness. The minimum performance standard or skill-level performance threshold allowable under Army Regulations for passing a criterion-referenced course was found to be 70%. The COR and DHM Courses were criterion-referenced, mastery learning courses, with a summative test standard that limited students to one attempt at correctly answering the number of questions required to achieve a score of at least 70%. Therefore, the summative test grades earned by students in the COR and DHM Courses were pass-fail, and were reported as such. Students who missed eight or more questions were failed, thus, correctly answering 18 items (72% of the total number of test items) was the threshold for passing these two courses. A one-way analysis of variance, with an alpha = .05, determined there were no significant differences among modes of instruction in the learning which was measured by the summative test scores administered in these two courses. Table 19 shows the results of the analysis of variance.

Table 19

ANOVA: Differences Among Summative Test Scores From The OS, RES, And TV Modes Of The COR And DHM Courses

SOURCE	*DF*	*SS*	*MS*	*F*	*P*	*F* crit
Mode	2	.0132	.0066	.2102	.810	3.014
Error	492	15.4696	.0314			
Total	494	15.4828				

Note. Alpha = .05.

The DDM Course was norm-referenced, and learning was assessed by measuring student performance during an oral presentation (OS and RES only), a computer simulation, a practical exercise and two summative tests. A one-way analysis of variance, with an alpha = .05, determined there were no significant differences among modes of instruction with respect to the learning that was measured by the summative tests and final course grades. The results of the analysis of variance pertaining to the DDM Course are shown at Table 20.

Table 20

ANOVA: Differences Among Summative Test Scores From The OS, RES, And TV Modes Of The DDM Course

SOURCE	*DF*	*SS*	*MS*	*F*	*P*	*F* crit
Mode	2	50.2726	25.1362	1.0141	.369	3.168
Error	54	1338.403	24.7852			
Total	56	1388.675				

Note. Alpha = .05.

Because there were no significant differences among the intramodal summative test scores reported for the COR and the DHM Courses, and no significant differences among the intramodal summative test and final grade scores reported for the DHM Course, H_o^2 was accepted.

Performance Learning-Effectiveness. A major two-day computer-simulated Depot Management Simulation in the DDM Course offered students reinforcement, role playing, and experience with trouble shooting and decision making in realistic, simulated inventory management activities. The reported simulation means for each mode of instruction were 94.17 (OS), 92.32 (RES), and 90.60 (TV). Because of the extensive hands-on nature of the simulation, and because in the television mode, the instructors were replaced by facilitators, a one-way analysis of variance, with an alpha = .05, was performed to determine the significance of the effects that pertained to the level of student performance across the three modes of instruction, and the results showed there were statistically significant differences among the three modes. Table 21 shows the results of the one-way analysis of variance.

Table 21

ANOVA: Differences Among The Simulation Scores From The OS, RES, And TV Modes Of The DDM Course

SOURCE	*DF*	*SS*	*MS*	*F*	*P*	*F* crit
Mode	2	133.391	66.6955	3.6024	.034	3.168
Error	54	999.754	18.5139			
Total	56	1133.145				

NOTE. Alpha = .05.

Due to unequal sample sizes, the Kramer variation of the Studentized Range Statistic , *q* multiple comparison method was used for post hoc testing, which produced a somewhat less significant result, with a *t*-value of 3.77 and a critical *t*-value of 3.44 when testing for the difference between the on-site and television modes with an aplha = .05. The *t*-value for the difference between the residence and the on-site modes was 1.69, and for the difference between the residence and the television modes the *t*-value was 1.71, neither of which were significant with an alpha = .05.

Costs for Developing Courses

H_o^3 stated: It is hypothesized that courses designed for the television mode of instruction cost the same to develop as do the same courses when designed for the residence or on-site modes of instruction. It was found that the programmed funding for developing courses in the ALMC had been determined by an engineered standard that had provided the College with a given number of mandays each year with which to develop courseware, and the mode of instruction had not been a factor in determining costs. In effect, the cost- basis for every instructor had been divided into two or more categories by this approach. The first category had accounted for course implementation (teaching) activities, and the second category accounted for course development activities, and in some instances, for consulting, research, and other unspecified activities.

In FY94, an engineered standard work-year equated to 2080 duty hours, minus 364 hours to account for annual leave, sick leave, and other non-productive activities. The resulting 1716 hours of productive time were programmed for teaching, developing and maintaining instructional

materials, consulting, and research. In FY94, the standards established by the engineered work-year allocated 1100 hours for teaching, with the remainder allocated to the other activities.

In practice, it was found that ALMC Course Directors had customarily assigned courseware development activities to those instructors who were not otherwise engaged in teaching. These instructors were either "between teaching assignments" or temporarily excess due to changing student enrollment patterns. In addition, many ALMC instructors were found to be subject matter experts who customarily taught their subjects in more than one course, using the same sets of courseware. In addition, it was found that the ALMC faculty routinely employed the same given courseware in all three modes of instruction.

This system may have resulted in leveling the costs for developing courseware across the spectrum of available personnel without regard for the engineered standards, and without regard for course identification. Generally, records had not been maintained concerning courseware development, and no audit trails were found that might have provided reliable information pertaining to either programmed or actual costs. Given the absence of reliable data, H_o^3 was neither accepted nor rejected.

Costs for Implementing Courses

H_o^4 stated: It is hypothesized that, in dollars spent on a per pupil basis, courses designed for television cost the same to implement in the television mode, as do courses designed for the residence and on-site modes when implemented in those modes.

Programmed implementation costs. The ALMC costs for implementing courses in residence, on-site, and by television were organized under the following cost categories: (a) salary & benefits; (b) per diem; (c) travel; and (d) overhead. An additional cost category budgeted for and managed by the DoD Satellite Education Network, pertaining only to the television mode, accounted for studio operations, equipment replacement, maintenance, and other broadcast-related expenses. Costs for buildings and grounds maintenance, utilities, and other non-academic overhead (identified as base operations costs) were not included in this study because they were funded and managed by the Army Corps of Engineers, which is responsible for base operations activities at all Army installations.[2]

Instructor Salaries. The first cost category, Instructor salaries, projected salaries at the rate in effect in FY94 for a general services employee in pay grade 12, step 5 (GS12/5), plus 18% to account for benefits, which amounted to $26.62 per hour. Each residence and on-site course was budgeted at 40 hours per week, per instructor, regardless of the number of instructor contact hours that were expended, and each television iteration was budgeted at the number of broadcast hours.

Per Diem and Travel. The second and third categories, per diem and travel, applied to instructors when they taught on-site. Per diem costs differed from area to area, and travel costs were contingent upon the mode of transportation and the round-trip distances between the on-site locations and

[2] Additional cost factors, such as television classroom facilitators' salaries, residence and on-site custodial services, etc., were not considered because these costs were paid by host installations as a part of their routine training expenses. Non-governmental organizations, may budget differently. Capital expenditures for classrooms, television studios, and startup equipment were not included because construction costs were authorized by the Congress as a line item in the military construction authorization (MCA) allocations for the years during which the facilities were constructed. MCA costs are not amortized.

Fort Lee, Virginia. Student per diem and travel costs were not paid by the College; however, they were included in the ALMC Student Cost Model and were reported to higher headquarters as a part of the costs for ALMC training. Therefore, they were included in the cost analysis for this study. For every student projected to attend an ALMC residence course, the ALMC costs model allocated $350 in pro rata travel costs (to Fort Lee and return), $100 in pro rata local travel costs (car rental, mileage), and a per diem (lodging and meals) allowance of $70 for each residence student, which was the official government per diem rate in effect for Fort Lee and the surrounding area during FY94. To accommodate travel days, one additional day of per diem allowance was programmed for each student.

Student load factor. The Student Load Factor accounted for ALMC student services, course materials, shipping and mailing, telephone, and clerical support. These costs were annualized and pro rated under a budgeting factor identified as a "student year," which accounted for the dollars that would be needed by the government to support one student for 243 duty days (260 duty days minus 17 days to account for holidays and other personnel administration factors). The student year cost factor during FY 94 was $3,772, or $15.52 per student day ($3,772/243). The Student Load Factor for each course was programmed in the same manner as shown in Figure 1 (see following page).

Television Broadcasts. The hourly costs associated with operating the television studios, satellite transponder fees, telephone WATTS line fees, and the pro rata costs of maintaining the studio equipment, uplink dishes and transmitters, were combined into a pro rata hourly costing unit called a "broadcast hour." During the period of the study, one broadcast hour cost

Figure 1. Formula For Determining ALMC Student Load Factor

	1 Wk Crse	2 Wk Crse	4 Wk Crse
Number of Weeks:	1	2	4
(Times) Days Per Week:	5	5	5
(Times) Number of Students:	35	35	35
(Equals) Student Days:	175	350	700
(Times) Student Day Factor:	15.52	15.52	15.52
(Equals) Student Load Factor:	$2,716	$5,432	$10,864

$650. Of that amount, $384 accounted for studio operations, $66 accounted for maintenance, and $200 accounted for television satellite transponder rental fees. The programmed costs for implementing the OS, RES, and TV modes of instruction in the COR, DHM, and DDM Courses are provided at Table 22 (see following page).

Actual implementation costs. In general, the OS modes of instruction for all three courses were found to be less costly with respect to costs per course *hour* than the RES and TV modes, in part, because the OS students did not travel, thus eliminating the high costs associated with travel and per diem. In the TV mode, student travel and per diem cost savings were offset by the costs associated with broadcasting. With respect to the RES mode, it was found that course length affected the costs per course hour because student travel costs had to be paid only one time, regardless of the number of days the students were in residence. For example, the RES mode costs per course hour for the 160 hour residence mode of the DDM Course were lower than the costs per course hour for the 40 hour COR and DHM residence

Table 22

Programmed Costs for the COR, DHM, and DDM Courses by Modes of Instruction

	OS	R	TV
COR Course			
Course Length	(1 WK)	(1 WK)	(27 HR)[a]
Student Load Factor	$2,716	$ 2,716	$ 3,259
Instructor Salary & Benefits	$1,065	$ 1,065	$ 719
Travel & Per Diem	$1,188	$30,450	N/A
Broadcast Costs	N/A	N/A	$17,550
Total Costs for COR Course	$4,969	$34,231	$21,528
DHM Course			
Course Length	(1 WK)	(1 WK)	(24 HR)[b]
Student Load Factor	$2,716	$ 2,716	$2,716
Instructor Salary & Benefits	$1,065	$ 1,065	$ 639
Travel & Per Diem	$1,322	$30,450	N/A
Broadcast Costs	N/A	N/A	$15,600
Total Costs for DHM Course	$5,103	$34,231	$18,955
DDM Course			
Course Length	(2 WK)	(4 WK)	(45 HR)[c]
Student Load Factor	$5,432	$10,864	$ 5,432
Instructor Salary & Benefits	$2,130	$ 4,259	$ 1,198
Travel & Per Diem	$1,276	$81,900	N/A
Broadcast Costs	N/A	N/A	$29,250
Total Costs for DDM Course	$8,837	$97,023	$35,880

Note. Costs based upon average course load of 35 students, and one instructor in classroom during any given block of instruction

a 27 class hours covering six days

b 24 class hours covering five days

c 70 class hours covering ten days (45 broadcast hours plus 25 class hours with facilitators)

courses. Table 23 shows the comparative costs per course hour for the three modes of instruction for each course assuming that the instructors' and students' were engaged in course activities throughout the 8 hour course days.

