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The Effect of Instructional Presentation on Student Satisfaction and Performance as Demonstrated in an Electronic Distance Educational (EDE) Delivery System

R. Alan Seamons
Utah State University

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THE EFFECT OF INSTRUCTIONAL PRESENTATION ON
STUDENT SATISFACTION AND PERFORMANCE AS
DEMONSTRATED IN AN ELECTRONIC DISTANCE
EDUCATIONAL (EDE) DELIVERY SYSTEM

by

R. Alan Seamons

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF EDUCATION

in

Instructional Technology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah
1987
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Michael, Kathrine, Rachel, John and Jacob, for their understanding, sacrifices, and support of Daddy and his quest, and to their mother, my wife, Cindy, who gave it all meaning.
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ABSTRACT

The Effect of Instructional Presentation on Student Satisfaction and Performance as Demonstrated in an Electronic Distance Educational (EDE) Delivery System

by

R. Alan Seamons, Doctor of Education
Utah State University, 1987

Major Professor: Dr. Brenda Branyan-Broadbent
Department: Instructional Technology

The purpose of this study was to gain insight into the emerging field of electronic distance education (EDE) so as to improve and enhance the delivery of educational programs utilizing EDE. The study was conducted at Utah State University, using an EDE-method (COM-NET) as the research setting. Thirty-seven instructors taught 45 courses over the COM-NET system from Fall quarter, 1985 through Summer quarter, 1986.

The design of this study was based upon simple correlation coefficient matrices and the subsequent prediction models of multiple regression analysis. Contextual data were gathered from a solicited instructor self-reporting instrument. The objective was to identify potential relationships between teaching styles and instructional utilities employed on student satisfaction and student performance in an EDE-based learning system. Teaching style data were gathered using the Gregorc Style Delineator (GSD). Instructional utilities data were gathered using the Instructional Utilities Inventory (IUI). Student satisfaction was measured
using the USU course evaluation form and student performance assessments were made by using mean grades for those courses taught via COM-NET during the time period of concern in this study. The Abstract/Random teaching style had an effect on student satisfaction. Discovery techniques had an effect on student performance. The Abstract/Random and the Abstract/Sequential teaching styles utilized abstract devices.

Instructors were generally enthusiastic about their COM-NET teaching experience. The need for improved on-campus administrative awareness and support in terms of released time and money were identified as measures to improve the system. Instructional flexibility was stressed as important. The COM-NET students performed as well as on-campus students, due in part to their maturity and experiences.

It was concluded that instructional presentations have a significant effect on student outcomes. Given the emerging EDE methods more study is necessary to determine precise instructional procedures which result in improved student performances when learning via an EDE system.

(207 pages)
CHAPTER I
STATEMENT OF THE PROBLEM

Introduction

If humankind's entire history was represented by one month, then for 29 days and 22 1/2 hours people would have lived as nomadic hunters and gatherers who existed at the mercy of the environment. For 1 hour and 24 minutes of this period, individuals would have been engaged in agriculture and building of cities for trade and protection. Four minutes of this month represent the time since the Renaissance wherein modern nations developed and serfdom and slavery were eliminated. For 1 minute and 10 seconds humankind would have lived in an industrial age and the remaining 50 seconds would have brought about the advent of the "information age", which was ushered in by the advent of the telephone. It is interesting to note that out of the final 50 seconds, only 12 seconds cover the period of time of the computer and space exploration (Pelton, 1981).

At the heart of the information age are both the computer with its ability to store, manipulate, and generate millions of bits of information and the new communications technologies which can link the growing wealth of information to the people who need it. These systems have generated and delivered information which resulted in its compounding. The ultimate limits for the growth of information lie in the capacity of the potential users and the time allocated for reflection, analysis, and integration (Branscomb, 1979). Branscomb has maintained that rather than being useless
information, there are only people who have not yet learned how to use it.

As chief scientist for IBM, Branscomb (1979) further maintained that:

Information is so far from being scarce that it is in "chronic surplus". Science is far from discovering all of the laws of nature but the "yawning chasm" between what is already known by some but not yet used by others is growing exponentially (p. 148).

At the onset of the information age, Whitehead (1931) warned that society was experiencing an age when the duration of major cultural change was shorter than that of an individual's life. The pre-packaged parcel of skills and knowledge gained during youth's traditional education experience now falls short of sustaining individuals throughout their lifetimes (Silva, 1973). Many fundamental axioms of traditional education have crumbled and have been replaced by the notion that education is a process which continues in one form or another throughout an individual's lifetime. Its purpose and form of delivery must be adaptable to the changing needs of the individuals (Cremin, 1976).

Adult Education

"Rapid change poses great psychological, intellectual as well as adaptive threats to those involved" (Cropley, 1963 p. 512). This is not to suggest that change is entirely bad or that it should be resisted, as Berlyne (1960) has shown certain levels of uncertainty and unpredictability energize learning and without which a condition of stagnation could result. Adult education has risen from a perspective that learning promotes controlled change resulting in adaptation which continues throughout an individual's lifetime. "Adult Education is a process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values or skills" (Darkenwald &
Merriam, 1982, p. 9). Other terms related to adult education include: continuing education, life-long education, recurrent education, non-traditional education, and androgogy.

National Commission on Excellence in Education stated in its report *A Nation at Risk*: "In our view formal schooling in youth is the essential foundation for learning throughout one's life. Without lifelong learning, one's skills will become rapidly dated" (National Commision on Excellence in Education, 1982, p. 15). Geograhic isolation of individuals in rural America impacts information access.

