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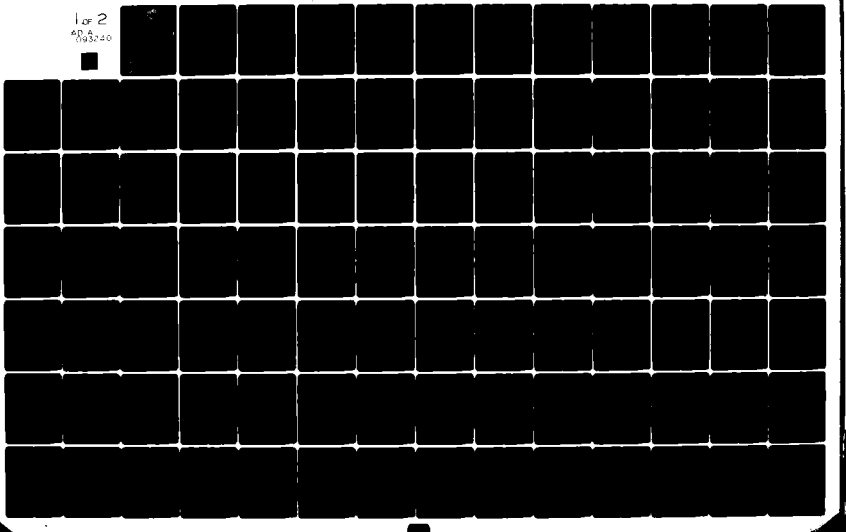

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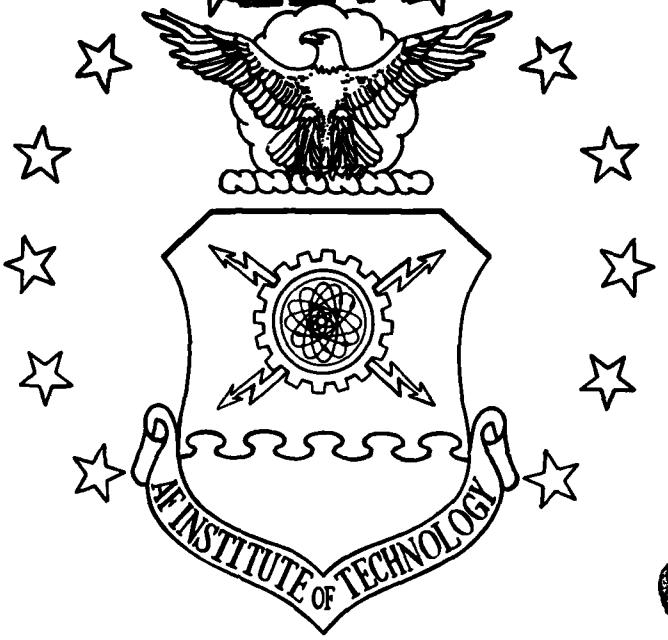

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AN EVALUATION OF THE AFIT TELETEACH EXPANDED DELIVERY SYSTEM (TEDS) METHOD OF INSTRUCTION (PHASE 1)

Captain David E. Fortna, USAF
Captain Ronne G. Mercer, USAF

LSSR-49-80

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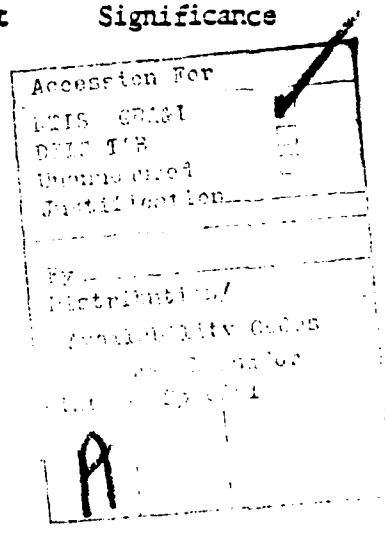

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: LSSR 49-80	2. GOVT ACCESSION NO.: AD-A093 240
	3. RECIPIENT'S CATALOG NUMBER:
4. TITLE (and Subtitle): AN EVALUATION OF THE AFIT TELETEACH EXPANDED DELIVERY SYSTEM (TEDS) METHOD OF INSTRUCTION (PHASE 1)	5. TYPE OF REPORT & PERIOD COVERED: Master's Thesis
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): David E. Fortna, Captain, USAF Ronne G. Mercer, Captain, USAF	8. CONTRACT OR GRANT NUMBER(s):
9. PERFORMING ORGANIZATION NAME AND ADDRESS: School of Systems and Logistics Air Force Institute of Technology, WPAFB OH	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: Department of Communication and Humanities AFIT/LSH, WPAFB OH 45433	12. REPORT DATE: June 1980 13. NUMBER OF PAGES: 154
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

APPROVED FOR PUBLIC RELEASE AFR 190-17.

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Teleteach
Instructional Method
AFIT
Attitudes
Learning Effectiveness

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Thesis Chairman: Micheal B. McCormick, Lt Col USAF

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

The School of Systems and Logistics, Air Force Institute of Technology (AFIT), located at Wright-Patterson OH, is responsible for providing graduate and professional continuing education (PCE) to the Air Force, and in selected interest areas, to the Department of Defense (DOD). Neither the facilities nor the manpower, however, has been available to meet the demand for the continuing education program. As a result AFIT implemented a telephonic educational delivery system to help provide the quantity of education necessary to prevent backlogs. The purpose of this study was to determine (1) if the Teleteach Expanded Delivery System (TEDS) used was as effective educationally as the previous delivery system; (2) if the TEDS was an acceptable mode of learning for both students and instructors; and (3) if the TEDS was less costly on a per student basis than the previous mode. The authors concluded based on an evaluation of one continuing education course, LOG 220, that (1) TEDS is as effective educationally as the previous system; (2) TEDS is more economical on a per student basis than the previous system; and (3) TEDS is acceptable to both students and faculty.

LSSR 49-80

AN EVALUATION OF THE AFIT TELETEACH EXPANDED DELIVERY SYSTEM (TEDS) METHOD OF INSTRUCTION (PHASE 1)

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

David E. Fortna, BS
Captain, USAF

Ronne G. Mercer, BBA
Captain, USAF

June 1980

This thesis, written by

Captain David E. Fortna

and

Captain Ronne G. Mercer

has been accepted by the undersigned on behalf of the Faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

DATE: 9 June 1980

Michael B McCormick
COMMITTEE CHAIRMAN

ACKNOWLEDGEMENTS

The authors wish to express appreciation for the cooperation and assistance rendered by the staff and faculty, School of Systems and Logistics, Air Force Institute of Technology. In particular, we are indebted to Lieutenant Colonel Micheal B. McCormick, our Faculty Advisor, and to Lieutenant Colonel Charles W. McNichols, Dr. G. Ronald Christopher, and Major Al Milam, without whose collective help and guidance this study would not be possible.

We are especially grateful to Barbara Fortna, our typist, part-time editor, and constant source of inspiration, for her invaluable assistance in meeting deadlines, buoying our spirits, and developing as complete a final product as possible.

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CHAPTER I

INTRODUCTION

"The mission of the Air Force is to Fly and Fight, and don't you forget it!" This slogan embodies the spirit, drive and sense of urgency felt by the professional DCD personnel assigned to the United States Air Force. However, to hundreds of military and civilian Air Force employees, the daily task is not to fly or fight, but rather to educate men and women in areas as diverse as programming computers to maintaining aircraft to acquiring a graduate degree in electrical engineering. Each year the Air Force expends millions of dollars to further the education of its personnel. The Air Force Institute of Technology (AFIT) receives much of this money every year to develop and conduct programs both in Professional Continuing Education and in undergraduate, graduate, and postgraduate disciplines.

This is an era of exponential growth in technology and management requirements. It is also a time of tighter money and reduced manpower--a time when the majority of agencies must maintain and expand their knowledge and capabilities while using fewer total resources. In this environment, AFIT is required to provide increasingly

diverse curricula to a wider range of DOD and allied personnel using the most economical methods possible.

Background

The Air Force Institute of Technology is located at Wright-Patterson Air Force Base, Ohio. Organizationally, it is a part of Air University, which in turn is part of the Air Training Command. AFIT consists of a headquarters unit, the Civilian Institutions Program, and three major schools: The School of Engineering (EN), the School of Civil Engineering (DE), and the School of Systems and Logistics (LS). Activities at this last school are further divided between the Professional Continuing Education (PCE) mission and the Graduate Education mission. Professional Continuing Education offers a total of 41 different courses per year and has, since its inception in 1957, produced over 70,000 graduates. Current annual resident student throughput amounts to over 7000 professionals (2:1). The purpose of the PCE program is succinctly stated in the AFIT Catalogue:

> The [PCE] program is designed to provide the highest quality of educational opportunities for managers in systems acquisition and logistics or the functional areas of maintenance, supply and procurement . . . . The objective result is a more knowledgeable group of systems and logistics managers . . . [1:114].

A wide variety of personnel take advantage of the numerous continuing education programs. Members of the United States Air Force, Army, Navy, Marines, civilian

corps, as well as specially selected allied officers, learn new professional skills or update old ones (1:114). Within the Air Force, the majority of students come from the Air Force Logistics Command (AFLC) and the Air Force Systems Command (AFSC). To meet the challenge of properly educating its students in its diverse continuing education courses, AFIT uses both a permanent faculty and a variety of guest lecturers to teach resident and nonresident courses.

As indicated above, over 7000 students attended PCE resident courses at Wright-Patterson in fiscal year (FY) 79. The same number of students is scheduled to complete similar in-residence courses during FY80 (2:1). These courses are typically from three days to ten weeks in length. Students arrive from all over the world and receive instruction for six to seven hours per day, five days a week. Each course is structured to present the maximum relevant material in the minimum time possible. This approach provides students with the most up-to-date information available in a specific area while minimizing the actual time students are absent from their duty stations (6).

Nonresident Professional Continuing Education courses covering a variety of subjects are also offered. This allows students the opportunity to be exposed to managerial theory, techniques, and application without leaving their home stations. Among the various instructional

techniques available for this form of PCE, AFIT uses seminars, workshops, on-site offerings at the students' location, and correspondence courses. The overall nonresident program graduated approximately 10,000 students in FY79 (2:1). In FY80 these figures should start increasing dramatically due to the initiation of new teaching methodologies.

This increase in student throughput is AFIT's response to an increasingly complex and frustrating problem. The PCE nonresident program began as an attempt to reach and teach the large number of supervisors and managers in the field who are not able to attend a resident course. However, despite the educational efforts of both the resident and nonresident PCE programs, the School of Systems and Logistics is unable to meet the demands placed on it for more classes, a greater variety of programs, and a more flexible approach to teaching more students while holding the line on per pupil and total cost. Numerous resident courses within the Logistics PCE program currently have a two- to three-year backlog of personnel requirements. These additional personnel cannot be absorbed into the resident program due to a limited number of classrooms, study facilities, faculty, and funds. Further, it costs the government more each year to have a person attend an in-residence school in terms of travel expenses,

loss of that person's skills at his/her home station, and per diem (2:1; 2). Finally, AFIT has received a large number of requests to develop new courses for Air Force and other DOD agencies, thereby increasing the strain on the system even more (10:3).

To resolve these problems, personnel from the AFIT School of Systems and Logistics investigated a number of concepts and programs currently being used by civilian institutions in the field of education delivery systems (10:1). Several state and private higher education institutions were questioned on new techniques, practices, and breakthroughs in the area of electronic education. Eventually the search focused on telephonic networking, and from this the system known as the AFIT Teleteach Expanded Delivery System (TEDS) was developed. As the word "Teleteach" implies, the core of this instructional method is the telephone.

Because AFLC and AFSC are the primary users of the PCE program, and because the majority of their personnel are located in a small number of centralized activity centers (depots and divisions, respectively), they seemed the logical beneficiaries of any improvements made to the program. Therefore, they agreed to share the cost of the new TEDS (2:3). Consequently, the first two telephonic networks installed connected AFIT (at Wright-Patterson AFB)

with the five AFLC Air Logistic Centers (ALCs) and with the four primary AFSC locations. These nine remote sites are geographically dispersed throughout the United States. Each telephone network consists of two pairs of dedicated telephone lines which connect the "home" classroom with all the remote sites. One pair of lines sends and receives verbal transmissions while the other pair transmits writing generated upon an electronic blackboard, a device manufactured by American Telephone and Telegraph (2:2). This instrument is used by the instructor much as a normal blackboard. However, the words or computations placed on this board are digitized, transmitted over telephone lines, then reproduced on television monitors at the remote site classrooms. It should be noted that the television displays only what is written on the electronic blackboard. It is not a source of student-to-teacher or teacher-to-student video (i.e., the students and teachers can only hear, not see, each other). Oral communication is accomplished via microphones located at students' desks and at the instructor's position.

Because each site has the capability to transmit as well as receive (via these two pairs of dedicated lines), presentations can originate at any site. Of course, an electronic blackboard must be available to transmit video information. AFLC and AFSC each has its own separate network, thereby allowing AFIT to offer two courses

simultaneously. Colonel Lewis M. Israelitt, Dean of the School of Systems and Logistics, points out that, via TEDS, his faculty can teach as many as six classrooms of students at the same time for AFLC (one at Wright-Patterson and one at each of the ALCs) and five for AFSC (one at Wright-Patterson and one at each division), thereby educating as many as four to five times as many students as are possible in the resident program (10:3-4).

The school chose this system for several reasons. First, the use of telephonic instruction is not entirely foreign to AFIT. Starting in 1973, the School of Civil Engineering and the School of Systems and Logistics each conducted one- to two-hour classes by telephone. Coordination requirements were simpler under this program. When a base requested instruction on specified topics, AFIT sent out a packet of materials consisting of slides or viewgraphs and a course outline. At a mutually agreed-upon time, a faculty member conducted the class by telephone (3:89). Though this program was much more primitive and limited than the TEDS methodology, it did provide AFIT with a conceptual and practical background in the teleteach system (6). Second, numerous civilian institutions have incorporated some form of telephonic instructional networks into their methodology for years. During their research, AFIT personnel discovered that use of such delivery systems has been increasing in the civilian sector

since the early 1960s. As of this time, approximately 37 universities and colleges use telecommunications as a regular method of instruction for students who are remote from the originating classroom (2:2). Although schedules vary, the majority of civilian-conducted telephonic network instruction is given in one- or two-hour blocks and occurs once or twice a week. Most network areas are restricted to specific state or geographic parameters.

The University of Wisconsin, with its fourteen-year-old Educational Telephone Network (ETN), is considered the civilian university leader in teleteach related instruction. Recently in one year alone this school had almost 24,000 participants in 1000 ETN programs (19:15-16). Other major institutions such as the Virginia Polytechnic Institute, the University of Illinois, and Kansas State University, incorporated the telelecture/teleteach delivery methodology in teaching undergraduate- and masters-level programs. Each school mentioned has evaluated its particular methodology and concluded that telephonic network instruction is as effective a learning methodology as is the traditional classroom instruction (9:73; 5:56; 20:68).

Telephonic instructional networks are currently used to provide continuing education for legal, medical and agricultural specialists as well as for students in such diverse courses as agriculture, business, engineering,

and mathematics. Thus far the telelecture/teleteach methodology has not been found inappropriate for any of the disciplines taught via this technique (19:2; 15:20).

It is important at this juncture to clarify several definitional points. A variety of terms are used by a number of authors to focus on one element in a family of instructional delivery systems; viz., the terms TEDS, telecture, telelecture, teleteach, telephonic delivery, and telephonic network instruction all relate to a type system wherein a telephone line (or paired lines) is used to transmit instructional, educational material from one "home" site to one or more remote sites and return immediate oral feedback from the students. For purposes of definition, the last two terms are generic in scope, encompass any instructional delivery system utilizing one or more telephones, and may or may not include one of several electronic devices which provide video, as well as oral, communication capability to the system. The terms "telelecture" (or "telecture") and "teleteach" are basically synonymous today, though there were some distinctions between them when they originated during the 1950s and 1960s, respectively. In particular, the concept of telelecture for college-level academics began at the University of Illinois Chicago Medical Campus in late 1947. From there this idea of, literally, "lectures by telephone" gained popularity at many educational levels.

Typically, the telelecture system was used for short-term seminars or one-time projects (15:18, 19). Then in the 1960s another type of telephonic delivery system originated. This method, known as teleteach, differs from telelecture in that teleteach is implemented by a teacher or course director on a continuous basis to teach regular curriculum to students removed from the main school facilities. Also, the teleteach instruction can be accomplished at the same time the teacher is instructing a "home" class. This contrasts with telelecture, which, as indicated above, is not usually conducted on a continuous basis and is usually used as a supplement by the "home" teacher (15:19). Though these two methods are still distinguishable today, the terms describing them are used interchangeably by many authors on this topic.

