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Distance Education And Its Relevance To Nonresident Foreign Language Training: Review And Synthesis Of The Literature

William J. Bramble

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INSTITUTE FOR SIMULATION AND TRAINING

November 1990

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**Distance Education and its
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William J. Bramble, Ph.D.

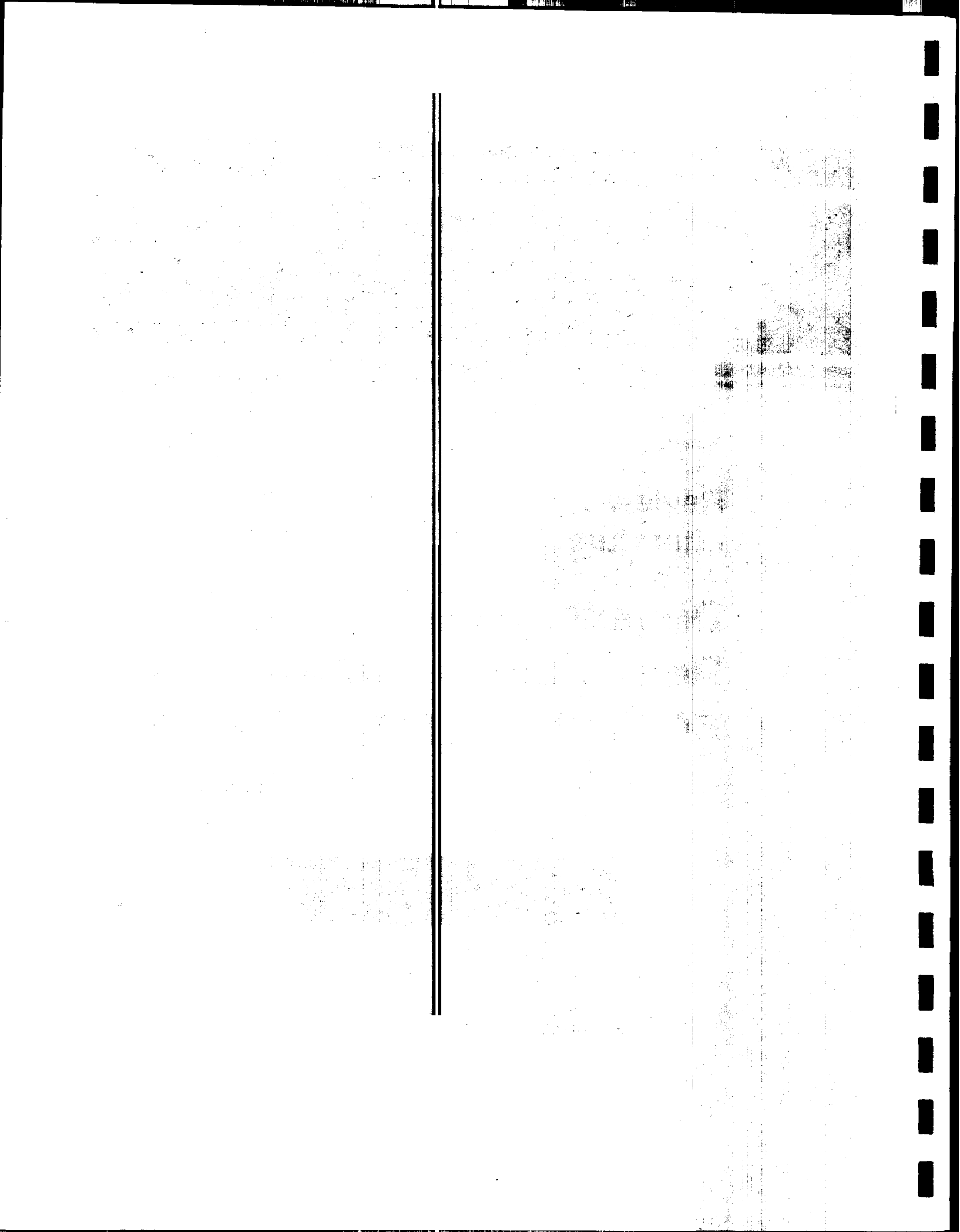
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November 1990

Review and Synthesis of the Literature:

Distance Education and its Relevance to Nonresident Foreign Language Training

William J. Bramble, Ph.D.

A Report of the Educational Technology Needs Assessment Project

Prepared for

The Defense Language Institute, Foreign Language Center, and The Defense Training and
Performance Data Center

Institute for Simulation and Training
12424 Research Parkway, Suite 300
Orlando FL 32826

University of Central Florida
Division of Sponsored Research

The logo for the Institute for Simulation and Training (IST), consisting of the letters 'IST' in a bold, sans-serif font.

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FOREWORD

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This report is one in a series of reports from a project conducted by the Defense Training and Performance Data Center (TPDC) to examine present and future use of modern technologies for the teaching of foreign languages. The project is being performed to assist the Defense Language Institute Foreign Language Center (DLIFLC) in Monterey, California. The joint TPDC/DLIFLC project is named the Educational Technology Needs Assessment (ETNA) project. ETNA is designed to provide specific information about technology use for resident and nonresident foreign language training.

The ETNA project addresses the following issues. What are the available present and future technologies to provide resident foreign language training? What special concerns exist in the use of technology for training in Chinese and other non-Romantic languages? How can instructional and distance education technologies best be used to enhance the effectiveness of nonresident foreign language training? What are the legal and regulatory constraints associated with the use of foreign language broadcasts and satellite transmissions?

The project is performing research on these issues through the following methodologies. In-depth interviews are being conducted with the faculty, students, staff and administrators at DLIFLC. The interviews assess needs and determine the current status of technology use in language instruction, both resident and nonresident. A thorough review is being conducted of the literature related to technology for language instruction. Interviews and discussions with experts in the field of language instruction/technology are included. Special task forces are being formed to address specific issues. Alternative approaches to the effective use of technology for language instruction are being compared. Special issues, such as copyright, are being addressed in depth to determine how existing broadcasts and materials can be incorporated into the instructional process. The end result of this analysis will be a comprehensive set of recommendations for consideration by DLIFLC in improving language training through the use of technology for resident and nonresident instruction.

This particular report is a review of the recent literature on distance education as it relates to its possible use as a technology for improving or extending the DLIFLC nonresident program. The report specifies the particular functions which

distance education could serve in the nonresident program. It reviews the history of distance education, the forms it can take, the conditions for its success, its cost-effectiveness, and methods for implementing distance education systems. It also reviews the lessons learned from its application and the specific ways in which it has been applied to language learning. The report was prepared for DLIFLC by the University of Central Florida, Institute for Simulation and Training under contract to TPDC. The author of the report is Dr. William J. Bramble.

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Executive Summary

Distance education is an approach to teaching and learning under conditions where the teacher and learner are separated during the learning process. The approach is generally thought to provide an alternative means for educating/training learners when conventional face-to-face teaching and learning is not feasible. Distance education has its roots in correspondence study, where instruction is mostly delivered via the print medium distributed through the postal service. More recently, sophisticated technologies such as computers, communications satellites, teleconferencing, advanced forms of video communications, and data communications have opened new possibilities for distance education. They allow for a variety of media of presentation and offer new opportunities for interactive instruction. The recent literature on distance education, and specifically, language learning via distance education is the subject of this report.

Distance education, which we use as the central theme of the report, goes by a variety of names (distance learning, distributed learning/training, teletraining, tele-distance learning, etc.). However, the central concept of separation of teacher and learner is essential to all forms. For convenience in this report we use the term distance education to represent all of these forms. Interest in and use of distance education appears to be increasing in a number of arenas including K-12 and higher education, business, government and the military. The literature on distance education cites a great many fields in which the approach is said to be used effectively.

Because of the current investment in traditional forms of education/training, because the high-tech versions of distance education are so new, and because of the high capital costs required to establish many distance education systems, many managers of education/training remain skeptical of the method. Perhaps because of these factors and because distance education is still regarded as an innovation, policy makers and administrators demand hard evidence about the cost-effectiveness of distance education. While most indicators of success are positive, an indisputable body of hard evidence is lacking regarding the conditions of success and cost effectiveness based upon rigorous scientific investigation.

However, there is a mounting degree of evaluative and experiential verification of distance education based upon its use in ever-expanding areas of application. There is evidence that distance education can lead to achievement equivalent to or better than school-based instruction; at least for motivated students who initiate and complete courses. There is some evidence that the cost of instruction/training in specific distance education applications can reduce costs by between 2 and 3 to 1 compared to traditional alternatives. There is evidence regarding student, teacher, and administrator satisfaction with the technique (though students ultimately appear to prefer high quality face-to-face instruction if it is available). And there is mounting evidence that in many cases, where traditional forms of education/training are simply not feasible, distance education can be used to provide valuable education/training.

The technologies available for distance education are varied. They include traditional print courses delivered via the postal service. They also include technologies such as one and two-way audio and video, data communications, and computers. There is no general formula for selecting the best technology components for distance education, nor are the specific technologies to fit individual course applications well known. However, experience appears to point to combinations of appropriate technology as being more effective than single technologies. The requirements for interaction, audio, still video, motion video, etc., appear to be subject matter specific. Yet, reported successes with systems incorporating apparent technology mismatches with subject matter requirements muddy the picture.

The extensive experiential base with distance learning systems and course application yields proposed "principles" for best applying distance education. Some of these principles are discussed in this report. Probably the most significant principle is that successful distance education systems must be justified by serving compelling, agreed-upon needs. Other "principles" spell out factors that contribute to the success of distance education systems; purposes for alternative technologies; factors in planning, designing, developing and managing a distance education system; and factors for designing and implementing effective distance education courses of study.

The report describes a number of applications of distance education to the teaching of foreign languages. Some applications involve the distribution of instructional material for locally taught language courses (e.g., foreign video programming transmitted by satellite). Applications involve

the training of language teachers. Other applications involve the provision of high school or college language courses or specialized language training. Rigorous research on these applications is limited. A comprehensive pedagogical theory for language learning through distance education is needed. In addition, research into the specifics of its proper application is needed.

Experience in the field appears to indicate that distance education holds promise for language training. There appears to be evidence for the success of distance education and an emerging information base regarding methods of application to support installation and testing by the DoD, where it is justified on a needs basis.

Other applicants for the position of
teacher or instructor in the
field of education should apply to the
Director of the Department of Education,
100 North Main Street, Boston, Massachusetts
02109.

For information, the following is a list of
the names of the persons who have been
appointed to the position of teacher or
instructor in the field of education
for the year 1967-68. The names are
listed in alphabetical order by last name.
The names of those who have been appointed
to the position of teacher or instructor
in the field of education for the year
1967-68 are listed in the following table.

B. Introduction

Distance education, when reduced to its essential form, is an approach to teaching and learning under conditions where the teacher and learner are separated during the instructional process. The approach offers a way to provide instruction to students who are not able to obtain instruction or training from a competent, resident classroom teacher. This can be due to factors such as geographic dispersion, temporal separation, unavailability of qualified instructors in the local community, etc. Distance education is often seen as most useful when a training or education institution cannot feasibly or economically provide quality face-to-face instruction to serve the needs of students at remote sites.

Distance education is not usually viewed as a way to replace face-to-face instruction or training for learners who are able to attend regular classes at a campus or learning center. When asked, students tend to prefer face-to-face instruction. At least in concept, distance education may present a threat to the status quo of those with a vested interest in campus-based instruction (e.g., local program personnel and teaching staff). Therefore, distance education providers have been careful to present the approach as an alternative to conventional instruction to be employed when the conventional form is not feasible or cost effective. Yet, distance education is often reported to be a cost effective way to provide high quality education and training regardless of the availability of traditional alternatives. In this sense, the caution with which it is applied may be unjustified from a pedagogical or cost viewpoint.

Distance education is an old approach. It is also a very new one. It is an "old" approach because, when distance education is defined as above, it has its roots in the long tradition of correspondence education in which printed materials (sometimes accompanied by audio tapes) are distributed and returned via the postal system. It is a "new" approach due to the forms it is taking with modern-day communication technologies such as teleconferencing systems, satellite communications, computer networking, and other state-of-the-art technologies (e.g., fiber optics, compressed video and specially designed microwave networks). Modern communications technologies offer broadened opportunities to provide education over long distances and, at the same time, to decrease the perceived distance separating the teacher and learner.

The Defense Language Institute, Foreign Language Center (DLIFLC) has an interest in assessing the potential of distance education technologies for improving its nonresident training programs. DLIFLC offers basic (global) language courses in twenty languages to defense and other governmental personnel. An immersion approach is used in the resident instruction program which requires some 8-12 months of study for completion of the basic courses. The length of a program depends primarily upon language difficulty. While the emphasis at DLIFLC is justifiably upon its resident programs (which graduate over 3,000 students annually), the institute also offers significant assistance to personnel in field units through its nonresident training program.

In formulating the Educational Technology Needs Assessment (ETNA) project, the research staff at the DLIFLC identified distance education as an important aspect of instructional technology to be investigated. In particular, it was determined that modern distance education technologies should be investigated to determine their potential for improving or enhancing the DLIFLC Nonresident Training Program. The main focus (although there are other areas of concern) of the nonresident program is the DLIFLC graduate, now functioning as a linguist in military or governmental assignments. In this regard, the nonresident program approves local language training programs, provides technical assistance, mobile training teams, and training materials. It is well established (Lett, 1989) that language skill decay occurs rather rapidly after DLIFLC course completion due to lack of use or practice with the language. Despite current efforts, local programs appear to have difficulty providing the training required to arrest or reverse this decay process. The ETNA project is assessing the potential of distance education technologies to address this problem.

The DLIFLC Nonresident Training program seeks to offer assistance and courses to DLIFLC graduates and other relevant students in a nonresident mode. Sometimes this assistance is provided, at considerable cost, by mobile training teams (MTTs) from DLIFLC in an on-site, face-to-face mode. Additional DLIFLC assistance is offered through developing and distributing a vast array of language instruction materials (including some self-instructional or correspondence courses). Technical assistance to field personnel is also provided by trained DLIFLC language specialists in the DLIFLC Nonresident Training Program via telephone. The nonresident program provides course materials to graduates and to local language programs operated on-location at military bases, military language learning centers, and other government in-

stallations worldwide. It assists local language programs by providing information and language training materials for introductory maintenance, enhancement, refresher, and remediation purposes. The program has a worldwide mission to provide technical assistance to training program personnel and foreign language teachers at U.S. installations around the globe.

Distance education technologies have received considerable recent attention in both the defense and civilian sectors. Given this interest and the remarkable, continuing developments in modern communications technologies, DLIFLC recognizes the potential of the approach to enhance its capability to carry out its nonresident training mission. Several components of the ETNA project derive from this interest on the part of the DLIFLC. The present review of the research literature on distance education technology is one such component. In addition, a needs assessment is being conducted to identify specific nonresident language training needs which could be addressed by specific distance education applications. Alternative distance education designs for foreign language training are being developed and evaluated. Specific recommendations will be formulated regarding potential uses of distance education technologies in the DLIFLC nonresident program.

This report is one of a series of reports being prepared by the ETNA project. Its purpose is to present, review, and synthesize the literature on distance education. The report provides answers to a set of key questions identified as important to the DLIFLC. The following questions are addressed:

1. What is distance education? What are its roots and what are its current directions? What does the future hold?
2. When is distance education appropriate? Who uses it and for what purposes? How could distance education be used in DLIFLC nonresident programs?
3. Is there general evidence on the cost-effectiveness of distance education? What does it indicate?
4. What are the general factors that contribute to the success of a distance education system? What should you do to make such a system work?

5. What technologies are used in distance education and for what purposes? What alternative configurations of technologies have been used? What is the relative cost of the technologies?
6. What factors should be considered in planning, designing, developing, and managing a distance education system?
7. What factors should be considered in designing effective distance education courses? These factors include instructional design, appropriate technology use, and factors related to the learning site, the teacher, and the student.
8. What specific information is available regarding the teaching of foreign languages through distance education?
9. What lessons have been learned about foreign language instruction/training in other distance education programs or projects that can be of help to DLIFLC in planning for possible use of distance education for its nonresident program?
10. How should distance education programs be evaluated?

To identify documents to be included in the review of the literature, searches of computerized, bibliographic databases were conducted. These were supplemented by more traditional approaches using the University of Central Florida computerized library catalog system, by following up leads in original sources, and by gathering relevant documents through personal contacts. Although the resulting search was by no means exhaustive, it was extensive, and resulted in the identification of several hundred publications with specific relevance to the above set of questions. Specific reports and articles were reviewed in detail and included in this report on the basis of their unique relevance and contribution to the body of information reported in the document.

In some areas, particularly those areas regarding generic writing about distance education, a great deal of redundant information is available in the literature. In such cases an attempt was made to capture the essence of this information through examining and reporting representative documents. In other areas less information was available and a greater percentage of documents was utilized. A special effort was made to review available information germane to the topic of language instruction.

The results of this report are intended to be useful to DLIFLC and the larger defense language community, both in terms of the information provided about the technology of distance education and the specific information about foreign language instruction/training at a distance. The results provide a foundation upon which to conduct the subsequent project activities dealing with the feasibility of alternative applications of distance education technologies in the nonresident training program at DLIFLC.

What follows in this report are sections describing the methodology of the literature review, the results of the review (organized by the ten questions addressed in the report above), and a summary of the major findings of the literature review regarding distance education for foreign language instruction and training.

The following sections describe the methodology of the literature review, the results of the review (organized by the ten questions addressed in the report above), and a summary of the major findings of the literature review regarding distance education for foreign language instruction and training.

C. Method

In conducting the review and synthesis of the distance education literature, there were several key tasks to perform. They were: determining specifically what information is sought, identifying appropriate sources of information, defining search procedures that lead to the identification of the needed items from the literature, conducting automated searches using appropriate key words and supplementing that with other manual search methods where needed, obtaining the documents identified, systematically reviewing the documents to determine the information they contained which specifically related to the questions to be addressed, and then synthesizing and reporting the information obtained.

To determine the scope of the literature search, the project staff began by obtaining agreement with DLIFLC officials on the types of information required. This resulted in the list of ten questions cited in the introduction to this report. This step both assured that the search could be targeted to obtain information relevant to the DLIFLC and that the boundaries of the bibliographic search process could be established to allow task completion within the resources and time allowed for the project.

We were fortunate in conducting the literature searches to have access to various computerized bibliographic data bases through the University of Central Florida Library Information Network and Exchange (LINE). A search of the following on-line databases was conducted for the ETNA project by trained university library personnel: LISA, Library and Information Science Abstracts; A-V Online; MLS Bibliography; Language Abstracts; Microcomputer Software and Hardware Guide; British Education Index; NTIS; Supertech; Compendex Plus; INSPEC; PTS Prompt; Microcomputer Index; Psych INFO; and LLBA. The project was assisted by a search of the distance education literature by bibliographic researchers at the U.S. Air Force, Air University Library, Maxwell Air Force Base, Montgomery, Alabama. Ms. Kenda C. Wise, bibliographer, compiled the bibliography. In addition, project personnel conducted searches of the current Educational Resources Information Center (ERIC) system database on an in-house CD-ROM ERIC database and of DTIC through MATRIS.

The project was also fortunate to have access, through the University of Central Florida Library and through inter-library loan, to the collections housed in the University of Florida libraries at all campuses. Other materials were available from university and other libraries in the Southeastern United States through inter-library loan agreements. Some key documents, unavailable through library sources, were purchased from U.S. Government distributors or ordered directly from producing agencies or individuals.

The project assigned an experienced researcher with practical experience in the instructional technology and distance education areas to conduct the review and synthesis of the literature identified through the search process. His experience both assisted with the interpretation of the findings in the literature and allowed for additional insights based upon 15 years of practical experience in the field of distance education. Several months effort were required to read and evaluate the materials gathered for the literature review. The information was sorted according to the questions being addressed. The information was then evaluated for its relevance to each question and synthesized in this report. The results of the study are presented in the following section of the report.

The following section of the report presents the results of the study. It is organized into three main sections: a summary of the findings, a discussion of the implications of the findings, and a list of recommendations. The summary of the findings is presented in the following section.