Table 23

Comparison of Actual Costs Per Course Hour, by Mode Of Instruction

	COR[a]	DHM[b]	DDM[c]
	Costs	Costs	Costs
On-Site	$ 124	$ 128	$ 110
Residence	$ 856	$ 856	$ 606
Television	$ 797	$ 790	$ 797

a COR Course Hours: OS, 40; RES, 40; TV, 27
b DHM Course Hours: OS, 40; RES, 40; TV, 24
c DDM Course Hours: OS, 80; RES, 160; TV, 45

Costs per course hour were determined to be deceptive when comparing the relative course implementation costs among modes of instruction, due to the finding that the TV mode demonstrated a capability to reach 5 to 9 times more students per hour in the courses studied, than were reached by the face-to-face modes. For example, during every respective course hour, the COR Course instructor taught 188 students by TV, while reaching 34 students in the OS mode and 27 students in the RES mode. As a result, while costs per course hour for implementing the three courses in the television mode ranged from $790 to $797, the costs per student, per hour, were as low as $4.07 for students in the television mode. Table 24 presents a comparison of the actual costs per student, per hour for each mode of

instruction, assuming that the instructors' and students' were engaged in course activities throughout the 8 hour course days.

Table 24

Comparison Of Actual Costs Per Student, Per Hour, By Mode Of Instruction

	COR		DHM		DDM	
	n	Costs	n	Costs	n	Costs
On-Site	34	$ 3.65	21	$ 6.07	18	$ 6.14
Residence	27	$31.10	38	$22.52	14	$43.31
Television	188	$ 4.24	194	$ 4.07	26	$30.67

As can be seen in Table 24, in this study, the COR Course OS mode of instruction offered the lowest cost per student, per hour, at $3.65, indicating that when optimally filled (35 students), the OS mode might be perceived to be the least expensive mode to implement. An extrapolation of the actual costs for implementing the COR Course OS mode indicated that with 35 students, the COR Course OS mode cost per student, per hour, might have been as low as $3.54. In this one iteration of the COR Course, therefore, the OS mode was the least costly to implement. However, an analysis of the cost factors pertaining to course implementation and scheduling provided the finding that, among others, two important variables might be expected to continuously impact costs with respect to the OS and the TV modes of instruction.

The first variable is faculty availability. It was found that in order to have trained the same number of COR Course students OS that were trained

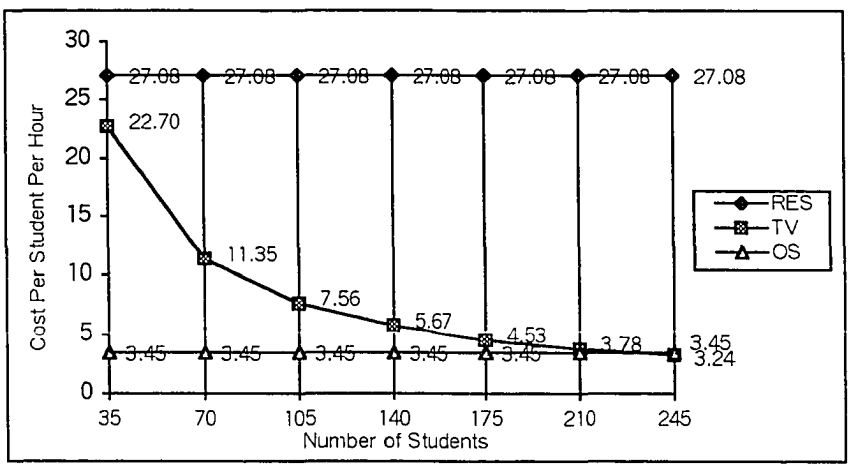
in the TV mode, it would have required the need for 5.4 times the amount of instructor support, either in terms of an increased number of faculty OS at 5.4 locations for one week, or in terms of increased OS instructor contact hours for one faculty member over a period of 5.4 weeks at one location. The combined instructor salary and the costs for faculty travel and per diem for the OS mode of the COR Course was $2,253 for the 5 days the ALMC instructor was OS (see Table 22). While this amount was properly factored into the equation to determine costs per student, per hour pertaining to the OS mode for the COR Course, when comparing the costs per student, per hour between the OS and TV modes, the OS costs for faculty salary, travel, and per diem become cost avoidance items with respect to the TV mode. Thus, in order to train 188 students OS (matching the number who were trained by the TV mode), an additional $12,160 would have had to be expended to cover the additional costs for instructor salary, travel, and per diem.

The second, and perhaps the most significant, implementation and scheduling variable pertains to the total optimal number of class seats available for every course iteration in the TV mode. During FY94, the Satellite Education Network was affiliated in some manner with 102 receiving locations, which, at 35 students per location, equated to the optimal potential to reach 3,570 students during any given course broadcast. While reaching such a high number of students for any given course might not be realistic, it was found that it is realistic to expect to reach the number of students during a broadcast course needed to achieve a cost per student, per hour that might match or be lower than the cost per student, per hour achieved for the COR Course OS mode during this study. Using the actual costs that were found to

be expended for the OS and the TV mode iterations of the COR Course, for example, enrolling 30 additional students in the TV mode would have increased the total number of students reached to 218, thereby reducing the cost per student, per hour in the TV mode to $3.65, which was what it cost per student per hour in the COR Course OS mode with 34 students. In other words, if the COR Course OS mode location had been added as a TV mode location, the costs per student, per hour might have been no higher than the per student, per hour costs achieved for the OS mode. In addition, the instructor travel and per diem costs that were invested in the OS mode iteration might have been avoided, and the instructor might have been freed for a week of other activities.

A fair comparison of costs per student, per hour, can be made by comparing the average costs per student, per hour for training the optimal number of students per classroom (35) in the OS, RES, and TV modes across the three courses that were sampled for this study. Using extrapolations from the actual costs incurred for each mode in each course, the average costs, per student, per hour, to reach 35 students were found to be $3.45 (OS), $27.08 (RES), and $22.70 (TV). Figure 2 shows graphically the relationships among student enrollment, modes of instruction, and costs per student, per hour, when starting with an optimal classroom load of 35 students. As can be seen in Figure 2, with each additional increment of 35 students the OS and RES mode costs remain constant, because one faculty member can reach only 35 students. The TV mode costs decrease, falling below the OS mode cost per student, per hour of $3.45, when reaching 230 students, because only one faculty member is required regardless of the number of students reached.

Figure 2. Comparison of Average Costs Per Student, Per Hour, by Mode of Instruction.



NOTE. TV and OS axis lines cross at 230 students, at which point both modes reflect costs of $3.45 per student, per hour.

To summarize, when all factors were analyzed pertaining to the three courses sampled, the costs for implementing courses in the television mode were found to be less, per student, per hour, than the costs for implementing courses in the on-site and residence modes in all three courses, except for one iteration of the OS mode in the COR Course. An analysis of ALMC faculty availability found that the College must make the equivalent of one additional faculty member available for every additional 35 students taught in residence or on-site. This factor, coupled with the capability to reach over 3,000 students at any given time by television, resulted in a finding that lower costs for one course iteration cannot be cited as being representative of the costs encountered for implementing all courses. Just the loss of 5 students in the COR Course OS mode, for example, might have raised the cost per

student, per hour to $4.28, which was higher than the cost per student, per hour, in the TV mode ($4.24). In addition, consistent use of the TV mode over time might fairly be expected to average to a lower implementation cost than might the OS mode. Given these findings, and the strong probability that the television mode allows for a more efficient use of the faculty over the academic year, H_o^4 was rejected.

Chapter 5

Conclusions

This chapter presents a brief summary of the major issues that were addressed by this research and the major findings from the literature that were pertinent to the research issues. Conclusions are presented that were reached with respect to student attitudes, the relative learning-effectiveness, and the costs of course development and implementation pertaining to the residence, on-site, and television modes of instruction. Implications for the field of adult education and distance learning are provided, and recommendations for future research are presented.

Summary

The Issues

The Department of Defense (DoD) has an annual requirement to provide training to as many as 2.6 million military and civilian personnel who represent more than 58% of the total Federal workforce (USBC, 1993, p. 350). The reductions in personnel and funding that have been imposed upon the DoD during the past 3 years have made it increasingly difficult for the military to provide critical training in residence settings, and planners within the DoD have urged training managers to investigate the use of distance learning technologies as an alternative approach. Although the U.S. Army Logistics Management College (ALMC) houses the oldest and largest

television training facility in the DoD, it has been generally rejected by the ALMC faculty, who have cited as reasons for their rejection their perceptions that (a) the ALMC students do not want to take courses in the television mode, (b) that logistics courses are too complex to be taught effectively via television, and (c) that the television mode is too expensive to use for teaching.

Research On Distance Learning

Research on attitudes. The research literature review for this study made it clear that, like the ALMC faculty, most teachers in this country have been skeptical about using television as a mode of instruction, citing fears, such as, "television can isolate students, undercut local autonomy and instructor control... and make students passive recipients of overstructured packets of knowledge" (Kerka, 1989, *p.* 3). Countering these fears, other researchers have generally concluded that when the instruction has been appropriately designed and implemented, television has been found to be an effective mode for teaching adult learners (Wagner, 1992b). On balance, televised distance learning programs have been increasing since the early 1980s. By 1986, over 500 American colleges were offering televised courses to hundreds of thousands of students, (Bolduc, 1989), and today, nearly every state has invested in distance learning for students from K-12 to continuing- and higher education. In addition, many large corporations now train their employees through distance learning programs.

Within this setting, what fidelity do the three perspectives cited by the ALMC faculty hold with respect to findings reported by the literature? The ALMC faculty perceptions that students do not want to take courses by television are generally unsupported by research findings. Although relatively

few studies have been reported that pertained directly or even indirectly to learner attitudes about television, the few that have been published tend to show that learners have been inclined to focus upon the practical matters associated with learning from a distance. For example, Howe (1983) reported that "most students find it impossible to take notes while viewing, and those that do are usually very dissatisfied with [them]" (*p.* 61).

Other concerns that have been expressed by distance learners have been potentially more serious. Lacina and Book (1991), for example, found that "the most commonly cited drawbacks to the remote classroom included the ease of turning off the instructor and becoming inattentive, difficulty in gaining access to the instructor or in having information repeated, and difficulty in participating in class discussions" (*p.* 157). Some teachers have been disturbed by the finding that distance learners have been more assertive, more willing to debate and disagree with instructors and other students, and more apt to cause distractions than their residence counterparts (Foster, 1993). Whether viewed from a pejorative or a positive aspect, these characteristics might be expected to prompt distance learners to be more vocal about perceived issues than their residence counterparts. Although there is no disputing that notetaking, inattentiveness, and difficulty in gaining access to instructors are serious matters, the literature further reflected that these complaints might have been readily resolved by better teacher preparation and planning, by the use of appropriate instruction that has been designed for use in a distance learning setting, and by helpful, knowledgeable facilitators in the distance classrooms.

Researchers have concluded that distance learning may not be appropriate for everyone, and it has been found that learners who are inclined towards distance learning may be more assertive and may differ in

other ways from learners who are inclined towards face-to-face learning. Voegel (1986) reported that "institutions offering telecourses must identify students for whom distance learning is inappropriate and either help them to learn new study techniques or direct them to other, more supportive instructional situations" (p. 10). Just as for learners, distance learning may not be appropriate for every teacher. Wagner (1992b), reported that some teachers find face-to-face and distance education comparable, while some teachers have trouble adapting to differences that are attributable to geographic separation. Where teachers have been ineffective, the ineffectiveness was related more to their inability to adapt than to the methods of delivery (p. 44).