The Teleteach Expanded Delivery System (TEDS) method of instruction is an AFIT variation of the more general teleteach system. As discussed earlier, the TEDS incorporates a television monitor to reproduce written video data corresponding to that which is placed on the electronic blackboard. Other of the above-mentioned systems may use a device known as an Electrowriter in lieu of the electronic blackboard. The basic Electrowriter system came into being in the early 1960s and consists of the following assemblies: a transmitter, a receiver, two telephone lines, and two data phones. Both the receiver and

transmitter have a writing area of approximately 17-1/2 square inches. As the writer at one end moves the pen on his paper, a pen at the receiving end reproduces the message, which is then (typically) projected onto a larger screen via an attached overhead projector (15:20). By incorporating the electronic blackboard (with its greater versatility due to larger--3-1/2' x 4-1/2'--writing space) into the TEDS instead of the older Electrowriter, AFIT decided to use one of the most current telephonic instructional delivery systems available.

The Air Force Institute of Technology initiated TEDS at Wright-Patterson AFB in October 1979 via a two-phased pilot program encompassing four Professional Continuing Education courses: LOG 220 (AFLC Materiel Management); SYS 223 (Program Management); SYS 326 (Fundamentals of Acquisition Management); and QMT 170 (Principles of Contract Pricing). The first phase involves only one course--LOG 220--which had four separate offerings in the June through November 1979 time period. Phase Two involves all four courses, each with several different offerings. Contrary to the typical civilian university telelecture schedule mentioned above, the AFIT TEDS instruction lasts four hours a day, five days a week (3:89).

The LOG 220 course is the first program to collect comparison data under both the nonteleteach and teleteach environment. The June and July offerings of this course

were conducted as standard in-residence, nonteleteach classes. The September class incorporated teleteach equipment (microphones and electronic blackboard) but did not include transmission to remote sites. However, the class conducted from 10 October 1979 to 16 November 1979 used the total TEDS system. This class simultaneously involved students in the home classroom at Wright-Patterson as well as students at each of the five ALCs. Whether it was presented in the TEDS or nonTEDS format, the purpose of the course was the same, that is:

> . . . to improve the management effectiveness of key personnel assigned to the materiel management and related AFLC activities which provide support to the Air Force and other DOD agencies. The course is intended to familiarize the student with the structure, philosophy, policies, functions, processes, and subsystems of Air Force logistics, particularly their impact on the Directorate of Materiel Management (MM) [1:115].

Students in LOG 220 usually range in military grade from 02 through 06 and in civilian grade from GS-11 through GS-14. The curriculum is taught using lecture, lecture-discussion, and system management simulation exercise formats.

Problem Statement

A requirement exists within the Air Force Institute of Technology for an evaluation of the recently-implemented TEDS method of group instruction. This evaluation focuses on (1) the cost effectiveness of this method per student

as compared to that of the in-resident, one instructor-one class method of instruction, (2) the effectiveness of the TEDS method from an educational point of view, and (3) the acceptability of this new delivery method by students and faculty. Because LOG 220 is the first course from which comparative data on nonteleteach and teleteach methodologies are available, the July and October offerings form the basis of this evaluation. (The June and September classes were excluded from this study due to insufficient data and only partial implementation of the new methodology, respectively.)

Justification

By initiating a TEDS instructional methodology in selected courses within its Professional Continuing Education portion of the School of Systems and Logistics, AFIT established the correlative need to evaluate this new program to determine: (1) the viability of this concept in the total AFIT educational environment; and (2) the desirability of expanding the use of this system to other PCE courses. Specifically, prior to committing additional funds, physical resources, and faculty and administrative capabilities, AFIT decision-makers must be more cognizant of this system's impact in several areas. First, the cost effectiveness of TEDS as compared to the current in-residence program must be established. If, on a per student

basis, this new method does not produce cost reductions, AFIT cannot justify the required expenses of the system. Second, AFIT leaders feel that they have a professional obligation to maintain AFIT's reputation for a high quality of education in all its education programs. The TEDS method must be evaluated in terms of its effectiveness, viz., is the student gaining as much knowledge under teleteach as he or she might have under the in-residence approach? The third area which must be evaluated centers on acceptability. If the students do not accept the TEDS approach to instruction because they feel uncomfortable with it or because they do not feel they are acquiring the requisite knowledge from the course, AFIT's efforts to educate more people in a more rapid manner may be ineffective. Also, if the participating faculty members reject this as a legitimate delivery system, the program as constructed could be seriously compromised and may have to be re-evaluated and either revised or discarded. These major areas must each be rigorously evaluated by an impartial body before AFIT leaders can look to TEDS both as an acceptable solution to their perceived problems and as the impetus for greater educational expansion and flexibility.

Objectives

To determine the cost effectiveness of implementing the TEDS approach within the LOG 220 course.

To determine the effectiveness of learning using the TEDS approach for LOG 220.

To determine the acceptability of the TEDS approach to the LOG 220 students and faculty.

Hypotheses

The TEDS approach used in the LOG 220 course is less costly per student than the in-residence method of instruction for the same course.

Learning via the TEDS approach is as effective as learning by the in-residence method of instruction in the LOG 220 course. Effectiveness in the context used here would be established if there is no statistically significant difference between TEDS and nonTEDS test scores.

The TEDS method of delivery used in LOG 220 is acceptable to participating faculty members.

Students enrolled in LOG 220 consider the TEDS an acceptable instructional delivery system.

CHAPTER II

LITERATURE REVIEW

A large number of professional educators have examined the telephonic method of instruction delivery in terms of its relative success. A review of literature reveals a variety of attempts to quantify and evaluate the results.

Writing in Adult Leadership, Lily Edelman discussed reasons for requiring innovative teaching systems which parallel the requirements at the Air Force Institute of Technology. One of these reasons is the shortage of qualified instructors necessary to provide educational opportunities to all those desiring them. In Ms Edelman's case, there is a shortage of qualified teachers (8:163); but the AFIT shortage occurs primarily because of budgetary limitations (2). In both situations, the net result is a serious backlog of people interested in receiving additional learning opportunities (6; 8:163).

One test program described by Ms Edelman centered on a telelecture class in Hebrew which was created to meet the needs of a large group of adult students spread over a substantial area (Chicago, Illinois, Grand Rapids and East Lansing, Michigan). The specific system used was the telelecture-plus-Electrowriter technique described in

Chapter I of this paper. This program included the establishment of an appropriate control group. The ensuing results were favorable with the achievement level of both the control group, which had in-residence instruction, and the remote groups, taught by telelecture, being comparable. In addition, the remote group considered the learning environment a pleasant situation (8:164). Similarities between Ms Edelman's study and the present study include the use of adult education groups being taught by either in-residence methods or telelecture.

A minor difference occurs with particular equipment used. The AFIT system uses an electronic blackboard instead of an Electrowriter; however, the opportunity for two-way communication exists using either transmission device. The conclusions reached by Ms Edelman are supportive of hypotheses generated within the current study, i.e.:

1. Instruction received by way of telephonic delivery systems (in this case, telelecture plus Electrowriter) can be as successful as the in-residence methods of instruction.

2. This system provides an excellent opportunity to simultaneously share the talents of guest speakers by a number of students in different locations (8:164).

Professor Dotterweich, in his article in Audio-visual Instruction, has taken a close look at the variables

he feels are necessary to improve the effectiveness of teaching remote classes. Although his primary concern is teaching with the use of video tape recordings, many of his ideas appear applicable to the effective use of the telephonic network approach (7:39). A prime responsibility of the instructor has always been adequate preparation of his subject matter; however, when remote teaching is taking place this aspect is extremely important (7:42). Because of the lack of face-to-face contact, the greatest challenge to the instructor is to retain the students' attention and impart that level of knowledge that is desired for the students to gain (7:42). Professor Dotterweich concludes that the use of visual aids as supplements to the lesson will help the student continue to feel as though he were right there in the classroom with the instructor.

As implied above, the availability of a medium for feedback to the instructor is essential for an effective remote learning system (7:42). Questionnaires distributed by Professor Dotterweich surveyed attitudes toward remote teaching, and results indicated good acceptability of the medium as long as there was the opportunity for instant feedback (7:42). This opportunity does, of course, exist in the AFIT TEDS in the form of the remote classroom microphones.

The University of Wisconsin has been an active user of the telephonic delivery mode of instruction in the

continuing education of health professionals (4:208). Arndt and Weinswig present their analysis in the American Journal of Pharmaceutical Education. They support the contention that telephonic instruction is a viable means of communicating knowledge. The acceptability of the University's program is most notably shown by a substantial increase in enrollment in telephonic courses over a five-year period. Specifically, the number of enrollees increased from 267 in the spring of 1968, to 426 in the fall of 1972 (4:213).

Some differences do exist, however, in the overall Wisconsin program and the AFIT program which could distinguish Wisconsin's results from those of AFIT. The participants in the Wisconsin program were all voluntary, whereas AFIT continuing education students are normally selected to attend to better prepare them to fulfill their roles as government employees (1:208; 2). Consequently, a measurement of class attendance and enrollment increase or decrease would not serve any useful purpose for our study.

Some differences in presentation also are present. The authors found that a single lecturer for a course provided greater continuity; however, AFIT continuing education courses are structured toward multiple instructors and frequent use of guest speakers who are experts in their areas of endeavor (4:210; 2).

A number of authors have focused on the impact that attitude has on the success or failure of educational delivery systems similar to TEDS. Attitude as used here relates to two sets of individuals--the students and the instructors. Regardless of how intrinsically good an educational system might be, it must be accepted by the students as a viable instructional methodology or they will (intellectually) turn their backs to it. Similarly, if the instructors feel that the method is invalid, they will probably not support it. In either case, the potential results are the same: the desired information will not be received by the student, and the overall effectiveness of the delivery system will be minimal or nonexistent.

A. A. Reid, in Human Factors, discusses various attitudinal factors, such as how different age groups may have divergent attitudes toward various telecommunications devices used to impart knowledge. Their attitudes may determine (to a great extent) the effectiveness of the instruction (16:453). This concept is the primary motivation for comparing student attitudes about TEDS. As stated by the author:

> Thus, the possibility of substituting [telephonic instructional techniques] . . . for face-to-face meetings will be affected by the readiness of users to forego the peripheral niceties of hospitality which the face-to-face meeting affords [16:453].

An area that contributes greatly to a potential lack of effectiveness using the telephonic delivery system

is discussed by Ruth Weinstock in Planning for Higher Education. This area--instructor resistance to accepting a system that utilizes the telephone--can be overcome if properly anticipated and prepared for by the implementing agency. Prime causes of instructor resistance or rejection of this approach appear to be linked to the instructor's perceptions about how well his presentation is being or will be received. Many instructors do not want to change their instructional delivery method and soon discover that customary approaches will not work with remote audiences (19:18-19). The present study looks closely at instructor attitudes in terms of its potential impact on success (effectiveness) of TEDS.

Rao and Hicks wrote an interesting article for Audiovisual Instruction which reviews the history of telephone-based instructional systems and purports to identify some of the advantages realized by using the telephonic instructional delivery system. The authors suggest a method to estimate costs of establishing a telephonic network which includes the following: equipment rental; installation; and average cost per long distance call (15:19). Although this constitutes a valid start for estimating costs, this paper will go into much greater detail in identifying the expenses entailed in developing the TEDS. The specific data used to compare the TEDS and nonTEDS costs are in the next chapter.

The articles cited here constitute a representative cross section of the extensive literature dealing with the telephonic method of delivery instruction. Although the authors presented address their comments to a variety of specific professional audiences, several major concepts emerge. First, as expressed by Edelman, the telephonic delivery system appears to be a viable solution to the conflict between high demand for education and low resource availability. Second, Edelman, Dotterweich, Arndt and Weinswig, Weinstock, and Reid all contend that attitude--both student and instructor attitude--will determine how effective this type of system is. Third, many evaluators, including Edelman and others cited throughout this study, have tested the learning effectiveness of this delivery system as a basis for determining overall effectiveness. Fourth, the other major measure of effectiveness used by authors such as Rao and Hicks focuses on the cost of this type of system as compared to the in-residence methodology. This comparison is exceptionally relevant to AFIT's TEDS in light of the Air Force's limited resources and its desire to realize maximum benefit from each dollar spent for education. With these concepts in mind, it is necessary to develop a methodology comprehensive enough to fully evaluate TEDS.

CHAPTER III

METHODOLOGY

Introduction

This chapter was designed to develop the methodology used in evaluating the effectiveness of the TEDS instructional program. Effectiveness was based on a comparison of TEDS and nonTEDS programs and was viewed from three different perspectives: cost effectiveness, learning improvement, and acceptability (by students and instructors). The chapter begins with a discussion of the universe, population, and sampling plan. Next the data collection process for each of the three areas is described. The chapter continues with an explanation of the major statistical tests conducted on the data and the descriptive statistics used in classifying the data. Then criteria tests (decision rules) were established to determine significance of analysis results. The chapter ends with the set of assumptions necessary to permit use of the specific statistical tests.

Universe and Population

The universe included all civilian and military personnel who were assigned to the Air Force Logistics Command and were eligible to participate in Professional

Continuing Education courses. Historically, the AFLC headquarters (located at Wright-Patterson AFB, Ohio) and each of the Air Logistics Centers independently determine which students will be selected from among those eligible to attend both the in-residence and remotely taught AFIT PCE courses. Air Logistics Centers participating in the initial TEDS program are located at:

1. Ogden, Utah (OOALC)
2. Oklahoma City, Oklahoma (OCALC)
3. Sacramento, California (SMALC)
4. San Antonio, Texas (SAALC)
5. Warner-Robins, Georgia (WRALC)

The population of interest consisted of all those personnel eligible for participation in the PCE courses who were also eligible for enrollment in the LOG 220 course. Also included within the population of study are AFIT faculty and guest instructors.

Sampling Plan

A convenience sample of students who were enrolled in the LOG 220, Materiel Management course, between 1 July and 30 November 1979, was selected. This course had sufficient data available to compare nonTEDS, resident TEDS, and remote TEDS classes. The group of 24 students completing LOG 220 in class 79E during the summer of 1979 in residence at Wright-Patterson AFB was established as

the nonTEDS control class. The 24 students attending the LOG 220 course at AFIT during the October-November 1979 offering were designated the resident TEDS class and were an integral part of class 80AT. The remaining students in class 80AT were located at their respective Air Logistics Centers and were designated the remote TEDS classes. The combined resident TEDS class and remote TEDS classes constituted the overall TEDS class.

Selection of students for a particular class was accomplished by the applicable ALC/Hq AFLC unit and was assumed to have been random. There were no known biasing variables operating in student selection for any of the classes included in the study.

Instructors' attitudes toward TEDS were limited to those instructors teaching class 80AT because they were the first instructors to fill out critiques of the TEDS. Most of these instructors, however, had taught the LOG 220 course prior to implementation of TEDS, so they had experience in both teaching methods.

Cost data applicable only to students, equipment, specific TEDS materials, supplies, and support personnel associated with LOG 220 were considered.

Data Collection

Student and instructor data were collected using standard answer sheet A, Optical Scanning Form DS1120-A.

The scan sheets were processed through the AFIT CREATE computer system, and the resulting computer outputs were evaluated for relevant information.

Demographic Data

Demographic data relating to students' rank/grade, educational achievement level, age, and years of logistics experience were collected during the first session of each class (Appendix A). These data were used to determine homogeneity of separate classes in accordance with Table 1.

The demographic data were grouped into five categories, and each category was assigned an ordinal ranking for purposes of comparison.

Pre-test Scores

A fifteen-question pre-test developed by the LOG 220 course director was administered during the first session of each class. This test covered a wide range of general logistical topics and was devised to determine the beginning knowledge level of the students. A percentage of correct answers was calculated, and the interval data were used as a basis for comparison to determine homogeneity of classes.

TABLE 1

DEMOGRAPHIC CATEGORIES

	1	2	3	4	5
Rank / Grade	Lt, GS-10 or lower	Captain GS-11	Major GS-12	Lt Col GS-13	Col, GS-14 or higher
Education	High School degree or lower	College through Associate degree	College through Baccalaureate degree	College through Masters degree	College through Doctoral degree
Age (Yrs)	20-25	26-35	36-45	46-55	56 or older
Experience (Yrs)	0-1	2-3	4-5	6-7	8 or more

Post-test Scores

The percentage of total correct answers on three quizzes developed by the course director and administered periodically throughout the duration of the course were compiled. This figure was used as a basis for comparison between the nonTEDS, resident TEDS, and remote TEDS classes. It constituted a determinant of the learning effectiveness of TEDS.

Student Attitudes

Student's perceived learning and acceptability of TEDS were ascertained through use of a student end-of-course critique (Appendix B). Questions or statements from the critiques which pertained to the LOG 220 course and which were evaluated in our study were as follows:

1. The course objectives were made clear either orally or in the instructions.

2. The course appeared well structured.

3. The course structure permitted questions to be asked and answered satisfactorily.

4. There should have been more handout materials.

5. I will be able to do my job better as a result of this course.

Questions or statements pertaining specifically to the acceptability of TEDS and evaluated in our study were as follows:

1. The room was conducive to learning.

2. I liked the hours the course was offered.

3. The teleteach delivery system is an acceptable learning medium.

4. I would take another course which used this delivery system.

5. There should be more interaction among the sites.

*6. The absence of eye contact with the instructor created a learning barrier/problem.