7

D. Results

1. Distance Education

Interest in distance education has increased in recent years as a result of rapid developments in communications technologies. Textbooks have been written on distance education (e.g. Sewart, Keegan, and Holmberg, 1984; Holmberg, 1986; Keegan, 1986; Smith and Kelly, 1987). Conferences are being held on the topic with increasing frequency. Distance education projects have been conducted. The American Journal of Distance Education was initiated in 1987 to disseminate the best thinking in this new discipline. Literally hundreds of journal articles, papers, and reports have been written on the topic. Universities have established cooperative distance education programs (e.g., the National Technological University). Federal interest in distance education has been expressed through the recently funded U.S Department of Education STAR schools program for public schools (see Withrow, 1990). Studies and surveys have been conducted at federally funded regional educational laboratories (see Batey and Cowell, 1986). Last year, a series of research studies and a comprehensive report on distance education were completed by the U.S. Congress, Office of Technology Assessment (see OTA, 1989).

Interest in the United States Departments of Defense and Energy and in the various branches of the military is increasing. The TITE conference held in Colorado Springs in March 1990 featured specific sessions on distance education. Conferences were sponsored by the Los Alamos (NM) National Scientific Laboratory in June, 1989 and June, 1990 (see Los Alamos National Laboratory, 1990), to define government and defense initiatives in distance education. A seminar for Defense Department representatives was held during the Telecon IX conference in San Jose, California in October 1989. The Army Logistics and Management College (see Brockwell, 1989; Shaw, 1988) now operates a distance learning network. The latest long-range planning documents from Headquarters TRADOC (Department of the Army, 1989a, 1989b) point to future changes in the Army training strategies including a greatly expanded role for distance delivery of Army training across the next 10-20 years. The Reserve Components are interested in distance learning as a method to address training of guard and reserve units (see Kitfield, 1989). These are but a few

examples which illustrate the current interest in distance education.

Why all the interest? Isn't face-to-face education and training, which has in one form or another been a part of man's history since verbal communication evolved, been sufficient to meet our needs? The answer is, of course, yes and no.

Who could argue that the opportunity to learn in the presence of a truly gifted teacher is what most learners prefer. Yet, it is not always possible for each of us to have such a learning opportunity. Distance education can provide valuable alternatives and opportunities. There may not be a gifted teacher, or for that matter any qualified teacher, available locally in a needed course area. It may be impossible to travel and spend the required class time at a college, university or other training or education institution. Adult responsibilities for employment or family may prevent students from attending classes where or when they are offered. For specialized skill training, students may be so geographically dispersed that it is only possible to obtain the critical mass required for cost-effective instruction through somehow pooling students at a central location. These are some of the challenges that face adult learners and institutions providing education or training. Distance education appears to offer a solution to the dilemmas stated above.

Society is changing. In past years most Americans worked in agricultural or in industrial production careers that lasted a lifetime. In today's modern information-age society the vast majority of our jobs exist in the information realm (that is collecting, processing, analyzing, understanding, distributing and managing, and/or evaluating information). And jobs in this sector often demand high levels of skills. Jobs are evolving and changing at a fast pace as information technologies continue their rapid advance. To compound the problem, the amount of available information is increasing exponentially. Most modern adults face an employment picture of multiple jobs with requirements for high levels of skill maintenance and constantly evolving requirements.

Concomitantly, education and training have taken on new meaning. No longer can we rely on an industrial-age model of education and training where an individual through the classroom-as-a-factory approach of standardized learning can be stamped out as a young adult for a single industrial-age job to be pursued for the remainder of his or her working life. Job requirements are constantly changing. New requirements have been introduced into the process of education and

training for the adult learners, employers, and education or training providers. Instruction/training must fit the changing needs of the learner, and programs must be available when and where they are needed by the learner. The learning process must be as effective and efficient as possible. The learner must remain committed to finding and obtaining recurrent education and training. Employers must provide both opportunities and resources to maintain and enhance worker skills and to retrain workers whose skills have become obsolete. Education and training providers must find effective ways to meet the needs of modern day learners and employers.

Employers attempt to meet these new challenges through a variety of techniques. New management styles seek to allow workers broader participation in organizations and to provide them the opportunity for a broader understanding of many facets of the business or organization. More experienced workers are tasked to serve as mentor/teachers for less experienced workers. Workshops and short courses are provided and time is allowed for training during work hours. Assistance and economic incentives are provided to encourage obtaining externally provided training. Child care is often provided for workers who can not pursue further training without it.

In-house learning centers have been established in both the government and the private sectors. Larger businesses are developing private communications networks to provide teleconferencing and training. Large communications companies such as AT&T (see Chute and Balthagen, 1988) are developing special teleconferencing and education networks. Companies such as ConferTech International (ConferTech, 1990) have been established to provide teleconferencing as the main thrust of their business.

Providers of education and training are also attempting to meet this challenge. Workshops and training sessions are increasingly being designed with the learner/consumer in mind and the response is very encouraging. Many colleges and universities are finding, as is the case at our university, that their extension/outreach programs serve nearly as many students each year as those served on-campus. Extension campuses have become popular as adult learners demand more programs in their home communities and find difficulty relocating to the site of a university campus for a period of months or years in order to obtain the education they need.

These same trends are manifested in government and in the military sector whether we are talking about training mechanics, communications personnel, linguists, or weapons spe-

cialists. Change is a fact of life. Under the Total Force Concept, Reserve and Guard units (Kitfield, 1989) are assuming new and expanded roles. Recent events in Eastern Europe, the Soviet Union, and the Middle East appear likely to bring about basic changes in doctrine, roles, and missions. Ever-advancing weapons systems and other technologies are creating additional training demands and changing the nature of individual training needs. Yet reductions to the overall Defense budget also appear to be a fact of life for future fiscal years, despite these escalating needs. Methods need to be found to effectively meet the complex needs for training in a period of tight funding.

In planning for meeting the future training needs of military personnel, planners are pointing strongly to modern training technologies of simulator, computer assisted instruction, imbedded training, interactive videodisc, teleconferencing, and distance learning technologies to meet modern day readiness requirements. This is reflected most significantly in recent long-range training documents from the Futures Group at Headquarters Army Training and Doctrine Command, TRADOC (see Department of the Army, TRADOC, 1989(a); 1989(b)).

Let's take a closer look at distance education (or from the perspective of the student learner, distance learning) given the increasing role it may play in military and government training generally and in the training of linguists in particular. What is it? What are its roots and its current directions? What does the future hold for distance education?

The Congressional Office of Technology Assessment (OTA) in its recent report on distance learning (OTA, 1989, p. 25) offers the following definition of distance learning.

"In this study, distance learning is defined as teaching-learning arrangements in which the teacher and student are separated physically: in these applications, a portion or all of the learning interactions occur in real time. Although distant delivery of information via broadcast, computer data links, and other means also provides important resources for the classroom and valuable tools for learning, they are not the principal focus of this ... report."

A practical definition of the term distance education is offered by Batey and Cowell (1986) in the report of a study and review of the literature on the topic conducted by the Northwest Regional Educational Laboratory in Portland, Oregon. In the report they define distance education as follows:

Distance education is a, "catch-all phrase for something as old as correspondence study and as new as interactive instruction by satellite. Many definitions have been offered in what has become extensive literature on distance education. ..."

Batey and Cowell continue, "For this paper we define distance education as a set of three elements:

1. Communication between teacher and the students is not face-to-face;
2. an organization plans, coordinates and supervises the program;
3. a technology based delivery system is often used (but is not required)."

Keegan (1986) offered a more formal definition of distance education. While perhaps not as practical or useful in the everyday sense as some others, it is a definition useful to this report and is often cited in scholarly works on the topic. His definition is as follows (p. 49):

Distance education is, "a form of education characterized by:

1. the quasi-permanent separation of teacher and learner throughout the learning process;
2. the influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services;
3. the use of technical media: print, audio, or video to unite teacher and learner and to carry the content of the course;
4. the provision of two-way communication so that the student may benefit from or even initiate dialogue; and,
5. the quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups, with the possibility of occasional meetings for both didactic and socialization purposes."

Note that Keegan's fifth point above considers students of distance education as individuals, who learn independently

and do not typically receive group instruction. This is the case for some distance education systems. However, group instruction at remote sites is also quite common, particularly in high-tech, U.S. applications.

Michael Moore (1987), editor of the American Journal of Distance Education and a well-known leader in the area of distance education, has led the effort to better define the field, establish a theory of distance education, and promote systematic and scholarly investigation of this approach to education. In his editorial words of welcome in the first issue of the journal in 1987 he offered a reply to Keegan's definition of distance education which he felt better expressed the essence of the term.

He argues (p. 12-13) that, "Keegan's definition is too restrictive in its view that distance education is an industrialized form of learning. Moreover, his definition leads to a characterization of distance education that is unnecessarily bounded by past practice and results in a tautological description. All indications are that we are moving into an Information Age characterized by technologies capable of interactive and individualized education at a distance. As a result of advances in telecommunication and microprocessor technologies, distance education methods exist that are 'de-massifying' delivery. The future task for education at a distance is to design and direct personalized information to specific target audiences. The industrialized form of distance education, with its mass-consumptive ideology and approach, will become less dominant in the future."

In volume 2 of the same journal Shale (1988, p. 26) adds that we should not stress the "distance" in distance education as a point of differentiation between itself and education, but rather should speak of education at a distance.

"In sum, distance education ought to be regarded as education at a distance. All of what constitutes the process of education when teacher and student are able to meet face to face also constitutes the process of education when teacher and student are physically separated. All the necessary conditions for the educational process are inherent in face-to-face contact. They are not necessarily actualized, but the potential is always there. This is not the case when teacher and student are physically apart. The task of distance education is to find means by which to introduce these necessary conditions, or to simulate them so closely as to be acceptable proxies."

Distance education has its roots in correspondence study. William Rainey Harper, whom some regard as the founder of distance education, spoke of the distinction between traditional and correspondence study. In his comments a century ago he stated (Harper, 1886):

"Away therefore with all baseless and foolish prejudice in this matter! The correspondence system would not, if it would, supplant oral instruction, or be regarded as its substitute. There is a field for each which the other cannot fill. Let each do its proper work."

These comments are echoed by distance educators today, who propose that distance education serve students who do not otherwise receive adequate opportunities for education in needed areas. Since Harper, (as pointed out by Moore, 1987, p. 4) "two major changes have occurred. The first has been the invention and proliferation of new technologies to be set alongside the correspondence study guide as well as improvements in ways of teaching by print. The second has been the growth in need -- or more precisely 'felt need' -- for continuing education among adults at all levels. ... It also appears that these needs cannot be met, nor need they be met, by withdrawing workers and homemakers from their proper places in adult society and sending them back to school. With the aid of modern communications media, education can be provided at the adult's convenience, when, where and in whatever ways are most congenial to the individual. In our colleges, universities, private home study schools, armed forces, corporations, community colleges, and in our medical centers, are many people of great skill who are able, when properly organized, to meet the changing needs of the contemporary adult learner. Organizing and enhancing these skills to meet those needs is what distance education is all about."

Modern efforts in distance education are described in this report. What does the future hold? Virginia Ostendorf, who publishes directories of uplinks, downlinks, and distance education providers (see Virginia Ostendorf, 1989; 1990 (a), (b)) states that (Ostendorf, personal communication, April 1990) growth in available distance education has been exponential across the last 5-10 years. She expects this rate of growth to continue into the foreseeable future. Her observation is consistent with the findings of the ETNA researchers in a project conducted for the Defense Training and Performance Data Center. In this project we surveyed distance education course providers to determine how many courses were

available to Florida Reserve and National Guard Units to assist in training their members in common military occupation speciality (MOS) skills. Our finding was that there are currently nearly a thousand such courses and workshops which could be accessed by these units and the number is growing rapidly. The work of the TRADOC futures group (Department of the Army, TRADOC, 1989 (a);(b)) and that of Brockwell (1989) portends growth in distance education use in the Department of Defense as well. Thus, one aspect of projecting the future of distance education seems to be that, for the foreseeable future, growth in the industry and the education and training opportunities it can provide is likely.

Similarly, the present and future rate of development for technologies available to support distance education appears promising. Microcomputers have followed an astonishing growth pattern since their introduction in the mid 1970's. One has only to compare the initial personal computers (e.g., Apple or Apple II, IBM PC, Radio Shack) with today's successors to see the improvements and expanded capabilities -- internal and external memory, processing speed, etc. The remarkable fact is that increased capability in these machines (today's microcomputers are as powerful as expensive mainframes of a few years ago) has gone hand-in-hand with reduced prices. Fought (1987, p. 421) reports that the estimated time between consecutive generations of microcomputers (a new generation defined as a doubling of capacity or halving of the price for a given capacity) is currently 18-24 months. Remarkable advances in off-line storage (e.g., video disc, CD-ROM, magneto-optical storage) and software (e.g., hypermedia, windows) has made possible the integration of various forms of media for computer-based instruction.

Advances in communications have been no less astonishing. In the early 1970's high-power, geosynchronous communications satellites were introduced. This technology allowed broad signal coverage and provided the opportunity for receivers of these signals to be produced at a cost low enough for millions of home owners and education/training institutions to afford them. Advances in this area (e.g., direct broadcast satellite, development of the capability to utilize additional extremely high frequencies) are occurring. More intense use of available frequencies (e.g., compressed audio and video, vertical blanking interval, use of side-bands, etc.) can increase the flow of information across existing channels. And, fiber optics appear to hold the potential to bring enormous volumes of communications to our homes and classrooms at low cost.

2. When Distance Education is Appropriate

Some authors, particularly those viewing distance education as a means to provide the equivalent of the campus curriculum to home based or remote classroom students, as in the British Open University (see Hodgson, et.al., 1987), hold a somewhat restricted view of distance education. They see distance education systems as providing standard, for credit, courses covering the same material as their parallels on-campus, but doing it at a distance through some form or forms of communications technology and media. Others, for example the authors of the Northwest Regional Educational Laboratory (NWREL) report, Distance Education: An Overview (Batey and Cowell, 1986) or the authors of the U.S. Congress, Office of Technology Assessment report, Linking for Learning: A New Course for Education (OTA, 1989), have considered the purposes of distance education to be broader. In this report, we have taken the position that the usefulness of distance education may prove to be quite broad and thus hold a position closer to those of the NWREL researchers.

Batey and Cowell (1986, p. 3-4), whose report focuses upon distance education for public schools, list the following functions for distance education:

1. Provide equity and increase quality of educational opportunity;
2. Provide access to subject matter experts or career role models not available in the local community;
3. Provide interaction and joint activities with students in other schools; and
4. Provide increased access to information and instructional resources.

These functions can also apply in a rather straightforward way to the training world except, perhaps, for the first one. In the case of training targeted for employees such as military linguists, this function might better be stated as - provide needed training to linguists on-site, regardless of where they are currently stationed. Batey and Cowell also stress the capability of distance education to provide staff development and in-service training and to promote increased school/community linkages. Again, the extrapolation of these functions to the training community are rather direct.

The OTA report (1989, pp. 31-33) lists the following purposes for distance education. Providing:

1. Whole courses;
2. Partial course materials;
3. Enrichment materials;
4. Training and staff development; and
5. Student and professional communications.

Rather than constraining distance education to the role of providing complete courses like those given in the resident program of an institution of education or training, we feel that it is advantageous to look at distance education as an approach to delivery which can serve multiple goals of both students and instructors. Given this broader view of functions that can be performed by distance education, we list below some functions that distance education could play in DLIFLC nonresident instruction.

Some Possible Roles for Distance Education in the DLIFLC Nonresident Training Program

Good management dictates that the implementation of any new instructional program should only be undertaken if it offers a cost-effective response to legitimate needs of the learners. The new program should be feasible and offer a distinct advantage over the status quo. These factors need to be carefully considered prior to the implementation of distance education services by the DLIFLC Nonresident Program. In view of the role of the Nonresident Training Program at the DLIFLC, the division might consider a distance education option in any of the following illustrative forms. These examples are presented for illustrative purposes only and are not, at this point, recommended programs for the DLIFLC. The specific analyses of these and other options and distance education recommendations for DLIFLC will be included in future project reports.

a. Language Program Improvement Courses or Workshops. Extend the work of Mobile Training Teams through providing, via audio or video conferencing, program improvement sessions to language program managers. These sessions would assist language program managers in more effectively managing and implementing their language training programs. These sessions could include such topics as: effective training of local

language personnel; improving teacher selection and training; utilizing the most up-to-date, effective instructional methods; effectively utilizing language training materials available from DLIFLC; use of technology in language instruction; and locating and ordering other effective language training materials.

b. Inservice Training to Language Instructors. Provide, through video conferencing or satellite television specific training to foreign language instructors in local programs. Training topics might include diagnosis of skill deficiencies; remediation, maintenance, and enhancement training for linguists; effective instructional management techniques; use of instructional technology; use of authentic audio and video for instruction; and locating or developing effective instructional materials.

c. Language Program Technical Assistance. Provide on-call assistance to local language program managers as a supplement to distance education efforts -- through a computer network, computer conferencing system, audioteleconferencing and/or electronic bulletin board. Examples of this would be a bulletin board to share information about effective techniques and materials, an on-line query system to locate effective materials for particular instructional purposes; an electronic system to order instructional materials from DLIFLC; telephonic access master teachers at DLIFLC to discuss instructional techniques for instruction in specific languages; or electronic access to a resource file containing the names of curriculum experts available to assist with specific language instruction issues. As an extension of this effort, DLIFLC foreign language training materials could be specially redesigned to better meet local needs, placed on a three-year renewal/ update cycle, and the quality of print materials improved through computerized text processing, layout, and graphics.

d. Language Tutorials. Assist individual student linguists in local programs to maintain, remediate, and/or enhance their language skills through computer conferencing, enhanced with audio access to appropriate language instructors at DLIFLC. Print and audiotape instruction materials, and computer activities would be available to the students on-site. This system would not necessarily replace the on-site language teacher, but could be configured to operate in the absence of the on-site language teacher in a self-

study mode, where appropriate. Technical assistance from DLIFLC in the use of the computer for on-site training would be provided.

e. Language Short Courses. Offer intensive short courses for maintenance, remediation, and/or enhancement of language skills or short courses such as DLIFLC's Gateway or Headstart courses through two-way compressed video or through an interactive, satellite-based video system with telephonic audio interaction. Students would receive instruction at local training centers or gather at state or regional locations. Other technologies (e.g., videotext, interactive videodisc, CALL, interactive audio) could be included, where appropriate, in the overall design of the instructional package.

f. Language Courses. Provide full-length language courses at appropriate levels for linguists through a satellite-based video distribution system, perhaps linked into local cable, fiber optic, or microwave signal distribution. Students could receive instruction at a local learning center or through home-study. A toll-free telephone number could be made available for tutorial assistance from skilled language instructors at DLIFLC. Print materials, audiotapes, computer-assisted language learning, and other appropriate technologies could be incorporated into the design as required. These courses may have special relevance to linguists in Reserve and National Guard Units and may require flexible scheduling for this purpose.

3. Cost-Effectiveness of Distance Education

Developing the capacity to provide education or training through distance education requires a substantial investment in equipment and personnel. It often requires organizational changes for successful implementation. Program personnel, especially instructional technologists, are often enthusiastic proponents for developing new approaches to education and training using the latest in high technology. They may feel that distance education offers enormous potential to solve a great number of training problems. However, those responsible for policy and administration need to know that distance education is well justified prior to applying scarce capital and operating resources to its development and operation. If the need and feasibility of distance education for a particular application of distance education can be established, the critical question remains -- is this a cost-effective solution to meeting a given set of education or training needs.

Precise information needed for specific decisions about distance education may require a specially designed cost analysis addressing the particular situation (see the section of this report on evaluation of distance education programs). Discussion of the determination of cost effectiveness in distance education can be found in Rule, et.al. (1988), Chute and Balthagen (1988) also, Rumble (1988), and Markowitz (1987).