Although major studies show that our nation is undergoing a transition from an industrial-intensive to an information intensive society, the information/educational linkages have not yet reached the rural countryside. Throughout the United States, rural residents find themselves educationally disenfranchised and information poor; their opportunities for jobs, for improved economic status, for life-enriching experiences, and for adequate counseling and guidance concerning careers and employment are limited, if available at all. Rural residents who, because of employment, family responsibilities, personal obligation or who live great distances from the metropolitan centers, are excluded from many of the educational opportunities necessary for economic survival or personal development (Western Rural Development Center, 1985, p. 5).

Adult participation in formal education has been increasing more than twice as fast as the population itself. It is estimated that 32 million adults participate in coursework (Harrison, 1979, p. 2). The return of the adult learner to formal educational settings has been attributed to a number of factors of which a few follow:

1. The aging American population due to declining birth rates, increased life expectancy, and the entry into adulthood of the postwar baby boom (U.S. Bureau of Census, 1980);

2. The changing status of women in advanced industrial societies (U.S. Bureau of Census, 1980);
3. Increased occupational mobility wherein it is estimated that a 20-year-old man will make up to seven job changes in the course of his working life (Witz, 1975);

4. Rapid technological and social change (Lindsay, Morrison, Kelley, 1974).

Not only has the amount of human knowledge continue to grow exponentially, but the structure of knowledge, technology, and work have become increasingly complex and specialized. Consequently, more people must continue to learn throughout their lives just to keep abreast of changing demands on their respective job skills. As a result of this increased need for information, new educational methods have been established.

Verner (1962) established a conceptual scheme for the identification and classification of educational processes, (i.e., method, technique, and device). Educational method is the relationship established by the institution with a potential body of participants for the purpose of systematically diffusing knowledge among a pre-described, but not necessarily fully identified public. Houle (1982) cautioned that appropriateness of any educational method must be determined by the institutional and learner needs. Verner (1962) defined technique as the relationship established by the instructional agent to facilitate learning among a particular and precisely defined body of participants in a systematic, specific situation. Techniques are the identifiable generally recognized procedures used by the instructor to achieve specific educational goals or objectives. These techniques have been determined by analyzing the learner needs which determine the educational method and consequently the most appropriate instructional techniques to be employed. Verner
defined a device as a mechanical instrument or environmental factor which enhances the effectiveness and utility of techniques, but cannot independently function as a technique for the acquisition of knowledge. Devices do not teach in and of themselves. They are tools which embellish the techniques chosen for the specific educational method (Verner, 1962).

Historically, it appears that educational methods of instruction have been changing slowly yet constantly. For example, in the golden age of Greece and Rome, students came to the feet of the master teacher to be tutored individually. Through the didactic techniques that followed information was exchanged and ideas shared and expanded. During the Middle Ages, students became attracted to a particular educational center by the resident scholar or professor with vast areas of expertise, and the rare manuscripts they possessed. Students went from location to location in order to read manuscripts in the setting in which they were developed, sit at the feet of the master teacher, and gain access to his wisdom. The emergence of devices such as the printing press effected the type of educational experience just described. It then became possible for the once scarce manuscripts to be duplicated and stored in libraries (Putnam, 1896). The mass duplication of books and manuscripts made it possible for other individuals to have access to this knowledge and information. It soon became possible for manuscripts to be read and studied at home.

The dawn of the 19th century brought the advent of a reliable mail service which introduced to the world of learning the concept of distance education in the form of correspondence study. Now an individual could enroll in a course without actually attending a formal class. Instead of the student searching out the educational centers as in the past, educational institutions began to deliver coursework to potential students where they
lived. A fundamental difference between the traditional method of instruction and this new distance educational method was the lack of direct, instant feedback from the instructor.

Between 1920 and 1930, adult education began to take advantage of radio broadcast. From 1932-1938, using the newly-invented television, the State University of Iowa began broadcasting courses to learners in distant places. The Chicago Television College of 1956 was the first large-scale televised distance educational effort in the U.S (Peterson, 1979). The 1970s and '80s may be called the decades of devices, generating information and enabling the emergence of many new possibilities for electronic distance educational methods.

Over the last 100 years, the traditional face-to-face instructional method has been the state of the art in learning experiences for the individual. With the advent of Electronic Distance Educational (EDE) methods, questions of educational soundness arise. Fundamental to this issue is the subject of learning, what it is, and how to best accomplish it.

Studies of adult enrollment in open and distant learning projects throughout the world have disclosed that the major obstacles to participation in study programs are distance, time, age, expense, and fatigue (Hammer & Shale, 1981). These barriers are being addressed by emerging communication devices. Video networking, interactive video, computerized educational delivery systems, compressed video, audio teleconferencing, and full motion video over microwave satellites or fiber optics have been designed to help deliver education and training to learners who are geographically remote. Norwood (1982) stated "couple the home computer with the telephone as well as the television and a vast storehouse of information is unlocked" (p. 21). The fundamental purpose of these
information delivery devices is to overcome the distance between the source of information, generally the instructor, and the potential recipients of that information.

Mueller (1983) stated in a speech delivered at the 1983 meeting of the American Association of Higher Education:

Faced with this greater demand for up-to-date knowledge by an aging clientele, our delivery systems will have to change. It is inconvenient, expensive, and unnecessary for people to come to campus when they can be far more effectively served where they live and work (p. 93).

He further suggested that new delivery devices would broaden and expand the current learning environment rather than replace it.