*7. The site monitor appeared knowledgeable of equipment operation.

*8. The site monitor had the room and materials prepared for class.

*9. A different classroom should be used.

* Answered by remote TEDS students only

Responses to the above questions/statements were collected using a five-point scale consisting of "strongly agree", "agree", "neither agree nor disagree", "disagree", or "strongly disagree".

Instructor Attitudes

Instructor acceptability of TEDS was ascertained by analysis of the instructor critique developed by AFIT (Appendix C). Questions or statements evaluated were as follows:

1. Before using the teleteach system, I felt it would not be effective.

2. The teleteach system provides advantages not normally available.

3. Resident TEDS students participated adequately.

4. Remote TEDS students participated adequately.

5. Students appeared to have learned the material I presented.

6. I would like to use the teleteach system again.

7. I felt uncomfortable when I used the teleteach system.

8. Students do not seem to learn well with the teleteach system.

9. My inability to see remote TEDS students was disconcerting.

10. After using the teleteach system I feel more favorable toward its use.

Responses to the above questions/statements were collected using a five-point Likert scale consisting of "strongly agree", "agree", "neither agree nor disagree", "disagree", or "strongly disagree".

Cost Data

This study evaluated cost effectiveness in terms of per student expenditures for nonTEDS students versus that of TEDS students. Consequently, the actual numbers of

students involved in the July nonTEDS and October TEDS offerings were used. Further, because LOG 220 is an AFIT course conducted for AFLC personnel, the only costs relevant to this research were those incurred by these two commands in presenting the July and October classes. However, in certain situations cost factors cited included expenses incurred by AFSC as well. For instance, each of the three agencies involved in TEDS (AFIT, AFLC, and AFSC) paid specific amounts to American Telegraph & Telephone (AT & T) for installation and monthly rental of circuits, equipment, and a bridge (installed in building 641 at Wright-Patterson AFB) for the TEDS. These costs were amortized when appropriate (reference explanatory paragraphs under list of cost areas), and LOG 220's two-month share was identified. Of these, the total nonrecurring charges were for installation of circuits, equipment, and the bridge. Recurring costs consisted of rental of circuits, equipment, and the bridge. One additional recurring cost was the surcharge paid to the Defense Electronics Contracting Office for contract management of the AT & T contract. Rental costs of the bare classrooms were not included because the actual facilities used varied greatly in overall utilization rate and age, thereby making any such estimation too speculative for inclusion.

The total specific cost areas used to evaluate the TEDS LOG 220 course are listed below. Certain items

are explained more fully in the subsequent paragraphs.

1. Instructor wages
2. Visual aids
3. Remote classroom monitor wages
4. Circuit installation
5. Equipment installation
6. Bridge installation
7. Circuit rental
8. Equipment rental
9. Bridge rental
10. Classroom equipment
11. Contract management

Cost of instructor wages was strictly for time actually spent teaching. Under both the TEDS and the non-TEDS methodologies, the same number of classroom hours (108) was offered using the same mix of full-time AFIT instructors and guest speakers from other on-base agencies. Though it is fully acknowledged that the U.S. Government has to ultimately pay the wages of the guest speakers, in neither case were the guest speakers paid by AFIT. Therefore, only the cost to pay AFIT instructors for their platform teaching time was relevant here. The restriction of using only platform instruction time was established for several reasons. First, the researchers wanted to obtain the most objective data available. The platform

time met this criterion of objectivity by being readily definable and observable. Second, since this was the first attempt at teaching LOG 220 via TEDS, it was anticipated by the researchers that instructor preparation time would be longer than in subsequent offerings of the same course. This learning curve effect, though expected, could not be determined by only one iteration of the TEDS class. Third, because no specific logs were kept identifying work activities, the class' instructors could not provide a definitive statement of how much time was spent in preparation for the course. There was some speculation that the TEDS presentations took longer to prepare for, but no substantive proof was found to support this contention. As a result of these considerations, the researchers felt that any attempt to specify costs in terms of anything beyond simple platform instructor costs would be highly speculative and unjustifiable for purposes of this research. (There are two exceptions. The course director monitored and was paid for the entire 108-hour block. Also included is the time he and his assistant took to prepare materials, visual aids, etc., for distribution to all sites.)

Cost of visual aids applies to those aids made for the WPAFB classroom plus five remote sites. Though the course content for both the TEDS and nonTEDS classes are the same, an entirely new set of visual aids had to be

developed for the TEDS classes due to changes in instructional format and procedure. Visual aids initially developed for TEDS were expected to have a 100 percent turnover every three years. This was due to revised information, instructional modifications, and normal wear and tear.

The figures cited for the three installation and three rental areas sometimes included AFSC costs to AT & T as well as those from AFIT and AFLC to AT & T. In such cases, 6/11 of the total cost was attributed to AFIT and AFLC based on AFLC's five remote sites, AFSC's four remote sites, and AFIT's two classrooms. By so dividing the expenses, any costs directly attributable to AFIT but shared by users from AFLC and AFSC were apportioned equally.

Estimated cost of educational (nonAT & T) equipment for one AFIT classroom and each AFLC classroom was established. Equipment purchased specifically for the TEDS approach included audio equipment and a stereo tape recorder for all classrooms and two television monitors for the WPAFB classroom. Remote sites already had all other required equipment. However, the authors felt that, to more accurately depict all costs attributable to TEDS, all equipment used to support the course should be included. Since actual cost of on hand equipment was unknown, current prices were assumed, and the equipment (see Appendix E) was amortized over a 60 month period as if it had been newly purchased.

Total specific areas used to establish nonTEDS cost were:

1. Instructor wages
2. Visual aids
3. Student Temporary Duty (TDY) per diem
4. Student travel pay
5. Classroom equipment

In comparing the July and October classes, the home bases of the July students were used in computing the actual travel expenses incurred by AFIT. Also, a standard $25 incidental fee was added to each student's travel costs. This is standard procedure by AFIT Accounting and Finance personnel in order to cover such items as taxi fares to and from airports, etc.

The figure for classroom equipment includes all classroom equipment required to conduct LOG 220 at Wright-Patterson AFB. Equipment was amortized over a 60-month period then multiplied by two for the course length.

As mentioned above, in certain areas it was necessary to develop a series of formulae to establish the amount of an overall cost which would be attributable solely to the LOG 220 course. The formulae that follow are specific in nature but are applicable to both the unique offering of LOG 220 under study as well as to any other TEDS course that subsequently may be considered for

evaluation. As a result, where certain variables such as total transmission time in hours and total circuit cost would normally be stated in terms of total annual time and cost, they are here stated in terms of total system life (which amounted to two months) as of the end of the LOG 220 course. The first such area dealt with the percentage cost of visual aids made for the LOG 220 course that were applicable to the October TEDS offering. Total expenses for supplies and labor were obtained from the AFIT Comptroller. This figure was then divided by the number of LOG 220 classes programmed for the next three-year period (based on 100 percent turnover in slides every three years). According to the LOG 220 Course Director, LOG 220 will be offered approximately three times a year over the next three years (17). Therefore, the following formula was developed:

$$\frac{1}{\text{\# of LOG 220 classes offered in 36 months}} \times \text{Cost to Produce Visual Aids} = \text{Cost of Visual Aids for October LOG 220}$$

The second area requiring computations dealt with one-time investment costs paid to AT & T. The following formulae resulted in identifying a prorated investment cost for the October TEDS offering. All costs specified were derived from figures supplied by AT & T and the Defense Electronics Contracting Office.

$$(6/11 \times \text{Cost of Bridge}) + 6/11 \times \text{Total Circuit Start-up Cost}$$

$$+ \text{Specific AT \& T Equipment Purchases for one WPAFB room and five AFLC rooms} = X_1$$

and,

$$\frac{\text{Oct TEDS hours}}{Y_1} \times (X_1) = PI$$

where: X_1 = Total AFIT and AFLC One-time Charges

Y_1 = Total AFLC-related Transmission Time in Hours

PI = Prorated Investment for Oct TEDS

This amount specified by PI was amortized over a 60-month period to reflect anticipated service life of the one-time (or start-up) investment costs and to more equitably apportion this cost over the total system.

Y_1 for this study included only the 108 hours transmission time for the October offering of LOG 220.

The next set of formulae permitted accurate determination of that portion of recurring charges for AT & T circuit, equipment, and bridge which was allocatable to the October TEDS class:

(1) Recurring Circuit Charges:

(a) add the actual monthly charges for voice and data circuits at each AFLC classroom for all applicable months to establish X_2.

(b) next determine Y_1, the total actual circuit hours (transmission hours) used by AFLC (NOTE: this is same value of Y_1 as used above.)

(c) then compute the following:

$$\frac{\text{Oct TEDS hours}}{Y_1} (\%) \times X_2 = R_1 = \text{Circuit Cost Allocatable to Oct TEDS}$$

(2) Recurring Bridge Cost:

$$\text{Recurring Bridge Cost} \times 6/11 \times \frac{\text{Oct TEDS hours}}{Y_1} (\%) = R_2$$

$$= \text{Bridge Cost Allocatable to Oct TEDS}$$

(3) Recurring Equipment Cost:

$$\text{Recurring Equipment Cost} \times \frac{\text{Oct TEDS hours}}{Y_1} (\%) = R_3 = \text{Equipment Cost Allocatable to Oct TEDS}$$

(4) Total Recurring Cost:

$$R_1 + R_2 + R_3 = \text{Total Recurring Cost Allocatable to Oct TEDS}$$

Experimental Design

The experimental design encompassed herein compared test score data, demographic data, and end-of-course critique data across the various treatments or teaching

modes. The matrix depicted in Table 2 delineates the various combinations examined.

The matrix depicted in Table 3 succinctly depicts the specific areas of evaluation used in this study.

Statistical Tests

Statistical methods as delineated in the Statistical Package for the Social Sciences (SPSS) were applied to the experimental design discussed in the previous section.

Crosstabulation and Chi-square (contingency table) Analysis

A crosstabulation was used here to display the joint frequency distribution of cases according to the classificatory variables. This appeared to be the most commonly used analytic method in the social sciences, and was readily applicable to the present study (14:218). With this approach, data are presented in a two-way categorization which permitted a comparison of the response distribution to any given item by categories established by any other item. This technique was particularly useful in comparing demographic items among the various treatment levels under evaluation (14:4).

Each of these frequency distributions was further statistically analyzed by use of the Chi-square statistic. This statistic was calculated from the data array and was

TABLE 2

EXPERIMENTAL DESIGN TABLE

Teaching Mode	Demo-graphic Data	Test Score Data	End-of-Course Critique Data
NonTEDS to TEDS	X	X	X
Resident TEDS to Remote TEDS	X	X	X
Remote $TEDS_1$ to Remote $TEDS_2$ to Remote $TEDS_3$ to Remote $TEDS_4$ to Remote $TEDS_5$	X	X	X

TABLE 3

CONSOLIDATED MATRIX TABLE

	Demo-graphic Data	Test Score Data	End-of-Course Critique Data
Rank	X		
Education Level	X		
Age	X		
Experience	X		
Pre-test Scores		X	
Post-test Scores		X	
Improvement Index		X	
Overall Course Content			X
TEDS Related			X
Remote TEDS Peculiar			X

concerned with the question of statistical independence of the variables. The applicable hypothesis was that the variables were statistically independent. Rejection of this hypothesis implied that the variables were not independent and that there were statistically significant differences between the classes under observation. This technique was used to compare demographic and end-of-course data between nonTEDS, resident TEDS, and remote TEDS classes.

One-way Analysis of Variance (ANOVA)

ANOVA models are typically used to analyze the effects of the independent variable under study upon the dependent variable (14:424). Model I, the fixed effects model, was applicable here, both because the treatments were chosen due to a special interest in them and because they were not a sample from a larger population (14:426). Furthermore, no attempt was made to generalize the test results to other instructional delivery modes. The ANOVA technique presented a mean score or a single dependent, or criterion, variable for each class under observation. A test of the hypothesis that all group means are equal was then performed. Rejection of this hypothesis implied that at least two of the groups differed significantly in criterion mean score. This method was used to analyze the test score data within the experimental design.

Multiple Regression Analysis

Stepwise multiple regression was performed to evaluate predictors that could possibly explain any significant differences in mean post-test scores and improvement indices. Predictor variables evaluated were demographic variables, attitudes toward course material, instruction site (WPAFB or ALC), and mode of presentation. Regression models were constructed by entering the most significant predictor variables sequentially in order of their ability to predict the criterion variable (12:5, 6). Only those predictor variables that were statistically significant at the five percent level were included in these models.

Descriptive Statistics

Descriptive statistics were applied to the data obtained from the instructor end-of-course critiques. These were used to determine frequencies of alternative responses.

Likert Scale

A Likert scale using weighting factors ranging from zero for positive responses to four for negative responses was applied to selected questions from the end-of-course student and instructor critiques. The resulting variable was used for statistical testing and class comparison. To ensure compliance with Chi-square analysis,

requirements regarding minimum expected cell size, the "strongly agree" and "agree" responses were combined to form a single "agree" variable. The "strongly disagree" and "disagree" responses were combined to form a single "disagree" variable.

Criteria Tests

In addition to the statistical tests applied to the research data, decision rules were also necessary. These decision rules, or criteria tests, were used to determine if the results of the data analysis were of importance in accomplishing the research objectives.

To determine if the objective of cost effectiveness was met with the implementation of TEDS in the LOG 220, Materiel Management course, a decision rule was established. If the average cost per student under the TEDS method of instruction is less than the average cost per student under the nonTEDS method, accept the hypothesis that the TEDS method used in the LOG 220 course is less costly per student than the in-residence method.

To determine if the objective of learning effectiveness is met with the implementation of TEDS in the LOG 220 course, this decision rule was established: If there is no statistically significant difference between the post-test scores of the nonTEDS class and the TEDS class, accept the null hypothesis that learning by the

TEDS method is as effective as learning by the in-residence method in the LOG 220 course.

To determine if the objective of acceptability of the TEDS method was met with implementation of TEDS in the LOG 220 course, these decision rules were established: If the mean value of the questions selected to determine acceptability (questions six and ten from the instructor end-of-course critique; questions 23 and 25 from the students end-of-course critique) indicate that a majority of participants find the system acceptable, accept the null hypothesis that the TEDS method used in LOG 220 is acceptable to participating faculty members or students, as appropriate.

Assumptions and Limitations

Prior to commencement of a research study, certain assumptions had to be made about the probability distributions of the data under observation. These were necessitated by the inability to exactly enumerate the population of interest in this study. That is, as discussed in the first portion of this chapter, the population included all personnel eligible for participation in PCE courses who were also eligible for enrollment in the LOG 220 course, plus all AFIT faculty and guest instructors. This is a constantly changing, impossible-to-tally population.

Foremost among these assumptions (and highly desired for use of statistical methods employed for analysis) were the following:

1. Probability distributions of the dependent variables were normal.

2. Each of the probability distributions had the same variance.

3. The observations for each treatment were random observations from the corresponding probability distribution and independent of observations in any other treatment.

CHAPTER IV

ANALYSIS AND INTERPRETATION

Introduction

This chapter serves a twofold purpose. First, the authors analyzed the aggregate of information produced as a result of the methodology developed in Chapter III. Specifically, analysis was performed in the following six areas:

1. Economic
2. Demographic
3. Test Results
4. Student Acceptability
5. Causal Factor
6. Instructor Acceptability

Second, the results obtained in each of the above areas were interpreted to evaluate the numerous economic comparisons and statistically significant variables. In each instance, emphasis was placed on establishing relevance of the information to the initial hypotheses posited in Chapter I.

Economic Analysis

The specific cost items defined in Chapter III were used to analyze the total costs for each of the two methods.

The individual TEDS expenses were computed, totaled, then divided by the exact number of students that participated in the October TEDS class. The same process was completed for the July nonTEDS class. This permitted a comparison of per student costs for each type of instruction.

Instructor Wages

The figure derived here constituted the specific dollar value attributable to the actual time AFIT instructors spent in front of the students, i.e., platform lecturing time. Discussion in Chapter III identifies why only AFIT instructor platform time was used. The amount cited was the same for both TEDS and nonTEDS methods because the total hours taught were the same (108 hours): TEDS required 27 days at four hours per day; nonTEDS required 18 days at six hours per day. The cost for classroom instruction (minus AFLC guest speakers) is shown in Table 4.