It is instructive to see what others have found in assessing distance education. This section of the report reviews the cost-effectiveness information available in the distance education literature. As with many recent innovations, the available information is limited. Cost-effectiveness has been a factor in many, if not most, decisions to implement distance education projects or systems. Informal information about comparative costs is provided in many reports that describe applications of distance education. Rigorous cost-effectiveness analyses are infrequently reported in the literature reviewed for this study.

Several types of information are available to shed light on the issue of cost-effectiveness of distance education. First, there are evaluation results which deal with the educational effectiveness of distance education. Second, there is information available which compares the cost of distance delivery vs. traditional delivery of education and training. Third, there is a small number of formal cost studies. This information is summarized in the following.

The Office of Technology Assessment (Congress of the United States, OTA, 1989) summarizes findings of a contracted review of the research findings on the effectiveness of distance education performed by Moore (1989) and concludes (p. 11) that:

"In most instances, distance learning appears to be as effective as on-site, face-to-face instruction in the classroom."

This finding has consistently been shown in reviews of the research literature on this topic beginning with Chu and Schramm (1975).

In discussing the effectiveness of distance education, the OTA report (p.44) concludes that:

"This effectiveness literature has been quite consistent when used in business, military training, and adult learning, there is no significant difference in instruction methods and student attitudes are generally positive about the experience."

The issue of costs of distance delivery and the comparison of these costs to alternative delivery strategies (especially the traditional format) is less frequently reported. However, some illustrative results of cost or cost comparison studies are cited below.

* Rule, et.al (1988) addressed the issue of costs in distance delivered in-service training of educators in rural and remote areas in Utah State University's Hi-Tech Project. In year three of the project, when training moved from the developmental phase into the operational phase, the cost of telecommunication-supported training was determined to be approximately one-third of that delivered through the traditional, on-site mode.

* Brockwell (1989) and Brockwell (personal communication, May, 1990) reported that distance delivered Army Logistics Management College (ALMC) courses to students at remote sites are less expensive, by a fac-

tor of 3:1 than resident, on-campus instruction for students in these same courses.

- * The TRADOC Futures Group (Department of the Army, TRADOC, 1989) projects an annual savings of \$300 million as compared with institutional training, after the implementation of proposed Army distributed training systems.
- * Bramble and Ausness (1975) reported a cost analysis for teacher in-service training delivered by the Appalachian Education Satellite Project. They found cost advantages to delivery of televised in-service training via satellite to teachers in remote communities in Appalachia as opposed to campus-based delivery.
- * Withrow (1990) reports that the STAR schools projects (with developmental funding from the U.S. Department of Education) successfully offer high school courses to students at distant high schools on a competitive, cost-recovery basis.

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Moore (1989, 24-26) in his report "The Effects of Distance Learning: A Summary of the Literature" prepared for the U.S. Congress, Office of Technology Assessment, reports the following additional results regarding the cost effectiveness of distance education.

- * Christopher (1982) reports on the cost benefits of the Expanded Delivery System (TEDS) that provided instruction to Air Force 2982 students at remote sites. He demonstrates that the two-year, ten-site project resulted in a cost benefit of almost \$1 million (actual costs of \$497,139 in comparison with on-site projected costs of \$1,490,980, resulting in a cost avoidance of \$ 993,841).
- * Showalter reports on the cost benefit of delivering 5377 contact hours of continuing education to professionals via audio teleconferencing. In this case the cost of the teleconferencing was \$69,635 and the cost of the face-to-face instruction alternative was \$156,271. The cost avoidance was thus \$86,636, a 55% cost benefit.

- * Chute, Hulik, and Palmer (1987) report on cost savings of 1986 teletraining at AT&T resulting from avoidance of travel costs and productivity related costs. The teletraining costs were \$234,900. Travel avoidance savings were \$1,583,000 and productive time savings were \$457,800. Thus total cost benefits were \$1,810,900 that year.
- * Elbertson, Wydra, and Jolley (1987) report that a number of factors can serve to improve the cost effectiveness of distance education.

These include the following:

- 1) Transmission cost can be lowered by voice/data modems, dedicated lines and other techniques;
- 2) increasing the number of participating sites will usually lower the per-student costs of instruction.
- 3) increasing the number of courses per day will tend to lower instructional support costs;
- 4) using paraprofessionals at instructional sites will lower site monitoring costs;
- 5) serving increased numbers of students will tend to lower costs for a distance education system;
- 6) selecting less expensive technologies (e.g., audiographics vs. microwave) will lower costs;
- 7) including students at the originating site will help keep the marginal costs for teachers lower.

From the results cited above and other examples in the literature, it appears that distance education can provide a cost-effective approach to education and training, especially where geographic dispersion of learners is a factor. Cost ratios of 2:1 to 3:1 in comparison with traditional delivery formats are reported. Additional cost data are included in the sections of this report addressing alternative technologies for distance education and foreign language instruction through distance education.

4. Factors in the Success of Distance Education

What are some of the factors important to the success of distance education systems? These factors are addressed at two levels in this report, macro and micro. In this section of the report we address macro-level factors; administrative and organizational factors essential to the success of a system or network for providing distance education. In a subsequent section of the report we address micro-level factors in planning, developing, and implementing successful distance education courses on such a system or network.

Despite a tendency of some distance education reports to focus attention on the more glamorous components of distance education (e.g., satellite communications, interactive video, advanced computer learning systems, etc.), most authors whose work was reviewed, tend to emphasize organizational factors and sound educational principles when they name those factors most critical to the success of distance education. My own experience with the Appalachian Education Satellite Project (Bramble and Ausness, 1976), the Learn Alaska Instructional Network (Bramble, 1976), and other projects for whom I worked or consulted (see Mason and Bramble, 1982; Polley and Bramble, 1984) leads to the same conclusion.

Authors writing about distance education (see Batey and Cowell, 1986; OTA, 1989) and expert opinions too numerous to cite here tend to agree that the single most important prerequisite to the success of a distance education system is that distance education must address a valid, identified need or set of needs. If the need is not evident, no amount of sophistication or effort in providing a high quality service, will lead to success as judged by system output, popular acceptance, organizational support, and sustained resource availability. Some existing systems (such as the Army Logistics Management College (ALMC) System, see Brockwell, 1989; Shaw, 1988) were fortunate from the onset to have a pre-existing mandate to serve the needs of government employees in required areas with certified courses from designated course providers. In such a case need is established a priori and the main task is to prove the system from cost-effectiveness and acceptability points of view.

The Oklahoma State University (Midlands Consortium) distance learning system, ASTN (see Withrow, 1990) serves the compelling needs of small rural high schools in the Western U.S. for courses in hard-to-staff areas such as science, mathematics, and foreign languages. The involvement of a university

in offering high school courses is less straight-forward than that of ALMC in offering DoD off-campus courses in government procurement procedures. However, through gaining a wide reputation as a source of excellent and needed courseware and by offering the advantage of university credit for its courses, ASTN appears to have assured its niche in the field. Other successful providers serve the need of high school courses through distance education. These include the TI-IN Network (TI-IN, 1990) in Texas, the STEP Network (STEP, 1990) in Spokane, Washington, the Utah State Board of Education (IBM, 1987), and others.

Distance education projects require both an initial capital and development expenditure and a sustained organizational funding commitment in order to be successful. High-end systems, particularly those involving video communications, involve start-up costs in the hundreds of thousands or even several millions of dollars. Video production facilities and satellite uplinks can be especially costly. Thus, a high level commitment and/or external funding is required to launch a system including these elements. Having made this investment, which may already strain organizational resources, developmental and recurrent operational resources are required to successfully sustain a distance education effort. Over the years, the operational costs of an effective system may far surpass the original investment. This needs to be recognized from the outset. Organizational decision makers need to be aware of the magnitude of all types of costs (capital, developmental and operating) before committing to the establishment of such a system.

In making a decision to commit the required resources to a distance education system, administrators need information about several factors. Among these factors are the following. First, will the system provide a clear benefit? Does it provide a better way to serve an identified need? Is the effort likely to provide an educationally sound solution to a problem? Second, are the affected organizational levels willing and able to cooperate with and participate in the program? Third, is the effort feasible and supportable within the broader political and social context in which the organization operates? Is the service to be provided by the system cost-effective? Is it a less expensive solution than alternative solutions? Is it more effective than other competing solutions of comparable cost? Or does it provide a reasonably affordable solution where no other feasible solution is apparent (e.g., in cases of geographical learner isolation or dispersion)? And finally, is the size of the resource requirement consistent with the urgency to solve the particular

problem being addressed?

The report on distance education by the Northwest Regional Educational Laboratory (Batey and Cowell, 1987, pp. 11-12), after an extensive review of current distance education programs, identifies the following characteristics of successful distance education programs.

- * Successful projects tend to start small, addressing a specific need, a course which must be offered, or a change in requirements, and then expand as the system gains experience and acceptance.
- * Most successful distance education programs involve cooperation among agencies at several levels; for example schools, school districts, regional education agencies, or state departments of education. Successful organizational linkages are critical to the effectiveness of distance education systems.
- * Careful planning, well-organized management, and effective program and student support are necessary for the success of distance education projects.
- * Multimedia programs are more likely to be effective than programs with only one type of delivery. Simplistic single technology approaches are less likely to be effective.
- * Successful programs are based upon current educational theory and practice.
- * The master teacher or presenter of the distance education program is a crucial element in its success. In addition to being a subject matter specialist, he or she is highly motivated, enthusiastic, and charismatic and usually devotes much more time and energy to the program (than to traditional classroom teaching).
- * Successful distance education programs provide in-service training for staff at local schools or learning centers. This is particularly true when new technology is used.
- * Effective distance education can never be purely mechanical. Methods of meeting the social and emotional needs of the learners are built into the programs. Programs include methods for receiving feed-

back, help, and a sense of belonging to a classroom.

- * Learners who are independent, self-starting, and self-motivating help make a distance education program a success. Methods of motivating students and sustaining their interest are provided to ensure effectiveness.
- * Distance education programs often have unanticipated side effects, such as: increased communication and cooperation between schools and districts, parental involvement with courses, and mastery of a technology which students and/or teachers can apply to other areas.

Batey and Cowell (p. 31) draw the following conclusion about distance education:

"Distance education is not a panacea. There are many educational problems it can solve, and just as many that it cannot. Distance education must be separated in our minds from the technology which delivers it. We are tempted to romanticize technology -- and the more sophisticated or novel the technology is, the more this romanticization occurs. Technology, in and of itself, cannot guarantee that learning takes place, care about students and their progress, replace human interaction, nor perform a host of other functions which are integral to quality teaching and true education. What technology can do, and do very well, is deliver quickly and over great distances large amounts of varied information. Depending on what its results are being compared to, it can often do this efficiently, effectively, and cheaply.

There are many alternatives to distance education. Whether it is used or not should be determined only after a careful examination of goals and objectives, financial constraints, student needs, administrator and teacher capabilities, community opinion, and the like. Distance education and its attendant technology should follow, not lead.

The potential of the technology does not guarantee its actualization. ... What we don't have (in education) is the ability to use the technology effectively and efficiently. Educational ideas and procedures are

5. Distance Education Technologies

A number of technologies are available for distance education. It is common, although not universal, for distance education systems to employ several technologies in providing education or training. As Pratt (1987, p. 73) points out, technology can facilitate instruction through presentation of content, monitoring of progress, and provision of feedback to learners. Technologies can play any or all of these roles in distance education. A video lesson may focus on the presentation of content, teleconferencing may focus upon teacher/student interaction, or the computer may monitor student progress and provide learning activities that include instant interactive feedback. Each of the technologies can be used in several ways depending on the overall design for a course of instruction.

One way to categorize distance education technologies is to list the types of communications systems that can be employed for one-way or interactive instructional delivery. At the broadest level, these technologies are audio, video, computer, and supporting technologies. We describe below some of the forms that these technologies can take.

Audio. One-way audio communications in the form of radio broadcasts have been used in distance education. This low-cost form of distance education has been more popular in developing countries (see Jamison, et. al, 1974) than in the United States. In current U.S. distance education systems the telephone system is the most common means for transmitting audio information. In the case of a two-way conversation between teacher and student, a standard telephone call can be employed. Student access can be facilitated through the use of a toll-free, "800", number which allows students to contact the teacher at no direct cost to themselves. A telephone with a speaker or "push-to-talk" microphones and an amplifier/speaker can be used at the student location in order to allow the teacher to speak with several students simultaneously. When an instructor conducts an interactive session involving several sites simultaneously, a conference call can be arranged through a long distance operator or an audioconferencing bridge may be used. An audio bridge (see Winn, et.al., 1986) is a device which allows for the convenient telephone interconnection of a number of classroom sites. Through such a device, multi-point audio interaction is facilitated.

More recently, telephone systems have begun the installation of fiber optic transmission lines. These lines are composed of glass fibers that carry information as light pulses. Fiber optic systems have the potential to revolutionize telephone services in that they can carry enormous amounts of information in comparison to conventional copper wire. The ultimate vision of proponents of this technology is a widely-available Integrated Systems Digital Network (ISDN) in which all signals (data, voice, and video) could be transmitted in digital form rather than in analog form as is common today. This type of network would not only allow for more straightforward data communications (i.e., a modem would not be required to convert the digital information from computers into analog form for transmission over telephone lines), but it could also allow for enormous amounts of video, audio, and data available at each "telephone" site. The universal availability of sophisticated networks such as this are years or decades in the future. A host of regulatory issues remain to be resolved. However, their ultimate installation will likely revolutionize the nature of communications technologies available for distance education.

Meanwhile, fiber optic trunk lines are being installed between major cities. Local area fiber optic networks (e.g., interconnecting buildings on university campuses) are being installed at an increasing rate. Leading edge educators are becoming acquainted with this new form of communications technology and its potential uses in instruction and training.

Video. One-way video technologies have been in place for decades. They are employed to distribute a video signal from a single source (or through multiple repeaters) to one or many reception sites. One-way television (full bandwidth) is commonly distributed by the following means:

1. Terrestrial microwave through licensed, point to point transmitters;
2. ITFS broadcast, using private transmissions interconnecting educational centers;
3. Satellite transmission, broad scale transmissions via C-band and Ku-band geosynchronous communications satellites;
4. Cable systems, which use cable interconnections to homes and learning facilities;
5. Open air broadcast, using conventional over-the-air broadcast facilities.

The first four options above offer the opportunity for two-way video transmissions (see Brown, 1988, for a description of the use of this medium in distance education). Through two-way video, the instruction site and classroom site(s) can see as well as hear what is going on at other sites. This allows for teacher-to-student interaction that more closely approximates that in the physical classroom. However, the development and operation costs of two-way full band-width video are currently so high as to be beyond the reach of many distance education providers, especially where widely scattered, multiple instruction sites are involved.

Television signals may also be sent in a more limited fashion in which still frames or reduced versions of the signal are transmitted. These techniques allow for less expensive video transmissions. The quality of the viewed product is not equal to that of full band-width transmissions, but it is often sufficient for instructional purposes. Some types of more limited video transmissions are as follows:

1. Slow scan television, in which single frames of video are transmitted over standard telephone lines;
2. Picture phone, in which audio is accompanied by regularly updated single frames of video from each end of the line;
3. Compressed video, commonly used in video conferencing, in which each site in a conference has the capability to transmit and receive audio and a limited form of motion video via T1 telephonic lines or satellite.

The first two of the above types are sent over a conventional telephone line and present still pictures at the receiving end. These can be accompanied by audio. The third type of transmission, compressed video, utilizes a higher capacity, leased telephone link (T1) or a small portion of a satellite transponder. It provides video with motion, although the picture is not of the same quality as with full band-width. Notably, movements of subjects on the screen tend to be blurred or there is flutter associated with lip movements in speech. The advantage of the three video techniques above are that they offer closer approximations to the actual classroom experience through video and audio transmitted to and from each site than audio alone. Video types 1 and 2 above can also present illustrations, tables, charts, etc. Compressed video can present a reasonably good approximation of the visual

events in a classroom setting. Limited video options are less expensive than the full band-width video options when a relatively small group of classroom sites is involved. However, the cost of these technologies is still relatively high in comparison to some of the lesser expensive technologies that can be used in distance education. For a large number of simultaneous interactive sites, these communications methods may be more costly than other options (e.g., satellite video transmissions augmented by audio conferencing). This is due to the large number of telephone or satellite connections required to interactively connect a large number of sites.

Computers. Computers have been used in some distance education systems in one or both of the following two ways. Some systems (see German by Satellite, Wohlert, 1989) utilize the computer in a stand-alone (off-line) mode in the classroom. The computers provide portions of the study included in courses or provide practice and reinforcement of concepts introduced through instruction via communications technologies. Other systems (e.g., one developed by the Alaska Department of Education, Mason and Bramble, 1982) have successfully utilized stand-alone microcomputers (in the absence of extensive communications support) to present courses of instruction in remote high schools. In such cases, other technologies such as print and audio may be used in conjunction with the computer.

Some distance education systems (e.g., the Army Logistics Management College network, see Brockwell, 1989) utilize computers in an on-line mode to deliver or supplement instruction. In such systems data transmissions interconnect the network teaching site with classrooms using separate telephone lines, an audio bridge, a broad-scale computer network, or subcarriers on the television signal. Computers in the classrooms can display text and graphics to augment classroom presentations via audio or video technologies. When the technology is used in conjunction with audio, the technique is called audiographics. Teachers can refer to prepared charts or sometimes graphic displays. They can sometimes highlight or change portions of this information during their presentations. Alternatively, computer conferencing has been used to more directly manage or provide instruction (see Richards, 1987).

Supplemental Technologies. A variety of other technologies exist which can enhance distance learning. Some of these are as follows. Print materials often play an important

role in distance education. Facsimile transmission (FAX) can provide a quick way to transmit instructional materials or student tests to or from the classroom sites. Videotape players and audio tape player/recorders can be used for inexpensive off-line access to instructional materials. Video-discs and compact discs can be used on site for storage and quick access to enormous amounts of information.

Additional information can be transmitted to home or classroom sites over unused portions of an existing video signal (e.g., vertical blanking interval) to provide data and/or graphics for instruction (see DUBY, 1988, for a description of Teletext). This information can either be stored magnetically by computer on site or simply cycled at high speed as it is transmitted and searched and displayed locally. Such a system requires that a video network be in place to provide the communications to classroom sites and the service requires the approval of the network provider.

Information about many of the transmission technologies listed above is organized in a somewhat different way in the Office of Technology Assessment report entitled Linking for Learning, A New Direction for Education (OTA, 1989, p. 61). Their report lists the configuration, advantages, disadvantages and trends for each of the transmission technologies. This treatment of information about communication technologies for distance education is relevant to the current report and is included below.

1. Terrestrial broadcast.

Configuration - One-way broadcast of audio, video, and possibly data; possible audio return.

Advantages - No special receiving equipment or converters; reaches most schools and homes.

Disadvantages - Limited channels and air time; reception limited by geography; high transmission equipment and production costs.

Trends - Increased use of data/text transmission.

2. Fiber optic.

Configuration - Two-way audio, data, and video.

Advantages - High capacity/speed; channel capacity easily expandable; high quality signal.

Disadvantages - High installation cost; rights-of-way may be required to lay cable.

Trends - Costs are declining rapidly, fiber deployment is expanding rapidly.

3. Microwave
 - Configuration - Two-way, point-to-point audio, data, and video.
 - Advantages - Low-cost transmission time; no rights of way needed.
 - Disadvantages - Must be FCC licensed; tower space or location may be difficult to get; difficult and costly to expand channels; crowded frequencies; line of sight required.
 - Trends - Use of higher frequencies is expanding.

4. Instructional Television Fixed Service (ITFS)
 - Configuration - One-way broadcast or point-to-point audio, data and video; possibility of audio return.
 - Advantages - Low cost delivery of video.
 - Disadvantages - Crowded frequencies, especially in cities; FCC licensing required; limited transmission range; line of sight required.
 - Trends - Digitalization may triple channel capacity; wider coverage areas using repeaters; rebroadcast of satellite-delivered programming.

5. Public Switched Telephone Network (PSTN)
 - Configuration - Two-way voice; limited data and video.
 - Advantages - Wide coverage; low initial cost; high quality and capacity of fiber optic links; others handle repair and upgrades.
 - Disadvantages - Quality is spotty; limited transmission of data and video; cost is distance-sensitive.
 - Trends - Expanding fiber installation; digitalization of network increasing; increasing intelligence in the network.