While some researchers have reported negative findings, others have found that many learners have expressed positive attitudes towards distance learning, such as those reported by Chung (1991), who found that students in telecourses "rated them significantly higher than conventional courses when the telecourses included well-trained site facilitators, [well-trained] instructors, and well-designed learner materials" (p. 42). In another study conducted for the Office of Technology Assessment, researchers found that elementary, secondary, and adult learners all held generally positive attitudes towards televised instruction (OTA, 1989).

The most consistently reported findings, however, were that most adult learners expressed essentially the same attitudes with respect to distance- and face-to-face learning. In industry, for example, Chute and Balthazar (1988), found from a six month study of 329 AT&T employees who were enrolled in 45 residence courses and 590 employees who were enrolled in AT&T teletraining courses, that there were no statistical differences ($p < .05$)

in employee attitudes (which were positive) about the two modes of instruction.

There is a growing body of evidence to support the postulation that adult learner attitudes about enrolling in television courses may be less important than - - or even subsumed by - - the more powerful motivations stemming from the life circumstances that have spurred the learners' search for education or training in the first place. For example, Hezel and Dirr (1991) found that distance learning students today report their biggest challenge is not distance, but time, and how to manage it while raising families, going to work, and pursuing other responsibilities.

Research on learning-effectiveness. Despite the assertions of most ALMC faculty that logistics courses are too complex to be taught effectively on television, the one distance learning issue about which researchers have been nearly unanimous in their findings is that the instructional mode of television has been shown to be learning-effective with respect to all levels of the cognitive domain of educational objectives. Typical of these findings, the Office of Technology Assessment reported that "the effectiveness literature has been quite consistent: when used in business, military training, and adult learning, there is no significant difference in effectiveness between distance learning and traditional instructional methods" (OTA, 1989, p. 44).

Within the military logistics community, studies of courses broadcast by the DoD Satellite Education Network have shown that television can be an effective medium for teaching complex military logistics courses. In a study of three Acquisition Management Courses taught over the SEN in 1990-91, for example, the U.S. Army Materiel Systems Analysis Activity (AMSAA) concluded that there were no significant differences in the grades of students who completed the three courses offered by television from the grades of

students (all from the same population) who completed the same courses in residence.

Research on costs/benefits. The third perspective held by the ALMC faculty, that television is too expensive to be used for teaching, has not been addressed by researchers, possibly because of the extreme variations that have been found with respect to the myriad of communications technologies, distance learning populations, and training programs that have begun to characterize the distance learning community. These many variations have made it advisable to compare face-to-face and distance learning costs in terms of costs per student, per instructor contact hour, and that has been the procedure that was followed during this study.

Methodology

The procedures followed in this study were designed to address the issues raised by the ALMC faculty, therefore, the study measured and analyzed student attitudes, learning-effectiveness, and costs, as they pertained to three military logistics courses, each taught in the residence, on-site, and television modes of instruction by ALMC faculty members. To gain knowledge about three important intervening variables that impacted upon student attitudes pertaining to the on-site and television modes of instruction, the study measured and analyzed students' (a) perceived need to attend the sampled courses, (b) overall feelings about taking courses at the job site, i.e., on-site or by television, and (c) feelings about working on the job immediately before or after attending class sessions. As an aid to analyzing student attitudes or learning effects that might be associated with the technology of broadcast television, student attitudes pertaining to the quality

of the televised video and audio signals were measured. In addition, the televised courses were videotaped during their broadcasts, the technical clarity of the video and audio signals were reviewed, and distractions were noted.

Course mode length and time on tasks

Because this study compared attitudes, learning-effectiveness, and costs/benefits among three modes of instruction, it was necessary to determine the actual length of each course mode iteration in terms of instructor contact hours because instructor exposure and time-on-task were important factors relative to student attitudes and learning-effectiveness. In addition, costs per student, per hour, were a criterion used for determining costs/benefits.

Programmed as five day courses (40 Hours), the Contracting Officer's Representative (COR) Course and Defense Hazardous Materials/Waste Handling (DHM) Course residence classes were each observed to be in session for a total of approximately 28 hours of instructor contact time over a five day period, and the COR and DHM instructors reported that they spent the same number of hours in their on-site classrooms. The COR and DHM television courses were in session for 27 and 24 hours respectively. It appeared, therefore, that the COR Course instructors taught essentially the same number of contact hours in all three modes of instruction, while the DHM Course instructors taught essentially the same number of hours in the residence and the on-site modes, and for approximately three fewer hours in the television mode.

The Defense Distribution Management (DDM) Course was scheduled to meet for 4 weeks (160 hours) in the residence iteration, 2 weeks (80 Hours) in the on-site iteration, and for 45 contact hours over a two-week period of

time in the television iteration. The differences in course hours among the three modes of instruction were accounted for, in part, by requiring students who enrolled for the on-site and the television modes to complete certain blocks of instruction in the correspondence mode prior to enrollment. The learning objectives that were taught by correspondence required 2 weeks to teach in the residence course. Excluding the objectives that were offered by correspondence, and pertaining only to those learning objectives that were taught and tested in all three modes of instruction, the programmed DDM Residence Course length, therefore, equated to 80 hours.

The DDM instructors reported that they taught approximately seven hours per day in both the residence and the on-site iterations, which would equate to 70 instructor contact hours over a period of two weeks in each mode. The instructors further reported that they devoted approximately the same number of contact hours to given objectives regardless of the mode of instruction, including television. Therefore, approximately the same relative number of instructor contact hours were expended by the DDM Course instructors on teaching the same relative objectives in the residence and the on-site modes.

The television mode was approximately 25 hours shorter because a 25 hour work group portion of a 30 hour computer-assisted simulation was not broadcast. The simulation was facilitated by the course instructors in residence and on-site, and by specially-trained course facilitators at the television sites. During the television iteration, the course instructors were available for consultation by telephone or fax while the students worked on the practical exercise. At five specified intervals, the instructors conducted 1 hour broadcast reviews and discussions. During these discussions, students from each site, in turn, reported progress on the exercise, and the instructors

moderated the discussions which included comments from all sites. All three courses, therefore, were found to be offered in approximately corresponding lengths of time in each mode of instruction, and it was concluded that the observed small differences in modal course lengths were not critical.

Conclusions Pertaining To Sample Generalizability

To what extent will it be possible to generalize from the results that were obtained from this sample? This was an important consideration because the results had to be judged by the ALMC administration and faculty to be applicable to other ALMC courses and target populations. Attitude surveys were completed by 465 (85%) of the 546 students who attended the three courses, with no mode represented by fewer than 83% of its enrollees. The majority of the 465 respondents were civilians, males, and under the age of 40, which was not untypical for a sample drawn from military and civilian employees of the DoD.

Concerning demographic characteristics, however, the sample was not equally distributed between the courses studied and it was important to determine what effects might result from this unequal distribution that might impact upon generalizability. The COR Course on-site mode, for example, consisted entirely of civilian males, and the DHM Course on-site mode consisted primarily of military (95%). Analysis of all sample population characteristics showed that neither circumstance was unusual for the population, given the respective grade-levels of the enrollees and the locations where the on-site courses were taught. In the COR Course on-site mode, the respondents, although all males, were higher grade employees, which tended to reflect the generally low representation of females at higher

grade levels within the DoD logistics community. The DHM Course on-site mode was taught at a Navy Supply Depot, which explained not only why 95% of the respondents were military, but also why 75% were lower grade military.

The COR Course on-site sample distributions reflected the reluctance of local administrators to simultaneously release 33 senior grade personnel to leave their job site to attend a residence course when that course could be made available on-site (on-site courses were established, in part, to accommodate this type of situation). The DHM Course on-site sample population distributions were made as the result of Navy administrators trying to satisfy a DoD requirement to provide hazardous materials safety training to lower grade personnel at a time when budget cuts had greatly reduced the availability of funds needed to pay the TDY and Travel expenses associated with a residence course.

The sample distributions within all three modes of both courses were in keeping with what might be expected with respect to the subject matter. In the COR Course, which was targeted to personnel (and their supervisors) who had been assigned to monitor government contracts, the majority of students were higher grade personnel, which appeared to reflect the practice that higher grade personnel are more often appointed to serve as contracting officer representatives. In the DHM Course the majority of respondents were in the lower grades, which appeared to reflect the reality that most personnel who come into contact with hazardous materials are lower grade depot and warehouse storage and transportation personnel.

It was concluded that with respect to the population characteristics of age, gender, grade, military/civilian status, and job-experience, the sample was distributed across the courses and modes of instruction as might be

expected for employer-produced training within the milieu of the DoD logistics community. Therefore, it appears that generalizations from the results of this study might be applicable to the larger population within the DoD logistics community.

Conclusions Pertaining to Student Attitudes

Null Hypothesis 1

H_o^1 stated: it is hypothesized that student attitudes toward modes of instructional delivery will be equally positive ($p<.05$) towards satellite television when compared with the residence and on-site modes. This null hypothesis was rejected because one-way analysis of variance indicated that student attitudes, as measured by eight instructional climate subscales across all three modes of instruction, were least positive towards the TV mode, F (2, 45) = 5.79, p = .006. Post Hoc testing using the contrasts method of multiple comparisons produced more conservative results, with a t-value of -2.92 and a critical t-value of 2.86 when testing for the differences between the on-site and TV subscale means. Therefore, it was concluded that while the main effects were statistically significant, they may not have been practically statistically significant.

The mean of means obtained for the instructional climate subscales within the three respective modes were: 4.19 (OS); 4.18 (RES); and 3.90 (TV). The student attitude survey instrument developed for this study employed a five-factor Likert Summated Rating Scale with the most negative factor, Strongly Disagree, equal to 1 and the most positive factor, Strongly Agree, equal to 5. When scored, summed, and averaged, mean scores higher than 2.5 signified positive trends and mean scores below 2.5 signified

negative trends, and the positive and negative trends recorded for each subscale were equated to positive and negative student attitudes. The mean scores that were compiled for the eight instructional climate subscales across all modes ranged from a less-positive 3.74 to a more-positive 4.52. Delving further, within each mode the range of mean scores were 3.83 to 4.52 (OS); 3.85 to 4.40 (RES); and 3.74 to 3.99 (TV). The second conclusion pertaining to student attitudes, therefore, was that even with statistically significant differences in their attitudes towards the modes of instruction, the respondents exhibited positive attitudes towards all three modes.

Conclusions Pertaining To Instructional Climate

Instructor characteristics and instructional processes. Six of the eight instructor climate subscales measured instructor and instructional effects such as instructor competence and the effectiveness of instructional methodologies. The mean scores obtained for the six subscales in the TV mode were found to be lower than the mean scores for the same subscales in the OS and RES modes. Among these, the lowest mean score (3.74) was found for the subscale, Instructor-Learner Interaction. Conversely, Instructor-Learner Interaction received the highest mean score (4.52) in the OS mode, and the second highest mean score (4.34) in the RES mode. The third conclusion pertaining to student attitudes was that with respect to the courses studied, instructor characteristics and instructional processes were perceived by the respondents to be less effective in the TV mode, and instructor-learner interaction was the least effective instructional process in the TV mode. The broadcast videotapes showed that the instructors made early attempts to program interaction into their lessons. However, in the opinion of the researcher, these attempts were not always adequately sustained.