The October TEDS class incurred an additional cost due to sending 15 instructors to the five remote sites to conduct a major managerial exercise. Although these instructors were directly involved in the TEDS exercise for only four hours a day for five days, the researchers computed this cost using 40 hours per person. This was because the instructors were dedicated totally to the LOG 220 program for eight hours a day and used the non-exercise times to give extra instruction and evaluate students'

TABLE 4

INSTRUCTOR WAGES

Rating/ Rank	# of Instructors	Hourly Wage		# of Hours Taught		Cost
GS-13	6	$17.14	x	124	=	$3589.98*
GS-12	1	$13.47	x	1.25	=	$ 16.84
O-4	1	$12.31	x	1.5	=	$ 18.47
O-3	1	$10.61	x	5	=	$ 53.05
TOTAL						$3678.34

*This includes 142 hours of materials preparation time expended by the course director (62 hours) and his GS4 assistant (80 hours) for a total of $1464.62 (Appendix F).

results. The figure cited in Table 5 was a valid cost for inclusion in the TEDS method. However, this cost will not be repeated because local (on-site) personnel will be trained to conduct the exercise for all subsequent classes. Because it was impossible and irrelevant at this juncture to estimate cost of such local assistance, the expense was outside the purview of this research. However, future studies in this area must pay full consideration to this cost. The specific computations used to derive the various hourly wages shown in Table 5 are located in Appendix G.

Cost of Visual Aids

The relevant cost here was the cost, in terms of supplies and labor, to produce six sets of visual aids for the LOG 220 course. The six were comprised of one master set and five complete sets of copies. The following information identifies the specific expenses:

Item	Cost
Supplies	$3033.82
Labor	9130.00
	$12,163.82

Expected number of LOG 220 classes offered in three-year period: 9

Therefore:

$$(1/9) \times (\$12,163.82) = \$1351.15$$

TABLE 5

INSTRUCTOR COSTS INCLUDING MANAGERIAL EXERCISE (LOG-MAN-X)

Rating/ Rank	# of Instructors		Hourly Wage		# of Hours Taught		Cost
GS-13	9	x	$17.14	x	40	=	$6170.40
GS-12	1	x	$13.47	x	40	=	$538.80
0-6	1	x	$17.76	x	40	=	$710.40
0-5	1	x	$14.81	x	40	=	$592.40
0-4	3	x	$12.31	x	40	=	$1477.20
SUBTOTAL							$9489.20
PLUS TDY/TRAVEL COSTS							$6331.00
PLUS TOTAL WAGES, TABLE 4							$3678.34
TOTAL							$19,498.54

The specific costs for supplies and labor were derived from raw data supplied by the AFIT Comptroller.

Remote Classroom Monitor Wages

The cost of providing one monitor per remote classroom during the 27 four-hour periods is reflected in Table 6. The specific computations used to derive the hourly wages are located in Appendix G.

AT & T Equipment Installation/ Investment Costs

The combined cost paid to AT & T to install the circuits, bridge, and equipment is computed in Table 7. Equipment furnished by AT & T consisted of the electronic blackboard, transceiver, memory unit, blackboard stand, cabinet, 50A, amplifier, business line, and 503 key.

Therefore, applying the figure from Table 7 to the specified formula:

$$(6/11 \times \$12,941) + (6/11 \times \$1978.56) + \$3520.50 = \$11,658.44$$

$$(\$11,658.44 \div 60) \times 2 = \$388.61$$

And, Y_1 = transmission hours for LOG 220 = 108

Therefore:

$$\frac{108}{108} \times \$388.61 = \$388.61$$

TABLE 6

MONITOR WAGES

Site	GS Rating	Hourly Wages		4 Hours Per Day		27 Days		Wage Cost Per Site
OOALC	11	$10.92	x	4	x	27	=	$1179.36
OCALC	11	$10.92	x	4	x	27	=	$1179.36
SMALC	5	$ 5.95	x	4	x	27	=	$ 642.60
SAALC	11	$10.92	x	4	x	27	=	$1179.36
WRALC	12	$13.47	x	4	x	27	=	$1454.76
	TOTAL							$5635.44

TABLE 7

INSTALLATION/INVESTMENT COSTS

Item		Cost
Bridge		$12,941.00
Circuits		1,978.56
Equipment		
WPAFB	$586.75	
OOALC	586.75	
OCALC	586.75	
SMALC	586.75	
SAALC	586.75	
WRALC	586.75	
		$3,520.50
TOTAL		$18,440.06

Recurring AT & T Costs

To compute system-wide recurring charges, information was gleaned from AFIT Comptroller and Defense Electronics Contracting Office reports. For this study, the relevant rate period included October and November (from time TEDS circuits were activated to end of November).

1. Recurring Circuit Charge

   Total rate: $15,093.44

$\frac{10\text{¢}}{10\text{¢}}$ x $15,093.44 = $15,093.44

2. Recurring Bridge Charge

Total rate: $780

$780 x 6/11 x $\frac{108}{108}$ = $425.45

3. Recurring Equipment Charge

Total rate: $7056.08

$\frac{108}{108}$ x $7056.08 = $7056.08

4. Total Recurring Costs

$15,093.44 + $425.45 + $7056.08 = $22,574.97

Classroom Equipment

Specific classroom equipment purchased for the six classrooms consisted of microphone equipment and stereo tape recorders. Additionally, AFIT purchased two television monitors for its classroom. As stated in Chapter III, cost of all technical equipment (Appendix E) required to present the TEDS LOG 220 was considered in an attempt to determine total costs to initiate this methodology. Total costs are displayed in Table 8.

Contract Management

This cost was identified from reports supplied to the AFIT Comptroller by the Defense Electronics Contracting Office (DECC). It amounted to $7000.

Total TEDS Costs for October Offering of LOG 220

Table 9 constitutes a summary of costs for TEDS instructional method used in the October TEDS class.

TABLE 8

CLASSROOM EQUIPMENT

Item	Cost
Stereo Tape Recorders	$ 1,212.00
Projection Equipment	2,946.00
Television Monitors	4,800.00
Microphone Equipment	4,260.00
TOTAL	$13,218.00

AMORTIZED COST OVER 60 MONTHS:
($13,218.00 ÷ 60) x 2 = $440.60

TABLE 9

TOTAL TEDS COSTS FOR OCTOBER TEDS LOG 220

Item	Cost
Instructor Wages	$19,498.54
Visual Aids	1,341.15
Monitor Wages	5,635.44
Prorated Investment	388.61
Recurring Expenses	22,574.97
Classroom Equipment	440.60
Contract Management	7,000.00
TOTAL	$56,879.31

This figure was then divided by the number of students to determine the per student cost (minus AFLC guest speakers) to conduct the October LOG 220 TEDS class:

$56,879.31 ÷ 144 = $395.00

It must be reemphasized that this figure included the instructor costs of conducting the LOG-MAN-X exercise at the remote sites. Since this function will be accomplished by qualified local (on-base) personnel in the future, AFIT and AFLC will incur no additional direct costs. Therefore, the overall cost area of instructor wages will decrease dramatically. It is interesting to note that the per student cost for a TEDS LOG 220 class minus these TDY costs would be $285.13

Computing the nonTEDS per student costs was less demanding than the above process because fewer cost items were involved.

Instructor Wages

As noted in the analysis of TEDS Instructor Wages, the basic cost attributable to instructor platform time was the same for both types of instruction because total classroom hours were identical. Total TEDS Instructor Wages, as depicted in Table 4, were $3,678.34. This amount, however, included $1464.62 as the costs attributed to the course director and his assistant in preparing TEDS

materials for shipment to the remote sites. Since this action was not required for the nonTEDS course, it was deducted from the $3678.34. Consequently, the AFIT non-TEDS cost for Instructor Wages was $2213.72. As mentioned earlier, this expense related strictly to the cost of platform time for AFIT instructors. Because the class was conducted in July and this research effort did not begin until October, it was deemed infeasible to consider making even a crude guess at the costs related to unknown AFLC guest lecturers and their incidental expenses, e.g., automobile expenses, productive time lost from their every-day jobs, cost of administrative assistance in preparing lecture materials, at their various offices, and preparation time for their lectures. Rather, the researchers simply acknowledged the lack of accurate information in this area and computed per student costs without it.

Visual Aids

No cost data were available on the expense for visual aids (overhead slides) for the July nonTEDS class. This was due in large part to the fact that AFIT did not maintain most of these slides. Instead, each guest lecturer's home office maintained its own slides for the lecturer's use. AFIT kept only those slides used by its own instructors. However, in keeping with the idea that the AFLC/AFIT costs must be identified if possible, the

researchers asked for the LOG 220 course director's estimate of how many slides totally were used in the July nonTEDS class. His response of approximately 2000 was multiplied by $4, the approximate cost incurred by base graphics to locally produce a typical slide. The total cost computed was $8000. As with the TEDS visual aids (35mm slides), the expected turnover rate for these overhead slides was 100 percent every three years. Since the nonTEDS LOG 220 course had been offered an average of five times per year, this equated to 15 total offerings of the course during the last relevant time period. Consequently, by dividing the total cost of one set of overhead slides ($8000) by 15, the cost of visual aids for the July nonTEDS offering was $533.33.

Student Per Diem

A total of 25 students attended the July nonTEDS class. Seven of these were from Wright-Patterson and consequently did not receive per diem for their time spent in this course. However, the other 18 students traveled to this central location from the five Air Logistics Centers. Consequently, the per diem cost was computed as:

18 x $26 x 18 days = $8424

The $26 figure was a standard Temporary Duty (TDY) amount supplied by the AFIT Comptroller.

Student Travel Pay

Using the airline fares that were valid for the July 1979 period, the amounts specified in Table 10 constituted the major portion of travel-related expenses.

TABLE 10

STUDENT TRAVEL COSTS

Site	# of Students		Fare		Cost Per Site
CC ALC	2	x	$214	=	$428
OC ALC	2	x	$316	=	$632
SA ALC	6	x	$252	=	$1512
SM ALC	6	x	$444	=	$2664
WR ALC	2	x	$142	=	$284
TOTAL					$5520

An additional $25 per student was added to conform with standard Accounting and Finance procedures. This amount represented a variety of incidental costs such as taxi fare to and from airports.

$25 x 18 students = $450

Therefore, total student travel pay consisted of the sum of these two expenses, i.e.:

$$\$5520 + \$450 = \$5970$$

Classroom Equipment

This category related solely to equipment items used in the nonTEDS instruction of the LOG 220 course. Specific costs are displayed in Table 11. This amount was divided by 60 to determine the amortized cost over a 60-month period, i.e.:

$$(\$1604.68 \div 60) \times 2 = \$53.49$$

TABLE 11

CLASSROOM EQUIPMENT COSTS

Item	Cost
Overhead Projector	$350.00
TV Recorder/Playback	$1254.68
TOTAL	$1604.68

Total nonTEDS Costs for July Offering of LOG 220

Table 12 constitutes a summary of costs attributable to the nonTEDS instructional method used in the July non-TEDS class.

TABLE 12

TOTAL COSTS FOR JULY NONTEDS LOG 220

Item	Cost
Instructor Wages	$2213.72
Visual Aids	$533.33
TDY Per Diem	$8424.00
Travel Pay	$5970.00
Classroom Equipment	$53.49
TOTAL	$17,194.54

This figure was then divided by the number of participating students to determine the total per student cost to conduct the July nonTEDS class of LOG 220:

$17,194.54 ÷ 24 = 3716.44

Finally, by comparing the two per student totals, a measure of relative cost effectiveness was established. Specifically:

nonTEDS:	$716.44
TEDS:	$395.00
	$321.44

That is, it cost $321.44 less to teach a student via the October TEDS class of LOG 220 than it did to teach a student via the July nonTEDS class.

Analysis of Demographic Data

In accordance with the experimental design specified in Chapter III, the frequency distributions of the four demographic variables (rank, education level, age, logistics experience) were compared via crosstabulation. These results were then evaluated for homogeneity using a Chi-square Contingency Table analysis in conjunction with the hypothesis that the variables were statistically independent. To comply with the Chi-square analysis concept of minimum expected cell size, categories within each of the demographic variables were combined as necessary. The researchers used the standard five percent as a relevant level of significance. Any Contingency Table analysis results that differed significantly are identified and

discussed below. Those results that did not significantly differ are displayed in Appendices H through C. To provide the reader an opportunity for individual evaluation, the minimum significance levels which would have had to have been achieved for each demographic variable to reject the hypothesis are stipulated.

Comparison between TEDS and nonTEDS Demographic Variables

The nonTEDS students were slightly better educated than their TEDS counterparts (Appendix H), and the TEDS students were slightly older (Appendix I). However, overall there were no significant differences between the nonTEDS control group and the TEDS experimental group. To actually have rejected the hypothesis identified above, the minimum significance levels for each demographic variable would have had to have been set as shown in Table 13.

Comparison Between Resident TEDS and Remote TEDS

Within the overall TEDS contingent, significant differences were noted in both the rank (Table 14) and education (Table 15) distributions. The rank distribution indicated that the resident TEDS group had a greater preponderance of higher-ranking students than did the remote TEDS group. Also, the resident students appeared to be better educated than the remote students.

TABLE 13

MINIMUM SIGNIFICANCE LEVELS FOR
DEMOGRAPHIC VARIABLES

Variable	P-Value
Grade or Rank	.4952 (Appendix L)
Education Level	.1050
Age	.5074
Logistics Experience	.8019 (Appendix M)

TABLE 14

CROSSTABULATION OF RANK DISTRIBUTION
BY TEDS GROUPS

Rank	Resident TEDS	Remote TEDS	Total
O1, O2, GS5-GS10	8.3%	27.1%	23.9%
O3, GS11	4.2	46.6	39.4
O4, GS12	66.7	21.2	28.9
O5, GS13 and up	20.8	5.1	7.7

Significance level: $p < .0001$

TABLE 15

CROSSTABULATION OF EDUCATION DISTRIBUTION BY TEDS GROUPS

Education Level	Resident TEDS	Remote TEDS	Total
At Least High School	4.2%	21.2%	18.3%
Some College	16.7	40.7	36.6
Baccalaureate Plus	50.0	27.1	31.0
Masters Plus	29.2	11.0	14.1
Significance level: p = .0025			

The remote group appeared to be slightly older than the resident group (Appendix J); however, there were no statistically significant differences between the groups with respect to either age or experience. Minimum significance level for age was .0913 and for experience was .9451 (Appendix K).

Comparison Across Remote Sites

Both the distribution for rank (Table 16) and the distribution for experience (Table 17) showed significant differences when compared across all remote TEDS locations.

The rank distribution indicated a higher rank level at Sacramento ALC while the bulk of lower-ranking individuals were located at Ogden, San Antonio, and Warner-Robins.

TABLE 16

CROSSTABULATION OF RANK DISTRIBUTION BY REMOTE LOCATION

Rank	Ogden	Oklahoma City	Sacramento	San Antonio	Warner-Robins	Total
01, 02 GS5-GS10	43.5%	40.9%	4.2%	20.0%	29.2%	27.1%
03, GS11	39.1	27.3	50.0	64.0	50.0	46.6
04, GS12	8.7	31.8	29.2	16.0	20.8	21.2
05, GS13 and higher	8.7	0	16.7	0	0	5.1

Significance level: p = .0072

TABLE 17

CROSSTABULATION OF EXPERIENCE DISTRIBUTION BY REMOTE LOCATION

Experience	Ogden	Oklahoma City	Sacramento	San Antonio	Warner-Robins	Total
0-1 yr	13.0%	10.0%	65.2%	16.0%	30.4%	27.2%
2-3 yrs	30.4	30.0	8.7	20.0	26.1	22.8
4-7 yrs	4.3	15.0	4.3	24.0	4.3	10.5
8 yr or more	52.2	45.0	21.7	40.0	39.1	39.5

Significance level: p = .0022

By contrast, however, the experience distribution indicated the least experienced participants were at Sacramento and the most experienced students were located at Ogden.

Although not statistically significant, the Warner-Robins participants were slightly younger (Appendix N) and less-educated (Appendix O) than the rest of the remote TEDS students. The minimum significance level for education was .5127 and for age was .5961.

Test Results

This portion of analysis considered three variables: pre-test scores, post-test scores, and the difference between the two, which is referred to as the "improvement index." Mean scores were computed for each of these variables within each group. One-way analysis of variance (ANOVA) was used to test for significant differences in the following areas:

1. Between the nonTEDS and TEDS groups
2. Between the resident TEDS and remote TEDS
3. Among the five remote TEDS locations

Mean scores are presented in Table 18 and significance levels are displayed in Table 19.

The comparison of TEDS and nonTEDS groups indicated a highly significant difference in both pre-test scores and improvement indices; however, no significant difference

was discovered in post-test results at the five percent level. The low mean pre-test score obtained by the nonTEDS group was the major factor leading to these differences.

TABLE 18

MEAN TEST SCORES AND IMPROVEMENT INDICES

	Pre-test	Post-test*	Improvement
All Students	60.4%	82.3%	20.5%
NonTEDS	51.2	84.0	32.2
TEDS	61.9	82.0	18.6
Resident	64.5	83.2	18.6
Remote	61.4	81.7	18.6
Ogden	56.9	85.3	25.0
Oklahoma City	60.0	82.1	22.0
Sacramento	64.0	80.4	15.6
San Antonio	58.6	81.5	18.5
Warner Robins	67.3	79.4	11.9

*Mean Improvement may differ slightly from Mean Post-test minus Mean Pre-test score because of missing scores.