6. Satellite
 - Configuration - One-way broadcast of voice, data, and video; possibility of audio and data return.
 - Advantages - Wide coverage, transmission cost is distance insensitive.
 - Disadvantages - Expensive uplinks; high transmission costs; FCC licensing of uplinks; receive site microwave interference (C-band) or rain fade (Ku-band).
 - Trends - More use of Ku-band; possible transponder shortage; increased use of data; increased interactive capabilities.

7. Audiographics

Configuration - Two-way computer conferencing with audio interaction.

Advantages - Low cost; easy exchange of graphics; uses PSTN.

Disadvantages - Visual interaction limited to graphics/still video.

Trends - more powerful computers; better software and peripherals increase capabilities.

8. Cable television systems.

Configuration - One-way broadcast or two-way point-to-point audio, data, and video.

Advantages - Wide availability; low delivery costs.

Disadvantages - Limited capacity; can be difficult to interconnect; not usually designed for interactivity.

Trends - Capacity increases using fiber; more addressability and two-way capability.

It is essential in planning a distance education system to have an idea of the relative costs of the various technologies that can be applied. The OTA report (1989, Appendix B) provides some examples of prevailing costs (circa 1989) as follows.

Instructional Television Fixed Service (ITFS)

Transmission site - (exclusive of cost of real estate) - \$60,000 plus \$50,000 for tower).

Receive sites (each) - Reception equipment and tower, down converters and electronics, ITFS voice response system - \$5,850-58,000 (primarily depending upon the size of the tower required).

Operating costs - low compared to other broadcast technologies, example - \$213,000 annually or \$45/hr. For the WHRO, Norfolk, VA system with four channels, one hub location, and seven repeater stations.

Satellite

Complete uplink facility, including studio and all electronics can cost between \$500,000 and \$1,000,000 and higher depending on complexity.

Transmission time for satellite delivery (depends on time and capacity required, is distance insensitive) costs \$200 to \$600 per hour, costs are greater for small amounts of occasional use time and less in quan-

tity, costs vary according to time of day and day of week (costs are currently rising for this service, however).

Receive site costs for down linking signals from satellites are in the \$5,000 to \$10,000 range for C-band, \$800-\$5,000 range for Ku-band, and \$8,000 range for C/Ku-band.

Programming costs for existing satellite-based distance education services, for example from TI-IN are as follows. Annual subscription, \$5,050, courses \$240/student, with \$50/student over a set limit, and staff development course participation costs between \$2,200 and \$8,000/year depending on school district size.

Cable

Basic interconnection - often provided free to schools, but internal cabling is required to allow classroom viewing.

Cabling within schools: - Based on the experience of the Dallas Independent School District, the cost of wiring all classrooms in 235 schools with both cable and telephone (data) communications lines was \$3.8 million.

Cable systems - The costs to install interactive (two way communications) with coaxial cable are as follows: coaxial cable installation \$18,000 to \$25,000/mile; modulators \$500-\$2,000; demodulators \$2,000-4,000; reverse flow amplifiers \$3,500. Operational costs for cable systems vary, but usually run around 2% to 5% of the system cost annually.

Microwave

Transmission equipment - Duplex (two-way) microwave systems cost between \$40,000 and \$60,000 per channel.

Towers - Costs vary but range between \$25,000 to \$150,000 each.

Public Switched Telephone Network (PSTN)

Start-up costs are low and depend on the cost of telephone equipment and audio bridging equipment.

Transmission costs - These costs are time and distance sensitive. Costs also depend upon the number of interactive sites or-line and differ depending upon local rates and upon whether intrastate or interstate long distance rates apply. An example cited in the re-

port, based upon a study conducted by the Texas Higher Education Coordinating Board (see Texas Education Agency, 1987(a), 1987(b)), cited rates at 52 cents per mile per month for a 56 kbps terrestrial voice/data line and \$12.49 per mile per month for a higher capacity (1.544 Mbps) T1 line.

Audio/data bridges - These may be purchased at about \$1,000 to \$2,000 per port or leased (e.g., AT&T's Alliance Teleconference Service) at about 25 cents per port per minute. (Related site equipment may cost \$500 to \$1,000 per classroom).

Fiber Optics

Construction - Cost to connect a home or school is about \$1,500 for fiber vs. \$1,200 for copper, although the relative cost is expected to change in favor of fiber in the early 1990s.

Other electronics - are as follows: analog transmitters and receivers, \$12,000; repeaters (spacing varies), \$24,000; laser modulators, \$2,000 to \$3,000; coders/decoders (codecs), e.g., for compressed video, \$8,000-\$60,000.

OTA (1989, p. 80) lists some sample network installation costs as follows.

Panhandle Shar-Ed Video Network (fiber optic network interconnecting four schools - Installation \$340,000 including all hardware and 5-years maintenance, annualized cost per school \$17,000.

Missouri Education Satellite Network - Participating schools pay a one-time fee of \$8,000 for equipment and an annual programming fee of \$1,000.

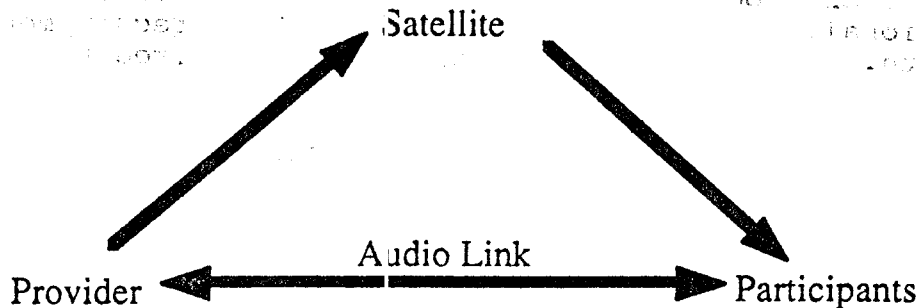
Kentucky Educational Television - Uplink plus downlink at each of the state's 1,300 public schools and construction of a new Telecommunications Center, \$11.4 million.

Houston's Interact ITFS System - Transmitting equipment (covering a 50-mile radius) \$330,000, participating schools invested an average of \$12,000 for hardware.

Pennsylvania Department of Education - audiographics system for 48 schools, \$952,000. Local school districts pay an average of \$45/month depending on use.

As is evident from the presentation above, the electronic technologies that can be employed for distance education are

Case 1. The live video conference in distance learning - one-way video delivered by satellite, two-way audio.



A recent article by Brown (1988) describes the use of one-way video, two-way audio conferencing in distance learning. She notes that the advantages of this type of system are geographic access, information access, financial/time access, organizational/institutional access, and efficiency. Geographic access is facilitated by the broad coverage possible through modern communication satellites. Access can be provided not just in high density urban centers but in rural and remote locations. Information access is made possible to persons who would have difficulty, because of their remote locations, to otherwise obtain the information. Recent examples Brown cites of training and information provided through this means are as follows: graduate courses for engineers; computer science courses; discussions of interpretation and implementation of church doctrine by Roman Catholic clergy; information about new car models, consumer buying trends; sales techniques for automobile dealers; and courses for law and health professionals and small business owners. Financial and time access has been demonstrated by practicing professional engineers taking courses from a distant university; organizations sharing the professional honorarium costs of expert presenters by having them simultaneously present to multiple locations via video conferencing; and small high schools sharing the cost of teacher salaries in low-density, specialized courses. Organizational/ institutional access to participants is provided by such systems as well (e.g., access to degree programs at distant universities).

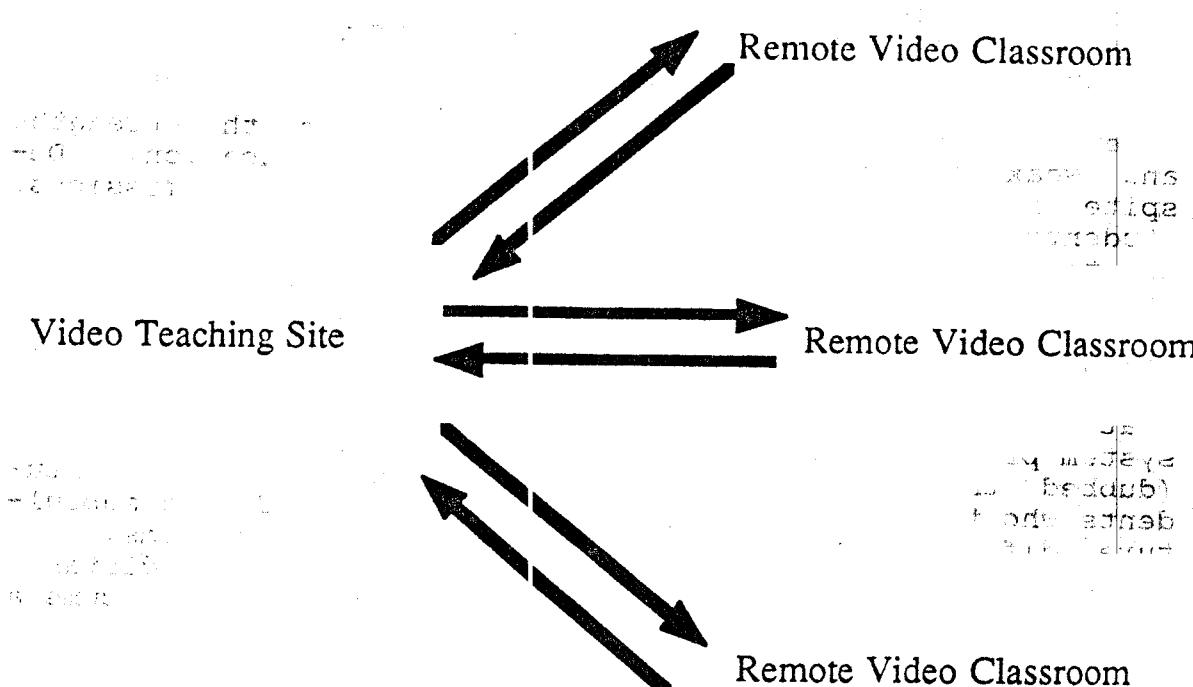
Brown observes that organizations can broaden communication and bases of support through expanding the participant base in courses and conferences. Making specialized courses more available in an area can increase the opportunities for economic development. Professional groups can broaden their base of support and membership through this technology. Efficiency can be achieved by systems such as these when large numbers of participants can be reached. Experts such as Peter Drucker and Anver Suleiman have addressed thousands through a single broadcast. When applied on a large scale, video conferencing can offer substantial cost savings in comparison to direct, face-to-face teaching.

Video conferencing is not without its limitations, however. Brown notes that while the medium represents a great leap forward, several dilemmas remain unsolved. First, the public is not generally aware of the nature and potential of the technique. All things being equal, the face-to-face mode is preferred by most people. Video conferencing is not as familiar as face-to-face interaction. Many persons have no experience with video conferencing. Second, television viewing represents passive learning and does not hold people's attention for long periods of time. It lacks the "high touch" required for most people's comfort levels. And third, the technique may be most useful for initial stages of learning characterized by information transfer. Later stages of learning may require more opportunity for interaction than these systems provide. With one-way video, two-way audio the interactive portion of each videoconference is often placed at the end of the program. Question input is handled by telephone. Only a small number of participants can ask a question due to time constraints.

While these limitations need to be taken seriously, Brown notes that they can be addressed in large part by appropriate measures at the local sites. Brown notes that other issues exist which can be addressed by proper planning and management at the network level. These factors include quality control, times and scheduling, costs and fees, and publicizing and marketing.

Brown concludes that video conferencing may be the "next best thing to being there". Its biggest selling points are that it can provide access for literally thousands of persons who could not have otherwise participated in organized learning experiences in key areas of interest. At the same time, it enables organizations to serve much broader audiences. In times of tight budgets, administrators often wonder if non-traditional programs should be developed. But Brown

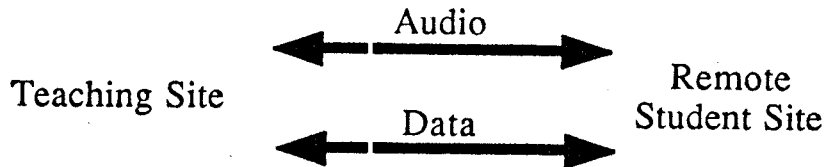
Case 2. Two-way interactive television.



Case two is taken from a paper by Jerry McClelland (1987). He describes the use of two-way interactive television to teach vocational education and foreign language classes in high schools. Other courses offered through the system include adult classes in parent education and food preservation. The main purpose of the system he describes is to serve the special needs of remote high schools that are unable to offer more specialized courses locally. He describes a closed circuit instructional television system serving four sites with a single teacher located at one of the sites. The system is configured so that it can be operated by the teacher and does not require attendant technicians to operate the equipment during classes.

The equipment consists of a television camera and monitor at each site with communications links through terrestrial microwave. Television monitors at each remote site display the teaching in progress at the teaching site. The television monitor at the teaching site can display what is being sent to the other sites or can display the signal (depicting

Case 3. Computer-aided personalized system of instruction for the "virtual classroom" -- two-way data and voice communications.



Kinsner and Pear (1988) report on the Computer-Aided Personalized System of Instruction (CAPSI) developed at the University of Manitoba. The utility of the system was designed to facilitate both on-campus and off-campus instruction in psychology and engineering. The system is reportedly independent of course content, as long as the course material is structured appropriately for the subject matter.

In the on-campus mode, the system is used to administer tests, to assign markers (scorers) to completed tests, and to keep track of the progress of each student through the course.

In the off-campus mode, students receive instruction via interactive audio. Like their on-campus counterparts, they take tests on the computer (in this case linked to the university's mainframe through a local area data network) and their answers are transmitted to the university for marking. Student progress is recorded on the computer. Beginning with the 1986-1987 term, students were also provided with electronic mailing and messaging capabilities. This allows for other communications about the course and for additional feedback to be provided concerning test performance. With this system in place, the authors refer to the remote sites as "virtual classrooms" since the physical boundaries of the classroom have "vanished" as a result of the communications capabilities of the system.

Evaluations of the system show a number of results. Students who completed the CAPSI courses do learn the course material and have evaluated the courses as being as good or better than courses using traditional methods. Students reportedly like the self-paced nature of the instruction and the tight

course design that prevents surprise questions on the exams. Negative aspects of the results include technical difficulties encountered, a lack of sufficient equipment, the potential for cheating on exams with limited student supervision during testing, and the absence of conventional lectures and discussions. An important feature of this system is that it saves data describing the interactions that occur during the entire course for later analysis. These data can provide feedback important to course revision and improvement.

The authors conclude that the system is a powerful teaching method with wide generality. They note that CAPSI facilitates off-campus learning by eliminating the spatial and temporal restrictions that exist in on-campus versions of the system. They suggest that "CAPSI opens a door leading to the next stage of computer-aided instruction, in which the computer will become more intimately involved in the educational process by aiding in the development of course materials (through the addition of an authoring system) and in the evaluation of the student's learning."

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6. Planning, Designing, Developing, and Managing a Distance Education System

The decision to proceed to develop a distance education system depends on a number of factors. Some of these were presented in section 4 above in the context of factors for the success of distance education. In summary, successful distance education systems are designed to address a valid need or set of needs. They should provide a cost-effective means to address the needs. They require the cooperation of agencies on a variety of levels, they require a multi-year commitment on the part of the lead agency, and they require sufficient capital and operating funds. The services offered should be of high quality and reflect high standards of educational design. Given that these are some of the ingredients for the success of a distance education system, what are some considerations in planning, designing, developing and managing an effective distance education system?

General Issues

Batey and Cowell (1987, pp. 21-22) list a number of general planning and development issues to be addressed in developing a distance education system to serve public schools. These are adapted for presentation in the current context as follows:

- * Developing and clearly stating a set of realistic goals for the system;
- * Gaining approval for a new approach to education or training and for the particular curriculum to be offered;
- * Fitting the use of the technology and the services it provides to DoD, military services, FCC, and other governmental regulations and procedures;
- * Certifying and accrediting new types of instructors and programs;
- * Obtaining start-up and operating funds for the system.
- * Establishing formal agreements with cooperating units, organizations, and individuals (e.g., DoD, NSA, Major Commands, participating units, military language program personnel, ACHS, universities or other providers of uplinking or language instruction, etc.);
- * Mounting public relations and publicity campaigns to gain the support of agencies and groups at all relevant levels; and

- * Establishing the criteria against which to judge the success of the system and the means for evaluating its success.

More specifically, within the sponsoring organization (with the consultation and/or approval of the cooperating agencies, where appropriate) Batey and Cowell list a number of development and planning issues to be defined.

- * Specific objectives for the system;
- * Selection of appropriate mix of technologies and specific equipment requirements;
- * Establishment of resource requirements for obtaining and operating the technical and human elements of the system;
- * Organizational and budgetary placement and line of authority for the program;
- * Staffing requirements -- management, technical, instructional, field support, etc. -- and requirements for contractors;
- * Relationship to on-campus program and established methods for accessing other required staff (e.g., teaching, testing and evaluation, curriculum, nonresident program specialists, military liaison staff, etc.) required for system implementation;
- * Research and formative and summative evaluation requirements for the system;
- * Procedures for prioritizing alternative services or courses to be offered;
- * Approach to curriculum development and implementation;
- * Specific processes for course development and implementation; and
- * Mechanisms for field training and support for systems use.

Managing and Scheduling Instruction

Batey and Cowell also suggest factors to be addressed in the management and scheduling of instruction at the instructional sites served by the network. The presentation below is adapted from their report to more closely fit the current context. These authors note that the more a distance education program differs from the normal events and procedures of the local learning center, the more new management skills will be required in order for such programs to succeed. In general, the aspects of management which most frequently

change due to the introduction of a distance education system are:

- * Establishing lines of responsibility;
- * Obtaining and handling funds;
- * Planning;
- * Record keeping and reporting;
- * Supervising students (managing, rather than providing instruction);
- * Obtaining, managing and repairing new types of equipment;
- * Scheduling classes;
- * Scheduling existing staff;
- * Recruiting new staff;
- * Managing program change and updating program content;
- * Managing contracts and financial agreements;
- * Cooperating with other educators; and
- * Dealing with new entities in the community and occasionally with new clientele.

Institutionalization

An often forgotten, but ultimately crucial, factor in planning and developing systems such as distance education systems is "institutionalization". Institutionalization refers to the transition between project status (with a definable short-term life span) and becoming a continuing program central to the operation of an institution. As Batey and Cowell point out, it is essential for the long term survival of any project, regardless of the successes it may exhibit in the project phase, to plan early and work to achieve institutionalized status. In this regard, they suggest (as adapted from the work of Emory (1981) on the institutionalization process) that the following factors be addressed:

- * Specific plans for integration are developed and approved at the beginning of the project;
- * Project evaluation is built into plans and procedures from the outset and this evaluation is carefully conducted so that decision makers have evidence on which to base their decisions;
- * The project develops a broad base of support and ownership by all groups it affects;
- * The project is flexible enough to allow for modifications or adaptations;

- * The project is located in a part of the regular administrative structure, rather than in a special area apart from the administrative flowchart;
- * Communication is open, all key administrators are kept informed of project progress, and as many of them as possible are involved in project operations;
- * There is early and frequent informal contact with key members of the relevant training community, influencers, and image makers by personnel directly involved in the project's development and implementation;
- * Project leadership is stable and of high quality;
- * Project norms, values and procedures are seen as congruent with those of the parent institution and the training community served; and
- * Administrators and teachers are provided thorough and continuous training in project goals, procedures and materials.

Instructional Considerations

The literature on distance education has another important contribution to make in the area of planning and developing distance education systems. The system should be designed to allow for the provision of high quality instruction. Thus, most designers of distance education systems are faced with selecting the most appropriate technologies to build into the system. There are two schools of thought on the topic of media selection.