**Instructional Theories**

Although philosophies of education vary, there are certain common principles of learning found in each. Ideas do appear to promote behavior as advanced by the liberal arts tradition (Adler, 1982). Dewey (1916), in his promotion of progressive education, maintained that experience is important in the learning process and given a variety of experiences, learners generate hypotheses and theories which take them beyond their present situations. Skinner's (1971), research on operant conditioning revealed that consciousless training is appropriate to maximize the effect while minimizing the effort expanded. Piaget (1952), in advancing ideas on structuralism, found that certain tasks were most easily learned at varying developmental stages. Maslow's (1971), humanistic approach stated that learning appeared to be cumulative in nature, thus stage-like progression through increasingly more advanced experience lead to deeper realms of thought.
Bruner (1985), in an address to the 1985 AERA annual meeting in Chicago stated:

There is no completely naturalistic way of resolving the question about what model of the learner we want to enshrine at the center of our practice of education. For there are many ways to learn and many ways of encouraging different forms of learning with different ends in view. At the heart of the decision process there must be a value judgment about how the mind should be cultivated and to what end (p. 8).

Learning can, and should, be a process with which to improve the state of those participating in the experience. Learning is something that the students do for themselves regardless of whether it is in a formal or informal setting; however in a formal learning situation the teacher has the responsibility to organize, stimulate, motivate, and evaluate. "The teacher is a learner and the learner is without knowing it, a teacher and on the whole the less consciousness there is on either side of either giving or receiving instruction the better" (Dewey, 1916, p. 160). Privately an individual can approach learning randomly or in a predetermined manner with predetermined outcomes. Independent learning can be as effective as formal institutional learning although the outcomes may be different. Educational delivery methods can, and should be, appropriately based on the individual recipient's needs in addition to institutional needs. It has been suggested that the most appropriate method and techniques be matched to the needs of the learner. Given the rural adult learner's informational needs in the communities of the nation and their inability to come to campus because of jobs and families (Kidd, 1973; Knowles, 1973; Knox, 1977), EDE methods become very appropriate (Hammer & Shale, 1981; Mueller, 1983; Norwood, 1982). In addition to the actual method, techniques and devices utilized, the cognitive styles of both instructors and learners are major variables to be considered.
Cognitive Structure

In any field of endeavor people can be identified with distinctive qualities or behaviors which are consistent through time and carry over from situation to situation. "Cognitive style is a pervasive quality that persists even though the content of what is being learned changes" (Fisher & Fisher, 1979, p. 246).

A variety of terms and behaviors have been identified and labeled by various researchers and authors over the past decade to identify these individual qualities and behaviors, they are:

1. Executive Control (Gagne', 1985)
4. Learning Style (Canfield, 1983; Kolb, 1976)
5. Teaching/Learning Style (Dunn & Dunn, 1979; Fisher & Fisher, 1979)
6. Teaching Style (Conti, 1978)
7. Mediation Style (Gregorc, 1986)

Although these terms differ slightly in actual process, they are highly similar in the notion that each individual processes information differently.

Romiszowski (1981) stated: "There are many ways of storing and cross-referencing knowledge. No person's conceptual schemata are identical to any other persons. We all make our own mental maps to interrelate what we have learned" (p. 78). Schema in an instructional setting are ways of structuring the factors considered important by the instructor. Teaching styles are hypothetical constructs which help explain
the teaching-learning process. There is a belief that teachers teach the way that they were taught or teach the way they learn (Fisher & Fisher, 1979, p. 245). Dunn and Dunn (1979) suggested, after many years of investigation, that instructors believe that the way they learn is the "easy" or "right" way and that they direct their students toward the same manner of acquiring knowledge (p. 238). Although an individual's style is as personal as his or her identity, it is believed that these differing styles can be categorized by certain similar constructs of behavior.

**Problem Statement.**

Formal education is dominated by three major variables, i.e., the instructor, the learner, and the educational environment or method. The interaction of these elements results in the degree of success or failure of any learning activity. As mentioned earlier, a growing variety of electronic devices have provided for educational delivery of information to students in remote locations from the instructor. This new method of instruction is referred to as Electronic Distance Education (EDE). Since EDE programs have increased, the study of the effects of varying instructor presentations has become necessary so as to better understand this new educational method. The on-campus measurement of successful delivery of instructional presentations are student satisfaction and student performance. Because EDE methods are new, there is virtually no information available on how instructional presentations implemented over them effect student satisfaction.

Although human information retrieval and processing are accomplished in similar ways by most individuals, they still maintain their uniqueness and individuality (Gagne', 1985). The cognitive styles of
individuals are the distinctive information processing abilities which have remained constant throughout time and situation (Dunn & Dunn, 1979; Gregorc, 1986; Fisher & Fisher, 1979). Based upon this individual uniqueness, the appropriateness of varying educational methods and the ensuing techniques and devices utilized should be determined.

Instructional techniques can be arranged on a continuum relative to the degree of student participation evoked, i.e., from exposition to discovery. Instructional devices can be categorized in terms of the degree of abstraction of the subsequent learning experience evoked by each, i.e., from concrete to abstract. Instructional utilities are the composite of both techniques and devices employed in an educational method. Instructional presentation is the composite of these utilities in conjunction with teaching style. Indications of the successful delivery of instructional presentation can be determined by two factors, i.e., relative student satisfaction and student performance. Student satisfaction is the degree to which the course adequately addresses the needs and expectations of the participants involved. Student performance is an assessment of how well the student meets the objectives of a given course.