Analysis of the five remote locations indicated no significant difference in test scores across the sites at the five percent level. There was, however, a significant difference in improvement which can be attributed to results at Warner-Robins and Ogden. Warner-Robins had the highest pre-test score but the lowest post-test score, hence

the smallest improvement index. Ogden, on the other hand, had the lowest pre-test score and the highest post-test score, hence the largest improvement index.

The analysis of these variables comparing the resident TEDS and remote TEDS groups indicated no significant difference at the five percent level. Although the mean scores for the remote group were slightly lower than those for the resident group, the improvement indices were particially identical.

TABLE 19

SIGNIFICANCE LEVELS FOR TESTS OF DIFFERENCES 1

	Pre-test	Post-test	Improvement
Between nonTEDS and TEDS	.0013	.2293	.0002
Between Resident TEDS and Remote TEDS	.3653	.3964	.9958
Among Remote TEDS Sites	.1043	.0856	.0397

The tremendous disparity of pre-test scores between the nonTEDS and overall TEDS groups tended to distort the improvement indices. As a result, further analysis was conducted comparing the nonTEDS group with the TEDS group (Ogden) that had a pre-test result closest to that of the

nonTEDS group (56.9). Significance levels for this comparison are displayed in Table 20.

TABLE 20

SIGNIFICANCE LEVELS FOR TESTS OF DIFFERENCES 2

	Pre-test	Post-test	Improvement
Between nonTEDS and Ogden TEDS	.1679	.5656	.1146

The comparison of the nonTEDS and the Ogden remote TEDS groups indicated no significant differences in pre-test, post-test results, or improvement indices.

Analysis of Student Acceptability

In accordance with the experimental design specified in Chapter III, the frequency distributions of the responses to end-of-course critique questions were compared using the crosstabulation statistical technique. These results were then compared for significant differences between groups using Chi-square Contingency Table analysis in conjunction with the hypothesis that the variables were statistically independent. The standard five percent was again used to determine relative significance. Each critique question with applicable response percentages is presented. The minimum significance levels necessary to determine statistical independence have been provided for each level of comparison.

Responses to the following question are displayed in Table 21: "The course objectives were made clear either orally or in the instructions."

TABLE 21

COURSE OBJECTIVES CLEAR

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	91.7%	4.2%	4.2%
TEDS	87.5	5.5	6.9
(Significance: p = .0534)			
Resident TEDS	96.0	0	4.0
Remote TEDS	85.8	6.7	7.5
(Significance: p = .2292)			
Ogden	91.7	4.2	4.2
Oklahoma City	81.8	9.1	9.1
Sacramento	100	0	0
San Antonio	76.9	3.8	19.2
Warner-Robins	79.1	16.7	4.2
(Significance: p = .1394)			

Analysis indicated no significant difference in the perception of clear course objectives between the TEDS and nonTEDS students. Most TEDS students appeared to be

in agreement that the objectives were made clear.

Responses to the following question are displayed in Table 22: "The course appeared well structured."

TABLE 22

COURSE WELL STRUCTURED

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	100.0%	0%	0%
TEDS	79.3	11.7	9.0
(Significance: p = .0740)			
Resident TEDS	96	4.0	0
Remote TEDS	75.8	13.3	10.8
(Significance: p = .1163)			
Ogden	91.7	8.3	0
Oklahoma City	68.2	18.2	13.6
Sacramento	87.5	0	12.5
San Antonio	57.7	23.1	19.2
Warner-Robins	75.0	16.7	8.3
(Significance: p = .1984)			

Analysis indicated no significant difference between the nonTEDS and TEDS students concerning the structure of the course. Both nonTEDS and TEDS students agreed that the course appeared well structured.

Responses to the following question are displayed in Table 23: "The course structure permitted questions to be asked and answered satisfactorily."

TABLE 23

QUESTIONS ASKED AND ANSWERED SATISFACTORILY

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	95.8%	0%	4.2%
TEDS	74.5	11.0	14.4
(Significance: p - .0141)			
Resident TEDS	100	0	0
Remote TEDS	69.1	13.3	17.5
(Significance: p = .0002)			
Ogden	70.8	20.8	8.3
Oklahoma City	81.8	18.2	0
Sacramento	70.8	12.5	16.7
San Antonio	84.6	0	15.4
Warner-Robins	37.5	16.7	45.8
(Significance: p = .0134)			

Analysis indicated significant differences at all levels of comparison concerning the interchange between student and instructor. The majority of the nonTEDS

students, resident TEDS students, and all remote TEDS students, except Warner-Robins, were satisfied with the opportunity for student-instructor interchange.

Responses to the following question are displayed in Table 24: "The room was conducive to learning."

TABLE 24

ROOM CONDUCIVE TO LEARNING

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	87.5%	8.3%	4.2%
TEDS	60.0	11.0	29.0
(Significance: p = .0057)			
Resident TEDS	74.0	8.0	8.0
Remote TEDS	55.0	11.7	33.4
(Significance: p = .0367)			
Ogden	95.8	4.2	0
Oklahoma City	36.3	18.2	45.5
Sacramento	79.2	20.8	0
San Antonio	53.9	15.4	30.7
Warner-Robins	8.3	0	91.7
(Significance: p = .0000)			

Analysis indicated a significant difference among the remote sites as to perceptions of adequacy of their academic environment. More Oklahoma City and Warner-Robins students found fault with their surroundings than did students at the remaining remote locations. It is interesting to note that the resident TEDS students expressed slightly less acceptance of the classroom than did the nonTEDS group although both used the same classroom.

Responses to the following question are displayed in Table 25: "There should have been more handout materials."

TABLE 25

MORE HANDOUT MATERIALS

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	37.5%	20.8%	41.6%
TEDS	22.1	17.9	60.0
(Significance: p = .2506)			
Resident TEDS	20.0	8.0	72.0
Remote TEDS	22.5	20.0	57.5
(Significance: p = .0995)			
Ogden	8.4	16.7	75.0
Oklahoma City	31.8	22.7	45.5
Sacramento	20.8	12.5	66.7
San Antonio	26.9	23.1	50.0
Warner-Robins	25.0	25.0	50.0
(Significance: p = .7858)			

Analysis indicated no significant differences for all comparison levels concerning the desire for more handout materials. With the exception of Oklahoma City, all TEDS sites felt there were adequate handout materials. The NonTEDS group tended more strongly toward additional handout materials than any TEDS site, resident or remote.

Responses to the following question are displayed in Table 26: "I will be able to do my job better as a result of this course."

TABLE 26

ABLE TO DO JOB BETTER

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
NonTEDS	95.9%	4.2%	0%
TEDS	72.4	20.0	7.6
(Significance: p = .0178)			
Resident TEDS	80.0	16.0	4.0
Remote TEDS	70.9	20.8	8.4
(Significance: p = .7646)			
Ogden	83.3	12.5	4.2
Oklahoma City	59.1	27.3	13.6
Sacramento	87.5	8.3	4.2
San Antonio	61.6	19.2	19.2
Warner-Robins	62.5	37.5	0
(Significance: p = .2674)			

Analysis indicated significant difference between NonTEDS and TEDS. The NonTEDS group felt the course would contribute significantly more to their job performance than did the TEDS group. There was no significant difference noted between the resident TEDS and remote TEDS groups, nor among remote TEDS sites. Students in all groups expressed a positive attitude toward the course's contribution to their future job performance.

Responses to the following question are displayed in Table 27: "I liked the hours the course was offered."

TABLE 27

LIKED THE HOURS

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Resident TEDS	24%	4.0%	72.0%
Remote TEDS	47.0	14.3	46.2
(Significance: p = .0397)			
Ogden	54.2	25.0	20.8
Oklahoma City	45.4	18.2	36.4
Sacramento	8.4	4.2	87.4
San Antonio	46.2	11.5	42.3
Warner-Robins	43.4	13.0	43.5
(Significance: p = .0094)			

Analysis indicated significant differences between resident and remote TEDS groups and also among remote groups concerning the desirability of the classroom schedule. Classroom schedules differed for the groups depending upon the time zone in which the site was located. Classes ranged from noon to four o'clock in the afternoon for Eastern time zone students and from nine o'clock in the morning to one o'clock in the afternoon for Pacific time zone students. Neither the resident TEDS students nor the remote TEDS students as a group were pleased with the classroom hours. Only Ogden students liked the hours.

Responses to the following question are displayed in Table 28: "The teleteach delivery system is an acceptable learning medium."

TABLE 28

TELETEACH ACCEPTABLE

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Resident TEDS	68.0%	20.0%	12.0%
Remote TEDS	65.8	8.3	25.8
(Significance: p = .2256)			
Ogden	75.0	8.3	16.7
Oklahoma City	45.5	9.1	45.5
Sacramento	83.3	8.3	8.4
San Antonio	76.9	7.7	15.4
Warner-Robins	45.8	8.4	45.8
(Significance: p = .1830)			

Analysis indicated no significant difference between the resident students and the remote students as a group concerning the acceptability of TEDS as a learning medium. Also there was no significant difference among the remote sites. The Oklahoma City and Warner-Robins students were equally divided in response to this question and neither provided a majority in the contrasting categories.

Responses to the following question are displayed in Table 29: "I would take another course which used this delivery system."

TABLE 29

WOULD TAKE ANOTHER COURSE

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Resident TEDS	68.0%	4.0%	28.0%
Remote TEDS	65.8	13.3	20.8
(Significance: p = .2124)			
Ogden	70.8	20.8	8.4
Oklahoma City	50.0	13.6	36.4
Sacramento	83.3	8.3	8.4
San Antonio	69.2	15.4	15.4
Warner-Robins	54.1	8.3	37.5
(Significance: p = .2756)			

Analysis indicated that most students were in agreement that they would take another course presented by TEDS.

Responses to the following question are displayed in Table 30: "There should be more interaction among the sites."

TABLE 30

MORE INTERACTION

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Resident TEDS	56.0%	32.0%	12.0%
Remote TEDS	64.2	29.2	6.6
(Significance: p = .6109)			
Ogden	50.0	45.8	4.2
Oklahoma City	45.4	45.5	9.1
Sacramento	83.3	12.5	4.2
San Antonio	65.4	26.9	7.7
Warner-Robins	75.0	16.7	8.3
(Significance: p = .2749)			

Analysis indicated no significant differences between or among groups concerning the level of interaction among the sites. Most students indicated the level of interaction should be increased.

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AN EVALUATION OF THE AFIT TELETEACH EXPANDED DELIVERY SYSTEM (T--ETC(U)
JUN 80 D E FORTNA, R G MERCER
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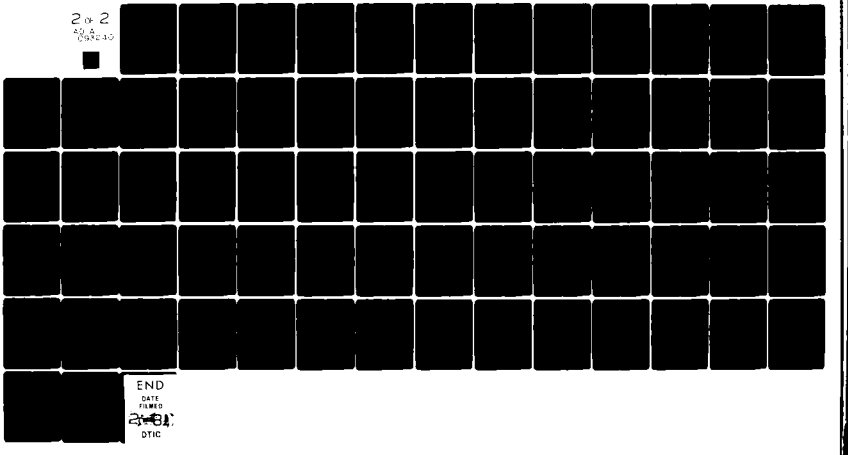

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Responses to the following question are displayed in Table 31: "The absence of eye contact with the instructor created a learning barrier problem."

TABLE 31

EYE CONTACT PROBLEM

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Remote TEDS	82.5%	6.7%	10.8%
Ogden	70.9	8.3	20.8
Oklahoma City	90.9	4.5	4.5
Sacramento	87.5	0	12.5
San Antonio	73.1	19.2	7.7
Warner-Robins	91.7	0	8.3
(Significance: p = .0367)			

Analysis indicated most remote students considered the lack of eye contact with the instructor an impairment to their learning the material presented. A significant difference was revealed, however, in the comparison of responses among the remote sites.

Responses to the following question are displayed in Table 32: "The site monitor appeared knowledgeable of equipment operation."

TABLE 32

SITE MONITOR KNOWLEDGEABLE

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Remote TEDS	92.5%	2.5%	5.0%
Ogden	100.0	0	0
Oklahoma City	100.0	0	0
Sacramento	95.8	4.2	0
San Antonio	76.9	7.7	15.4
Warner-Robins	91.7	0	8.3

(Significance: p = .1085)

Analysis indicated no significant differences among the remote sites concerning the students' perceptions of the site monitors' equipment knowledge.

Responses to the following question are displayed in Table 33: "The site monitor had the room and materials prepared for class."

TABLE 33

SITE MONITOR PREPARED CLASSROOM

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Remote TEDS	84.2%	5.0%	10.8%
Ogden	100.0	0	0
Oklahoma City	100.0	0	0
Sacramento	95.8	0	4.2
San Antonio	38.5	19.2	42.3
Warner-Robins	91.7	4.2	4.2

(Significance: p = .0000)

Analysis indicated that only San Antonio students felt the site monitor had not adequately prepared the classroom. This accounted for the significant difference in responses among the remote sites.

Responses to the following question are displayed in Table 34: "A different classroom should be used."

TABLE 34

DIFFERENT CLASSROOM NEEDED

Type Presentation	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree
Remote TEDS	44.2%	22.5%	33.3%
Ogden	8.3	25.0	66.7
Oklahoma City	63.6	27.3	9.1
Sacramento	20.8	37.5	41.7
San Antonio	30.8	23.1	46.2
Warner-Robins	100.0	0	0

(Significance: $p = .0000$)

Analysis indicated a significant difference among the remote sites concerning the need for a different academic environment. Warner-Robins students were in total agreement, and a majority of the Oklahoma City students indicated that a different classroom should be used. All other sites indicated that their classroom was adequate.

As established in Chapter III, the overall acceptability of TEDS was determined by the combination of responses to the questions concerning TEDS acceptability (Table 28) and desire to take another TEDS course (Table 29). The results

of this merger are displayed in Table 35.

TABLE 35

OVERALL TELETEACH ACCEPTABILITY

Type Presentation	Acceptable	Neutral	Unacceptable
Resident TEDS	68.0%	20.0%	12.0%
Remote TEDS	68.3	14.2	17.5
(Significance: p = .6562)			
Ogden	79.2	16.7	4.2
Oklahoma City	45.5	27.3	27.3
Sacramento	87.5	4.2	8.3
San Antonio	80.8	3.8	15.4
Warner-Robins	45.8	20.8	33.3
(Significance: p = .0066)			

Analysis indicated no significant difference between the overall remote responses and the resident responses. The majority of the TEDS students found the mode acceptable. A significant difference did exist, however, among the remote sites with a considerable percentage of students at both Oklahoma City and Warner-Robins indicating that TEDS was not acceptable.

Casual Factor Analysis

Stepwise multiple regression models were constructed to compare and evaluate the relative importance of the demographic variables, mode acceptability, and type or location of instruction in influencing student learning. Models were constructed to explain only those significant differences encountered in the ANOVA tests for post-test scores and improvement indices. The following variables were used as predictors and were included in the model if the corresponding coefficients differed significantly from zero at the five percent level.

1. Student rank
2. Student educational achievement level
3. Student age
4. Student logistics experience
5. Type (TEDS or nonTEDS) or location of instruction (coded using dummy variables)
6. TEDS acceptability, determined by combining the students' responses to the following critique question: "Teleteach is an acceptable learning medium."; and "I would take another course which used this delivery system."

The predictor model constructed to explain the significant difference in the improvement index for TEDS and nonTEDS is displayed in Table 36.

TABLE 36

PREDICTOR MODEL, TEDS/NONTEDS

Criterion Variable: Improvement Index			
Significant Predictor Variable	Unnormalized Coefficient	Beta Weight	Significance Level
Dummy var TEDS	-12.35	-.26	$p < .05$
Education level	3.01	.17	$p < .05$
(Constant term)	23.68		
Coefficient of determination, $R^2 = .11$			

Analysis indicated the most significant predictor variable to be associated with mode of learning. A member of the TEDS group was predicted to achieve a significantly lesser amount of improvement than a member of the nonTEDS group. Although education level was found to be a significant predictor, previous demographic analysis indicated no significant differences between the TEDS and nonTEDS groups with respect to educational achievement level. As a result, the effects of this predictor variable were inconsequential.

The predictor model constructed to explain the significant difference in the improvement index for the remote TEDS sites is displayed in Table 37.