Facilities and ambiance. The seventh subscale, Academic Facilities/Ambiance, was included for the purpose of focusing attention upon the physical and ambient characteristics of the classrooms and other academic support facilities. The mean scores obtained for this subscale were 3.83 (OS), 4.40 (RES), and 3.96 (TV). Because it could not be shown that any of the enrollees had attended ALMC courses at any other locations, the mean scores for the subscale could be interpreted to be indicative only of student observations pertaining to their respective facilities, including such attributes as heating, lighting, furniture, ambient sounds, and odors. The fourth conclusion pertaining to student attitudes was that the academic facilities and ambiance at the ALMC were apparently perceived to be physically very well suited to academics with few or no ambient distracters.

The mean scores obtained for this subscale in the OS and the TV modes, while relatively positive, were significantly lower than those found for the RES mode, suggesting that the OS and TV mode facilities were perceived in some way to be less well-suited to academics. Empirical evidence supports the conclusion that the perceptions of the respondents in the OS mode did not negatively effect their attitudes towards their mode of instruction. While the OS respondents rated their facilities somewhat lower than the TV facilities were rated by the TV mode respondents, the OS respondents exhibited the most positive attitudes towards their mode of instruction as measured by their ratings for the other instructional subscales, which were the highest among the three modes of instruction. No conclusions were drawn with respect to the impact, if any, that might have been associated with the attitudes towards facilities that were expressed by the respondents in the TV mode.

Need to take the course. The eighth instructional climate subscale was Need For The Course, and the modal means obtained for this subscale were 4.16 (OS); 4.10 (RES); and 3.95 (TV). Need to take the course was included as a subscale because (a) course need might be expected to effect student motivation to attend a course, (b) in some other way effect student attitudes towards the mode of instruction, and (c) course need might be expected to effect learning. For this subscale, the higher the score, the more intense was the attitude that the course was needed. Given that the modal subscale means for Need To Take The Course were each within one *SD* of their respective modal mean scores for all eight subscales, they can be said to represent typical feelings across all three modes.

Course prerequisites required that the students in both courses were to attend these courses when it was perceived by their supervisors that the enrollees would need the training with respect to their duties. An analysis of the consequences of inadequate performance associated with the two sampled courses revealed that in the COR Course, the learning outcomes stated that inadequate performance of certain tasks on the job might result in fines, dismissal, or even criminal prosecution in a Federal Court. In the DHM Course, the learning outcomes stated that inadequate performance might result in dismissal, personal injury, or even death. Such potential consequences might be expected to focus students' attention upon the need to complete the courses successfully.

Additional evidence was found to support the contention that the students needed the courses studied. An analysis of the demographic data collected by the student surveys indicated that 72% of all respondents reported they had been in their current positions for fewer than 5 years, and 25% reported they had been in their current positions for less than 1 year. In

the researchers' 23 years of experience in a military environment, personnel turn-over has been relatively volatile among military service members, regardless of rank, with a typical tour of duty lasting approximately 3 years. Therefore, it might be expected that military job holders might not have held their current positions for longer than 3 years.

Civilian personnel in the DoD environment customarily have worked in their organizations for longer periods, changing organizations far less frequently during their careers. With respect to the courses studied, not only had 72% of the respondents been in their present positions for fewer than 5 years, but 72% of the respondents across all three modes were civilian service members. It was thus concluded that a large percentage of the civilians, as well as the military, who attended the courses studied were fairly recent entrants into their positions. When tested, one-way analysis of variance resulted in the finding that the independent variables time in service, time in job series, and time in position produced effects that were statistically significant with respect to student attitudes about the eight instructional climate subscales. Given the subscale mean scores, supervisor selection to attend the course, the consequences of inadequate performance, and the strong evidence that the military and civilian respondents in both courses were relatively new to their jobs, it was concluded that a majority of the students perceived they needed these courses. Implications pertaining to this conclusion will be discussed in a following section.

Conclusions Pertaining To Taking Courses At The Job Site

Training on the job. Two subscales which pertained only to the OS and the TV modes, and three subscales which pertained only to the TV mode, were measured in addition to the instructional climate subscales. One

subscale that pertained to the OS and the TV modes was Training On The Job. While no significant effects were found from testing for differences pertaining to the respondents' attitudes about having to take a course and then return to work on the same day, some respondents were being required to work on the job before, during, or following their classes, and the means for this subscale were 2.91 (OS); and 3.04 (TV). One of the operational statements that comprised this subscale, "Having to work at my job each day while taking this course is unfair," compiled a combined modal mean score of 2.79. The lower means found with respect to this subscale supported the seventh conclusion pertaining to student attitudes: The impacted respondents tended to resent having to report to their duty stations while enrolled in the courses studied, yet, reporting to their duty positions did not appear to interfere significantly with learning-effectiveness, nor did these relatively negative student attitudes interfere with the overall ratings pertaining to the instructional climate attitudes. Otherwise, the OS student rating means for the instructional climate subscales might have been expected to be lower; instead, they were the highest means obtained among the three modes of instruction.

Job-site mode preference. The second subscale that was measured only in the OS and TV modes was Mode Preference. This subscale was included to obtain information directly pertaining to student attitudes about the mode of instruction in which they were enrolled when compared with the RES mode. The lower the means, therefore, the less positive the respondents were towards their mode of instruction when compared with the RES mode. The combined modal means for this subscale were 3.19 (OS) and 2.91 (TV). The lower mean scores obtained for the TV mode were indicative of the lower mean scores obtained for the TV mode with respect to the eight instructional

climate subscales. With respect to the subscale, Mode Preference, one-way analysis of variance showed that age, grade, time in service, and time in job series produced moderate effects that were statistically significant. The eighth conclusion, therefore, was that when given the chance to compare the TV mode with the OS and RES modes, the TV respondents showed more positive attitudes towards the OS and the RES modes than they showed for the TV mode.

Conclusions pertaining to broadcast quality, visual support and facilitators.

Broadcast quality. Three subscales, Broadcast Quality, Visual Support, and Facilitator Support, pertained only to the TV mode. An analysis of the responses provided for each of the three operational statements that comprised the subscale, Broadcast Quality, revealed that respondents rated operational statements pertaining to video and audio quality higher than the operational statement, "Students from other sites can be clearly understood when asking questions," which obtained a relatively low mean score of 2.94.

The videotapes made of the television mode broadcasts substantiated the perception that students could not always be understood over the push-to-talk microphone feedback system. The students contributed to the poor quality when they did not follow instructions with respect to how to use the microphone system, and at times they clipped the beginning or the ending of their comments due to their own poor coordination in pushing or in letting up on the microphone activation button while speaking. There were occasions when audio feedback or other types of technical problems were experienced that were traced to the equipment or other factors that were beyond the control of the students, and the Network audio technology must be improved. It was concluded that the problems experienced pertaining to understanding

student questions and responses from other TV mode locations may have produced negative ramifications pertaining to the TV mode student attitudes. For the courses studied, this technically-oriented problem might have been corrected by more careful monitoring by the instructors and the facilitators, better control of the push-to-talk microphones by the students, and by more careful foresight and more effective trouble-shooting by the Network personnel responsible for technical applications.

Visual Support. A second subscale that pertained only to the TV mode was Visual Support which obtained a mean score of 3.87. The lowest rated operational statement pertaining to the subscale was, "All televised written text could be seen clearly enough to read comfortably," which obtained a mean score of 3.66. This lower rating indicated that some televised written text might not have been seen clearly enough to read. A review of the videotapes substantiated that viewgraphs were employed by instructors in the TV mode that had been designed for use on an overhead projector in a face-to-face setting, and the textual information presented on approximately a dozen of these viewgraphs was very difficult to read. It was concluded that the use of these inappropriate viewgraphs might have annoyed many students, not only because they were unable to read the text, but also because of the delays caused while the textual information was read aloud or otherwise explained. It was not clear to what extent, if any, student attitudes towards the TV mode - as measured by the instructional climate subscales - were effected by the use of inappropriate visuals. The mean score for the operational statement that measured students' ratings for this factor fell below the mean of means obtained for the instructional climate subscales for the TV mode (3.90). For the courses studied, the instructors were graduates of an ALMC course in which they had successfully demonstrated their

knowledge and ability to use graphics that were appropriate for use in the TV mode of instruction. Therefore, the instructors might have avoided the use of inappropriate visuals had they followed procedures that were known to them. In addition, the ALMC administration might have prevented the ensuing problems by taking steps to assure that appropriate course development procedures had been followed.

Facilitator support. Means compiled for the subscale, Facilitator Support, were 3.84. An analysis of the scores obtained for the operational statements that comprised this subscale, revealed that respondents rated their facilitators' overall knowledge (m = 4.08) higher than their timeliness in providing support (m = 3.66). It was concluded that most facilitators appeared to have acquired at least the minimal technological knowledge and skills required to facilitate the courses studied in the TV mode of instruction. It was not clear to what extent, if any, student attitudes towards the TV mode - as measured by the instructional climate subscales - were effected by the facilitators.

Discussion Of Student Attitudes

Instructional climate effects: One factor that may have led to less positive attitudes towards the instructional climate in the TV mode was the ALMC faculty's' practice of using courseware in the TV mode that had been developed for face-to-face modes of instruction. Evidence developed with respect to course development activities indicated that the faculty seldom, if ever, developed instruction specifically for use in the TV mode. Using overhead viewgraphs developed for face-to-face learning situations instead of developing more suitable electronic graphics was just one example of this tendency.

Research findings have shown that instructional materials and methodologies intended for distance learning applications must be designed to accommodate the attributes attendant to the media and the physical separation between teachers and students (Willis, 1993a). Research has further shown that distance learners have tended to resent poor instruction and other factors that might have been perceived to interfere with learning (Lacina & Book, 1991). Thus, had students in the TV mode determined that instructor characteristics and instructional processes were not up to their expectations, one result might have been lower ratings from the students in that mode.

Instructor-learner interaction. It was concluded that instructor-learner interaction was the least effective instructional process in the TV mode of instruction. It might be speculated that instructor-learner interaction was so ineffective as to effect student attitudes negatively towards the other instructor climate subscales. Interaction has been found to be an important distance learning activity, in part, because it provides learners with a sense of control over the pace and sequence of the instruction (Wagner, 1992a). Stone (1989) found that distance students - especially those aged 26 to 35 - performed better in those circumstances where they could control where and when learning occurs. Stone attributed his findings to the age of the respondents, "who, during this stage of their personal lives and professional careers, are hard pressed to balance the myriad demands placed on their time" (Stone, 1989, p. 16). With respect to this study, 55% of the respondents in all modes were under the age of 40.

Course need. The conclusion that the students needed the skills and knowledges taught in the courses in which they were enrolled could not be empirically examined with respect to effects, if any, that might have been

generated. However, researchers have found that positive or negative attitudes pertaining to distance learning modes of instruction often have been subsumed by the larger circumstances of life that have prompted adult learners to take distance learning courses to start with. This hierarchy of need has been found to motivate adult learners to be more concerned about obtaining needed skills and knowledges, and less concerned about attributes of the modes of instruction in which courses are taken. As Holmberg, 1989 reported, distance learners tend to make their own decisions pertaining to goals. "Their inclinations, work, and family conditions are the decisive factors" (p. 128). In this study, the COR Course respondents, 75% of whom were in the two highest grades, and 55% of whom were younger than 40, reported equally positive attitudes towards the three modes of instruction, as might be predicted of students whose need to take the course superseded their attitudes pertaining to instructional mode preference.