**Purpose and Objectives**

The purpose of this study was to determine to what degree the varying teaching styles of the instructors, in conjunction with the subsequent utilities employed in EDE methods, influence student satisfaction and student performance. The objectives of this study were to determine if: (a) teaching style predicts student satisfaction, (b) teaching style predicts student performance, (c) instructional utilities predict student
satisfaction, (d) instructional utilities predict student performance, and (e) teaching style predicts instructional utility use in EDE methods.

Statement of Delimitations

The EDE network used to collect the data for this study was the Utah State University COM-NET telecommunications network. (For a detailed description of this network, see Appendices A and B).

Significance of the Study

Utah State University is the land-grant institution for the State of Utah. As a result, the entire state literally becomes a campus and its residents become potential students. USU has taken its land grant function as an important institutional role and as a result experienced a 97 percent increase in off-campus credit enrollments between 1979 and 1984 (Sleight & Tueller, 1984) outstripping both faculty and financial resources.

In response to increasing enrollments of students in communities at a distance from the University and to diminishing University resources, an EDE network known as COM-NET was developed and implemented in 1984. The COM-NET system consists of 13 outreach centers throughout the State of Utah (see Appendix C). Table 1 shows COM-NET use over the first six academic quarters it was in operation.
Table 1

**COM-NET Use By Quarter**

<table>
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<tr>
<th>QUARTER</th>
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<th>ENROLLMENT</th>
<th>WEEKLY HRS. ON SYSTEM</th>
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<td>Fall 84</td>
<td>35</td>
<td>284</td>
<td>33 Hrs/Week</td>
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<td>Winter 85</td>
<td>40</td>
<td>332</td>
<td>38</td>
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<td>Spring 85</td>
<td>38</td>
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<tr>
<td>Summer 85</td>
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<td>157</td>
<td>24</td>
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<tr>
<td>Fall 85</td>
<td>28</td>
<td>253</td>
<td>25</td>
</tr>
<tr>
<td>Winter 86</td>
<td>46</td>
<td>468</td>
<td>43.5</td>
</tr>
</tbody>
</table>


Enrollment increases were the catalyst which initiated the concern for learning effectiveness with this innovative technological system. Student satisfaction and student performance were used to determine this effectiveness. The relationship of varying instructional presentation on these two variables were the outcome of this study. Electronic distance education at institutions of higher education as well as in business and industry, is on the increase worldwide (Chute 1984). The results of this study were believed to contain implications for all EDE projects both nationally and internationally.

**Hypotheses**

Based upon the above stated purpose and objectives, the following hypotheses were stated:
Ho1 There is no significant relationship between teaching style employed during a given EDE course and student satisfaction with that course.

Ho2 There is no significant relationship between teaching style employed during a given EDE course and student performance for that course.

Ho3 There is no significant relationship between instructional utilities employed during a given EDE course and student satisfaction with that course.

Ho4 There is no significant relationship between instructional utilities employed during a given EDE course and student performance in that course.

Ho5 There is no significant relationship between teaching style and instructional techniques employed in EDE methods.

Ho6 There is no significant relationship between teaching style and instructional devices employed in EDE methods.

Definition of Terms

Terms pertinent to this study were defined as follows:

1. Adult Education is a process whereby persons whose major social roles, characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values or skills (Darkenwald & Merriam, 1982, p. 9).

   (a) Method is the relationship established by the institution with a potential body of participants for the purpose of systematically diffusing knowledge among a prescribed but not necessarily fully-identified public
(Verner, 1962, p. 9). Houle (1982) stated that the appropriateness of the method was determined by institutional and learner needs.

(aa) Distance Educational Methods are educational settings or environments in which the instructor and students are separated by distance and time. Its existence is based upon organized cost effectiveness with regard to time and money resulting in increased service to a clientele (Cowan, 1984, p. 1). Examples include: correspondence study, telecourses, telecommunications, and traditional class method.

(ab) Correspondence Study is a form of distance education initiated after the organization of a reliable mail service. Founded upon a "print-basis", the materials interaction is distributed through the postal service (Green Chair Group, 1982).

(ac) Electronic Distance Education (EDE) is a method enabled by the growing variety of electronic devices providing for educational delivery of information to students in locations remote from the instructor. Examples include networks of audio, computers, audiographics (i.e., electronic graphic boards and pads), slow-scan video and full-motion video (see Appendix D for detailed description of the EDE devices).

2. Mediation Style/Cognitive Style refers to the way an individual selects, encodes, stores, retrieves, and disseminates information. It is the identifiable distinctive information processing abilities in an individual which are consistent through time and situation (Fisher & Fisher, 1979; Dunn & Dunn, 1979; Gregorc, 1986). Other terms with similar meaning are executive control, cognitive structures, cognitive style, teaching style and learning style. There are two types of mediation styles, i.e., perception (Concrete&Abstract) and ordering (Random&Sequential), which appear to
be universal to all individuals despite race, nationality, or sex. By combining these two dualities, four distinct styles emerge: Concrete/Sequential (CS), Abstract/Sequential (AS), Concrete/Random (CR), and Abstract/Random (AR). Each of these combinations reveal a particular orientation (Gregorc, 1982). Most individuals are equipped with all four qualities yet may be predisposed strongly toward one channel and few are equally strong on all four channels (see Appendix H).

(a) **Perceptual Abilities** are the means through which the individual assimilates information on an abstract/concrete continuum (Gregorc, 1986).

(aa) **Abstract** ability is the means to grasp, conceive, and mentally visualize data through the faculty of reason and to emotionally and intuitively register and deal with inner subjective thoughts. The ability to apprehend and perceive that which is invisible and formless to the physical senses of sight, smell, touch, taste and learning is also characteristic of abstract thought (Gregorc, 1986).