TABLE 37

PREDICTOR MODEL, REMOTE TEDS

Criterion Variable: Improvement Index

Significant Predictor Variable	Unnormalized Coefficient	Beta Weight	Significance Level
Dummy var, Ogden	10.88	.28	.0001
Dummy var, Oklahoma City	7.79	.19	.0045
Education level	2.67	.16	.0191
(Constant term)	12.01		

Coefficient of determination, R^2 = .08

Analysis indicated the most significant predictor variables to be associated with location at a particular site. Being a participant at either Ogden or Oklahoma City predicted a significantly greater improvement than being at the base site, Warner-Robins. Although education level was found to be a significant predictor, previous demographic analysis indicated no significant differences among the remote sites in regard to academic achievement level. As a result, the effects of this predictor variable were inconsequential.

Analysis of Instructor Acceptability

Frequency distributions were accomplished for the collected responses to the TEDS instructor end-of-course critiques. Distribution results from the 36 participating instructors are presented with the percentage of responses to each alternative.

Question 1: "Before using the teleteach system, I felt it wouldn't be effective."

A. Strongly agree - 0

B. Agree - 5.6

C. Neither agree nor disagree - 33.3

D. Disagree - 44.4

E. Strongly disagree - 16.7

The responses indicated no preconceived notion of ineffectiveness attributed to this mode of presentation.

Question 2: "The teleteach system provides advantages not normally available."

A. Strongly agree - 22.2

B. Agree - 63.9

C. Neither agree nor disagree - 13.9

D. Disagree - 0

E. Strongly disagree - 0

The responses indicated that instructors felt TEDS offered advantages over other presentation methods they had previously used.

Question 3: "Students at WPAFB participated adequately."

A. Strongly agree - 25

B. Agree - 61.1

C. Neither agree nor disagree - 5.6

D. Disagree - 5.6

E. Strongly disagree - 2.8

The responses indicated that resident TEDS students participated to the extent expected by the instructor.

Question 4: "Students at remote sites participated adequately."

A. Strongly agree - 5.6

B. Agree - 41.7

C. Neither agree nor disagree - 25.0

D. Disagree - 25

E. Strongly disagree - 2.8

The responses indicated that instructors thought that remote TEDS students might have participated more, yet their participation was certainly adequate.

Question 5: "Students appeared to have learned the material I presented."

A. Strongly agree - 11.1

B. Agree - 41.7

C. Neither agree nor disagree - 41.7

D. Disagree - 5.6

E. Strongly disagree - 0

The responses indicated that over half of the instructors felt learning had occurred while a considerable percentage, 41.7, were not willing to speculate.

Question 6: "I would like to use the teleteach system again."

A. Strongly agree - 30.6

B. Agree - 47.2

C. Neither agree nor disagree - 16.7

D. Disagree - 5.6

E. Strongly disagree - 0

The responses indicated that a large majority of instructors would like to use the TEDS instructional method again.

Question 7: "I felt uncomfortable when I used the teleteach system."

A. Strongly agree - 8.3

B. Agree - 33.3

C. Neither agree nor disagree - 5.6

D. Disagree - 38.9

E. Strongly disagree - 13.9

The responses indicated that most instructors felt comfortable using the system while an important percentage, 41.6, did indeed feel uncomfortable.

Question 8: "Students don't seem to learn well with the teleteach system."

A. Strongly agree - 0

B. Agree - 2.8

C. Neither agree nor disagree - 47.2

D. Disagree - 38.9

E. Strongly disagree - 11.1

The responses indicated that most instructors felt this system did not negatively impact student learning. Responses to this question confirm the results of question 5.

Question 9: "My inability to see the students at the remote site was disconcerting."

A. Strongly agree - 8.3

B. Agree - 27.8

C. Neither agree nor disagree - 13.9

D. Disagree - 41.7

E. Strongly disagree - 8.3

The responses indicated that most instructors did not feel a lack of face-to-face contact impaired their presentations.

Question 10: "After using the teleteach system I feel more favorable toward its use."

A. Strongly agree - 16.7

B. Agree - 38.9

C. Neither agree nor disagree - 30.6

D. Disagree - 11.1

E. Strongly disagree - 2.8

The responses indicated that TEDS gained favor as a result of use by participating instructors.

Questions 11-15 were not included in our analysis since they pertain only to course related aspects and do not contribute to the acceptability factor under consideration.

Questions six and ten directly addressed the issue of tele-teach acceptability. Therefore, the results were combined to determine overall instructor acceptability of TEDS. Results indicated that 75 percent of the instructors found TEDS acceptable, 5.6 percent found it unacceptable, and 19.4 percent remained uncommitted.

Assimilation of the preceding analysis areas led to the inferences, conclusions, and recommendations presented in the next chapter.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Introduction

In this chapter the findings discussed in Chapter III were evaluated in light of the initial hypotheses specified at the end of Chapter I. Each of these hypotheses is restated and considered below. Because this research effort analyzed only the data from a single TEDS offering of the LOG 220 course, it would have been inappropriate to generalize these findings across either the LOG 220 program in general or the TEDS instructional mode in toto. Therefore, it is stressed at this juncture that the conclusions drawn from the analysis in Chapter IV relate solely to the July and October 1979 offerings of LOG 220.

Conclusions

Cost Evaluation

The first hypothesis dealt with economic comparisons. It stated: "The TEDS approach used in the LOG 220 course is less costly than the in-residence method of instruction for the course." Due to the different types of expenses incurred in each of the methods, there was no opportunity to do a point-by-point comparison of TEDS costs and nonTEDS

costs. Further, in discussing costs of educational programs such as these, it is typical to consider per student costs as a prime indicator of overall program viability. Therefore, information was gathered and analyzed to determine total per student costs of each instructional method.

In an after-the-fact evaluation such as this study, it was extremely difficult (and in some cases infeasible) to identify, separate, and weigh all relevant costs. Consequently, certain heuristics had to be applied to allow cost specification and comparison. The authors readily admit that a much more comprehensive future economic evaluation could be done if all applicable costs were tracked as they occurred. As discussed in Chapter IV, in those areas where nothing but a gross guess could have been made (such as with AFLC instructor-related costs), the choice was consciously and conscientiously made to acknowledge the lack of information and pursue a legitimate result without that specific bit of information. This process resulted in a definitive per student cost for the July nonTEDS class and for the October TEDS class. It is recognized that future comparisons of this type may result in different conclusions. However, the conclusion reached in this study that the TEDS method of instruction costs less on a per student basis than does the nonTEDS method is firm and valid based on the information obtained. Therefore, the above-stated hypothesis is supported.

Learning Effectiveness

The second hypothesis was concerned with relative learning effectiveness. It stated: "Learning via the TEDS approach is as effective as learning by the in-residence method of instruction in the LOG 220 course." As used in this statement, the term "in-residence" was synonymous with the term "nonTEDS". Based on the scores obtained from tests administered throughout the course, there was in fact no significant difference in learning effectiveness between the TEDS and nonTEDS approaches. Therefore this hypothesis is also supported.

The significant difference in improvement index between the two groups was attributed to the large disparity in pre-test scores. To compensate for this disparity, additional analysis compared the nonTEDS class with the TEDS class displaying the lowest pre-test average. Analysis established that no significant differences were present. Additionally, there were no significant differences in performance results between the resident TEDS students who had the advantage of face-to-face contact with the instructor and the remote TEDS students, whose contact with the instructor was limited to audio and blackboard video. Among the remote locations, the slight difference in improvement was again attributable primarily to differences in pre-test scores. This was evidenced by the regression analysis.

Although regression analysis also delineated educational achievement level as a significant contributor to an individual's degree of improvement, demographic analysis indicated group homogeneity in this area. Therefore, education level did not appear to be the reason for any improvement differences.

Based on these findings, it was concluded that the Teleteach Expanded Delivery System was as effective as the traditional nonTEDS approach in achieving learning.

Instructor Acceptability

The third and fourth hypotheses both dealt with acceptability of the TEDS instructional method. The third hypothesis focused on acceptability of TEDS by the instructors. It stated: "The TEDS method of delivery used in LOG 220 is acceptable to participating faculty members." The analysis of instructor end-of-course critiques indicated that 75 percent of the participating instructors found the teleteach system acceptable. In addition, 55.6% of the instructors indicated they had become more favorable towards TEDS after using the system.

Based on these findings, it was concluded that the teleteach system was acceptable to the instructors. Therefore, the hypothesis was supported.

Student Acceptability

The final hypothesis looked at acceptability of the TEDS method by the students. It stated: "Students enrolled

in LOG 220 consider the TEDS an acceptable instructional delivery system." Based on the responses to end-of-course questions, the students using TEDS generally felt it was an acceptable way to learn. The TEDS students thought the organization of the LOG 220 course as a whole was acceptable. Further, the nonTEDS class appeared to be satisfied with the general conceptual framework of LOG 220 and the TEDS classes also appeared satisfied. It followed that any dissatisfaction with the mode did not create a hostile attitude toward the course in general.

Time zone differences appeared to be more of a concern for those students in the Central and Mountain time zones than for those in the Eastern and Pacific time zones. Perhaps the requirement to report to work as normal and accomplish daily job-related tasks both before and after classes created an unsuitable climate at three of the sites. However, the factor did not seem to exist at Sacramento or Wright-Patterson. An inconsistency appeared between the two Eastern time zone locations, viz., Wright-Patterson students favored the hours of instruction, but Warner-Robins students did not approve of the hours. Further information would be necessary to ascertain the reason for this difference as their work and classroom schedules should have been the same. The demographic difference of age, education, and rank may have given them different perspectives on their schedules and work load

requirements.

The classroom environment appeared to create considerable discontent. For Oklahoma City and Warner-Robins, students felt another room should be used. The students at Warner-Robins did not like the classroon environment, and thought a change of rooms was necessary. In the case of Ogden students, however, a desire for another classroom did not appear to impair their learning since they achieved the greatest degree of improvement from beginning to end of the class. At Warner-Robins, on the other hand, the classroom environment may have been primarily responsible for the students' lesser degree of improvement.

One of the more interesting elements that was considered in this study was the effect on learning of eye contact (or lack thereof) between instructor and student. Most of the students and some of the instructors perceived the lack of eye contact to be a problem. This is not, however, supported by the test results. Comparisons were made between the various classes to narrow and explain, if possible, this impact. Resident students with the advantage of eye contact did not fare any better on the tests than did the remote students. The comparisen of the Ogden remote class to the nonTEDS class which had the advantage of eye contact showed no apparent differences. Although lack of eye contact was perceived by the program's participants as a problem, it did not appear to actually impair learning.

Based on these findings it was concluded that the TEDS method of learning is acceptable to participating students. Therefore, the hypothesis was supported.

Recommendations

Throughout this study, it has been stressed that no attempt should be made to generalize the findings herein over the wider range of the entire TEDS program. Rather, this paper constituted an initial evaluation of a new mode of instruction methodology developed by AFIT. The analysis conducted and the conclusions reached were limited to two specific LOG 220 classes. However, even though the actual scope of this study was confined, certain recommendations can be made which will hopefully improve the overall TEDS program. These recommendations fall into two areas--those that are made to directly improve the current system, and those that suggest related areas of study to pursue.

Research completed for this study resulted in discovery of several areas where the current TEDS system could be improved. San Antonio students indicated the site monitor should make a concentrated effort to prepare the classroom.

With respect to the second point (classroom requirements), AFIT and AFLC headquarters must stress to the ALCs the absolute necessity of identifying a classroom for TEDS use which is environmentally and physiologically desirable. Poor classroom conditions can result in negative feelings

about the class offering in particular and the entire TEDS system in general.

Students should be given an initial briefing on the positive and negative aspects of TEDS. This "up front" approach to explaining TEDS will hopefully dispell false assumptions (such as the effect upon learning when there is no eye contact) and allow the students to concentrate on the message of the course rather than its medium.

Possibly the course director should explain to the instructors and students the potential of TEDS to reach more students, to teach effectively, and to save the Air Force a great deal of time and money.

The student end-of-course critique should be revised so as to draw out students' specific feelings about TEDS and reasons for liking or disliking it. The present critique does not adequately do this.

Turning to those recommendations regarding further study in this area, it became obvious as this research drew to a close that much follow-on research could be accomplished. Since this study evaluated strictly the first TEDS offering, a logical step would be similar evaluation of a subsequent LOG 220 class or of other TEDS courses. Such research could examine each of the areas evaluated in this study (cost, learning effectiveness, attitude), or it could focus in much greater detail on one specific parameter. Or, research could be done on the overall TEDS for some period of time, e.g.,

one fiscal year. This would entail a systemic evaluation approach which included all TEDS courses offered in that year. Again, research could concentrate on one, all, or some combination of the three primary areas of evaluation. By way of suggestion, if the attitudinal area is to be assessed thoroughly, the researchers should prepare and use specific attitudional questionnaires for students, instructors, and site monitors. This would preclude the use of the somewhat limited existing end-of-course critique. Such research as is suggested in this paragraph should accomplish two things: it should validate the findings of this study; and it should help round out the overall evaluation of TEDS, thereby helping it become a powerful and positive mode of instruction.

It is obvious that many questions regarding LOG 220 and TEDS remain unanswered. But then, it was not the purpose of this study to identify or analyze all aspects of the new system. Rather, the intent was to determine if, with respect to this initial class, TEDS could provide at least the same level of learning at less cost and still be accepted by its users. Based on the analysis herein, TEDS succeeded in all three areas.

APPENDICES

APPENDIX A

DEMOGRAPHIC INFORMATION

DEMOGRAPHIC INFORMATION

GENERAL INSTRUCTIONS FOR COMPLETING THE SURVEY

Use the attached answer sheet to mark your responses. Use only a No. 2 pencil when filling out the answer sheet. DO NOT USE INK. Enter your 4-digit student number in the last four positions in the STUDENT NUMBER area. Please do NOT write your name or social security number anywhere on the answer sheet. Select only one answer to each question. Mark the answer sheet carefully to negate computer error. Fill in the box with a heavy mark; do not go outside the lines of the box. If you make a mistake, erase the mark completely before entering a new one.

1. My present military rank is:

   A. 06
   B. 05
   C. 04
   D. 03
   E. 02 or 01

2. My present civilian grade is:

   A. GS-14 or higher
   B. GS-13
   C. GS-12
   D. GS-11
   E. GS-5 thru GS-10

3. My educational background: (mark highest completed)
   (You will answer question 3 or 4, not both.)

   A. Did not complete high school
   B. High school graduate or equivalent
   C. College--some credits
   D. College - Associate degree (A.A. or A.Sc.)
   E. College - Baccalaureate degree (B.A. or B.S.)

4. Educational background: (continued from above)

   A. College - Graduate credit, no graduate degree
   B. College - Master's Degree
   C. College - Work beyond Master's
   D. College - Doctorate
   E. None of the above

You will only answer three of the next six questions, 5 or 6, 7 or 8, 9 or 10.

The first digit of your DAFSC or Civilian Occupation Code:

5.	A.	0	B.	1	C.	2	D.	3	E. 4
6.	A.	5	B.	6	C.	7	D.	8	E. 9

The second digit of your DAFSC or Civilian Occupation Code:

7.	A.	0	B.	1	C.	2	D.	3	E. 4
8.	A.	5	B.	6	C.	7	D.	8	E. 9

The third digit of your DAFSC or Civilian Occupation Code:

9.	A.	0	B.	1	C.	2	D.	3	E. 4
10.	A.	5	B.	6	C.	7	D.	8	E. 9

11. My present age is:

A. 20-25
B. 26-35
C. 36-45
D. 46-55
E. 56-or over

12. Years of experience in a job related to the course:

A. 0-1
B. 2-3
C. 4-5
D. 6-7
E. 8 or more

APPENDIX B

STUDENT END-OF-COURSE CRITIQUE

STUDENT END-OF-COURSE CRITIQUE

This critique is designed to obtain feedback concerning whether the course achieved its objectives. Your daily critiques have addressed most of the specific aspects of the course. Your contribution to the improvement of this course is greatly appreciated and will benefit future students.

Please answer each question to the best of your ability. Your answer sheet will be machine processed except for the last six questions. Additional written comments are welcomed.

GENERAL INSTRUCTIONS FOR COMPLETING THE SURVEY

Use the attached answer sheet to mark your responses. Use only a No. 2 pencil when filling out the answer sheet. DO NOT USE INK. Enter your four digit student number in the last four positions of the STUDENT NUMBER area. Please do NOT write your name or social security number anywhere on the answer sheet. Select only one answer to each question. Mark the answer sheet carefully to negate computer error. Fill in the box with a heavy mark; do not go outside the lines of the box. If you make a mistake, erase the mark completely before entering a new one. The last six questions in the critique require a written response. Put your answers on the back of the answer sheet.

PART I

Respond by using the options A thru E indicating the degree to which you agree with the statements below.

A. Strongly agree
B. Agree
C. Neither agree nor disagree
D. Disagree
E. Strongly disagree

(These options will be repeated at the top of each page for your convenience.)