One school is exemplified by the work of Stanford University's Chu and Schramm (1967) which is regarded as seminal research on the effectiveness of instructional television. The study reviewed several hundred studies of instructional television. The studies dealt with instructional television as a non-interactive medium (primarily through video broadcasts or videotapes). Among the many conclusions of the study are the following:

- * Given favorable conditions, children and adults learn from television;
- * The use of visual images will improve learning of manual tasks as well as other learning where visual images can facilitate the association process;
- * Student response is effectively controlled by programmed methods, regardless of the instructional medium.

The authors go on to point out the various factors that contribute to better or worse learning outcomes using this medium. However, after reviewing research studies available at the time in which student performance was compared under competing technologies, the authors did not find systematic differences in effectiveness. Thus they concluded, point 53 in their study, that "given favorable conditions, pupils can learn from any instructional media (whether it is television, film, radio, language laboratory, or programmed instruction) that are now available". And that, point 56, "radio is less expensive than television; economy of scale usually governs cost comparisons of television and film". This study was conducted before the extensive development of modern interactive technologies such as microcomputer-based computer assisted instruction; interactive videodisc; and interactive audio and video instruction. The indication, at the time of their work, was that the effect of the medium used in instruction was insignificant and that cost factors are thus preeminent in system selection.

For example, it was suggested that, because of cost, radio is a better distance education broadcast medium for instruction than television. This conclusion led Stanford's Patrick Suppes to focus on radio instruction in his work in Nicaragua in the early 1970s. An article by Jamison, Suppes and Wells (1974) cites the findings of the Chu and Schramm study and reviews additional work in instructional radio and instructional television. They conclude that, (p. 33) "Radio has been used extensively for formal classroom instruction in the United States (more in the past than at present) and elsewhere. There exist, however, only a limited number of good evaluations of the effectiveness of (instructional radio - IR). These evaluations indicate that IR (supplemented with appropriate printed material) can be used to teach most subjects as effectively as a live classroom instructor or ITV". Regarding ITV, they conclude (p. 38) that, "ITV can teach all grade levels and subject matters about as effectively as (traditional instruction), though some evidence indicates that it performs relatively better at lower grade levels. A significant fraction of teachers and students have initially negative attitudes toward ITV; these negative attitudes tend to lessen, but not necessarily disappear, with time and appropriate administrative behavior. Evaluations that report no significant difference between ITV and (traditional instruction) are usually based on experimental designs that hold almost everything but the medium constant."

In reviewing 15 years of evaluations on programmed instruction, Jamison, et.al. find that (p. 41), "(programmed

instruction) is generally as effective as (traditional instruction) and may result in decreasing the amount of time required for students to achieve specific educational goals." Concerning computer assisted instruction, they conclude (p. 55), "at the secondary school and college levels, a conservative conclusion is that CAI is about as effective as (traditional instruction) when it is used as a replacement. It may also result in substantial savings of student time in some cases." Jamison, et.al. (1974, p. 58), in assessing the role of technology in the classroom (without regard for the element of greater student access addressed by distance education) conclude that, "On the one hand, it seems almost inevitable that productivity improvements in the schools, if they are to occur, will require the use of technology. On the other hand, in spite of very considerable expenditures on educational technology for many years, we are pressed to find an example of its use to improve productivity. ... We should be exploring much more systematically the potential of technology to reduce system costs through productivity improvement."

JAMISON

Media Selection

A second school of thought holds that media do hold individual advantages that should be considered in instructional systems design. While there is no definitive research base in the area of media selection for distance education, there is a considerable body of evidence about the effectiveness of newer interactive technologies and the roles they can play in instruction. For example, see Smith (1988, 1989) for reviews of the use of technology in foreign language instruction. Evidence such as this leads to the discussion of media selection in distance education which is addressed below.

General media selection models exist (e.g., Gagne and Briggs, 1974; Reisner, 1982). Their models attempt to relate attributes of the teaching/learning process to media characteristics. Because these models are well known, they are not reviewed here. A noteworthy model for selecting distance education systems is proposed by Spencer (1986). Her model resulted from a study of continuing education deans or directors at 126 public four-year colleges and universities in 19 rural states. The study attempted to determine the use of a variety of educational delivery methods, and the advantages and disadvantages of each method from the perspective of the continuing education provider. In addition, a model was developed (p. 143), "to assist in providing a framework for the

analysis of the research findings and to provide guidance in decision making when selecting an educational delivery method." The "Selection System" is a descriptive model with five components as follows:

- * instructional strategies;
- * student access;
- * complexity of the method for the student;
- * complexity of the method for the provider; and
- * budget/market.

The model provides a means to assess the strengths of a given delivery system.

Table 1 (adapted from Spencer, 1986, p. 144) is presented below. It describes the five components of the Selection System model in further detail.

Component	Description
Instructional Strategies	...
Student Access	...
Complexity of the method for the student	...
Complexity of the method for the provider	...
Budget/Market	...

Table 1

Selection System for Evaluating Alternative Delivery Systems
Spencer (1986)

Instructional Strategies	Student Access	Complexity for Student	Complexity for Provider	Budget/Market
Interactive	Eliminates time constraints	Familiar delivery method	Minimal technical expertise	Low capital investment
Motivates to complete	Eliminates place constraints	Minimal student expertise to use	Minimal preparation of written materials	Low instructional development cost
Attention holding	Far-reaching	Minimal student equipment required	Minimal staff time for development	No license fees
Self-Pacing	Transportable		Minimal instructional development time	No air time or line fees
Aural contact with instructor			No on site coordination	No handling charges
Face-to-face contact with instructor				Reusable program
Visuals				Reaches large market
Personalized instruction				Low delivery costs
Appropriate for goals				
Total of 9	Total of 4	Total of 3	Total of 5	Total of 8

Commenting about the use of the system, Spencer (p. 144) indicates that:

"Variables are presented as strengths if held by a delivery system. A plus is given for each variable held by the delivery system being evaluated (and these are totaled by component). By completing this evaluation for each system, comparisons can be made not only in the totals but in the subtotals for each component."

Spencer goes on to say (p. 152), "The Selection System model is an attempt to identify areas in which questions should be asked when selecting an educational delivery method. Advantages and disadvantages identified in the research should be considered as one uses the model. However, the model is not designed to provide a right or wrong score since a (distance) education provider may weigh the components differently based upon an institution's resources, market and mission, as well as program goals."

Table 2, from the same article (Spencer p. 147), provides useful information about the capabilities of alternative delivery methods. This information is reproduced below. The delivery methods which are considered are (1) in-class, on-site, (2) correspondence study, (3) audio tape, (4) radio, (5) phone, (6) video tape, (7) television, (8) instructional television, fixed service (ITFS), (9) satellite, and (10) computer. These delivery methods are then evaluated in terms of their advantages/disadvantages on fifteen factors including instructional factors, cost, ease of use, transport ability, and others.

of the system
-level of
-level of

Far reaching
Transportable
Reusable
Easy to use
Legend:
TA: audio
(TA) tape
(TV) television
satellite

Table 2

Advantages of Educational Delivery Methods
(Spencer, 1986)

	IC	CR	AT	RA	PH	VT	TV	ITFS	SA	CP
Best learning situation	X									
Preferred by students	X									
Interactive	X				X			X	X	X
Personalized instruction	X									X
Self-pacing	X	X	X			X				X
Accessible		X	X	X	X	X	X			X
Flexible/convenient		X	X			X				X
Eliminates time constraints		X	X			X				X
Eliminates place constraints		X	X	X		X	X	X		X
Low cost		X	X		X	X				
Access to national experts			X	X	X		X		X	
Far reaching		X	X	X	X	X	X		X	X
Transportable		X	X			X				X
Reusable		X	X			X			X	
Easy to use	X	X	X	X	X		X			

Legend: In-class, on site (IC); Correspondence (CR); Audio tape (AT); Radio (RA); Phone (PH); Video tape (VT); Television (TV); Instructional Television Fixed Service (ITFS); Satellite (SA); Computer (CP).

Design of Distance Education For Language Instruction

Theory development for language instruction via distance education is in its infancy. No comprehensive articles on this topic were located through the present literature review. Thus, a great deal of work remains to be done in this area. However, there are items in the literature which provide information relevant to language pedagogy and the use of media in distance education. This information, examples of which are cited below, may provide a starting point for developing a theory of language instruction via distance education.

An article by Davis (1988), "Distance Education and Foreign Language Education", calls for such a development. Davis points out that the distance education movement is growing in size and prestige. He notes that many distance education systems have incorporated minimal opportunities for interaction and thus may be unsuited for language instruction. He argues that distance education systems suitable for foreign language instruction should incorporate better interactive capabilities and suggests profession-wide dialog on this "powerful channel for instruction."

Davis makes a number of specific points about the application of distance education technologies to foreign language instruction. He notes that (p. 548), "the problems most common to distance educators include encouraging student-teacher and student-student dialog and learner autonomy." He follows the work of Moore (1983) in looking more closely at "distance" in distance education. Physical distance (e.g., across broadly separated sites in the U.S.) characterizes some distance education systems, but other factors beside geography can result in distance between teacher and student or among students. Thus, Moore uses the term transactional distance to characterize the type and amount of teacher-learner separation in the educational process. In turn, transactional distance has two components: dialog (characterized by how much the teacher and student can respond to each other) and structure (characterized by how much the educational program responds to individual learner needs).

Davis notes that it is the dialogic distance that most concerns foreign language educators, while many distance educators may be more concerned with structure. Davis reviews the work of Krashen (1985) and Krashen and Terrell (1983). He notes (p. 548) that:

"For Krashen, foreign language acquisition depends upon two closely linked components: comprehensible L2 input must be provided by the course of study, and the input must be received by the student. At early stages, comprehensible input consists of talking about the "here and now" ..., allowing students to utilize the extralinguistic context. At more advanced levels, familiar narrow subject matter can supply more easily understandable samples of the target language. ... One other facet of Krashen's thinking, his proposals for appropriate practice at the different stages of language teaching, is (also applicable)."

Davis goes on to point out that, following Krashen's thinking, interaction and immediate feedback assume greater importance in higher levels of language learning than at lower levels. The problem this presents is that a high degree of interaction carries a substantial price tag associated with communications costs in distance delivery. Thus, distance education, in its more typical form (one-way video, limited audio feedback) may be more appropriate at Krashen's stage 1 of learning (pre-speech; presentation of comprehensible input with little or no response) and stage 2 (early production; one word student responses to input) than at later stages of language learning. Technologies allowing a greater degree of cost effective, dialogic interactions may be required for distance education to be effective at higher levels of language learning. Davis' work requires further discussion among language professionals and empirical investigation before a widely acceptable theory can be developed.

Ariew (1988), writing about integrating cassette video tapes and CALL into the language curriculum, presents information of potential use to distance educators concerned with appropriate media use in foreign language instruction. He notes (pp. 47-49) that the advantages of video are: realism; motion; color; and flexibility. Video's disadvantages are that it: is linear; does not allow interactivity; has difficulty with explaining abstractions (as opposed to providing images); is often of low resolution; and has high production costs. The advantages of Computer Assisted Language Learning (CALL) are: interactivity; answer judging; graphics and sound; timing, animation, and control of media. CALL disadvantages are said to be: voice quality; low realism/low resolution; no "free expression"; high implementation costs; and high production costs. Ariew goes on to present what he feels are the particular strengths and weaknesses of the two media for developing foreign language skills. Table 3 below

is from p. 51 of his article. Ariew included a third medium (textbook) for comparison purposes. Others (e.g., interactive audio and video) could be added.

Table 3

Strengths and Weaknesses of Three Media in Relation
to Four Language Skills
(Ariew, 1988)

Skill	Media		
	Video (one-way)	CALL	Textbook
Listening	+	-	-
Speaking	-	-	-
Reading	- (?)	+	+
Writing	-	+ (?)	+

In table 3 a strength is indicated by "+" and a weakness by "-". Thus, from the table it would appear that listening skills are best addressed by video, reading skills by CALL or textbooks, and writing skills by textbooks and, perhaps, CALL. None of the media considered in the table appear to address speaking skills, which are more appropriately addressed by the skilled language teacher. This may be an area where interactive video or interactive audio can play a significant role. Table 3 presents an interesting starting point for additional research into the selection of media options available for language learning via distance education. It also lends support to the advantages of media mixes for language instruction, since no single technology appears effective at building all of the requisite language skills which may be required in typical training situations.

Ariew goes on to discuss how video and CALL relate to the American Council on the Teaching of Foreign Language (ACTFL) proficiency guidelines, specifically postulating tasks at various levels best implemented through CALL vs. video. A more thorough analysis of distance education media in relation to proficiency levels, and skills will be required to optimize the use of distance education for foreign language instruction. Additionally, the design parameters for proficiency, as opposed to achievement-oriented instruction/training, need to be established.

Holmberg (1989), of the German Distance Teaching University, conducted an international study of the distance teaching of modern languages. He discusses the educational theory of language teaching in relationship to media selection, building upon the work of Noam Chomsky (1972). Holmberg notes (1989, p. 3) that for the design of distance education courses in languages and for the selection of media for these courses, goals such as 1) reading and understanding, 2) listening and understanding, 3) speaking and 4) writing are very general. "To be useful as practical guides for content selection and methodology they must be analyzed so that more specific objectives can be catered for. Does, for instance, the capacity to write French imply translation into French or free writing of, say, essays, reports, letters." Holmberg goes to distinguish between two competing approaches to instruction -- the behavioral approach (exemplified by the work of Mager) and the taxonomies of educational objectives by Bloom and others) and the cognitivist approach (exemplified by Chomsky, 1972).

Holmberg discusses issues in the use of patterned drill, inductivism vs. deductivism, the teaching of pronunciation, the use of the "mother tongue", contrastive vs. direct methods, and the teaching of speech when teaching foreign languages through distance education. He notes the special difficulty in teaching speech through distance education, because of the requirement for practice in conversation and the absence of face-to-face practice.

In part II of the Holmberg report, survey results from an international study of the teaching of foreign languages by distance education institutions (mostly correspondence study programs) are reported. Survey questionnaires were mailed to 988 institutions throughout the world. A response rate of 28.5% was obtained and the estimated percentage of distance education institutions offering language courses was 57.1%. Reported language courses ranged from the elementary school level to the university level. The courses address each of the four major goals of language study. The preponderance of respondents were correspondence schools utilizing assignments sent via the postal service. Thus, the technologies available for instruction were limited.

However, the report is useful in reporting the approaches to instruction utilized when teacher and student are separated during the language instruction process. The institutions reported using a combination of inductive and deductive approaches, audio tape recordings to teach pronunciation, use of the contrastive method, use of pattern drill, techniques for introducing new words, and conversation exercises.

Teacher Training

Batey and Cowell (1986, pp. 16-17) stress the importance of effective teacher training for distance teaching. They note (consistent with the thinking of Shale, 1988) that, "good teaching is good teaching, whether the teacher and learner are in close proximity or are at a great distance from each other. However, many types of distance education imply, or in some cases demand, changes in teacher competencies and behaviors. Whenever teachers are expected to adapt their teaching techniques, use new equipment and technologies, or relate to learners in different ways, there are important implications for both pre-service and in-service teacher training."

The following are basic instructor competencies cited by Chute, et al. (1988, p. 60). The competencies were specified by AT&T researchers to provide a basis for selecting distance mediated instruction teachers:

1. Familiarity with the basic principles of learning theory;
2. Skills in organizing and managing materials and the learning environment;
3. Skills in managing course structure and organization;
4. Skills in administration and evaluation;
5. Knowledge of verbal and non-verbal presentation methods;
6. Effective at responding to trainees;
7. Skill in questioning techniques;
8. Skill in coordinating group activities;
9. Subject matter expertise;
10. Teaming skills; and
11. Teletraining skills.

From a report by Bradshaw (1989, p. 22), the following description is provided of the effective distance education teacher: "Just as every person in the world is not born to be a teacher, every teacher is not born to be a teleteacher. Being a good teleteacher calls for all of the understanding, experience, and skills of a live, classroom teacher -- and lots more. A good voice; pleasing appearance; stage presence; plenty of self confidence; a flair for the dramatic, artistic; creative; and a willingness to go the extra mile are all vital qualities. Most important is an openness to becoming comfortable with the new technology and an ability to use its

strengths to enhance teaching and learning."

According to Batey and Cowell (1986, pp. 16-17), teachers in charge of delivering educational material at a distance will need training and preparation for the following:

1. Teaching lesson plans partly or completely developed by others;
2. Preparing very detailed lessons well in advance of delivery;
3. Teaching without a group of responsive students in attendance;
4. Teaching with new types of feedback (or sometimes with no feedback at all) from learners;
5. Organizing and structuring materials in new ways;
6. Systematically pre-testing materials and explanations for appropriateness, clarity and comprehensibility;
7. Pacing and delivering lessons in a different manner;
8. Presenting lessons according to strict and inflexible time schedules;
9. Balancing multiple materials and inputs to students;
10. Planning differently for the provision of social and emotional needs of student groups; and
11. Projecting style and personality in new ways.

Site Facilitator Training

Likewise, Batey and Cowell (1986, pp. 17) suggest that the teacher (or site facilitator) who supervises the students receiving learning at a distance will need training and preparation for the following:

1. Using plans, materials and teaching methods largely developed by others;
2. Keeping to a schedule which is often not of his or her own making;
3. Preparing students to receive input in new and different ways;
4. Helping students to focus their attention on unfamiliar stimuli;

5. Helping students to make responses in a manner they may not be used to;
6. Using different methods to aid students in asking for help and assistance;
7. Employing new ways to promote student concentration and persistence;
8. Evaluating and rewarding students for new behaviors;
9. Teaching students to use new machinery and equipment, both hardware and software, with ease and confidence;
10. Scheduling repairs and maintenance of this equipment when indicated, and, on occasion, performing simple repairs; and
11. Keeping new types of records and keeping these records in different ways.

Instructional Support for Students

Communication with and between students is reportedly essential to successful distance learning courses. Alternatives suggested by Batey and Cowell (1986, pp. 18-19) for providing effective student support in distance learning are as follows:

1. Written communications sent by mail: personal letters, journals and logbooks;
2. Exchange of audio cassettes: voice letters;
3. Telephone contacts, either regularly scheduled or "on demand";
4. Student get-togethers, either face-to-face or via telephone;
5. Training for aides or monitors so that they can provide help and support;
6. Group scrapbooks or photo albums;
7. Tutorial groups, either in or out of school;
8. Materials for parents (or for purposes of this report, significant others in the training process - commanders, education specialists, etc.) so they may assist (the students);
9. Electronic mail;
10. Imaginative supplementary materials featuring activities which integrate social and emotional concerns with subject matter content;

- 11. Connection of distance learning to regular courses so that the teacher of the regular course is available for help and advice; and
- 12. Special recognition of schools, classes, or individual students during presentations or broadcasts.

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7. Designing Effective Distance Education Courses

Key to the success of distance education systems is the quality of the instruction they deliver. Distance education systems vary in the technologies they employ for instructional delivery and in the methods of course development and presentation. For example, courses delivered through computer conferencing differ substantially from those with a video component. There appear to be common design elements which lead to effective distance education courses. By the nature of distance education, there is often less opportunity for the teacher to correct and adapt instruction in-progress as can be done with traditional forms of instruction. Hence, greater preparation and planning are needed. The principles of instructional design (e.g., Gagne and Briggs, 1970) apply to the development of distance education courses. These principles are well known and are not described in detail in this report. Rather, some of the design elements described by distance education practitioners and researchers are included in this section of the report because of their special relevance to potential providers of distance education courses.

Design Factors.

Batey and Cowell (1986, pp. 13-14), based upon their review of the distance education literature, identify factors in designing effective distance education courses. They note that the curricular ingredients of an effective distance learning effort are essentially the same as those of more standard methods of delivering educational content. Minimally, these are embodied in a course or program which includes the following:

1. Is comprehensible to students;
2. Contains appropriate and easy-to-follow instructions;
3. Contains clearly and completely stated goals and objectives;
4. Uses material (both primary and supplementary) and methods which are exciting, motivating and varied;
5. Meets the needs of students and adjusts for individual differences in abilities, desires and interests;

6. Is accurate and up-to-date according to the latest scholarly opinion;
7. Is clear, consistent and well organized;
8. Is paced in a logical and flexible manner;
9. Contains fair, accurate and complete evaluation;
10. Contains pretests and other diagnostic procedures;
11. Meets the social and emotional needs of both students and teachers;
12. Guides students to sources of help when they become bored or confused;
13. Has aesthetic appeal;
14. Articulates in a clear and appropriate manner with other courses, subject matter and grade levels;
15. Employs technology appropriate for the content presented and for the learners' abilities;
16. Employs record keeping procedures which are manageable and not greatly time-consuming; and
17. Employs technology that is "user friendly" -- its use is well explained, it does not "get in the way" of learning, and it overcomes the potential reluctance of teachers and students to use it.