Pay grade or rank. Students in the two lowest grade categories represented 0%, 8%, and 8% of the enrollment in the OS, RES, and TV modes of the COR Course, and 75%, 47%, and 68% of the enrollment in these respective modes in the DHM Course. Conversely, students in the two highest grade categories represented 100%, 54%, and 72% of the enrollment in the OS, RES, and TV modes of the COR Course, and 0%, 30%, and 16% of the enrollment in these respective modes in the DHM Course. It might be speculated that, pertaining to the courses studied, grade representations may have effected student attitudes. The higher grade students tended to be equally positive towards all three modes, and the lower grade respondents tended to be more positive towards the OS and the RES modes, and less positive towards the TV mode. These associations were supported by the mean scores obtained for the COR Course modes of instruction, which were

3.95 (OS), 3.99 (RES), and 3.95 (TV), while the respective mean scores obtained for the DHM Course were 4.44 (OS), 4.38 (OS), and 3.84 (TV).

Previous research into learner readiness with respect to distance learning has shown that lower grade students might be more likely to relate more positively to the OS and the RES modes, and relate more negatively to the TV mode. This is because many adults who hold lower paying jobs have been found to have a tendency to favor face-to-face learning. These adults have appeared to be less comfortable or less prepared for distance learning, due to factors such as lower self-image and the tendency to have lesser-developed learning skills. All except one of the students enrolled in the OS mode of the DHM Course, for example, were enlisted military, 75% of whom were in the lower two pay grades, and these students reported the highest modal scores for the eight instructor climate attitudinal subscales. Grade rather than military/civilian status was conjectured to be the impacting factor because one-way analysis of variance showed that grade significantly effected mode preference, while military/civilian status did not.

Learner readiness. Oliver (1993) reported that students who were unfamiliar with the television mode of instruction - which often lacks the familiar social norms associated with the residence mode - often were not prepared to learn independently, and they required strong and consistent instructor motivation. Chung (1991) found that "telecourses typically have been developed to teach more mature, self-motivated learners" (p. 42), and Willis (1993b) found that "students must take an active role in the distance delivered course by independently taking responsibility for their learning" (p. 3). The students in the two courses surveyed for attitudinal responses tended to be younger, and those in the DHM Course tended to be from lower-graded positions. Their attitudinal ratings were in keeping with what has been found

by other researchers in situations where instruction was not appropriately structured, and where instructor-learner interaction was not consistently encouraged.

Conclusions Pertaining To Learning-Effectiveness

Null Hypothesis 2

H_o^2 stated: It is hypothesized that students will achieve equal learning ($p<.05$) within selected ALMC courses (A,B,C) regardless of their modes of instructional delivery: residence, on-site, or television. One-way analysis of variance demonstrated that there were no significant differences among modes of instruction as determined by the learning which was measured by the summative test scores administered in the COR and the DHM Courses. In addition, no significant effects were found pertaining to the learning which was measured by summative tests and end-of-course grades reported for the three modes of instruction within the DDM Course. Therefore, the null hypothesis was accepted.

Conclusions pertaining to learning objectives. It was concluded that equal learning took place with respect to the knowledge, comprehension, and application level objectives that were taught and tested in the three courses, because the scores that were analyzed to determine learning-effectiveness were generated by multiple choice instruments testing knowledge, comprehension, and application level learning objectives. A sub-set of the objectives taught and tested in the DDM Course, however, were generated by a major two-day performance-oriented, computer-simulated Depot Management Simulation that offered students higher order skill reinforcement, role playing, and experience with trouble shooting and

decision making in realistic, simulated inventory management activities. Because the analysis of learning-effectiveness for this study included a review of all of the performance measures that were available to the course instructors, the simulation scores were analyzed separately to determine if learning-effectiveness differed among modes of instruction with respect to the higher order skills that were evaluated by the simulation.

The reported simulation evaluation score mean of means within the three modes of instruction in the DDM Course were 94.17 (OS), 92.32 (RES), and 90.60 (TV). A one-way analysis of variance, with alpha = .05, was performed to determine if there was a significant difference in simulation scores among the three modes of instruction, and the results showed that there were statistically significant main effects, (F = 3.6024, 2, 54), with p = .034. Post hoc testing indicated a less-significant difference between the OS and TV modes, with a t-value of 3.77 and a critical t-value of 3.44. This small difference, although statistically significant, suggested that the differences between the OS and the TV modes were perhaps not statistically practically significant. The differences between the OS and the RES mode, and between the RES and the TV mode were not found to be significant.

It was concluded that the mean scores for each mode were high enough (m = 90.60 and above on a scale of 1 to 100) to indicate that learning had taken piace with respect to the higher order skills. The results obtained in the TV mode were not equal to the results obtained in the OS mode, and it was concluded that in the DDM Course, learning of higher order skills in the TV mode was not equal to the learning of higher order skills that was achieved in the OS and the RES modes.

Discussion of Learning-Effectiveness

The literature was more consistent pertaining to learning-effectiveness than for any other aspect of distance learning. The majority of researchers have found what this study has confirmed, that learning at all skill levels can take place in the television mode. However, not all courses are appropriate candidates for distance learning just as not all teachers or learners are good candidates. It would appear, therefore, that the relative degree of complexity pertaining to the skills to be taught in the cognitive domain should be carefully considered and planned for when developing course materials and teaching in the TV mode. Clearly, more research should focus upon learning-effectiveness in the TV mode pertaining to the analysis, synthesis, and evaluation levels of the cognitive domain of educational objectives.

It was concluded that, in the DDM Course, the learning of higher order skills was less effective in the TV mode than in the OS and RES modes. It is speculated that a part of the difference might be explained by the use of facilitators to replace the instructors during the simulation in the TV mode. The facilitators had successfully completed a three day workshop at the College that was designed to provide them with the knowledge and skills required to administer the simulation and to facilitate student participation. In addition, the course instructors were available to consult and answer questions by telephone during the exercise. However, this was the first application of the simulation for all three facilitators, and the potential for facilitation errors of omission or commission that might have impacted learning was certainly higher than it might have been had the instructors been present. This possibility should be accorded further study.

The DDM Course television mode respondents rated their facilitators higher, with respect to helpfulness and timely assistance, than facilitators

were rated in the other courses. The mean scores across courses, pertaining to the subscale, Facilitators, were COR, 3.62; DHM, 4.06; and DDM, 4.31. Unfortunately, the facilitators were not rated for their assistance during the simulation in the DDM Course, which might have provided clarification on this matter. This oversight should be noted by future researchers and appropriate studies undertaken.

Conclusions Pertaining to Costs/Benefits

Null Hypothesis 3

H_o^3 stated: It is hypothesized that courses designed for the television mode of instruction cost the same to develop as do the same courses when designed for the residence or on-site modes of instruction. Because there were no empirically supported audit trails available that might identify personnel, time, or dollar commitments with respect to course development activities, Ho3 could not be tested.

Discussion of Course Development

Researchers have been nearly unanimous in their findings that distance learning courseware should be developed specifically for the medium used for delivery by following a systems approach to courseware design, development, implementation, and evaluation. Willis (1993a) reported that following an instructional development process "is essential in distance education, where the instructor and students may share limited common background and typically have little [or no] face-to-face contact" (p. 1). The ALMC administration had no systematic process in place for performing job or task analysis, for designing learning objectives, for developing teaching and testing strategies, or for performing any of the basic

instructional development activities that might have helped to assure that instruction would meet the needs of the target population. As a result, the ALMC curricula - i.e., the series of structured, intended, learning outcomes that had been established for the series of ALMC courses - that had taken shape from this type of unstructured approach to course development may have been wholly unsuited to their respective purposes.

The availability of a solid audit trail might have made it easier for faculty members to update and to revise course materials, because the basis for decisions that had affected earlier courseware development might then have been known. An audit trail might then have resulted in helping the administration to develop a systematic approach to identifying courseware shortcomings and appropriate remedies. At the same time, with the guidance of a viable audit trail, nearly any qualified faculty member might have been able to seek out and to determine cause and effect relationships pertaining to any phase of the courseware development process. A viable audit trail would be expected to lead to better quality control and to better consistency in developing appropriate and sound course materials, with less chance for repeating previous mistakes, and a better chance for establishing realistic cost guidelines for future development.

Null hypothesis 4

H_o^4 stated: It is hypothesized that, in dollars spent on a per pupil basis, courses designed for television cost the same to implement in the television mode, as do courses designed for the residence and on-site modes when implemented in those modes. It was found that, over time, the television mode is less costly per student, per hour than are the OS and the RES modes, and this hypothesis was rejected.

Conclusions Pertaining To Course Implementation

While programmed costs indicated that, in terms of dollars, the on-site mode was the least costly and the residence and televisions modes were the most costly, it was concluded that a more realistic, and more accurate, way of viewing the costs of implementation was to determine the composite costs per student, per hour for each of the three modes of instruction over a period of time. Following this procedure, it was concluded that the RES mode was generally the most costly, both with respect to single courses and with respect to training over time. In addition, it was concluded that, for selected courses, there are circumstances that might justify expenditure of the higher costs that were found to accompany the residence iterations. For example, laboratory equipment, library support, or similar adjunctive services necessary for appropriate training that might be too expensive to duplicate elsewhere, might justify using the residence mode. However, in these instances, the cost per student, per hour, still might be less than duplicating the equipment or services elsewhere.

It was concluded that the OS mode might be more cost-effective in individual circumstances, such as when a large group of students at a given installation demonstrate unique training needs that are not required by groups at other installations. In addition, the OS mode might reflect the least costs from time to time pertaining to isolated OS Course offerings.

It was concluded that the TV mode can be shown to be the least expensive mode to implement on a per student, per hour basis because of the large number of students who are accommodated by a relatively small number of instructors. During FY92-94, for example, the ALMC administration estimated that more than 230,000 DoD logisticians required training that might have been satisfied by ALMC Courses. The average enrollment for the

courses broadcast by the Satellite Education Network during FY92-94 was 171 students. Exclusive of this average, one course during FY94 was broadcast to 21 locations with a composite enrollment of more than 650 students. It was, therefore, concluded that the population needs for logistics training within the DoD are more than sufficient to assure that appropriately-developed courses, taught by trained faculty, might be expected to generate average enrollments of more than 230 students per course, which is the number of students needed to assure that costs per student, per hour, for the courses that were studied fall below the costs found for the COR Course OS mode of instruction.

It was found that additional television sites could be added to the television network during FY94 for approximately $7,400 per site. Because installations joining the network since its inception in January 1985, have installed the television and audio feedback equipment in existing classrooms, it was concluded that no additional facilities had to be built to accommodate the TV mode of instruction, and this practice might be expected to continue. Further, it was found that costs for joining the Network have been decreasing as new technologies have been developed to support television distance learning.

While not all courses, instructors, or adult learners were found to be good candidates for distance learning, the preponderance of empirical evidence showed that the television mode of instruction offered equal learning benefits for less cost than did the face-to-face modes with respect to knowledge, comprehension, and application level learning objectives, and it was shown that higher level learning objectives were taught to acceptable standards, even though the course materials might have been inappropriate for the TV mode. Overall, it was concluded that, based upon costs per

student, per hour, and the time savings that pertain to instructor and facilities availability, the television mode of instruction offered the most efficient and effective array of costs/benefits.