1. The course objectives were made clear either orally or in the instructional aids.

2. The course appeared well structured.

3. The course structure permitted questions to be asked and answered satisfactorily.

4. The room was conducive to learning.

5. I was in a position where I could hear and see well.

A. Strongly agree
B. Agree
C. Neither agree nor disagree
D. Disagree
E. Strongly disagree

6. There should have been more handout materials.

7. The course should have been longer.

8. My time could have been better utilized elsewhere.

9. I will be able to do my job better as a result of this course.

10. The course met my expectations.

11. The course was more informative than I had anticipated.

12. Overall, the course was extremely difficult.

13. Throughout the course, there was adequate transition between the various days of instruction in terms of tying in and relating materials.

14. The simulation exercise aided in the total learning experience. (Darken "C" if not applicable.)

15. Discussion of the tests helped me learn.

16. The tests were given at proper intervals.

17. I liked the hours the course was offered.

18. I learn more from a course when I am TDY (completely removed from my job location).

19. When required to critique presentations, I learn <u>less</u> of the content presented.

20. The "class day" should be:

A. 1-2 hours
B. 2-3 hours
C. 3-4 hours
D. 4-5 hours
E. 5-6 hours

21. How many classes were you unable to attend?

A. 1-3 B. 4-6 C. 7-10 D. 11-15 E. More than 15

22. How many classes did you "make up" through playback of the audiotapes?

A. 1-3 B. 4-6 C. 7-10 D. 11-15 E. More than 15

Use these responses:

A. Strongly agree
B. Agree
C. Neither agree nor disagree
D. Disagree
E. Strongly disagree

23. The teleteach delivery system is an acceptable learning medium.

24. The teleconferencing equipment (mikes and blackboard) was easy to operate.

25. I would take another course which used this delivery system.

26. There should be more interaction among the sites.

NOTE: WPAFB personnel do not answer questions 27-30.

27. The absence of eye contact with the instructor created a learning barrier/problem.

28. The person locally aiding the course director (site monitor) appeared knowledgeable of equipment operation.

29. The local person aiding the course director (site monitor) had the room and materials prepared for class.

30. A different classroom should be used.

PART II

Answer these six questions on the back of your answer sheet.

(The six questions referenced were not analyzed in this study.)

APPENDIX C

INSTRUCTOR CRITIQUE OF TELETEACH DELIVERY SYSTEM

INSTRUCTOR CRITIQUE OF TELETEACH DELIVERY SYSTEM

Use the attached answer sheet to mark your responses. Please do NOT write your name or social security number anywhere on the answer sheet. Select only one answer to each question. Use only a No. 2 pencil when filling out the answer sheet. DO NOT USE INK. Mark the answer sheet carefully to negate computer error. Fill in the box with a heavy mark; do not go outside the lines of the box. If you make a mistake, erase the mark completely before entering a new one. The last statement in the critique requires a written response. Put your answer on the back of the answer sheet.

Respond by using the options A thru E indicating the degree to which you agree with the statements below (1-10).

A. Strongly agree
B. Agree
C. Neither agree nor disagree
D. Disagree
E. Strongly disagree

1. Before using the Teleteach system, I felt it wouldn't be effective.

2. The Teleteach system provides advantages not normally available.

3. Students at WPAFB participated adequately.

4. Students at remote sites participated adequately.

5. Students appeared to have learned the material I presented.

6. I would like to use the Teleteach system again.

7. I felt uncomfortable when I used the Teleteach system.

8. Students don't seem to learn well with the Teleteach system.

9. My inability to see students at the remote site was disconcerting.

10. After using the Teleteach system I feel more favorable towards its use.

11. The Teleteach system caused me to change my presentation.

A. A great deal
B. Some
C. Not at all

12. If I were to use the Teleteach system again, I would change my presentation.

A. A great deal
B. Some
C. Not at all

APPENDIX D

COMPUTER PROGRAMS

```
0010$$S,R(SL) :,8,14;;,16
0020$:IDENT: WP1186. AFIT/LS R. G. MERCER 80A
0030$:SELECT:SPSS/SPSS
0040RUN NAME;ANALYSIS OF TELETEACH EXPANDED DELIVERY SYSTEM (TEDS)
0050VARIABLE LIST;STUDNO,RANK,EDUC,AGE,EXPER,PRETEST,POSTEST,DIFF,
0060;Q1 TO Q14
0070INPUT MEDIUM;CARD
0080SUBFILE LIST;WRTPAT(25),OGDEN(24),OKCITY(22),SACMTO(24),SANTONE(26),
0090;WRNROB(24),MONTED(24)
0100INPUT FORMAT;FIXED(F4.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,
0110;F3.0,1X,F3.0,1X,F3.0,5X,14F1.0)
0120MISSING VALUES;STUDNO TO POSTEST(0)/DIFF(100)/Q1 TO Q14(9)
0130VAR LABELS;STUDNO,STUDENT NUMBER/RANK,GRADE OR RANK/EDUC,
0140;EDUCATIONAL ACHIEVEMENT LEVEL/AGE,AGE GROUP/EXPER,YEARS OF
0150;LOGISTICS EXPERIENCE/PRETEST,PRETEST SCORES/POSTEST,
0160;QUIZ RESULTS/DIFF,IMPROVEMENT INDEX/Q1,COURSE OBJECTIVES CLEAR/
0170;Q2,COURSE WELL-STRUCTURED/Q3,SATISFACTORY RESPONSE TO
0180;QUESTIONS PERMITTED/Q4,ROOM CONDUCIVE TO LEARNING/Q5,MORE
0190;HANDOUT MATERIALS/Q6,ABLE TO DO JOB BETTER/Q7,LIKED THE
0200;HOURS/Q8,TEDS IS ACCEPTABLE/Q9,WOULD TAKE ANOTHER TEDS
0210;COURSE/Q10,MORE INTERACTION NECESSARY/Q11,ABSENCE OF EYE
0220;CONTACT A PROBLEM/Q12,SITE MONITOR KNOWLEDGABLE/Q13,SITE
0230;MONITOR PREPARED CLASS/Q14,NEED DIFFERENT CLASSROOM/
0240VALUE LABELS;STUDNO(1)TEDS (2)NON-TEDS/RANK(1)01-02,GS5-GS10
0250;(2)03,GS11 (3)04,GS12 (4)05,GS13 & HIGHER/EDUC(1)HIGH SCHOOL
0260;GRADUATE (2)SOME COLLEGE (3)BACHELORS DEGREE (4)MASTERS
0270;DEGREE/AGE(1)20-35 YRS (3)36-45 YRS (5)46 YRS & OLDER/
0280;EXPER(1)0-1 YR (2)2-3 YRS (3)4-7 YRS (5)8 YRS OR MORE/
0290;Q1 TO Q14(0)STRONGLY AGREE (1)AGREE
0300;(2)NEUTRAL (3)DISAGREE (4)STRONGLY DISAGREE/
0310COMPUTE;Q15=TRUNC((Q8+Q9)/2)
0320COMPUTE;Q16=(Q8+Q9)
0330IF;(STUDNO GE 1000 AND LT 7000) METHOD1 = 1
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0340IF;(STUDNO GE 1000 AND LT 7000) D1 = 1
0350IF;(STUDNO GE 7000) METHOD1 = 2
0360VAR LABELS;Q15,OVERALL STUDENT ACCEPTABLILITY/Q16,TELETEACH
0370;ACCEPTABILITY/METHOD1,METHOD OF INSTRUCTION/D1,TELETEACH/
0380VALUE LABELS;Q15(1)ACCEPTABLE (2)NEUTRAL (3)UNACCEPTABLE/METHOD1(1)TEDS
0390;(2)NON-TEDS/
0400RECODE;Q15(0,1=1)(2=2)(3,4=3)/RANK(5=4)
0410;/EDUC(5=4)/AGE(2=1)(4=5)/EXPER(4=3)
0420TASK NAME;CROSSTABS OF DEMOGRAPHIC AND ATTITUDINAL DATA
0430RUN SUBFILES;ALL
0440CROSSTABS;VARIABLES=RANK(1,4)EDUC(1,4)AGE(1,5)EXPER(1,5)
0450;METHOD1(1,2)Q1 TO Q7(0,4)/
0460;TABLES=RANK TO EXPER,Q1 TO Q7 BY METHOD1
0470OPTIONS;3,5,7
0480STATISTICS;1
0490READ INPUT DATA
0500$:SELECTA:THEDATA1
0510TASK NAME;ANOVA FOR PRETEST, POSTTEST, AND IMPROVEMENT
0520BREAKDOWN;VARIABLES=PRETEST(0,100)/POSTEST(0,100)/
0530;DIFF(-50,99)/METHOD1(1,2)/
0540;TABLES=PRETEST TO DIFF BY METHOD1
0550STATISTICS;ALL
0560TASK NAME;STEPWISE REGRESSION ANALYSIS
0570REGRESSION;VARIABLES=RANK TO EXPER,POSTEST,DIFF,D1
0580;REGRESSION=POSTEST(5,1) WITH RANK TO EXPER,D1(1)/
0590;REGRESSION=DIFF(5,1) WITH RANK TO EXPER,D1(1)/
0600OPTIONS;2
0610STATISTICS;1,2
0620TASK NAME;FREQUENCY DISTRIBUTION OF END-OF COURSE CRITIQUE ITEMS
0630FREQUENCIES;INTEGER=Q1 TO Q7(0,4)
0640FINISH
0650$:ENDJOB
```

```
0010$#S,R(SL) :,8,16;;,16
0020$:IDENT: WP1186,AFIT/LS  R. G. MERCER 80A
0030$:SELECT:SPSS/SPSS
0040RUN NAME;ANALYSIS OF TELETEACH EXPANDED DELIVERY SYSTEM (TEDS)
0050VARIABLE LIST;STUDNO,RANK,EDUC,AGE,EXPER,PRETEST,POSTEST,DIFF,
0060;Q1 TO Q14
0070INPUT MEDIUM;CARD
0080SUBFILE LIST;WRTPAT(25),OGDEN(24),OKCITY(22),SACMTO(24),SANTONE(26),
0090;WRNROB(24),NONTED(24)
0100INPUT FORMAT;FIXED(F4.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,
0110;F3.0,1X,F3.0,1X,F3.0,5X,14F1.0)
0120MISSING VALUES;STUDNO TO POSTEST(0)/DIFF(100)/Q1 TO Q14(9)
0130VAR LABELS;STUDNO,STUDENT NUMBER/RANK,GRADE OR RANK/EDUC,
0140;EDUCATIONAL ACHIEVEMENT LEVEL/AGE,AGE GROUP/EXPER,YEARS OF
0150;LOGISTICS EXPERIENCE/PRETEST,PRETEST SCORES/POSTEST,
0160;QUIZ RESULTS/DIFF,IMPROVEMENT INDEX/Q1,COURSE OBJECTIVES CLEAR/
0170;Q2,COURSE WELL-STRUCTURED/Q3,SATISFACTORY RESPONSE TO
0180;QUESTIONS PERMITTED/Q4,ROOM CONDUCIVE TO LEARNING/Q5,MORE
0190;HANDOUT MATERIALS/Q6, ABLE TO DO JOB BETTER/Q7,LIKED THE
0200;HOURS/Q8,TEDS IS ACCEPTABLE/Q9,WOULD TAKE ANOTHER TEDS
0210;COURSE/Q10,MORE INTERACTION NECESSARY/Q11,ABSENCE OF EYE
0220;CONTACT A PROBLEM/Q12,SITE MONITOR KNOWLEDGABLE/Q13,SITE
0230;MONITOR PREPARED CLASS/Q14,NEED DIFFERENT CLASSROOM/
0240VALUE LABELS;STUDNO(1)TEDS (2)NON-TEDS/RANK(1)01-02,GS5-GS10
0250;(2)03,GS11 (3)04,GS12 (4)05,GS13 & HIGHER/EDUC(1)HIGH SCHOOL
0260;GRADUATE (2)SOME COLLEGE (3)BACHELORS DEGREE (4)MASTERS
0270;DEGREE/AGE(1)20-35 YRS (3)36-45 YRS (5)46 YRS & OLDER/
0280;EXPER(1)0-1 YR (2)2-3 YRS (3)4-7 YRS (5)8 YRS OR MORE/
0290;Q1 TO Q14(0)STRONGLY AGREE (1)AGREE
0300;(2)NEUTRAL (3)DISAGREE (4)STRONGLY DISAGREE/
0310COMPUTE;Q15=TRUNC((Q8+Q9)/2)
0320COMPUTE;Q16=(Q8+Q9)
0330IF;(STUDNO GE 1000 AND LT 2000) LOCATT = 1
```

```
0340IF;(STUDNO GE 1000 AND LT 2000) D1 = 1
0350IF;(STUDNO GE 2000 AND LT 7000) LOCAT1 = 2
0360VAR LABELS;Q15,OVERALL STUDENT ACCEPTABILITY/Q16,TELETEACH
0370;ACCEPTABILITY/LOCAT1,LOCATION OF INSTRUCTION/D1,RESIDENT
0380;TEDS/
0390VALUE LABELS;Q15(1)ACCEPTABLE (2)NEUTRAL (3)UNACCEPTABLE/LOCAT1(1)RESIDENT
0400;TEDS(2)REMOTE TEDS/
0410RECODE;Q15(0,1=1) (2=2) (3,4=3)/RANK(5=4)
0420;EDUC(5=4)/AGE(2=1)(4=5)/EXPER(4=3)
0430TASK NAME;CROSSTABS OF DEMOGRAPHIC AND ATTITUDINAL DATA
0440RUN SUBFILES;(WRIPAT,OGDEN,OKCITY,SACMTO,SANTONE,UNKNOB)
0450CROSSTABS;VARIABLES=RANK(1,4)EDUC(1,4)AGE(1,5)EXPER(1,5)
0460;LOCAT1(1,2)Q1 TO Q10,Q15(0,4)/
0470;TABLES=RANK TO EXPER,Q1 TO Q10,Q15 BY LOCAT1
0480OPTIONS;3,5,7
0490STATISTICS;1
0500READ INPUT DATA
0510$:SELECTA:THEDATA1
0520TASK NAME;ANOVA FOR PRETEST, POSTTEST, AND IMPROVEMENT
0530BREAKDOWN;VARIABLES=PRETEST(0,100)/POSTEST(0,100)/
0540;DIFF(-50,99)/LOCAT1(1,2)/
0550;TABLES=PRETEST TO DIFF BY LOCAT1
0560STATISTICS;ALL
0570TASK NAME;STEPWISE REGRESSION ANALYSIS
0580REGRESSION;VARIABLES=RANK TO EXPER,POSTEST,DIFF,D1,Q1o
0590;REGRESSION=POSTEST(5,1) WITH RANK TO EXPER,D1,Q15(1)
0600;REGRESSION=DIFF(5,1) WITH RANK TO EXPER,D1,Q15(1)/
0610OPTIONS;2
0620STATISTICS;1,2
0630TASK NAME;FREQUENCY DISTRIBUTION OF END-OF COURSE CRITIQUE ITEMS
0640FREQUENCIES;INTEGER=Q1 TO Q10,Q15(0,4),Q15(0,8)
0650FINISH
0660$:ENDJOB
```

```
0010NWS,R(SL) :,8,16;;,16
0020$:IDENT: WP 5.1 386. AFIT/LS R. G. MERCER 80A
0030$:SELECT:SPSS/SPSS
0040RUN NAME;ANALYSIS OF TELETEACH EXPANDED DELIVERY SYSTEM (TEDS)
0050VARIABLE LIST;STUDNO,RANK,EDUC,AGE,EXPER,PRETEST,POSTEST,DIFF,
0060;Q1 TO Q14
0070INPUT MEDIUM;CARD
0080SUBFILE LIST;WRTPAT(25),OGDEN(24),OKCITY(22),SACMTO(24),SANTONE(26),
0090;WRNROB(24),MONTED(24)
0100INPUT FORMAT;FIXED(F4.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,F1.0,1X,
0110;F3.0,1X,F3.0,1X,F3.0,5X,14F1.0)
0120MISSING VALUES;STUDNO TO POSTEST(0)/DIFF(100)/Q1 TO Q14(9)
0130VAR LABELS;STUDNO,STUDENT NUMBER/RANK,GRADE OR RANK/EDUC,
0140;EDUCATIONAL ACHIEVEMENT LEVEL/AGE,AGE GROUP/EXPER,YEARS OF
0150;LOGISTICS EXPERIENCE/PRETEST,PRETEST SCORES/POSTEST,
0160;QUIZ RESULTS/DIFF,IMPROVEMENT INDEX/Q1,COURSE OBJECTIVES CLEAR/
0170;Q2,COURSE WELL-STRUCTURED/Q3,SATISFACTORY RESPONSE TO
0180;QUESTIONS PERMITTED/Q4,ROOM CONDUCIVE TO LEARNING/Q5,MORE
0190;HANDOUT MATERIALS/Q6,ABLE TO DO JOB BETTER/Q7,LIKED THE
0200;HOURS/Q8,TEDS IS ACCEPTABLE/Q9,WOULD TAKE ANOTHER TEDS
0210;COURSE/Q10,MORE INTERACTION NECESSARY/Q11,ABSENCE OF EYE
0220;CONTACT A PROBLEM/Q12,SITE MONITOR KNOWLEDGABLE/Q13,SITE
0230;MONITOR PREPARED CLASS/Q14,NEED DIFFERENT CLASSROOM/
0240VALUE LABELS;STUDNO(1)TEDS (2)NON-TEDS/RANK(1)01-02,GS5-GS10
0250;(2)03,GS11 (3)04,GS12 (4)05,GS13 & HIGHER/EDUC(1)HIGH SCHOOL
0260;GRADUATE (2)SOME COLLEGE (3)BACHELORS DEGREE (4)MASTERS
0270;DEGREE/AGE(1)20-35 YRS (3)36-45 YRS (5)46 YRS & OLDER/
0280;EXPER(1)0-1 YR (2)2-3 YRS (3)4-7 YRS (5)8 YRS OR MORE/
0290;Q1 TO Q14(0)STRONGLY AGREE (1)AGREE
0300;(2)NEUTRAL (3)DISAGREE (4)STRONGLY DISAGREE/
0310COMPUTE;Q15=TRUNC((Q8+Q9)/2)
0320COMPUTE;Q16=(Q8+Q9)
0330IF;(STUDNO GE 2000 AND LT 3000) SITE1 = 1
0340IF;(STUDNO GE 2000 AND LT 3000) D1 = 1
0350IF;(STUDNO GE 3000 AND LT 4000) SITE1 = 2
0360IF;(STUDNO GE 3000 AND LT 4000) D2 = 1
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0370IF;(STUDNO GE 4000 AND LT 5000) SITE1 = 3
0380IF;(STUDNO GE 4000 AND LT 5000) D3 = 1
0390IF;(STUDNO GE 5000 AND LT 6000) SITE1 = 4
0400IF;(STUDNO GE 5000 AND LT 6000) D4 = 1
0410IF;(STUDNO GE 6000 AND LT 7000) SITE1 = 5
0420VAR LABELS;Q15,OVERALL STUDENT ACCEPTABLILITY/Q16,TELETEACH
0430;ACCEPTABILITY/SITE1,SITE OF INSTRUCTION/D1,OGDEN/
0440;D2,OKLAHOMA CITY/D3,SACRAMENTO/D4,SAN ANTONIO/
0450VALUE LABELS;Q15(1)ACCEPTABLE (2)NEUTRAL (3)UNACCEPTABLE/SITE1(1)OGDEN (2)
0460;OKCITY(3)SACMTO (4)SANTONE (5)URNROB/
0470RECODE;Q15(0,1=1)(2=2)(3,4=3)
0480;/EDUC(5=4)/AGE(2=1)(4=5)/EXPER(4=3)
0490TASK NAME;CROSSTABS OF DEMOGRAPHIC AND ATTITUDINAL DATA
0500RUN SUBFILES;(OGDEN,OKCITY,SACMTO,SANTONE,URNROB)
0510CROSSTABS;VARIABLES=RANK(1,4)EDUC(1,4)AGE(1,5)EXPER(1,5)
0520;SITE1(1,5)Q1 TO Q15(0,4)/
0530;TABLES=RANK TO EXPER,Q1 TO Q15 BY SITE1
0540OPTIONS;3,5,7
0550STATISTICS;1
0560READ INPUT DATA
0570$:SELECTA:THEDATA1
0580TASK NAME;ANOVA FOR PRETEST, POSTTEST, AND IMPROVEMENT
0590BREAKDOWN;VARIABLES=PRETEST(0,100)/POSTEST(0,100)/
0600;DIFF(-50,99)/SITE1(1,5)/
0610;TABLES=PRETEST TO DIFF BY SITE1
0620STATISTICS;ALL
0630TASK NAME;STEPWISE REGRESSION ANALYSIS
0640REGRESSION;VARIABLES=RANK TO EXPER,POSTEST,DIFF,D1 TO D4,Q16
0650;REGRESSION=POSTEST(5,1) WITH RANK TO EXPER,D1 TO D4,Q16(1)/
0660;REGRESSION=DIFF(5,1) WITH RANK TO EXPER,D1 TO D4,Q16(1)/
0670OPTIONS;2
0680STATISTICS;1,2
0690TASK NAME;FREQUENCY DISTRIBUTION OF END-OF COURSE CRITIQUE ITEMS
0700FREQUENCIES;INTEGER=Q1 TO Q15(0,4),Q16(0,8)
0710FINISH
0720$:ENDJOB
```

```
0010$$S,R(SL) :,8,16;;,16
0020$:IDENT:  WP1186,AFIT/LS R. G. MERCER 80A
0030$:SELECT:SPSS/SPSS
0040RUN NAME;FREQUENCIES OF INSTRUCTOR CRITIQUES
0050VARIABLE LIST;Q1 TO Q10
0060INPUT MEDIUM;CARD
0070N OF CASES;36
0080INPUT FORMAT;FIXED(10F1.0)
0090VAR LABELS;Q1,PRIOR OPINION OF TEDS INEFFECTIVITY/Q2,TEDS PROVIDES
0100;ADVANTAGES/Q3,ADEQUATE PARTICIPATION AT U-P/Q4,ADEQUATE PARTI-
0110;CIPATION AT REMOTES/Q5,STDNTS APPEARED TO LEARN MATERIAL/Q6,
0120;WOULD LIKE TO USE TEDS AGAIN/Q7,FELT UNCOMFORTABLE USING TEDS/
0130;Q8,STDNTS DON'T SEEM TO LEARN WITH TEDS/Q9,INABILITY TO SEE
0140;STDNTS DISCONCERTING/Q10,AFTER USING FEEL MORE FAVORABLE TO TEDS/
0150VALUE LABELS;Q1 TO Q10(0)STRONGLY AGREE (1)AGREE
0160;(2)NEUTRAL (3)DISAGREE (4)STRONGLY DISAGREE/
0170COMPUTE;Q11=TRUNC((Q6+Q10)/2)
0180VAR LABELS;Q11,INSTRUCTOR ACCEPTABILITY/
0190VALUE LABELS;Q11(1)ACCEPTABLE (2)NEUTRAL (3)UNACCEPTABLE/
0200RECODE;Q11(0,1=1) (2=2) (3,4=3)/
0210FREQUENCIES;INTEGER=Q1 TO Q11(0,4)
0220OPTIONS;3,8,9
0230READ INPUT DATA
0240$:SELECTA;THEDATA2
0250FINISH
0260$:ENDJOB
```