(ab) **Concrete** ability is the means to grasp and mentally register data through the direct use and application of the physical senses. The ability to apprehend that which is visible in the concrete physical world through the physical senses of sight, smell, touch, taste and hearing is also characteristic of concrete thought (Gregorc, 1986).

(b) **Ordering Abilities** are the ways in which information is arranged and systemized in the individual for future reference and disposal emerging on a sequential random continuum (Gregorc, 1986).

(ba) **Sequencing** is the ability to grasp and organize information in a linear step-by-step methodical predetermined order. By gathering and linking elements of data together in a chain-like fashion,
information is assembled. The ability to express oneself in a precise, progressive, logically systematic manner is also characteristic of sequencing (Gregorc, 1986).

(bb) **Randomizing** is the ability to grasp and organize information in a non-linear manner making it possible to imprint mentally large segments of data in a fraction of a second. Information is held in abeyance and at a given time, all has equal opportunity to receive attention. The ability to deal with numerous diverse and independent elements of information simultaneously with multiplex patterns or data processing is also a characteristic of randomizing (Gregorc, 1986).

3. **Technique** is defined as the relationship established by the instructional agent to facilitate learning among a particular and precisely defined body of participants in a specific situation (Verner, 1962, p. 9). They are the identifiable, generally recognized procedures used by the instructor to achieve specific educational goals or objectives. These techniques are determined by analyzing the learner needs which determine the educational method, and consequently the most appropriate instructional techniques to be implemented (Houle, 1982). Instructional techniques appear to fall on a continuum relative to the degree of student participation evoked, i.e., from expository to discovery.

(a) **Expository Techniques** include activities in which the instructors' presentations are highly structured and the students are inactive recipients of the information presented. Examples include: lecture or discourse, demonstration, rote memorization, drill and practice, directional reading, student presentations, programmed learning, computer-assisted instruction, and rule application (Joyce & Weil, 1980; McKeachie, 1978; Romiszowski, 1981).
(b) **Discovery Techniques** include activities in which the instructor is a guide, or creator of learning situations and the students are active participants in their own learning experience. Examples include: independent reading, open discussion, brain storming, written activities, discussion groups, inquiry teaching, role playing, gaming, case studies, student projects, and field trips (Joyce & Weil, 1980; McKeachie, 1978; Romiszowski, 1981).

4. **Device** is a mechanical instrument or an environmental factor which enhances the effectiveness and utility of techniques but cannot independently function as a technique for the acquisition of knowledge (Verner, 1962, p. 10). Examples include: writing boards, overhead projectors, diagrams, pictures, slides, television sets, films, video tapes, realia, and computers (Cowan, 1984; Heinich, Molenda & Russell, 1982; Joyce & Weil, 1980; McKeachie, 1978; Romiszowski, 1981). Devices appear to lie on a continuum based upon the degree of abstraction of the experience evoked.

   (a) **Concrete Devices** are those materials which enable the learner to experience a relatively real multi-dimensional experience or "total situation" (Dale, 1969; Hoban, Hoban & Zissman, 1937).

   (b) **Abstract Device** are those materials which enable the learner to experience a symbolic representation of a real experience (Bruner, 1966; Dale, 1969).

5. **Student Performance** is an assessment of how well the student meets the objectives of a given course. For this study, the mean student grades and average (GPA) for the course taught on the EDE system were used to measure this variable (see Appendix L).
6. **Student Satisfaction** is the degree to which a course adequately addressed the elements which constitute a successful course. For this study the mean student satisfaction score for a given course was obtained from the standard university course evaluation form (see Appendix E).
CHAPTER II

REVIEW OF LITERATURE

The review of the professional and scholarly literature attempted to develop the relationship among the sociological aspects of adult education and instructional theory and the psychological aspects of cognitive structures. This chapter is organized according to these three major elements. In the summary comments are included regarding alignment between the above-stated variables.

Adult Education

Verner (1978) defined adult education as:

A field of social practice in which adults are provided opportunities for systematic education to meet their persistent need to learn. Systematic education incorporates planned, purposeful learning activities conducted under the continuing guidance of an educational agent who can influence the conditions for learning to increase the probability that learning objectives will in fact be achieved (p. 43).

Adult education can be traced back as far as the early 18th century, yet it wasn't established in the United States as a field of professional practice until the founding of the American Association for Adult Education in 1926. As Knowles (1964) pointed out, adult education is one of the newest fields of social practice in the United States.

Most of the significant research to date bearing on adult education was produced by social scientists in disciplines such as psychology and sociology. Thorndike (1928) demonstrated that an individual's learning ability increases to age 25 and that thereafter it declines very gradually. Thorndike continued his work on adult learning into the 1930s, focusing
on interests and motivations. Havighurst (1952) studied the developmental tasks associated with adulthood. He found that in most cases they related to the physical maturation, cultural pressure of society, and personal values and aspirations of an individual. Vaillant (1977), in an indepth longitudinal study of 95 Harvard graduates, charted the psychological development of adults. He concentrated on the subjects' adaptations to life demands discovering that adaptive style matures with age. Tough (1971) indicated that adults engage in a wide variety of learning activities in response to their daily needs and problems. He estimated that 90 percent of the adult population conducts at least one major learning effort a year, and that 73 percent of these are self-planned (Tough, 1978, p. 215). Recent research in the field of adult education indicated that adults, of all levels of intelligence and at all ages, are capable of learning and that they experience a sense of well being derived from learning (Gould, 1978; Levinson, 1978; Neugarten, 1968).