Implications For Training And Education

Implications Pertaining To Attitudes

Several implications can be drawn from the review of literature, the findings, and the conclusions made from this study. First, the empirical evidence showed that while ALMC students may have preferred to take courses in the face-to-face modes, student attitudes towards the TV mode were positive. Distance learning faculty and College administrators must be informed that, for *most* adult learners, however, attitudes about modes of instruction may not matter with respect to learning. Evidence was found that suggested many distance learners can separate their attitudes pertaining to distance learning from their attitudes pertaining to course content, especially when the learners perceive they have a strong need for the training. The evidence generated from this study was supportive of findings made by previous researchers, leading to the conclusion that many of the students who were enrolled in the ALMC television mode were capable of separating their feelings about the mode of instruction from their desire or need to learn the subject matter.

There is evidence to show that adult distance learners, even those who are well-suited to distance learning, may be less tolerant of *poor* teaching than are students in face-to-face courses. Other researchers have reported that where face-to-face learners might role-play compliance, a small minority of distance learners have been found to turn off television sets, leave the

classroom, or drop out of class altogether. Some students have become intrusive and have interrupted the instruction. These differences must be acknowledged and instructors must be prepared to meet the challenges that might arise should these kinds of behaviors be encountered.

Implications Pertaining To Learning-Effectiveness

The ALMC administration should initiate a program to demonstrate to the faculty that military and civilian logisticians can and do learn many subjects just as well in the television mode as they do in the face-to-face modes. At the same time, it should be recognized that not every course is a good candidate for distance learning, and the course mode selection criteria should include a criterion for selecting only those courses that have been designed for delivery via television. In addition, not every student is a good candidate for distance learning, and the student prerequisites established for courses taught in the television mode should be designed to give precedence to those students who will have the best chance for success in a televised course. In situations where this cannot be accomplished, instructors must be prepared to take the additional steps needed to help these students to succeed in the distance mode.

Implications For Administering ALMC Courses.

The College administration should establish a systematic set of criteria for mode selection that will insulate the mode selection process from the potential biases of the faculty. The criteria should accommodate faculty fears pertaining to the television mode, by allowing those who are not well-suited to teaching in this mode to opt out. To encourage installations to use the television mode, the administration should continuously enforce the ALMC

regulation that restricts the offering of ALMC on-site courses at installations that have ALMC television downlinks.

Course Directors should be made aware that the TV mode was shown to offer the greatest training costs/benefits over time. In addition, the administration should be made aware that by taking advantage of the Network capacity to reach large numbers of students with fewer instructors, the concurrent savings in instructor workload can free faculty members for course development activities.

Course Development

The ALMC administration and faculty should be made aware that ALMC courses may not have been appropriately designed or developed, and these factors may have motivated negative attitudes among students in all three modes of instruction. The ALMC administration and faculty should make immediate changes to the way they develop and update course materials, including the development of a system for maintaining appropriate audit trails that record course development costs as well as activities.

In conjunction with course development activities, the ALMC administration should be made aware of the potential consequences of continuing to use instructional materials in the television mode that were developed for face-to-face modes, and the faculty should be made aware that mediated distance learning programs are not simply extensions of face-to-face programs. Methods should be incorporated into the distance learning instruction that will accomplish what has been heretofore accomplished face-to-face. Faculty members should be made aware that teaching methodologies that are appropriate for residence courses are not necessarily appropriate for distance learning, and that interaction and visualization, in particular require

special considerations. Most importantly, the administration should budget for the instructional technology assistance required to develop course materials for use in the television mode of instruction.

It was noted that every one of the instructors who taught in the television mode of the three courses studied had attended the ALMC Advanced Educational Television Course - Television (AETC). Yet, it was concluded that many of the lessons learned in that course had not been appropriately applied. For example, residence mode course materials apparently were used in the television mode, several visuals were inappropriate for television, and, in general, interaction in the television mode was not well-developed between the instructors and the students. The ALMC administration should continue to ensure that the College faculty who teach in the television mode graduate from the AETC. Next, a way should be found to provide ALMC instructors with the time and the assistance required to develop appropriate course materials. Finally, the administration must ensure that the faculty will apply the lessons learned in the AETC on a continuing basis.

Many of the findings and conclusions from this study are generalizable to the larger DoD training community. These findings and conclusions should be provided to other DoD schools.

Suggestions for Future Research

The following recommendations are made for future research concerning the use of satellite television as a mode of instruction for distance learning:

1. Develop an experimental study that will examine the effectiveness of different teaching methodologies for teaching higher order skill level performance objectives in the satellite television mode of instruction, using the 1way video/2way audio, studio supported format.

2. Develop an experimental study that will compare the effectiveness of teachers who have been trained to teach in the television mode, using courseware that has been designed for the purpose that employs teacher-centered interaction strategies, with the effectiveness of trained teachers, using the same courseware, except for the substitution of student-centered interaction strategies. One purpose of such a study would be to identify the learner characteristics that respond most and least effectively to each set of circumstances. Another purpose would be to identify and improve upon teacher-centered and learner-centered interaction strategies.

3. Develop a descriptive study that will identify, catalog, and analyze adult distance learner traits that lead to successful learning in 1way video/2 way audio and 2way video/2 way audio formatted television modes of instruction. This research should test for differences in student attitudes and learning-effectiveness pertaining to the two formats, and determine if there is a difference in the adult distance learner traits that lead to success in the two approaches.

4. Develop a descriptive study that will identify and analyze social presence initiating factors in the television mode of distance learning, and determine their role in successful learning at a distance. In particular, investigate the media, the methodologies, and the instructor and learner traits that might be required to make it strategically possible to design a distance learning program that will approximate face-to-face learning to the extent that the media and the "distance" might be made wholly transparent.

5. Develop an experimental distance learning study that will investigate the attitudinal and learning effects caused by differences in student age, position, grade, and gender with respect to various factors such as the time of day courses are offered (morning, afternoon, and evening); course length; hours per day spent in the television classroom; length of time between classes; and time payback. Time payback would require that students be given at least equal time off from the job in exchange for attending job-related courses in the evening. Two variations of time pay back might be applied. In one variation, management would determine when the payback would be given, and in the second, the employee would make that determination, subject to following a reasonable set of criteria.

6. Develop an experimental or comparative distance learning study that will investigate the attitudinal and learning effects caused by differences in student perceived need for a selected course. Establish criteria to identify three ranges of need: e.g., urgent, moderate, and casual. Student need should be verified by use of a student survey, by interviewing randomly selected students and their supervisors, and by administering course pre- and post-tests, followed by test score and course grade analysis.

7. Design a descriptive or comparative study that investigates learner motivation with respect to face-to-face and distance learning courses or programs. The study should distinguish between larger, life-circumstance motivation, i.e., the overriding motivation for enrolling in a given course or program, and the more immediate motivation associated with mode selection. Controls should be included to account for certain variables such as the learners' age, job, career status, gender, and intrinsic attitude towards learning.

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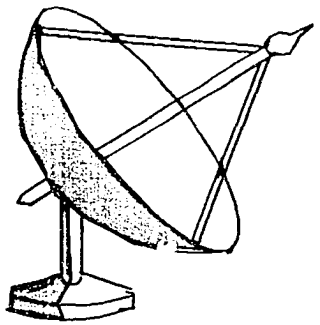
APPENDIX

A

Equipment Furnished to Television Downlink Site

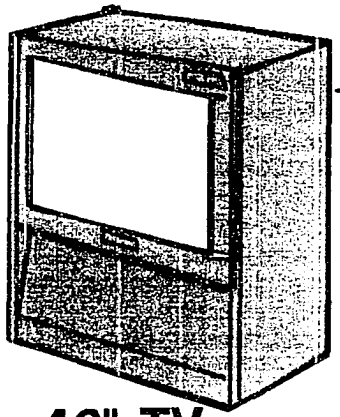
Army Logistics Management College

SEN DOWNLINK PACKAGE



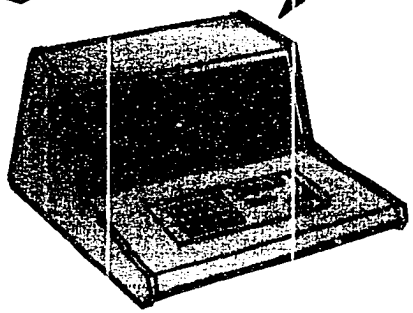
1.8 METER DISH

- SURVEY SITE
- INSTALLATION
- TEST



46" TV

EACH CLASSROOM



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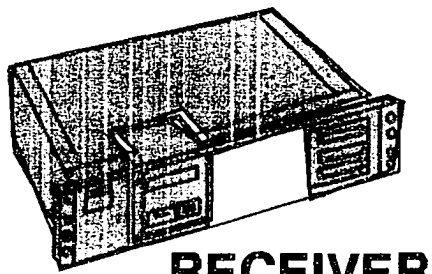

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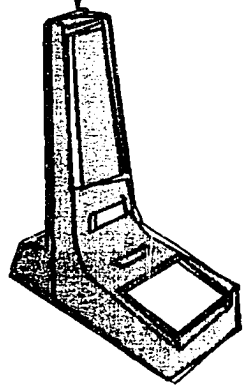
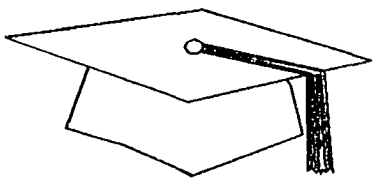


MICROPHONES
12 EA



Education Excellence For Tomorrow's Defense

APPENDIX

B

Attitude Survey (3 Forms)

US Army Logistics Management College
Course Evaluation Survey
(On-Site Mode)

INSTRUCTIONS

The following statements describe a wide variety of conditions related to the course you are about to complete. We want to know to what extent you agree or disagree with each statement. Therefore, please indicate your opinion by marking each statement as follows:

Circle the **SA** if you **STRONGLY AGREE** with the statement
A if you **AGREE** but not strongly
U if you are **UNDECIDED**
D if you **DISAGREE**
SD if you **STRONGLY DISAGREE**

PART ONE: (Circle one response for each item. Provide responses even if you had only one instructor)

1. I had the skills/knowledges needed to begin this course.	SA A U D SD
2. The objectives of this course were clearly explained to me.	SA A U D SD
3. The instructors are concerned that students learn the subject(s) they teach.	SA A U D SD
4. The instructors do not explain clearly how assignments are to be done.	SA A U D SD
5. The instructors usually provide all the help I need with assignments.	SA A U D SD
6. The instructors are willing to give students individual help outside of class time.	SA A U D SD
7. The instructors tend not to give me enough personal encouragement in this course.	SA A U D SD
8. The instructors recognize when students have difficulty comprehending the material.	SA A U D SD
9. I am satisfied with the teaching methodologies used in this course.	SA A U D SD

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

10. The academic climate of this class is conducive to learning.	SA	A	U	D	SD
11. The instructors in this course are competent teachers.	SA	A	U	D	SD
12. The instructors have no distracting peculiarities.	SA	A	U	D	SD
13. The instructors hold the attention of the class.	SA	A	U	D	SD
14. The students in this course are seldom motivated to do their best work.	SA	A	U	D	SD
15. In virtually all of the coursework, I can see a relationship between what I am studying and my daily job.	SA	A	U	D	SD
16. Regardless of what my grade may be, I feel that I am learning a lot in this course.	SA	A	U	D	SD
17. The instructors generate classroom discussion skillfully.	SA	A	U	D	SD
18. I have learned about all that I can from my experiences in this course.	SA	A	U	D	SD
19. I am satisfied with the variety of the experiences offered in this course.	SA	A	U	D	SD
20. Building facilities (work space, furnishings, etc.) are adequate to support the instruction.	SA	A	U	D	SD
21. This course is preparing students well for the complex tasks performed on the job.	SA	A	U	D	SD
22. The learning experiences offered to students in this course are of high quality.	SA	A	U	D	SD
23. I like the instructors' presentational style.	SA	A	U	D	SD
24. The instructors explain difficult material clearly.	SA	A	U	D	SD
25. The instructors allow sufficient time for notetaking.	SA	A	U	D	SD
26. Handouts are received in a timely manner.	SA	A	U	D	SD
27. Overall, the instruction is effective.	SA	A	U	D	SD