Advance Organizers

Marland and Store (1982), presented an article entitled, "Some Instructional Strategies for Improved Learning from Distance Teaching Materials." In their article, they note that modern distance education, in its short history, has not captured the attention of educational researchers and that there is limited available theoretical discussion or documentation of instructional practices. However, they note that there is a substantial literature on learning theory and its application. They go on to examine a number of devices that have been used in instructional text for tertiary level distance education learners. In particular, they focus on the devices that orient the learner and introduce textual material. By extension, the material they present can also apply to media-based instruction used in distance education.

Marland and Store note the importance of orienting the learner through a range of devices for introducing students to learning tasks. In this context they note the importance of advance organizers, overviews, pretests, objectives and

other devices. The concept of advance organizers emerges from the work of Ausubel. Advance organizers provide students a master plan for learning. An advance organizer can take the form of an ideational framework (framework of ideas) or can make explicit an already existing framework to which new ideas in the material to be learned can be anchored. Advance organizers are based on the notion, presented by Ausubel in his theory of meaningful verbal learning, that, "the most important factor influencing the meaningful learning of any new idea is the state of the individual's existing cognitive structure at the time of learning" (Ausubel and Robinson, 1969). Two kinds of advance organizers are proposed. These are: (a) expository organizers (e.g., a definition of a concept or a generalization), which are recommended when the material is unfamiliar to the learners and (b) comparative advance organizers (e.g., an analogy), when the material to be learned is not completely novel.

Marland and Store review the rather extensive research on advance organizers and their benefits. They offer guidelines as to when and how to use advance organizers in distance education. In addition, they offer specific guidelines to distance education course developers on when and how to use other devices such as statements of objectives, inserting questions in the text, and on presenting the text. Under text presentation they address typographical considerations, graphics, and the use of graphs, charts and tables. These are too extensive for inclusion in this report. However, guidelines are research based and offer important guidance to developers of distance education courses.

Practical Strategies for Effective Course Design

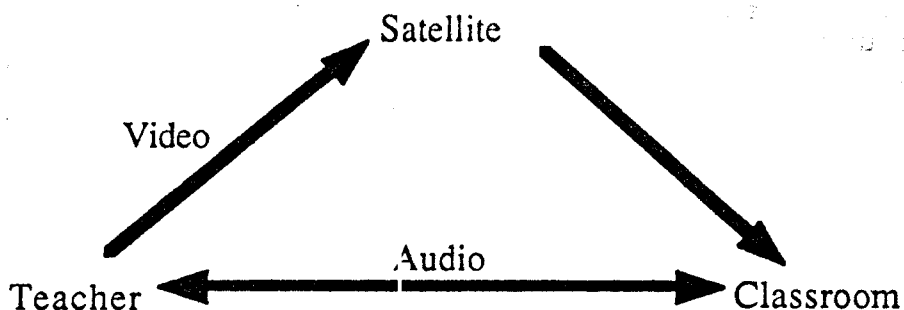
Stoffel (1987) conducted research on practical strategies in distance education delivery used in the external degree programs at Saint Mary-of-the-Woods College in Indiana. She describes three critical factors important to teachers in meeting the needs of distance education students. These are: providing specific feedback on the student's work; being helpful and supportive; and being prompt in answering questions, correcting student work and adjusting or correcting teaching strategies that don't work. Germane to her conclusions is the notion of overcoming the distance factor separating teacher and student in distance education and working to eliminate the delays in response and the impersonal nature of teacher-student communications which can hamper the effectiveness of such systems.

Willis (1989), based on the extensive experience of the University of Alaska system in college level instruction via audio teleconferencing, offers a number of insightful suggestions for effective distance delivered instruction. He notes (p. 46) that, "In a 'traditional' classroom setting, the instructor (and students) are privy, on both a conscious and subconscious level, to various forms of input and feedback not readily available in a distance education setting. ... Research indicates that even when interactive technologies are used, such as audio conferencing or two-way television, the dynamics that result are different from those encountered in more traditional classroom settings. Despite the new challenges posed by teaching at a distance, there are a number of strategies that the distance educator can use to build teacher/student linkages and improve instructional effectiveness." In particular, he offers the following strategies to improve instructional effectiveness:

1. Get to know your students and let them get to know you early in the course;
2. Treat distant students as if they were in the same room by being polite, warm and responsive.
3. Keep your instructional program flexible by offering a choice of delivery methods, times, and post-presentation activities to maximize student learning.
4. Emphasize early in the course that you and the students are part of the same distance educator team.
5. When developing a distance delivered course, make sure that the context, as well as the content, is relevant to your students.
6. Be aware of and respect cultural differences in communication patterns.
7. If possible, visit and teach a class from each site one or more times during the course.
8. Provide opportunities and encourage students to use available technology to work among themselves.
9. As a teacher, strive to feel comfortable in the role of "skilled facilitator" of instructor as well as "content provider".
10. Technical problems will occur when using technologies. Don't be embarrassed or defensive when this happens. Work with students and technical staff to minimize the number of problems and have instructional contin-

- gencies planned for when "glitches" occur.
11. Even in your "lectures", be sure to build in opportunities for discussion and interaction.
 12. Break presentations into small content blocks interspersed with interactive activities.
 13. Begin each class with a statement of purpose or objectives.
 14. Follow an outline that has also been provided to the students. Periodically refer to your place in the course's organizational scheme.
 15. When teaching in an interactive mode, give students enough time to respond to the questions you pose. Don't be afraid of silence.
 16. If you are having difficulty getting students from some sites to respond, don't hesitate to call on specific students by name.
 17. As teacher, it is your job to firmly control "verbal traffic" by regulating which sites (and students) have the "floor".
 18. While in the midst of course planning, realize that it will typically take longer to present a course lesson in a non-traditional mode as opposed to a traditional teaching format. Don't attempt to move through the content with unrealistic speed at the expense of student comprehension.
 19. Be yourself and relax. It makes your students feel more comfortable and the course more enjoyable.
 20. "Don't feel obligated to recreate traditional instructional methods in a non-traditional, distance education setting. Rather, minimize the difficulties inherent in distance education through effective planning, and constant feedback, while enjoying the unique opportunities that distance education offers."

A. Teacher Training
TI-IN, United Star Network, Education Service Center 20, San
Antonio, Texas, TI-IN (1990)



Subject: Courses and in-service training for foreign language teachers.

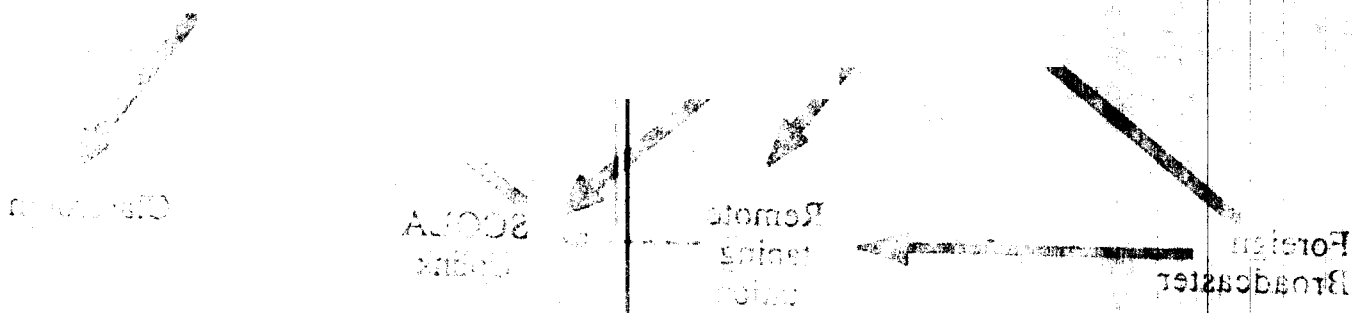
Technologies: Video programming is distributed by satellite. Two-way audio is provided through an audio bridge with sites interconnected through the telephone system. Data transmission using computers and electronic writing tablets is incorporated.

Rationale: The TI-IN, United Star network provides teacher training in the areas of mathematics, science and foreign languages under a \$9.7 million STAR schools grant (see Withrow, 1990) from the U.S. Department of Education. In addition, the network offers some college credit courses related to the teaching of foreign languages. Participating with Education Service Center 20 in San Antonio, Texas, the agency which developed TI-IN, are the following agencies or institutions: the University of Alabama; California State University at Chico; Western Illinois University; Mississippi State University; North Carolina Department of Public Instruction; Texas Education Agency; and the Illinois State Board of Education.

Course Format: Semester-long college credit courses entitled "Foreign/Second Language Education: Current Research and Development" and "Foreign/Second Language Education: Methods" were offered over the TI-IN network in the Spring semester, 1990. Chico State University was the course provider. Shorter workshops (e.g., 18 hours of instruction) were

offered for foreign language teachers in areas such as Foreign Language in the Elementary School (North Carolina Department of Public Instruction), and "Foreign Language Alternatives Lab".

Evaluation: Not available in information reviewed.



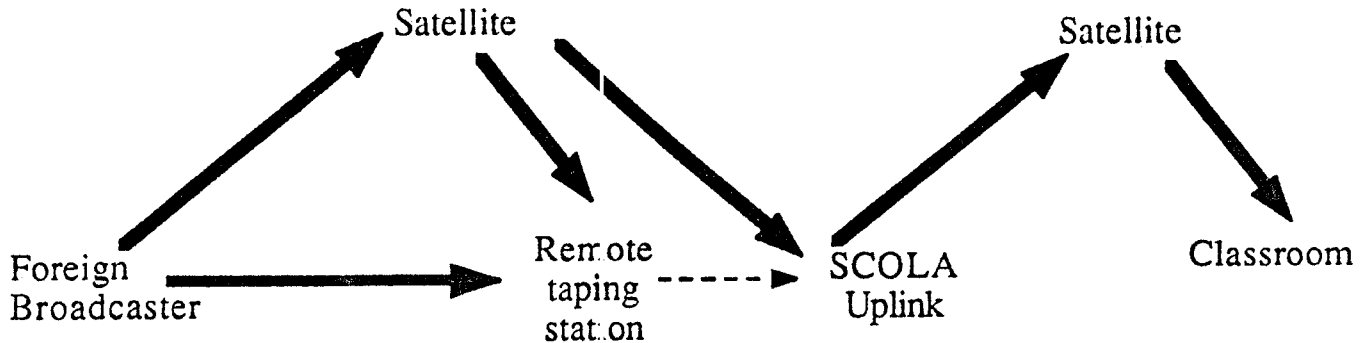
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B. Distribution of Instructional Support Materials

Satellite Communications for Learning Associated (SCOLA),
Creighton University, Omaha, Nebraska, SCOLA (1990).



Subject: Authentic foreign language video material to supplement college level foreign language instruction and government language training. A consortium of colleges and universities was formed in 1983.

Technologies: SCOLA completed its "Global Network" in 1987, including C-band satellite downlink earth stations in England, Sri Lanka, Japan, and Florida; and a downlink and uplink in Omaha, Nebraska. Video format conversion equipment is also located in Omaha. Data transmission of accompanying text materials is included for some video programs. Receiving site equipment includes a 10 foot C-band satellite dish, receiver, amplifier, television monitor, videotape recorder/players, and, optional data reception equipment.

Rationale: The project was undertaken to help students develop a broad international awareness of peoples and cultures in the full spectrum of political, economic, and social interdependence. It provides language departments of participating U.S. colleges and universities with a wide range of authentic journalism for instructional purposes. The project also serves the needs of DoD and other federal agencies for the supplemental language training materials. Since some federal project funding is provided to SCOLA, DoD and other government users are currently allowed access to the broadcasts (basic service) at no cost. Other users pay a fee to the consortium, based on the number of students served. The

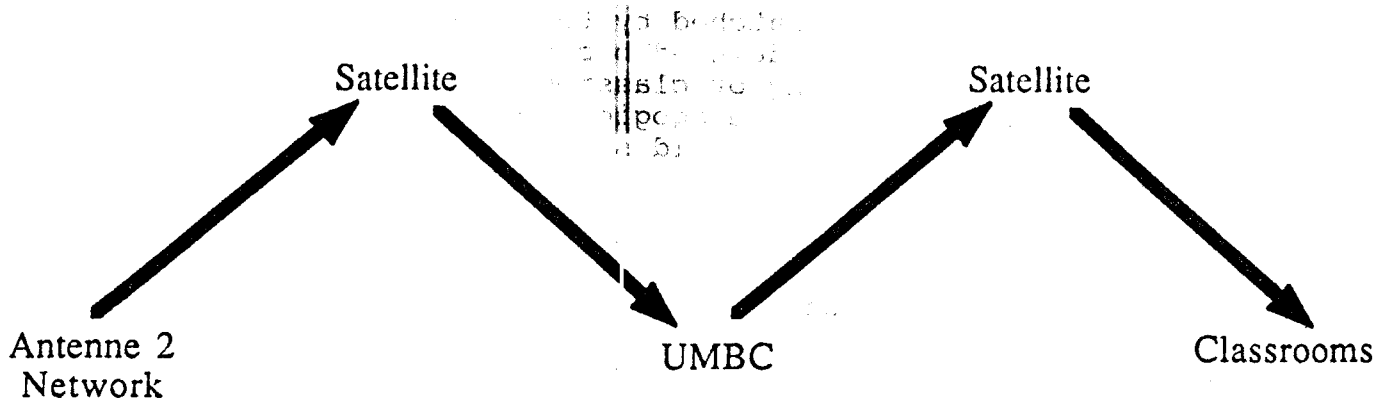
fee for service can run to several thousand dollars per year per school.

Description: Programs are broadcast via satellite in their entirety. They can be watched by teachers and students as they are broadcast (on a delayed basis) by SCOLA or they can be taped for later viewing or classroom use. SCOLA provides information on effective pedagogical uses and sponsors user conferences. SCOLA also provides some program transcripts, other written materials transmitted in hard copy or by data transmissions, and a periodic newsletter. Programming has been provided in a large number of languages including Arabic, Japanese, Chinese, Russian, Spanish, Portuguese, Italian, German and French.

Evaluation: SCOLA reports that several hundred sites use the service. Data on the pedagogical effectiveness of the materials were not available in the materials. Some copyright issues related to the repurposing of the video for instruction remain to be resolved (see Arnold, 1989 for further discussion of this issue).

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University of Maryland, Baltimore County, initiated in 1985, DuVerlie (1988).



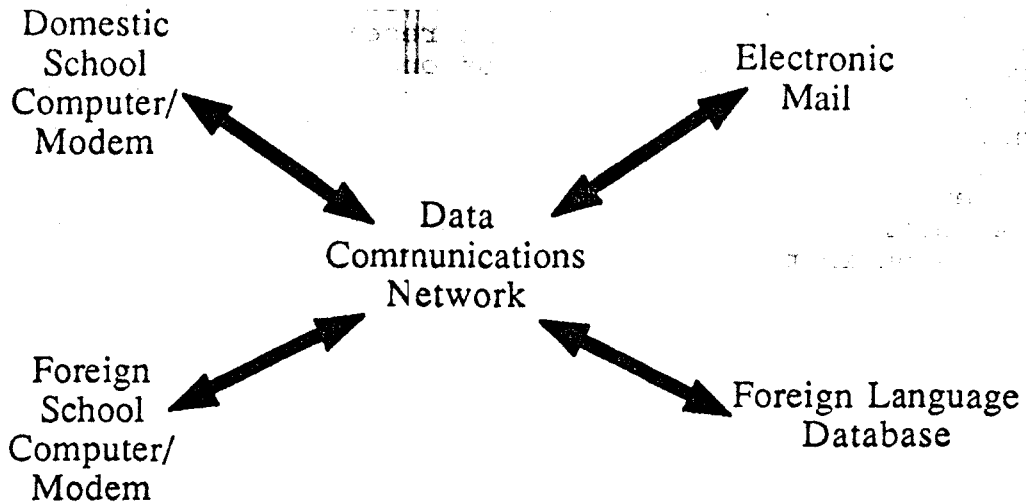
Subject: Authentic video material for high school, college, and university level instruction in French.

Technologies: Reception of video signal from the French, Antenne 2 TV Network, uplink of reformatted video programs to domestic U.S. satellite (Westar IV), C-band down link required on site.

Rationale: The paper describes a pilot project designed to determine the feasibility and desirability of providing satellite-distributed French video to 1) keep viewers on the North American continent abreast of current events and issues in France and the francophone world, 2) make these video materials available at minimal charge to the widest possible audience, and 3) present these news features in a format versatile enough to accommodate several levels of use in the classroom -- from viewing as a regular "TV show" to systematic pedagogical exploitation.

Description: Seven French TV magazine programs were distributed per year. The program took the form of sixty minute current French news and features broadcasts via satellite for use in U.S. classrooms. Programs were put together from programming received from the Antenne 2 French TV Network. Viewers were authorized to record programs and retain them up to forty-five calendar days after the date of recording and also to make copies to meet the legitimate needs of teachers. As of the date of the article, UMBC planned to develop and distribute supplemental print materials to be used with future programs.

The Role of Electronic Mail in Japanese Instruction, Lunde
(1990)



Subject: Electronic mail and its use in Japanese language instruction.

Technologies: Computer, modem, access to data networks.

Rationale: While it is relatively easy to send text using the 94 printable American Standard Code for Information Interchange (ASCII), seven-bit (maximum of 128) characters, it has proven more difficult to send text in the Japanese character set which contains some 6,877 characters (by Japanese Industrial Standards - JIS). To allow for data transmission, the Japanese have developed a system of representation using pairs of ASCII characters. Utilizing this and other knowledge about the transmission of Japanese text, foreign language teachers and students can use electronic mail for a number of instructional purposes.

Description: Electronic mail can be used for a number of instructional purposes including the following: 1) providing opportunities for foreign language students to improve their abilities in their target language through corresponding with penpals; 2) providing a means to administer and provide instructional support for correspondence courses; 3) accessing information services (e.g., the 122 newsgroups carried on the Japan UNIX News Network - JUNET); and 4) offering courses such as the Computer Assisted Composition in Japanese and Chinese course offered by the University of Toronto, Canada.

Evaluation: Lunde, a Ph.D. candidate in the Department of Linguistics at the University of Wisconsin, reports success in accessing the networks cited above and feels that the information they contain is potentially valuable for instructional purposes. He reports that the University of Toronto course has documented significant gains in student achievement.

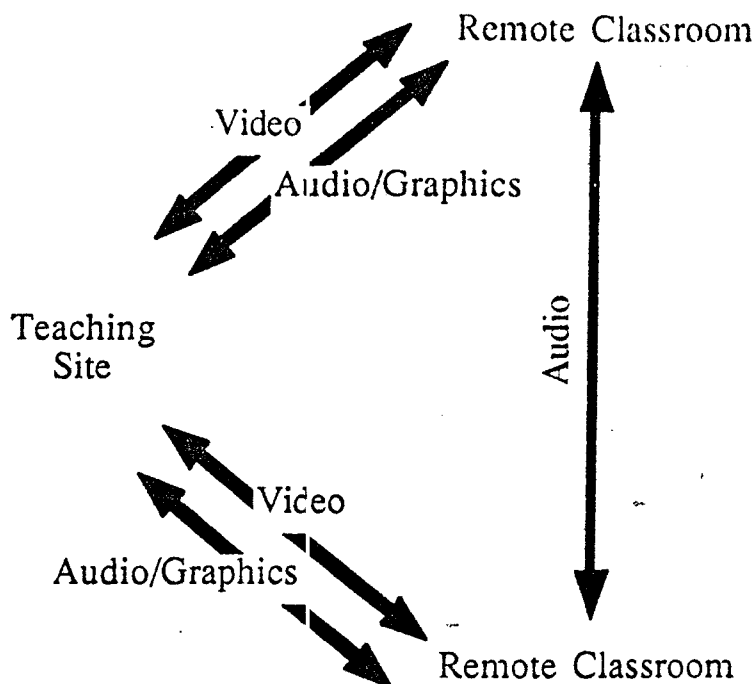
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C. Foreign Language Instruction through Distance Education

Defense Language Institute, Foreign Language Center, Non-resident Training Division, Arabic Course Pilot Project.