Knowles (1980) identified distinct differences between teaching approaches for adults, "androgogy", and those of children, "pedagogy". The term "androgogy" was defined as: "The art and science of helping adults learn" (p. 43). Androgogy is grounded in four assumptions: (a) adult maturity is characterized as a move from a dependent personality to a self-directed, self-actualizing one; (b) adult growth is enhanced by experiences which help to establish self identity; (c) adult readiness is closely related to the developmental tasks of his or her social role; and (d) adult time perspective changes from future application subject-centered, to immediate application problem-centered (p. 44-45).

Recent trends in adult education indicate rapid growth in participation since the 1960s. These increases, for the most part, can be
attributed to an aging American population. For example, in 1975 there were 19 percent more adults over age 17 than there were in 1969. The actual rate of adult participation in learning projects increased 38 percent between 1969 and 1978. Between 1969 and 1975, participation in adult education by women increased 45 percent, compared to an 18 percent increase by men. Participation by adults 55 years of age and older rose 55 percent between 1969 and 1975. The population of older people during the same time period increased only 11.5 percent (National Center for Educational Statistics, 1980, p. 250-263).

Technological evolution and advancement have led to the current information revolution. As information compounds exponentially, cultural adaptation becomes the major factor with which to contend (Kransberg, 1985). Education and training have been the prime vehicles to address this emergent problem. It would appear that if the "deep rooted technical and social factors that seem to be promoting this change continue, the future of adult education surely will be one of continued growth" (Darkenwald & Merriam, 1982, p. 123).

Formal educational institutions provided instruction to nearly half of all participants in organized adult education in 1978 (National Center for Educational Statistics, 1980). These included four-year universities and colleges, two-year colleges, and technical institutions as well as programs sponsored by public schools. Quasi-educational organizations are another major setting for adult learning. They range from cultural establishments such as the public libraries, service organizations, churches and synagogues to occupational associations, existing to advance the interests of their members (Darkenwald & Merriam, 1982). Many organizations use education to enhance their goals but do not have the end result of education
as their objective. As an example training in business and industry has mushroomed since World War II (Lusterman, 1977). Government agencies are another group of non-educational organizations which have become highly involved in adult education. These agencies comprise the second largest employer in the United States, with roughly one-fifth of the employees participating in organized learning activities annually (Peterson, 1979).

Barriers affecting adult participation in learning activities have been identified as lack of time, cost, home responsibilities, schedules, and job responsibilities (Carp, Peterson, & Roelfs, 1974; Johnstone & Rivera, 1965). Darkenwald and Merriam (1982) have classified four general obstacles to participation, i.e., situational, institutional, informational, and psychological.

1. Situational barriers are those aspects of an individual's life related to the social and physical environment. Examples include constant lack of time, transportation problems, child care, and geographical distance.

2. Institutional barriers are those difficulties created by institutions which designed or otherwise tend to discourage participation by certain groups of learners from attending educational activities. These can range anywhere from curriculum and scheduling to institutional policies and practices (Cross, 1979).

3. Information barriers result in a lack of awareness on the part of the potential student. This may be due to inefficient or ineffective advertising on the part of the institution as well as failure of many adults, particularly the lower educated and economically disadvantaged, to seek out and use available information (Johnstone & Rivera, 1965).
4. Psychological barriers are those individually held beliefs, attitudes, values and perceptions, which inhibit participation in any organized learning activity, lack of interest, age, and fatigue strongly affect participation (Mezirow, Darkenwald & Knox, 1975).

Verner (1962) established a conceptual scheme for the identification and classification of the adult educational processes, i.e., method, technique, and device. He defined method as "the relationship established by the institution with a potential body of participants for the purpose of systematically diffusing knowledge among a pre-described, but not necessarily fully identified public" (p. 9). Adult educational methods range from unsupervised, self-directed instruction where an individual learns alone to that of formal face-to-face traditional class with a wide range of methods in between. Distance educational methods are those adult educational methods in which there is a physical separation of the instructor and student (Keegan, 1983), and student/instructor interaction occurs with the aid of devices.

Verner (1962) defined technique as the "relationship established by the institutional agent to facilitate learning among a particular and precisely defined body of participants in a systematic, specific situation" (p. 9). These are the identifiable, generally recognized procedures used by the instructor to achieve specific educational goals or objectives. These techniques are determined by analyzing the learner's needs, characteristics, and learning objectives which determine the educational method and consequently most appropriate instructional techniques to be employed. Verner viewed techniques in a two dimensional sense: (a) the degree of student participation either permitted or required, i.e., exposition
to discovery, or (b) the degree of abstraction or removal from reality inherent in the technique, i.e., abstract to concrete (p. 21).

Verner (1962) defined device as a mechanical instrument or environmental factor with which to "enhance the effectiveness and utility of the technique, but cannot themselves function independently as techniques for the acquisition of knowledge" (p. 9). Devices do not teach in and of themselves, they are communication channels with which to embellish and enhance the techniques chosen for this specific educational method. Devices can be viewed on a continuum relative to the degree of abstraction and the learner experience provided.

Twenty-five years ago, Verner saw the possibility of emergent devices enabling the establishment of new educational methods, facilitating the interaction between student and instructor.

Unsupervised televiewing is not adult education even though a particular program may have an extremely high educational content . . . This does not exclude the possibility that at some future time we may develop processes (devices) that go beyond those now in use which would increase the adult educational quality of television (Verner, 1962, p. 4).

Thus a cyclical relationship was predicted within the scheme which is presently being realized with the influx of new communication devices into the world of distance education.