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

28. I need the knowledge and skills this course offers.	SA	A	U	D	SD
29. The instructors provide ample opportunity for questions during class.	SA	A	U	D	SD
30. Taking this course on-site is the same to me as taking it in residence.	SA	A	U	D	SD
31. Working on the job each day does not interfere with my performance in this course.	SA	A	U	D	SD
32. Having to work at my job each day while taking this course is unfair.	SA	A	U	D	SD
33. I value the skills and knowledges I am learning in this course.	SA	A	U	D	SD
34. I am learning as much from the instructors on-site as I would be learning in residence.	SA	A	U	D	SD
35. Courses taught on-site are not as desirable as those taught in residence.	SA	A	U	D	SD

Part Two: **Please rank preferences (1, 2, or 3)**

Sample: 1 On-Site 3 In Residence 2 By Television

Ties are permitted, For Example:

Sample: 2 On-Site 1 In Residence 2 By Television

36. I prefer to take government courses:
____ On-Site ____ In Residence ____ By Television.

37. For me, learning can best be achieved:
____ By Television ____ On-Site ____ In Residence.

38. I believe that instruction is most cost-effective when delivered:
____ In Residence ____ By Television ____ On-Site.

39. I believe that instruction is most interesting when delivered:
____ On-Site ____ In Residence ____ By Television.

Part Three: Please complete as requested.

40. Write answer in space provided:

Military Service & Branch_____&_____

Civilian Job Series_____

41. Place an X in the appropriate space:

Enlisted____ NCO____ WO_____ Officer____

Wage-Grade____ Wage-Grade Supervisor____

GS1-GS6____ GS7-GS10____ GS11-GS12____ GS13-GS15____

42. Gender: Female____ Male____

43. Age: Under 30_____ 31-40_____ 41-50_____

51-60_____ Over 60_____

44. Number of Years In Federal Service:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

45. Number of Years In Present Job Series/Branch:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

46. Number of Years In Present Organization:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

47. Number of Years In Present Position:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

US Army Logistics Management College
Course Evaluation Survey
(Residence Mode)

INSTRUCTIONS

The following statements describe a wide variety of conditions related to the course you are about to complete. We want to know to what extent you agree or disagree with each statement. Therefore, please indicate your opinion by marking each statement as follows:

Circle the **SA** if you **STRONGLY AGREE** with the statement
A if you **AGREE** but not strongly
U if you are **UNDECIDED**
D if you **DISAGREE**
SD if you **STRONGLY DISAGREE**

PART ONE: (Circle one response for each item. Provide responses even if you had only one instructor)

1. I had the skills/knowledges needed to begin this course.	SA	A	U	D	SD
2. The objectives of this course were clearly explained to me.	SA	A	U	D	SD
3. The instructors are concerned that students learn the subject(s) they teach.	SA	A	U	D	SD
4. The instructors do not explain clearly how assignments are to be done.	SA	A	U	D	SD
5. The instructors usually provide all the help I need with assignments.	SA	A	U	D	SD
6. The instructors are willing to give students individual help outside of class time.	SA	A	U	D	SD
7. The instructors tend not to give me enough personal encouragement in this course.	SA	A	U	D	SD
8. The instructors recognize when students have difficulty comprehending the material.	SA	A	U	D	SD
9. I am satisfied with the teaching methodologies used in this course.	SA	A	U	D	SD

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

10. The academic climate of this class is conducive to learning.	SA	A	U	D	SD
11. The instructors in this course are competent teachers.	SA	A	U	D	SD
12. The instructors have no distracting peculiarities.	SA	A	U	D	SD
13. The instructors hold the attention of the class.	SA	A	U	D	SD
14. The students in this course are seldom motivated to do their best work.	SA	A	U	D	SD
15. In virtually all of the coursework, I can see a relationship between what I am studying and my daily job.	SA	A	U	D	SD
16. Regardless of what my grade may be, I feel that I am learning a lot in this course.	SA	A	U	D	SD
17. The instructors generate classroom discussion skillfully.	SA	A	U	D	SD
18. I have learned about all that I can from my experiences in this course.	SA	A	U	D	SD
19. I am satisfied with the variety of the experiences offered in this course.	SA	A	U	D	SD
20. Building facilities (work space, furnishings, etc.) are adequate to support the instruction.	SA	A	U	D	SD
21. This course is preparing students well for the complex tasks performed on the job.	SA	A	U	D	SD
22. The learning experiences offered to students in this course are of high quality.	SA	A	U	D	SD
23. I like the instructors' presentational style.	SA	A	U	D	SD
24. The instructors explain difficult material clearly.	SA	A	U	D	SD
25. The instructors allow sufficient time for notetaking.	SA	A	U	D	SD
26. Handouts are received in a timely manner.	SA	A	U	D	SD
27. Overall, the instruction is effective.	SA	A	U	D	SD
28. I need the knowledge and skills this course offers.	SA	A	U	D	SD
29. The instructors provide ample opportunity for questions during class.	SA	A	U	D	SD

Part Two: **Please rank preferences (1, 2, or 3)**

Sample: 1 On-Site 3 In Residence 2
By Television

Ties are permitted, For Example:

Sample: __2__ On-Site __1__ In Residence __2__ By Television

31. I prefer to take government courses:
____ On-Site ____ In Residence ____ By Television.

32. For me, learning can best be achieved:
____ By Television ____ On-Site ____ In Residence.

33. I believe that instruction is most cost-effective when delivered:
____ In Residence ____ By Television ____ On-Site.

34. I believe that instruction is most interesting when delivered:
____ On-Site ____ In Residence ____ By Television.

Part Three: Please complete as requested.

35. Write answer in space provided:

Military Service & Branch_____&_____

Civilian Job Series_____

36. Place an X in the appropriate space:

Enlisted____ NCO____ WO_____ Officer____

Wage-Grade____ Wage-Grade Supervisor____

GS1-GS6____ GS7-GS10_____ GS11-GS12____ GS13-GS15____

37. Gender: Female____ Male____

38. Age: Under 30_____ 31-40_____ 41-50_____

51-60_____ Over 60_____

39. Number of Years In Federal Service:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

40. Number of Years In Present Job Series/Branch:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

41. Number of Years In Present Organization:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

42. Number of Years In Present Position:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

US Army Logistics Management College
Course Evaluation Survey
(Television Mode)

INSTRUCTIONS

The following statements describe a wide variety of conditions related to the course you are about to complete. We want to know to what extent you agree or disagree with each statement. Therefore, please indicate your opinion by marking each statement as follows:

Circle the **SA** if you **STRONGLY AGREE** with the statement
A if you **AGREE** but not strongly
U if you are **UNDECIDED**
D if you **DISAGREE**
SD if you **STRONGLY DISAGREE**

PART ONE: (Circle one response for each item. Provide responses even if you had only one instructor)

1. I had the skills/knowledges needed to begin this course.	**SA**	**A**	**U**	**D**	**SD**
2. The objectives of this course were clearly explained to me.	**SA**	**A**	**U**	**D**	**SD**
3. The instructors are concerned that students learn the subject(s) they teach.	**SA**	**A**	**U**	**D**	**SD**
4. The instructors do not explain clearly how assignments are to be done.	**SA**	**A**	**U**	**D**	**SD**
5. The instructors usually provide all the help I need with assignments.	**SA**	**A**	**U**	**D**	**SD**
6. The instructors are willing to give students individual help outside of class time.	**SA**	**A**	**U**	**D**	**SD**
7. The instructors tend not to give me enough personal encouragement in this course.	**SA**	**A**	**U**	**D**	**SD**
8. The instructors recognize when students have difficulty comprehending the material.	**SA**	**A**	**U**	**D**	**SD**
9. I am satisfied with the teaching methodologies used in this course.	**SA**	**A**	**U**	**D**	**SD**

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

10. The academic climate of this class is conducive to learning.	SA	A	U	D	SD
11. The instructors in this course are competent teachers.	SA	A	U	D	SD
12. The instructors have no distracting peculiarities.	SA	A	U	D	SD
13. The instructors hold the attention of the class.	SA	A	U	D	SD
14. The students in this course are seldom motivated to do their best work.	SA	A	U	D	SD
15. In virtually all of the coursework, I can see a relationship between what I am studying and my daily job.	SA	A	U	D	SD
16. Regardless of what my grade may be, I feel that I am learning a lot in this course.	SA	A	U	D	SD
17. The instructors generate classroom discussion skillfully.	SA	A	U	D	SD
18. I have learned about all that I can from my experiences in this course.	SA	A	U	D	SD
19. I am satisfied with the variety of the experiences offered in this course.	SA	A	U	D	SD
20. Building facilities (work space, furnishings, etc.) are adequate to support the instruction.	SA	A	U	D	SD
21. This course is preparing students well for the complex tasks performed on the job.	SA	A	U	D	SD
22. The learning experiences offered to students in this course are of high quality.	SA	A	U	D	SD
23. I like the instructors' presentational style.	SA	A	U	D	SD
24. The instructors explain difficult material clearly.	SA	A	U	D	SD
25. The instructors allow sufficient time for notetaking.	SA	A	U	D	SD
26. Handouts are received in a timely manner.	SA	A	U	D	SD
27. Overall, the instruction is effective.	SA	A	U	D	SD

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

28. I need the knowledge and skills this course offers.	SA	A	U	D	SD
29. The instructors provide ample opportunity for questions during class.	SA	A	U	D	SD
30. Taking this course by television is the same to me as taking it in residence.	SA	A	U	D	SD
31. Working on the job each day does not interfere with my performance in this course.	SA	A	U	D	SD
32. Having to work at my job each day while taking this course is unfair.	SA	A	U	D	SD
33. I value the skills and knowledges I am learning in this course.	SA	A	U	D	SD
34. I am learning as much from the instructors on television as I would be learning in residence.	SA	A	U	D	SD
35. Courses taught in the television mode are not as desirable as those taught in residence.	SA	A	U	D	SD
36. Having to use a microphone to talk with the instructors is intimidating.	SA	A	U	D	SD
37. The Instructors' personality enhances this course.	SA	A	U	D	SD
38. The visual materials used in this course support the teaching points well.	SA	A	U	D	SD
39. The video signal is of good quality.	SA	A	U	D	SD
40. The audio signal is of good quality.	SA	A	U	D	SD
41. Overall, the microphone talkback system allows me to participate freely in discussions.	SA	A	U	D	SD
42. Keeping pace with the instructors is generally not a problem.	SA	A	U	D	SD
43. All televised written text can be seen clearly enough to read comfortably.	SA	A	U	D	SD
44. Changing camera shots from the instructors to visuals is smooth and non-interfering.	SA	A	U	D	SD

SA = STRONGLY AGREE A = AGREE U = UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE

45. Facilitator assistance is timely.	SA	A	U	D	SD
46. No matter what happens, the facilitator knows what to do.	SA	A	U	D	SD
47. Students from other sites can be clearly understood when asking questions.	SA	A	U	D	SD

Part Two: **Please rank preferences (1, 2, or 3)**

Sample: 1 On-Site 3 In Residence 2 By Television

Ties are permitted, For Example:

Sample: 2 On-Site 1 In Residence 2 By Television

48. I prefer to take government courses:
____ On-Site ____ In Residence ____ By Television.

49. For me, learning can best be achieved:
____ By Television ____ On-Site ____ In Residence.

50. I believe that instruction is most cost-effective when delivered:
____ In Residence ____ By Television ____ On-Site.

51. I believe that instruction is most interesting when delivered:
____ On-Site ____ In Residence ____ By Television.

Part Three: Please complete as requested.