Subject: Two-week (15 hours) pilot test of interactive training in the Egyptian dialect of Arabic for U.S. Army Arabic linguists at Ft. Stewart, Georgia and Ft. Campbell, Kentucky. Four to five students participated in the training at each remote classroom site.

Technologies: Video teleconferencing (audio and compressed video) through DoD teleconferencing sites at Ft. Ord (teaching site), Ft. Stewart (instruction site), and Ft. Campbell (instruction site); audiographics between the teaching site and the instruction sites, and three-way audio connecting all sites.

Rationale: The purpose of this pilot test was to assess the feasibility of providing specific language training to assist U.S. Army linguists to maintain and enhance their global language skills in a category 4 language; Arabic, Egyptian dialect. A further purpose was to test the technology in the

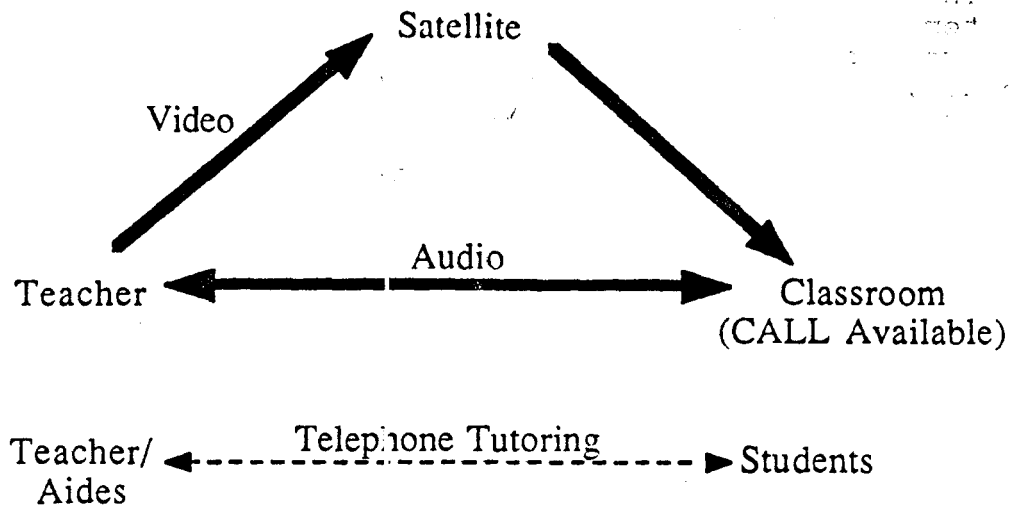
multipoint delivery of language instruction and to determine the feasibility of offering such training with existing DLIFLC staffing.

Course Format: Approximately 15 hours of teleconference-based training (generally two hours per day) was conducted during September 11-22, 1989. Sessions originated from the Ft. Ord teleconferencing center and were taught by experienced DLIFLC faculty. The format was small-group (four to five students per site), highly interactive, two-way video instruction.

Evaluation: The evaluation revealed both positive and negative findings as follows. On the positive side, the communication system had the capability to transmit and receive distance language instruction. The system could provide two-way interactive video between the teaching site at Ft. Ord and the instruction sites at Ft. Stewart and Ft. Campbell and audio interaction between all the instructional sites. The system also delivered and received audio graphics. On the negative side, there were technical problems. These include system breakdowns causing a loss of reception at the Georgia site, failure of VCR equipment to feed prepared video segments, audio delay, video delay, and phone ring interference. Two sessions were cancelled at the Georgia site due to the approach of Hurricane Hugo.

From an instructional perspective the project was reported to make it possible for three DLIFLC instructors to gain experience with the technology, work as a team in the development of the training, participate in the daily presentations, provide a variety of voices in the Egyptian dialect, and motivate the students toward the attainment of greater communicative skills. The conclusions about the study were that the teleconferencing technology appeared to work for Army linguist training, but the teleconferencing center setting is not optimal for originating instruction. For example, the origination of training from a video teleconferencing center, rather than a distance education classroom, restricted the instructor's mobility to the conference chair and table. Other conclusions were that the curriculum design and development must be carefully planned, instructors must be prepared to teach in a very constrained VTC environment, and instructors must be trained to respond quickly and positively to technical problems. It was also noted that training techniques must inspire active student participation. The students completing the training at Ft. Campbell showed an average pretest score (percentage correct on a 50-item oral comprehension test) of 26% and an average posttest score of 67% (DLIFLC, 1989).

Satellite Telecommunications Educational Programming (STEP), Educational Service District 101, Spokane, Washington, Talbot and Roscher (1989).



Subject: High school courses with college credit available in Japanese I and Spanish I and II.

Technologies: Classes originate from a fully equipped television studio. Technologies include Ku-band satellite uplink, receive-only satellite dishes at the classroom sites, television monitor and videotape player/recorders, toll-free telephone number for teletutoring.

Rationale: Many small rural high schools have difficulty in offering advanced courses in areas such as foreign languages. The system was designed to address this need, first in schools in the state of Washington, then in a number of other Western states.

Course Format: Televised presentations make effective use of audio and graphics. The teachers are selected for their ability to provide effective televised instruction. Students are assigned work in textbooks and furnished other specially designed materials. Tutoring is available from the Spokane-based teachers via toll-free telephone connections.

Evaluation: Student achievement is reported to be excellent although no actual data were available for review. System multi-state growth speaks to the growing interest in the

system. Individual schools pay a per student/per course fee plus a membership fee for the service. Given the number of schools participating on a pay basis, there appears to be support for the cost effectiveness of the system.



Teacher

Subject: Spanish

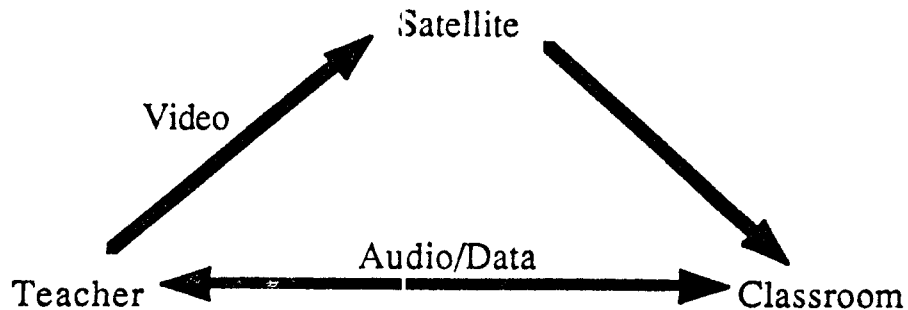
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TI-IN, United Star Network, Education Service Center 20, San Antonio, Texas, Barker (1987)



Subject: High school courses in French, Latin, German and Spanish

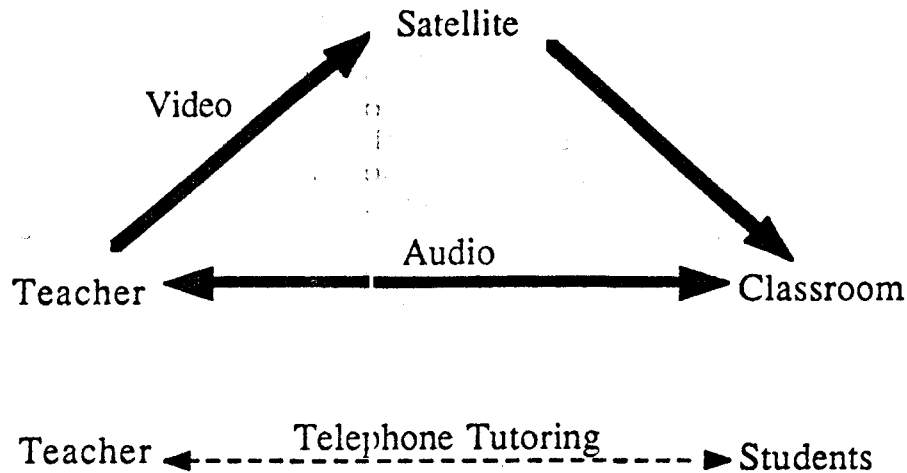
Technologies: Video programming is distributed by satellite. Two-way audio is provided through an audio bridge with sites connected through the telephone system. Data transmissions using computers and electronic writing tablets are incorporated.

Rationale: TI-IN reports that it is the largest and fastest growing of the interactive networks for high school instruction. It was designed to meet the needs of small rural schools facing the challenge of curriculum expansion or of providing staff development training. It offers low incidence courses or courses for which a certified teacher is not locally available.

Course Format: The classes include live teaching by video. Students at remote sites can ask questions of the teacher by telephone and these questions can be answered over the air. Alternatively, students can be addressed by name and asked questions. Their answers are then carried over the video network. Instruction is also supported by texts, written materials, audio tapes, and teletutoring via telephone.

Evaluation: Barker (1987) reports general evaluation results for the high school courses offered over the network. Some of his findings are as follows. School administrators hold positive views about the services offered by the system, are satisfied with student learning via this system, and feel that the cost of the system (annual fee and course fees) is

German by Satellite, Oklahoma State University, ASTN Network, Wohlert (1989).



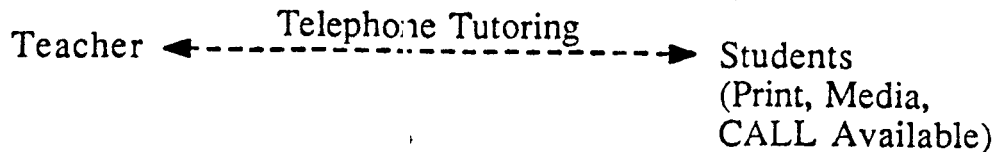
Subject: Two-year, accredited high school German course equivalent to a full-year college level course. College credit is available. Expansion is planned to include courses in Spanish and Russian.

Technologies: Video distribution by C-band satellite transmissions, interaction via telephone, standard college textbook, lab manual, workbook, audio cassettes for homework, CALL lessons including voice input/output. Equipment required at the participating schools includes a 10-foot satellite dish, receiver, amplifier, television monitor, videotape recorder/ player, audio equipment, and computers and modem.

Rationale: The ASTN network was developed to serve the needs of small rural high schools in low density courses in science, mathematics, and foreign languages.

Course Format: Twice weekly televised lectures are transmitted live from a studio on the campus of Oklahoma State University in Stillwater, Oklahoma. Each class day one high school (and now there are literally hundreds of schools that participate) is chosen to be the "host" school. The students at the host school are connected with the studio by telephone and interactively participate in the class presentation. Additional interaction occurs by toll-free telephone after the

Teacher-Assisted, Mastery-Based, Self-Paced Instruction (TAMBSPI) Project, Ohio State University, Twarog and Pereszlenyi-Pinter (1988).



Subject: Credit or non-credit continuing education, college level courses in Arabic, Czech, Chinese, Japanese, Polish, Russian, French and Spanish. Four quarters of instruction are offered in each language.

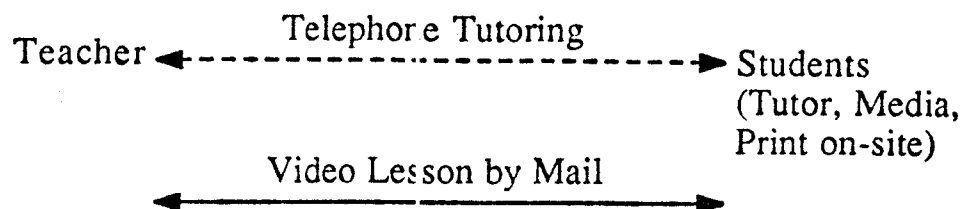
Technologies: Textbooks, audio tapes, programmed (sometimes computerized) supplemental materials, and teacher assistance by telephone are included.

Rationale: - Courses were developed to serve the needs of continuing education students requiring off-campus instruction in foreign languages.

Course Format: Courses use a self-study format. Students can work at their own pace, but are required to demonstrate mastery of one unit before proceeding to the next. In order to continue in the courses, students must complete at least two units of course credit per quarter. Students complete the written exercises and listen to the audio tapes. Tests are supervised by a proctor at the remote site. Telephone tutoring is one-on-one and is done in the target language as much as possible. The telephone center is open 14 hours per week during the evenings and weekends. Participating students were initially from the Columbus, Ohio area. In the second year of the project students were enrolled from six additional states.

Evaluation: Data are reported for the 1985 and 1986 calendar years. Student course completion rates were modest, but not atypically low for continuing education courses. Two forms of the TAMBSPI course were offered; with and without the availability of telephone tutoring. This enabled comparisons to be made between the two groups. Students in the telephone assisted course performed well on the oral tests (scores in the 90% to 100% range), but comparison data were not available

Televised Japanese Language Program, North Carolina State University, Kataoka (1986).



Subject: College-level, one-year Japanese language course.

Technologies: Videotaped class sessions, print support materials, audio interaction.

Rationale: An introductory course in Japanese was offered at colleges in the Southeastern United States which did not have a qualified Japanese language instructor on staff. The project was viewed as a stepping stone, in that the colleges were encouraged to hire their own Japanese teachers when they were able.

Course Format: Live, unrehearsed, highly interactive, classroom sessions are videotaped (three camera set, 3/4" videotape) at NCSU and unedited tapes then shipped to participants at ten universities and colleges in the Southeastern United States. Local representatives from the language departments at the participating universities coordinated the academic aspects of offering the distance education course on campus. Native speakers (though not trained teachers) of the language served as tutors at the remote sites. The tutors served as site monitors/facilitators and provided additional drills. A class session at a remote site consisted of the following: viewing the videotaped lesson; performing practice activities or drills developed by the NCSU instructors (many exercises contained visual aids which were sent to the remote sites); completing the same homework assignments as the on-campus students (homework assignments were graded by the NCSU instructors with several-day turnaround time); taking the same quizzes and exams as the on-campus students including the final oral interview (graded by the NCSU instructors); having access to special telephone office hours with NCSU instructors (via collect telephone calls); and participating in campus visits by the NCSU instructor.

Evaluation: Data are reported for the academic years 1984-1985 and 1985-1986. In comparison to NCSU students taking the course on-campus, no significant differences were found in major exam scores for the distance education students. Off-campus students actually performed better on 19 of the 24 quizzes given during the year. First to second semester attrition was no worse in remote sites than for the on campus students. Overall, student evaluations of the course were very positive. However, some students commented about the lack of immediate interaction with the instructor, lack of clarity of audio and video in the videotapes, and the lack of direct face-to-face interaction with the instructor.

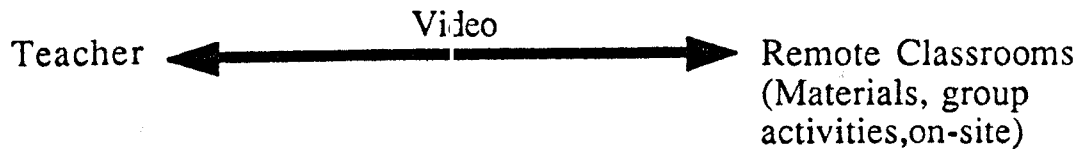
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Two-Way Instructional Television (TWIT) System, Wapello, Iowa County Schools, Volkman (1983) and Nelson (1985).



Subject: High school Spanish I-IV.

Technologies: Beginning in 1980, participating classrooms in four Iowa high schools were equipped with a color video camera, two unidirectional microphones, two wall mounted speakers, three 21" television monitor/receivers, and a master console. Video transmissions were by terrestrial microwave. The classroom camera at the teaching site was operated by study hall students. The total cost for the system was approximately \$250,000.

Rationale: Declining enrollments and reduced budgets in the small Iowa schools served by the project have made it difficult to offer a comprehensive curriculum, particularly where school consolidation is not a viable alternative. Upper-level foreign language courses have been most severely affected. The project demonstrated the use of two-way instructional television to address this problem. Four schools (some 6 to 27 miles apart) were served in the project.

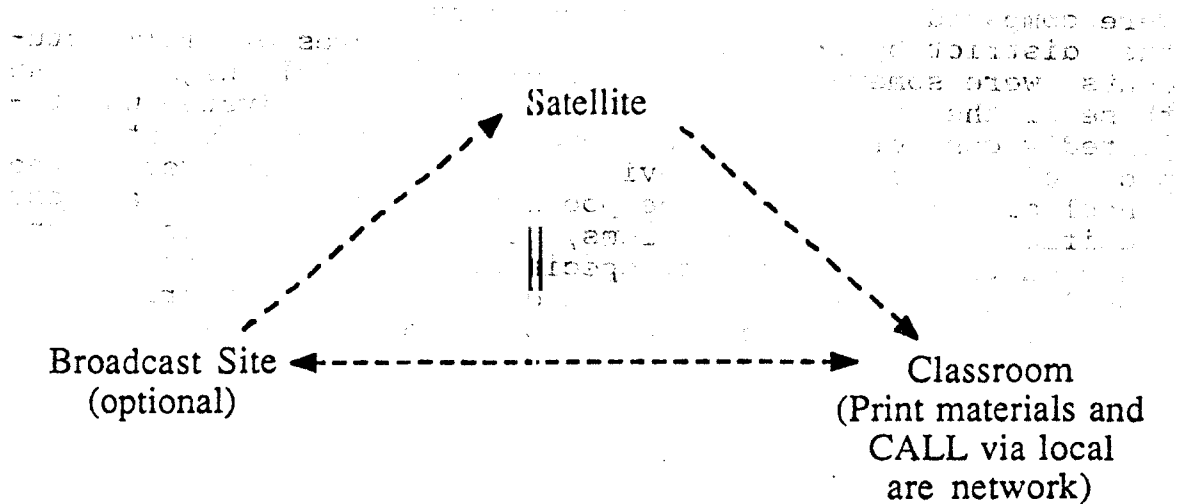
Course Format: The teacher held class at one of the four participating sites and was seen by students at all sites. Since the teacher could see and hear the students at the distance classrooms by two-way video, the students merely had to raise their hands to ask questions and participate in class discussions. The project attempted to develop special instructional strategies which made optimum use of the two-way technology employed. Special techniques were used for vocabulary reinforcement such as directed role playing and group "scrabble" games. Grammar practice activities included cooperative group sentences and focussing with a macro (close-up) lens on student worksheets for immediate correction by the instructor. Activities for oral work included translation exercises and conversational reviews. Cultural awareness activities were also included in the courses.

Evaluation: Teacher enthusiasm for teaching on TWIT was reported to be high. As a rule, TWIT classes appealed to the more highly motivated and conscientious students. This allowed schools to operate with limited classroom supervision. Student reaction to the courses was reported to be positive. When Spanish I TWIT students' scores on achievement tests were compared to those taking the course in other schools in the district by traditional means, the scores of TWIT students were somewhat (though not significantly) higher than those of the traditional class students. The system was reportedly cost effective, although no specific cost data were provided in the articles reviewed. Reported advantages to the school district included the pooling of resources to address specific instructional problems, freeing teachers to concentrate on their own areas of specialty, growth in student responsibility and independence, and breaking down barriers and increasing the level of cooperation between schools.

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"Se Habla Espanol": Interactive Learning Spanish Video/ Computer Course. A project of the Utah State Board of Education, International Business Machines Corporation, and Bonneville International Corporation (IBM, 1987).



Subject: High school Spanish, first year.

Technologies: The integrated course package requires video player and monitor and locally networked IBM PS-2 computers with speech capability, color display, and printer.