Correspondence Study

The dawn of the 19th century and the advent of a reliable mail service introduced the method of distance education in the form of correspondence study. This method is characterized by an individual enrolling in a course without personally attending classes. Print becomes the primary medium for instruction. All student/instructor feedback is done in a written, print format and then mailed accordingly. Most major institutions, especially
land-grant institutions, have highly integrated and functioning correspondence study programs established (Zigerell, 1984).

The statistics concerning correspondence study are impressive. Data gathered by the National Home Study Council (Lambert, 1983) showed 400 private home study schools enrolling three million students in about 600 areas of study. The number of adults studying by correspondence in Great Britain ranges from 500,000 to 750,000 annually (Boone, 1970).

Traditional correspondence courses are often supplemented by a variety of student support services, such as; television, newspapers, telephone conferences, seminars and so forth. These increase student/instructor interaction, either live or mediated, supplementing the print materials (Perry, 1977).

Perry (1977), the Chancellor of the British Open University, noted:

Correspondent study is characterized by a very large student drop-out rate. I am convinced that one reason for this is that many people lack the drive and dedication to maintain their work over a long period without an enforced pacing mechanism (p. 105).

The correspondence mode of instruction is highly self-directed and self-motivated. The "locus of control" or responsibility for the education resides wholly upon the student. This is in direct opposition to the K-12 mode of instruction where the responsibility for the education resides to a large part with the instructor. The instructor is present to motivate, encourage, and direct. In the correspondence study model of instruction, the teacher or instructor becomes a facilitator, moderator, or information guide as opposed to dispenser of information (Matarazzo, 1983).

Electronic Distance Educational Method

Because information has increased exponentially, the individual's need to assimilate a usable portion of that information has increased,
while the available time has diminished (Whitehead, 1931; Sartain, 1981). The removal of some of the long-standing barriers of time, distance and expense to the would-be learners has been accomplished by networking video, interactive audio and computers. Educators can now design systems that enable the delivery of education and training to adults at a distance, simultaneously meeting individual and institutional needs (Hawkridge, 1983). In a speech titled, "The Post-Gutenberg University" delivered at the annual meeting of the American Association for Higher Education, Mueller (1983) indicated that there will be a greater demand for up-to-date knowledge by an aging clientele. He stated: "In serving a different audience our delivery systems are going to change because it is inconvenient, expensive and unnecessary for people to come to campuses when they can be far more effectively served where they live or work" (p. 24). While this statement is not totally substantiated by research it does indicate that new communication devices have facilitated the emergence of a new educational method which will aid adults in their information retrieving processes. The proliferation of these communication devices are coinciding with the increased adult demands for education and training.

As shown in Figure 1, these Electronic Distance Educational (EDE) Devices lie on a continuum of "device complexity" and the subsequent electronic frequency demands of each. These frequency demands are represented by Hertz (Hz), the number of sine waves or bits per second. Examples include Killahertz (KHz or 1000 bits per second), and Megahertz (MHz or 1,000,000 bits per second).
Device complexity is also exponentially related to delivery cost (see Figure 2). The more complex the delivery device the greater the frequency demand and consequently the greater the subsequent carrier cost (Pelt, 1982).

<table>
<thead>
<tr>
<th>CARRIER</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite</td>
<td>One-Way Video/Audio</td>
<td>$100,000/mo.</td>
</tr>
<tr>
<td></td>
<td>Two-Way Video/Audio</td>
<td>or 6-900/hr.</td>
</tr>
<tr>
<td>Microwave</td>
<td>Two-Way Video/Audio</td>
<td>$265/hr.</td>
</tr>
<tr>
<td>T-1 Carrier</td>
<td>Two-Way Compressed Video/Audio</td>
<td>$700/mo + 150/hr.</td>
</tr>
<tr>
<td>Audio Graphics</td>
<td>Two-Way</td>
<td>$25/hr.</td>
</tr>
<tr>
<td>Audio</td>
<td>Two-Way</td>
<td>$8/hr.</td>
</tr>
</tbody>
</table>

Currently the least expensive form of interactive EDE delivery is that of video taped correspondence study. The interactive aspects are based on
postal delivery of tapes, tests, and assignments and/or on-site supplemental tutoring, supported by a predesigned program manual.

Audio-only teleconferencing has been in existence for many years. The interactive audio conferencing has only recently supplemented correspondence study. Student / instructor interaction with printed materials is accomplished through postal delivery.

Utilizing standard telephone lines, audiographic devices transmit data as opposed to audio conversations. One such lower-end audiographic device is the facsimile machine. It delivers subminute print materials from one location to multiple locations. Computer networks also perform similar functions through the interaction of machine memories. Other forms of audiographics include writing boards and writing tablets. Possessing full interactivity among locations these devices depict instantaneous manipulations of data on monitors in respective outreach sites. The use of devices independently or in harmony with other devices is termed "hybred networking" (Cowan, 1984).

Video is comprised of three basic categories, depending on the ultimate function. First, factual video utilizes the standard telephone lines previously mentioned (300-9600 Hz). The black and white video image is sent in a "freeze frame" slow scan mode requiring up to 31 seconds to be sent. Its uses include the video transmission of overhead transparencies, slides, and pictures of the instructor. Second, color video "slow scans" can be sent on the same telephone delivery mode as stated above, but requiring time periods of 90 seconds plus for delivery. Third, motion video requires significantly higher Hz capacities (60 MHz) in order to function demanding the "carrier" or delivery channel to be 1860 times faster than the "31 seconds" slow scan modes. Additionally Motion video in a "compressed
form" can be transmitted on special, highly conditioned telephone line referred to as a T-I carrier (56 KHz-1.5MHz). Motion video is extremely costly due to the high quantity of data that must be sent over the given delivery channel or carrier. Another dimension of motion video is full interactive video where the instructor sees the students and the students see the instructors, creating greater realism and interactivity, and thus simulating the traditional face-to-face experience to a greater degree than one way video. The advent and future implementation of fiber optics and the subsequent high-speed, error-free delivery will reduce the costs of delivering full-motion video substantially and make it possible to duplicate to a greater degree the face-to-face experience cost effectively (Cowan, 1984; Olgren & Parker, 1983) yet access to rural communities appears limited due to demand.