52. Write answer in space provided:

Military Service & Branch_____&_____

Civilian Job Series_____

53. Place an X in the appropriate space:

Enlisted____ NCO____ WO_____ Officer____

Wage-Grade____ Wage-Grade Supervisor____

GS1-GS6____ GS7-GS10____ GS11-GS12____ GS13-GS15____

54. Gender: Female____ Male____

57. Age: Under 30_____ 31-40_____ 41-50_____

51-60_____ Over 60_____

56. Number of Years In Federal Service:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

57. Number of Years In Present Job Series/Branch:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

58. Number of Years In Present Organization:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

59. Number of Years In Present Position:

Less than 1____ 1-5____ 6-15____ 16-25____ Over 25____

APPENDIX

C

Tables of Specifications

Specifications Table: COR Course Final Examination

Blocks/No. Of Items Tested

Key:(k) know, (c)comprehend (ap) apply **Objectives**		**Blocks of Instruction** 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Contract Elements	(k)	1																		
Agency Law	(k)	2																		
Contrast With KO	(c)		2																	
Authority	(k)		2																	
COR Files Contents	(k)			1																
Files Disposition	(k)			0																
Bidding/Negotiation	(c)				1															
Fixed Price/Cost Plus	(c)				2															
Responsibility	(c)				1															
Commercial Activities	(k)					1														
Gov Exceptions	(k)					0														
Specifications Policies	(k)						1													
Specs/WS Difference	(c)						1													
Contract Formats	(k)							1												
Writing Specifications	(c)								0											
Surveillance Plans	(c)									1										
Ethics	(k)										1									
Standards of Conduct	(c)										1									
Labor Provisions	(c)											0								
Construction Contracts	(k)											1								
Nonpersonal Services	(k)												0							
Service Contract Act	(k)												1							
Post-Award Conference	(c)												0							
Inspection	(c)													1						
Surveillance Methods	(c)													1						
Role of Sampling	(c)													0						
Elements of Sampling	(c)													0						
MIL-STD -105E	(ap)													0						
Defective Services	(c)													0						
Gov Furnished Property	(c)														2					
Appeals	(k)															1				
Changes Clause	(c)																	1		
Constructive Changes	(c)																	1		
Data Management	(c)																		0	
Terminate/Convenience	(c)																			1
Terminate/Default	(c)																			1

Note. 30 item multiple choice test.

Specifications Table: DHM Course Final Examination

Blocks/No. Of Items Tested

key: (k) know, (c) comprehend, (ap) apply **Objectives**		**Blocks of Instruction** 1	2	3	4	5	6	7	8	9	10
Identify Program Components	(k)	0									
Problem Areas	(c)	1									
Define Terms	(k)	0									
Logistics Lifecycle	(k)		0								
Hazardous Materials in Lifecycle	(k)		0								
Waste Minimization Incentives	(k)		0								
Source Reduction & Recycling	(c)		1								
Waste Reduction Operating Practices	(k)		0								
Regulatory Documentation	(k)			0							
Impacts of Haz/Mat Laws	(k)			3							
Solid & Hazardous Waste	(k)			0							
Resource Conservation Recovery Act	(k)			0							
Haz Waste Large Quantity Generator	(k)			0							
DOT Hazard Classes	(k)				0						
Properties/Dangers of DOT Haz Class	(ap)				3						
Hazardous Waste Characteristics	(ap)				1						
Hazardous Waste Criteria	(k)				3						
Mismanagement of Haz Chemicals	(k)					1					
Haz Materials/Waste Health Hazards	(c)					0					
Health Dangers of Haz Chemicals	(ap)					0					
Selecting Safety Equipment	(ap)					1					
Material Safety Data Sheet	(c)					1					
Haz Mat Labels & Markings	(ap)						6				
Label Requirements for Haz Materials	(ap)						0				
RCRA Requirements for Accumulation	(k)							1			
Safe Storage During Accumulation	(ap)							2			
Container Mgt Requirements	(k)							1			
DOT & UN Containers	(k)							0			
Planning & Response Requirements	(k)								0		
Spills/Release Into Environment	(c)								0		
SPCC & ISPC Requirements	(k)								1		
Emergency Guides	(ap)								2		
Haz Mat ID on Shipping Paper	(k)								0		
DRMO Haz/Mat Disposal	(k)									0	
Haz/Mat Turn-In	(k)									0	
Uniform Haz Waste Manifest	(k)									0	
Hazardous Compliance	(k)										0
Environmental Compliance	(ap)										0
Army Environmental Program	(k)										1
Environmental Points-of -Contact	(k)										1

Note. 30 item multiple choice test.

Specifications Table: DDM Course Examinations

Key: (k) know; (c) comprehend; (ap) apply		Blocks/No. Of Items Tested: Blocks of Instruction									
Objectives		1	2	3	4	5	6	7	8	9	10
Subfunctions of Physical Distribution	(k)	1									
Distribution System Performance Rqts	(k)	2									
Organizational Responsibilities	(k)	1									
Depot Functions	(k)	1									
Def Log Standard Systems Integration	(c)		0								
Purpose of DLSS	(c)		1								
Characteristics of DLSS	(k)		0								
Primary Uses of DLSS	(c)		3								
Environmental Factors In Depot Ops	(c)			1							
Depot Mission Support Elements	(k)			1							
Depot Mission Elements	(k)			3							
Mission & Support Relationships	(c)			1							
Roles of Storage in Physical Distribution	(c)				0						
Benefits of Efficient Storage	(c)				1						
Space Planning & Utilization	(p)				2						
Compare Methods of Storage	(c)				1						
Bin Replenishment System	(c)				1						
Principles of materials Handling	(k)				1						
Goals of Stock Location System	(k)					0					
Elements of Stock Location System	(k)					1					
Problems With Poor Location Accuracy	(k)					0					
Stock Location Performance Rqmts	(c)					3					
On Time Performance Measurement	(ap)						1				
Receipt Control Numbers	(k)						0				
Prepositioned Materiel Receipt Document	(k)						1				
Reporting Receipt Discrepancies	(ap)						2				
Tools For Control of Receiving Ops	(c)						0				
Receiving Performance Indicators	(c)						1				
Actions Required In Physical Inventory	(k)							2			
Types of Physical Inventories	(k)							1			
Conditions Requiring Physical Inventory	(c)							1			
Mgt Problems With Physical Inventories	(ap)							2			
UMMIPS Timeframes & DLA Issue Goals	(k)								0		
MRO Processing, Materiel/Document Flow	(c)								3		
Monitoring Performance In Issue Function	(k)								0		
Issue Problems & Solutions	(c)								1		
Transportation Agency Responsibilities	(k)									1	
Mission of DoD Transportation Agencies	(c)									2	
Functions of Depot Transportation Office	(c)									1	
Modes of Transportation	(c)									2	
Shipment Planning Management Reports	(k)									1	
Production Planning & Control Element	(k)										0
Forecasting & Budgeting	(c)										0
Purpose Of Workload Forecasts	(k)										0
Concepts of DBOF & Depot Unit Cost	(c)										2
Workload Forecast Generators	(k)										0
Workload Forecast Units/Terms	(k)										0
Workforce & Funding Rqmnts	(c)										1

Note. Combines two 25 item multiple choice tests.

APPENDIX

D

Commandant's Letter

ATIC-ETC-S

FROM: COMMANDANT,
US Army Logistics Management College
Fort Lee, VA 23801

As with most other schools in the Department of Defense, the US Army Logistics Management College has experienced budget reductions that have resulted in the need to trim personnel and programs. Now it appears that some ALMC courses may have to be reduced in scope or canceled altogether in order to assure that the courses we do offer can be made available to as many students as possible without sacrificing instructional quality.

I want to do everything that I can to assure that the College will continue to meet your training needs in an intelligent, timely, and cost-effective manner, and in that context, nothing is more important than your views about ALMC courses, especially concerning how and where they are taught. In this respect, Mr. Raymond Fenn, an ALMC staff member and a Doctoral Candidate at the College of William & Mary In Virginia, is analyzing ALMC student attitudes and other performance indicators relating to ALMC courses that are taught in residence, on-site, and by television. The accompanying survey is a part of this study, and you are one of a small number of students who are being asked to volunteer to complete it.

There is no penalty if you opt not to participate, however, your assistance with this project will help the ALMC to better understand the attitudes of its students everywhere concerning how and where the College teaches its courses. Let me emphasize that your anonymity is guaranteed. When you have completed the survey, place it in the envelop provided for the purpose. The envelop will be sealed by one of your classmates and returned directly to Mr. Fenn. If you should later have any questions about this project, you may phone Mr. Fenn at DSN: 539-4140.

The survey takes fewer than ten minutes to complete. Please accept my personal gratitude for the valuable assistance you will render to the College and to your fellow students by completing it carefully and thoroughly.

R. E. CADORETTE
COLONEL, TC
Commandant

APPENDIX

E

Means And Standard Deviations Found For The Eight Dependent Subscales Measured By The Attitude Survey

Means And Combined Means for 8 Instructional Climate Subscales Measured by Student Attitude Survey

	COR						DHM					
	OS n=33		RES n=26		TV n=144		OS n=20		RES n=35		TV n=168	
Subscale	*m*	*sd*	*m*	*sd*	*m*	*sd*	*m*	*sd*	*m*	*sd*	*m*	*sd*
Caring & Helpful	4.04	.66	4.16	.68	3.99	.07	4.41	.78	4.34	1.08	3.85	.22
Instructor Competence	4.22	.70	4.12	.07	4.02	.11	4.56	.77	4.39	1.06	3.89	.24
Learning Effectiveness	3.54	1.09	3.64	.98	3.82	.14	4.11	1.04	4.06	1.28	3.76	.26
Facilities & Ambiance	3.29	1.26	4.19	.62	3.92	.15	4.37	.55	4.61	.71	4.00	.20
Instructor Interaction	4.33	.73	4.10	.60	3.71	.07	4.70	.46	4.57	.79	3.76	.21
Instructional Methodology	3.82	.83	3.86	.65	3.96	.13	4.50	.54	4.36	.98	3.77	.28
Need For The Course	4.13	.78	3.98	.75	4.02	.08	4.18	.80	4.21	.97	3.88	.30
Instructor Presentation	4.19	.70	3.86	.75	4.14	.06	4.67	.48	4.51	.89	3.84	.26
Mean of Means	3.945		3.988		3.947		4.437		4.381		3.843	

Note. Combined Means: OS = 4.19; RES = 4.18; TV = 3.90

Vita

Raymond Camp Fenn

Birthdate: November 11, 1938

Birthplace: Medina, Ohio

Education:

1989-1995	The College of William and Mary Williamsburg, Virginia Educational Specialist Doctor of Education
1965-1967	Northwestern University Evanston, Illinois Post Graduate, Theatre
1962-1964	Kent State University Kent, Ohio Master of Arts
1957-1961	Kent State University Bachelor of Science in Education