APPENDIX E

REQUIRED SITE CLASSROOM EQUIPMENT

REQUIRED SITE CLASSROOM EQUIPMENT

Equipment - Each Site

	Item	Manufacturer	Quantity	Unit Cost	Total Cost
1.	Stereo Tape Recorder	Sony DC320	1	$202	$202
2.	35mm Projector	Kodak	1	153	153
3.	TV Monitor (25")	EVM	2	400	800
4.	Projection Screen	DaLite	1	48	48
5.	Projection Table (325 sq inches)		2	95	190
6.	Projection Stand (350 sq inches-60" high)		1	100	100

Supply - Each Site

7.	Microphones-Push-to-Talk	Turner 758	8	54	432
8.	Microphone Mixer	Shure M-68	2	139	278

APPENDIX F

FACULTY LOGISTICAL SUPPORT FOR TELETEACH

FROM: AFIT/LSM-1 15 May 1980

SUBJ: Faculty Logistical Support for Teleteach (Your Ltr, 29 Apr 80)

TO: AFIT/ED

The following information is offered in response to above referenced letter. Since no actual records were kept on the amount of time devoted to these activities, this represents the best possible estimate, based on initial preparations for the LOG 220 course, Class 80-AT.

a.	Taking materials to printing	- 0 manhours
b.	Return of materials from printing	- 6 manhours
c.	Taking materials to graphics	- *
d.	Taking graphics materials to Tech or Base Photo	- 4 manhours
e.	Return of materials from Tech or Base Photo	- 4 manhours
f.	Placement of slides into trays	-80 manhours
g.	Packaging materials for shipment	-40 manhours
h.	Taking materials to distribution	- 8 manhours

* This activity is regarded as part of the normal function of preparing for a course, since the graphic material must be developed and reviewed jointly by the course director (or instructor) and the graphics people. In preparing for this offering, several hundred manhours were devoted to such joint efforts.

HAROLD L. RUBENSTEIN
Course Director, LOG 220
School of Systems and Logistics

APPENDIX G

COMPUTATION OF HOURLY INSTRUCTOR WAGES

The following computations are based on an eight hour work day with 250 working days per year.

250 x 8 = 2000 hours per year

GS-13 (Step 6):

Annual wages $34,269.96

$34,269.96 ÷ 2000 + $17.14 per hour

GS-12 (Step 6):

Annual wages $26,937

$26,937 ÷ 2000 = $13.47 per hour

GS-11 (Step 5):

Annual wages $21,831

$21,831 ÷ 2000 = $10.92 per hour

GS-5 (Step 5):

Annual wages $11,907

$11,907 ÷ 2000 = $5.95 per hour

O-6:

Annual wages $35,526.96

$35,526.96 ÷ 2000 = $17.76 per hour

O-5:

Annual wages $29,620.85

$29,620.85 ÷ 2000 = $14.81 per hour

O-4:

Annual wages $24,619.99

$24,619.99 ÷ 2000 = $12.31 per hour

O-3:

Annual wages $21,226.45

$21,226.45 ÷ 2000 = $10.61 per hour

APPENDIX H

CHI-SQUARE CONTINGENCY TABLE:
TEDS v NONTEDS EDUCATION

		METHOD1		
	COUNT COL PCT	TEDS 1	NON-TEDS 2	ROW TOTAL
EDUC				
1		26	1	27
HIGH SCHOOL		18.3	4.2	16.3
2		52	6	58
SOME COLLEGE		36.6	25.0	34.9
3		44	12	56
BACHELORS DEGREE		31.0	50.0	33.7
4		20	5	25
MASTERS		14.1	20.8	15.1
COLUMN TOTAL		142 85.5	24 14.5	166 100.0

RAW CHI SQUARE = 6.13926 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.1050

APPENDIX I

CHI-SQUARE CONTINGENCY TABLE: TEDS v NONTEDS AGE

METHOD1

AGE	COUNT / COL PCT	TEDS 1	NON-TEDS 2	ROW TOTAL
20-35 YRS	1	40	9	49
		28.2	37.5	29.5
36-45 YRS	3	44	8	52
		31.0	33.3	31.3
46 YRS & OLDER	5	58	7	65
		40.8	29.2	39.2
	COLUMN TOTAL	142	24	166
		85.5	14.5	100.0

RAW CHI SQUARE = 1.35675 WITH 2 DEGREES OF FREEDOM. SIGNIFICANCE = 0.5074

APPENDIX J

CHI-SQUARE CONTINGENCY TABLE: RESIDENT v REMOTE AGE

AGE	COUNT / COL PCT	LOCAT1: RESIDENT	LOCAT1: REMOTE EDS	ROW TOTAL
		1	2	
20-35 YRS	1	9	31	40
		37.5	26.3	28.2
36-45 YRS	3	10	34	44
		41.7	28.8	31.0
46 YRS & OLDER	5	5	53	58
		20.8	44.9	40.8
	COLUMN TOTAL	24	118	142
		16.9	83.1	100.0

RAW CHI SQUARE = 4.78769 WITH 2 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0913

APPENDIX K

CHI-SQUARE CONTINGENCY TABLE: RESIDENT v REMOTE EXPERIENCE

		LOCAT1		
	COUNT I			
	COL PCT I	RESIDENT	REMOTE T	ROW
	I		EDS	TOTAL
	I	1	I 2	I
EXPER	---------I	--------I	--------I	
	1 I	7	I 31	I 38
0-1 YR	I	33.3	I 27.2	I 28.1
	-I	--------I	--------I	
	2 I	4	I 26	I 30
2-3 YRS	I	19.0	I 22.8	I 22.2
	-I	--------I	--------I	
	3 I	2	I 12	I 14
4-7 YRS	I	9.5	I 10.5	I 10.4
	-I	--------I	--------I	
	5 I	8	I 45	I 53
8 YRS OR MORE	I	38.1	I 39.5	I 39.3
	-I	--------I	--------I	
	COLUMN	21	114	135
	TOTAL	15.6	84.4	100.0

RAW CHI SQUARE = 0.37609 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.9451

APPENDIX L

CHI-SQUARE CONTINGENCY TABLE: TEDS v NONTEDS RANK

	METHOD1		
COUNT / COL PCT	ITEDS 1	NON-TEDS 2	ROW TOTAL
RANK			
1	34	9	43
01-02,GS5-GS10	23.9	37.5	25.9
2	56	7	63
03,GS11	39.4	29.2	38.0
3	41	7	48
04,GS12	28.9	29.2	28.9
4	11	1	12
05,GS13 & HIGHER	7.7	4.2	7.2
COLUMN TOTAL	142	24	166
	85.5	14.5	100.0

RAW CHI SQUARE = 2.39163 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.4952

APPENDIX M

CHI-SQUARE CONTINGENCY TABLE:
TEDS v NONTEDS EXPERIENCE

	METHOD1		
COUNT / COL PCT	TEDS	NON-TEDS	ROW TOTAL
	1	2	
EXPER			
1	38	9	47
0-1 YR	28.1	37.5	29.6
2	30	4	34
2-3 YRS	22.2	16.7	21.4
3	14	2	16
4-7 YRS	10.4	8.3	10.1
5	53	9	62
8 YRS OR MORE	39.3	37.5	39.0
COLUMN TOTAL	135	24	159
	84.9	15.1	100.0

RAW CHI SQUARE = 0.99722 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.8019

APPENDIX N

CHI-SQUARE CONTINGENCY TABLE: BETWEEN REMOTES AGE

ACE	COUNT / COL PCT	SITE1 1 OGDEN	2 OKCITY	3 SACMTO	4 SANTONE	5 WRNROB	ROW TOTAL
1		4	7	4	6	10	31
20-35 YRS		17.4	31.8	16.7	24.0	41.7	26.3
3		7	5	7	8	7	34
36-45 YRS		30.4	22.7	29.2	32.0	29.2	28.8
5		12	10	13	11	7	53
46 YRS & OLDER		52.2	45.5	54.2	44.0	29.2	44.9
COLUMN TOTAL		23	22	24	25	24	118
		19.5	18.6	20.3	21.2	20.3	100.0

RAW CHI SQUARE = 6.45756 WITH 8 DEGREES OF FREEDOM. SIGNIFICANCE = 0.5961

APPENDIX O

CHI-SQUARE CONTINGENCY TABLE:
BETWEEN REMOTES EDUCATION

	SITE1					
COUNT / COL PCT	OGDEN	OKCITY	SACMTO	SANTONE	WRNROB	ROW TOTAL
	1	2	3	4	5	
EDUC						
1	6	5	2	6	6	25
HIGH SCHOOL	26.1	22.7	8.3	24.0	25.0	21.2
2	10	8	9	9	12	48
SOME COLLEGE	43.5	36.4	37.5	36.0	50.0	40.7
3	5	7	9	9	2	32
BACHELORS DEGREE	21.7	31.8	37.5	36.0	8.3	27.1
4	2	2	4	1	4	13
MASTERS	8.7	9.1	16.7	4.0	16.7	11.0
COLUMN TOTAL	23	22	24	25	24	118
	19.5	18.6	20.3	21.2	20.3	100.0

RAW CHI SQUARE = 11.18993 WITH 12 DEGREES OF FREEDOM. SIGNIFICANCE = 0.5127

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BIOGRAPHICAL SKETCHES OF THE AUTHORS

Captain David E. Fortna is a native of Pontiac, Illinois. He graduated from the University of Illinois in 1971 with a Bachelor of Science degree in Education and was commissioned a Second Lieutenant in the Air Force via ROTC. He entered active duty as a Space Systems Operations Officer, and subsequently attended Undergraduate Navigator Training at Mather AFB, CA. Prior to attending AFIT, Captain Fortna was stationed at Castle AFB, CA, where he was Chief of the Wing Logistics Plans, Programs and Mobility Division for the 93d Bomb Wing. After graduation, he will work in war plans in the Logistics Plans Directorate at Headquarters Pacific Air Command, Hickam AFB, Hawaii.

Captain Ronne G. Mercer enlisted in the Air Force in Santa Barbara, CA, in 1966. A Technical Sergeant in the Supply career field, he entered Southwest Texas State University under the auspices of the Airman Education and Commissioning Program. He received a Bachelor of Business Administration degree in Management in December 1974, and was commissioned through the Officers Training School in April 1975. Prior to attending AFIT, Captain Mercer spent time as a Titan missile crew commander and Chief, Wing Scheduling Branch, 390th Strategic Missile Wing, Davis-Monthan AFB, AZ. His next assignment will be as Chief, Customer Support Branch, 35th Supply Squadron, George AFB, CA.


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