Rationale: The course package was developed through a cooperative effort of the Utah State Board of Education, International Business Machines Corporation, and Bonneville International Corporation. The purpose of the course is to provide high school Spanish instruction for schools without the foreign language teacher(s) necessary to provide conventional classroom instruction in the subject.

Course Format: The course package includes 69 videotaped lessons, computer based instruction (including speech capabilities), and cooperative learning activities. An on-site, certified Spanish teacher is not required for the instruction. However, a classroom manager is required to follow the lesson plans and to lead the instructional activities. The course emphasizes basic speaking proficiency. It also addresses listening, writing, and reading skills. The course provides an awareness of the Spanish people, their culture, and their contribution to world civilization. It was originally developed to serve students in remote areas and

includes an optional telecommunications component. Presently the course takes a prepackaged, stand-alone form for on site utilization. It is said to be appropriate for all high school students learning Spanish, regardless of location and with or without experienced Spanish teachers. The video lessons can be delivered by satellite, cable, or other means if desired. Alternatively, video cassette tapes can be played in the classroom.

The course design has six parts: introduction (advance organizer), relaxation (provides emotional support to develop confidence), active listening (students read slowly with the teacher), passive listening (students listen without reading), and guided practice (the teacher models activities through songs and games). IBM personal computers with speech adaptors and microphones support these components. They allow students to model their own pronunciation attempts after those of the master teachers who present the vocabulary in the video lessons.

Evaluation: The courseware has reportedly been successfully implemented as a two-year program in junior high school and as a one-year program at the high school level. The course reportedly provides accelerated learning with increased retention and represents a cost-effective alternative for instruction in schools. No specific evaluation data were available in the materials reviewed to verify these assertions.

9. Lessons Learned Regarding Foreign Language Training

The following generalizations are drawn from the case studies of distance education language instruction included in the previous section of the report:

- a. Language instruction can be supported or delivered by distance education technologies. That is learning supplemental to an ongoing program of instruction/training can be provided (e.g., foreign video broadcasts provided by SCOLA) or formal courses of study provided. As with other applications of distance education, there is limited rigorous evaluation evidence for the effectiveness of the systems. However, there is a growing base of evaluative and experiential information which encourages further development.
- b. The feasibility of delivering, via distance education technologies, a rich variety of instructional resources (e.g., foreign video) is amply demonstrated. The cost effectiveness and adaptability of these resources to classroom instruction have yet to be shown through rigorous evaluation. Various technologies have been used to deliver foreign language learning resources via distance education. Some copyright issues remain to be resolved.
- c. Progress is being made in demonstrating the feasibility of data communications for accessing/delivering instructional data resources for even the hard-to-learn category IV languages. The cost and instructional feasibility of the method have yet to be proven through rigorous research studies.
- d. The effectiveness of college level (distance delivered) language courses supplemented by videotapes, telephone, or computer communications is positively reported by distance education program managers.
- e. With assistance from the U.S. Department of Education STAR Schools Program, a number of high school foreign language video telecourses have been broadly distributed by satellite. These courses sometimes provide college credit and are favorably reported in the literature.

- f. The DLIFLC has demonstrated, on a small scale, the potential effectiveness of interactive video as a medium for refresher/enhancement training for practicing linguists.
- g. There is little in the literature to guide decisions about the specific pedagogical design of distance education courses for language training (e.g., the requirements for interactivity, individual vs. group learning time, optimal elements for off-line CBI, etc.). Nor is there a coherent adaptation of language learning theory to distance instruction. Theory formulation and research are needed.
- h. Interaction between the teacher and students and sometimes among students, is often stressed in foreign language instruction through distance education. Various technologies, including two-way audio, computer networking, toll-free access to tutors, interactive CBI, and videoconferencing have been used to provide the interactive component. Though not subjected to rigorous evaluation, each technique has reportedly been used with a degree of pedagogical success.
- i. Consistent with the research on distance education in general, foreign language students appear to prefer high quality face-to-face instruction where it is available. However, where such face-to-face instruction is not available, high quality foreign language instruction via distance education has been positively rated by students, teachers, and administrators.
- j. Again, consistent with general findings about distance education, foreign language learning appears to be most successful when it serves a compelling need and when the instruction is of high quality.

In summary, foreign language instruction has been provided through distance learning technologies. Various technologies, singly or in combination have been used with some reported success. Distance education can be used either to directly deliver instruction/training or to support its delivery through local programs. Research is needed to identify the conditions and strategies which provide for optimal effectiveness.

10. Evaluating Distance Education Programs

General Concerns

The importance of high quality evaluation of distance education is recognized by most who write about the topic. Evaluative and cost data are essential to the decision process regarding whether to implement and continue a distance education program. Because of the magnitude of the initial outlays for equipment and the level of organizational change often required to implement a distance education program successfully, skeptics and "nay sayers" abound during the planning stages. Thus, decision makers require hard information upon which to base the decision to proceed. During the development and operational stages of a distance education program, formative evaluation data are required for decision making and for fine tuning the system to best serve the needs it has targeted. And periodically, or at the close of a project with a finite level of funding, summative evaluation is usually needed.

To further define the issues in evaluating distance education, the Office of Technology Assessment contracted for a study of evaluation in distance education. The completed report, Clark (1989), offers a number of insights into the topic. Clark (p. 25) offers three major recommendations for evaluation of distance education projects. First, evaluation should begin at the start of distance learning program planning. An early commitment to evaluation will provide much more useful information about the strengths of a program as it develops. Changes can be made during the formative stage in time to strengthen the plan. The second recommendation is that all programs should adopt a multi-level evaluation plan. The different roles of qualitative (e.g., questionnaire) and quantitative (e.g., student achievement scores, monetary costs) data should be decided. Delivery and instructional evaluation should be separated and a variety of goals assessed. Finally, new techniques are available for cost-effectiveness evaluation of distance learning programs. Levin's (1983) "ingredients" method is suggested.

The early involvement of the evaluator at the planning phase of the project allows the evaluator to be aware of such issues as the set of conditions being replaced by the distance education program, the specific problems to be solved, the baseline data, the views and impressions of the stakeholders and the alternative solutions that were proposed. Early

evaluation makes it possible to determine which aspects of the program are positive and which are negative. Negative aspects can be modified and positive aspects emphasized.

Clark suggests separating questions about delivery vs. instruction in evaluating distance education systems. For example, satellite systems provide a way of delivering schooling, whereas particular courseware used (e.g., German by Satellite from Oklahoma State University) constitutes an instructional use of technology. There are different questions to be addressed in evaluating these two aspects of distance education and they should be treated separately. Some examples (Clark, 1989, pp. 12-16) of questions about instructional technology objectives are as follows:

"Which of the curriculum and teaching method choices in a given distance learning program impacted student achievement and subsequent ability to use (transfer) the knowledge acquired outside of the instructional setting?"

"What impacted student and teacher motivation to learn and invest effort in making this program a success?"

"Which of the curriculum and teaching method choices in a given distance learning program impacted student and teacher values for what was learned and subsequent motivation to teach and learn and to use what was learned outside of the instructional setting?"

"Which of the curriculum and teaching method choices in a given distance learning program impacted the cultivation of different kinds of knowledge including procedural skills and higher order thinking, learning-to-learn, and metacognitive skills?"

Some evaluation questions about delivery technology (Clark, 1989, pp. 17-19) would be as follows.

"Did the distance learning media maximize student access to new, and/or high quality courses and teaching when compared with other choices?"

"Did the media influence the utilization of school and community educational resources (e.g., space, equipment, skilled teachers, new courseware developed at one site but not readily available at others)?"

"Are distance learning media more reliable than other alternatives?"

A multi-level evaluation plan is recommended, one that addresses both overall project objectives and participant reactions. Participant reactions are useful, but not in providing the hard information often required concerning the degree to which project objectives are met. However, participant reactions are especially useful in uncovering unanticipated benefits and problems. These items are often essential to project management decisions and serve as input to other formal aspects of the project evaluation.

Consistent with good practices in educational research and evaluation, the reliability and validity of questionnaires and various measures of program success should not be overlooked in evaluations of distance education systems. Clark emphasizes the importance of valid and reliable measurement to internally and externally valid evaluation.

Cost Analysis

At the same time that effectiveness data are collected, Clark emphasizes that a parallel effort should be undertaken to collect cost data both for the distance learning program and for traditional or alternative means of instructional delivery. In combination, these will allow for a cost-effectiveness analysis and for the computation of comparative cost ratios which are useful in organizational decision making. Suggested categories of cost data to be collected for such analyses are as follows:

1) Delivery technology costs. Here Clark suggests that the evaluator explore the costs of alternatives. "In many cases, older technologies (e.g., tutors, books, cassette television programs, the mail system) are cheaper in monetary cost, but very expensive in delivery time and reliability. Evaluations of costs should always consider trade-offs with cheaper and more traditional delivery options. There are evaluation data which indicate, for example, that tutors who are trained and paid minimum wage may be cheaper than computers for some instructional purposes."

2) Instructional technology costs. Some teaching/learning tasks are more complicated and time consuming than others. One needs to be careful to specify what the required

outcomes are for a particular system. The cheapest, quickest or least painful option may not be best when addressing complex learning tasks. This is particularly true if the instructional goal is not reached through the instruction. For example, a military unit may wish to compare a distance learning system for language training to its existing program using locally contracted instructors. However, if the current program is not effectively training the linguists in the unit, it is senseless to directly compare the cost of an ineffective program to that of an effective program option involving technology. One solution to the dilemma above is to compare the costs associated with the mastery of different learning or performance goals with different instruction/training methods or technologies. Said another way, care should be taken not to focus cost evaluations on isolated factors such as time savings or convenience at the expense of the quality of learning.

There are several methods to determine costs of providing instruction through alternative means. The ingredients method of determining costs was developed by Henry Levin (1983). It requires three steps. First, all of the ingredients for a proposed or comparison system are identified. Second, a valuation or costing of these ingredients is performed. And third, a summation of the costs is obtained to determine the cost of the intervention. Sometimes costs are directly determined, as in determining the cost of equipment (although amortization and other factors apply here). However, in the case of educational institutions, factors such as instructor time required for the project may require costing through other means (e.g., calculating what is given up when a teacher is required to spend time on the project).

Ingredients may be listed in a number of ways. Levin suggests the following as a way to categorize ingredients of distance education programs: 1) personnel; 2) facilities; 3) equipment; 4) materials and supplies; and 5) all other.

The Batey and Cowell (1986, p. 25) report provides an alternative, but compatible, listing of cost categories. The category descriptions are directly relevant to distance education programs. This categorization of costs could profitably be integrated with the category breakout above to provide a more detailed understanding of the costs of a distance education program. The list suggested by Batey and Cowell is as follows:

1) Capital costs. Money that must be spent on hardware -- the actual equipment or facilities. Examples are satellite receivers, audio conferencing systems, mobile delivery equipment, facility construction and/or remodeling and the like. These costs go down when they are amortized over the life of the equipment or facility.

2) Development costs. These are the costs for putting the system into motion and getting the first presentation ready. These costs may make a distance education program more expensive in its first year of operation.

3) Operating and maintenance costs. These refer to money needed to keep the system operating smoothly and effectively once it has begun. These are recurrent costs.

4) Marginal costs. These are the costs to add additional sites, courses, or students to the system. They are costs associated with expansion of the system.

Economists have dealt with a number of other factors in determining costs of a system. While it is not feasible to deal with these in detail, it is important to mention a few others for consideration. There are time and social costs in implementing a system of instruction. Time and energy are needed to plan, develop and implement a distance education program. Social costs may include dislocation of staff, the confusion and sometimes hard feelings engendered when procedures and behaviors must be changed, and the necessity for explaining new programs to the larger community and enlisting its cooperation. There are opportunity costs. By committing staff time and resources to one course of action, other possible courses of action are often forfeited. The question is, what is lost by not being able to pursue other potentially valuable courses of action? This is not to say that "no action" is necessarily the best course of action. It is merely to say that one needs to be aware of what one is giving up in pursuing what appears to be the "best" course of action, when making decisions regarding change.

Summary

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This report presents a review and synthesis of the literature on distance education and foreign language instruction. A set of ten questions is addressed in the report. The resultant answers to these questions are summarized below.

- 1) What is distance education? What are its roots and what are its current directions? What does the future hold?

Distance education is defined as teaching/learning situations in which the teacher and learner are separated during the instructional process. Its historical roots are in correspondence study, but the emergence of modern communications and computing technology has allowed enormous improvements over the traditional print/audiotape format for correspondence study. The technologies that support distance education are developing rapidly. Distance education providers and services are growing rapidly. Distance education can play a key role in addressing the needs of adult learners in the information age.

- 2) When is distance education appropriate?

Learners tend to prefer face-to-face instruction, where high quality instruction is available locally at times and places convenient to the learner. Where such face-to-face instruction is not possible or practical, distance education has been shown to be a viable alternative for education and training. Distance education can provide standard courses of instruction. However, in the broader context, it can improve access to instruction/training, provide access to subject matter experts and role models, provide interaction and joint activities with students at other locations, and increase access to information and instructional resources. Functions of distance education can be to provide whole language courses, partial course materials, enrichment materials, training and staff development, and student/professional communications. Six illustrative potential uses of distance education for DLIFLC nonresident training are presented in the report.

- 3) Is there general evidence on the cost-effectiveness of distance education? What does it indicate?

Additional rigorous research is needed in distance education. However, a consistent finding in literature is that well-designed distance education is as effective as (sometimes more effective than) conventional face-to-face instruction. This appears to be true in all areas of application including language study and military training. Distance education start-up costs are substantial and continuing operational funds are needed. As an add-on to an existing program, without replacement of current functions, it can sometimes be expensive. However, as a replacement for current functions or as a method to provide a new function, cost savings of perhaps 2:1 to 3:1 are reportedly realized in comparison to traditional methods, especially where students are geographically dispersed.

- 4) What are the general factors that contribute to the success of a distance education system? What should you do to make such a system work?

Successful distance education systems address a valid, identified need or set of needs. Funding for such systems includes initial capital resources, development resources, and continuing operational resources. Successful systems tend to start small and then build upon their success. The systems require the cooperation of participating groups/agencies at all relevant levels. Successful systems incorporate a combination of technologies selected to meet the essential instruction/training requirements, rather than a single technology. Careful planning, management and evaluation are required. Successful instructional programs are well designed and grounded in current theory and practice. Motivated and competent personnel (teachers, curriculum specialists, evaluators, instructional designers, technology specialists, administrators, and local site facilitators) are needed to insure the success of a distance education system and the instruction/training programs it offers.

- 5) What technologies are used in distance education and for what purposes? What alternative configurations of technologies have been used? What is the relative cost of the technologies?

Two basic types of technology are used in distance education systems. Some technologies address the issue of reducing the distance between teachers and students and among students. These technologies generally involve some form of electronic communications. Other technologies are used at the learning site to enhance opportunities for student learning in an off-line mode. For effective distance education, technology mixes (with individual technologies selected based on their appropriate pedagogical roles) are desirable. In intermediate/advanced language instruction, distance education introduces higher requirements for interactive technologies.

Instructional technologies used in distance education broadly include one and two-way audio, one and two-way video, data communications, and supplemental technologies. Specific communications technologies include such items as satellite communications, terrestrial microwave, terrestrial broadcast, telephone, data transmission, FAX, compressed video, still-frame video, etc. On-site technologies include print, audio tapes, video tapes, computer-assisted instruction, interactive video disc, CD-ROM, etc.

Technology costs are dependent upon particular usage configurations. However, some general statements about costs follow. Computer technology is gaining in processing and storage capacity and, at the same time, costs are dropping. Communications technology costs often depend on distance, volume of information transmitted (e.g., phone is cheaper than television), and amount of time required for communications (thus one-way communications is generally cheaper than multi-point communications involving a high degree of interactivity). Special communications technologies are becoming available or are under development which offer cost savings (e.g., compressed video, use of vertical blanking interval, fiber optics, etc.). Satellite transmission costs may rise in the future due to additional demand vs. available capacity.

Many different technology configurations have been employed in distance education and each has its proponents. In general, the sophistication of electronic technologies tends to run ahead of the sophistication in their application to education/training problems. The level of theory development, design, and evaluation is not at a level sophisticated enough to easily determine

optimal configurations for alternative distance education delivery problems.

- 6) What factors should be considered in planning, designing, developing, and managing a distance education system?

Two types of factors are considered in the report -- (a) system design considerations and (b) instructional design and implementation. System factors include management considerations such as clear goal and objectives statements, gaining approval for the system, fitting the technologies to the intended uses, certifying and accrediting instruction, obtaining adequate start-up and operating funds, establishing formal agreements with participating agencies, mounting public relations efforts, establishing criteria against which to judge the success of the system, and establishing the means to evaluate it. Additional management considerations include appropriately locating the system within the organization, appropriately staffing it, establishing service priorities, establishing an approach to curriculum development, and developing mechanisms for field training and support.

Specific instructional program considerations include managing and supervising instruction, developing a means for institutionalizing the system, developing the necessary theory and procedures to implement the instruction, selecting purchasing and appropriately using the media components of the system, selecting and training competent instructors, selecting and training site facilitators, and developing and implementing student support mechanisms.

- 7) What factors should be considered in designing effective distance education courses? (Including instructional design, appropriate technology use, and factors related to the learning site, the teacher and the student.)

Key to the success of a distance education system is the quality of instruction it delivers. In the case of language instruction/training delivered by distance education, there lacks a coherent theory of instruction which shows clearly the match between the components of language learning and the technological capacities available in distance education. The report discusses factors

reported in the distance education literature including general instructional design considerations, use of advance organizers, and practical strategies for interactive instruction.

- 8) What specific information is available regarding the teaching of foreign languages through distance education?

Instructional applications from the distance education literature are presented in the report. Three categories of language instruction are exemplified. These include: teacher training; distribution of instructional support materials; and foreign language instruction through distance education.

Teacher training is exemplified by the language teaching courses and in-service teacher training provided by the TI-IN Network in San Antonio, Texas.

Distribution of training support materials is exemplified by the SCOLA Network at Creighton University; the distribution of foreign language videos by the University of Maryland, Baltimore County; and a project by Lunde involving the use of foreign language data transmissions.

Foreign language instruction through distance education is exemplified through: the DLIFLC Arabic Teletraining Project; the STEP Program in Spokane, Washington; the TI-IN Network; the ASTN Network at Oklahoma State University; the Televised Japanese Language Program at North Carolina State University; the TWIT System of the Wapillo, Iowa County Schools; and the "Se Habla Espanol" course developed by the Utah State Board of Education, IBM, and the Bonneville International Corporation.

Each of the above projects reports some degree of success in offering distance education for language instruction. However, the specifics of the technical and instructional design considerations are not well documented. Nor are comparative data available to judge the adequacy of competing system designs. However, what is apparent is that, at least for the levels of language instruction addressed, distance education appears to hold considerable promise for language instruction.

- 9) What lessons have been learned about foreign language instruction/training in other distance education programs/projects that can be of help to DLIFLC in planning for possible use of distance education for its nonresident program?

The feasibility of utilizing distance education to address language-related staff training, instructional support, and course delivery has been demonstrated in various settings. Data communications, even for category IV languages appears feasible. Interactive video and video by satellite have been utilized with some success. Due to the pedagogical requirements of second language acquisition, emphasis needs to be placed on interactive technologies for higher-level language instruction. Language learning through distance education is most successful when it serves a compelling need and is well designed and delivered.

There is lacking a coherent theory and methodology for optimizing language instruction via distance education. This needs to be developed. Students of foreign language participating in distance education courses typically would prefer high quality face-to-face instruction if it were available. However, if it is not, students appear to perform well under distance education and enjoy learning by this means.

- 10) How should distance education programs be evaluated?

The importance of high quality evaluation of distance education programs is widely recognized. Both formative and summative evaluation are needed. Questions about the delivery system vs. the instruction should be separated in conducting the evaluation of a distance learning program. Both cognitive and affective factors need to be addressed. Sample delivery and instruction questions are included in the report.

Cost analysis is another important evaluation concern. The methodology for conducting a cost comparison analysis is outlined in the report.

The importance of the early specification of criteria for program success and the early and continuous involvement of the evaluator is also stressed in the report.

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