Figure 3 illustrates the results of a 1982 national survey (Olgren & Parker, 1983) on telecommunication use in 136 businesses, institutions of higher education and government agencies. The survey respondents typically reported that teleconferencing was cost-effective. One organization saved an average of $1,000 in travel costs per hour of use. Another organization claimed $3 million saved in travel costs over a two-year period (Olgren & Parker, 1983, p. 72).

More recently the trend in business as well as education is away from high cost satellite networks. The lower end audio and audio graphic networks are proving functional as well as cost effective. The University of Alaska Instructional Telecommunications Consortium (UAITC) is an example of one organization initially establishing a successful audio-only network, expanding to satellite, and resorting back to the audio-only network due to costs (UAITC, 1986).
<table>
<thead>
<tr>
<th>Business Firms (N=62)</th>
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<tbody>
<tr>
<td>audio-only teleconferencing (27)</td>
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<td>audio and audiographics (11)</td>
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</tr>
<tr>
<td>freeze-frame video* (18)</td>
<td>29%</td>
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*some with audiographics

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<tr>
<td>audio and audiographics (5)</td>
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<tr>
<td>freeze-frame video* (2)</td>
<td>10%</td>
</tr>
<tr>
<td>full-motion video (6)</td>
<td>32%</td>
</tr>
</tbody>
</table>

Figure 3. Survey results of telecommunications use in business, higher education and government. (Adapted From "Teleconferencing Technology and Applications" by C.H. Olgren and L.A. Parker 1983, p. 68).

A review of varying communication devices and subsequent EDE methods established follows. Specific examples of noteworthy projects are included.

**Broadcast Video** consists of communication satellites which receive, modify and retransmit video, audio or data to receiving stations on earth. Satellites stationed in geosynchronous orbit (22,300 miles above the equator) remain "fixed" in positions with respect to their receiving stations thus allowing continuous communication. Any one satellite's coverage area or "footprint" can encompass up to one-third of the earth's surface.
The most notable broadcast video educational project is the British Open University (BOU). It is funded by a direct federal appropriation of 60 million pounds a year from the British government and also charges modest fees to the students. Approximately 50,000 students apply each year from which 25,000 are admitted. At times the waiting list extends up to two years.

The broadcast consists of weekly pre-produced programs throughout the British Isles. Printed support manuals assist each broadcast. Tests and assignments are exchanged through the postal service (Perry, 1977). There are tutors at 255 local study centers to answer questions, grade essays, and review materials in the units. Computers are also available at the central location for grading objective-type tests. The school year begins in January and continues without interruption through the summer, ending with final examinations in November. The faculty student ratio is 1 to 200 (Ferguson, 1976, p. 48).

The National University Consortium (NUC) was initiated by the Dean of Continuing Education at Linfield College, McMinnville, Oregon and funded by a two year grant from the Carnegie Corporation. The NUC initially consisted of seven pilot institutions, but by the end of the 1982-83 academic year it was comprised of 17 institutions and 22 broadcasting station members. Enrollments jumped 83 percent from Fall 1980-81 to Fall 1981-82. Based upon the British Open University model, students need a high degree of instructional commitment to succeed. Students use specific course study guides with a system of structured reading to supplement television viewing. Study guides contain a series of self-assessment exercises in every unit. They also include a detailed week-by-week syllabus which identifies readings and assignments, supplemented by bi-weekly
broadcasts. Regional groups of students meet once every two weeks for a period of three to six hours. Degrees in technology management, behavioral science, and humanities are offered. The NUC courses require that the students spend 20 hours a week reading books and articles, writing papers and assignments. One-half hour every other week is spent viewing TV programs. There are tutors, usually regular faculty, to engage the students and answer questions over telephone and through the mail.

The video materials for the 140 courses represent an investment of $700 million to NUC or about $500,000 a piece. NUC uses the British Open University videos as one source of their course content. Other sources are an occasional traditional telecourse and original courses developed by the consortium. The membership fee per institution is $10,000 with a $35 per student fee (Fehnel, 1982; Hechinger, 1982).

Japan's University of the Air (UA) offers three general curricula: natural and applied sciences, social science, and humanities. Requirements parallel those of conventional Chinese universities. One of UA's major goals is to serve 18 year-olds who are now in too great a number for the traditional institutions to absorb. It also gives working adults and housewives a chance to earn degrees and complete university study (Zigerell, 1983; Sakamoto & Fujita, 1980).

Costa Rica's Universidad Estatala Distancia (UEAD) is typical of educational projects in developing countries. Its purpose is three fold: (a) to serve those unable to start or continue study at one of the country's three conventional universities; (b) to serve agriculture and industrial workers with university-level abilities who are unable to attend the conventional universities; and (c) to bring the opportunity of study to non-university adults. Curriculum is targeted to specific audiences, i.e., teachers, public
administrators and bank employees. The UEAD course materials are written by single authors as opposed to team authoring. The major problem encountered by UEAD is a serious materials distribution bottleneck in that the post office will not handle packages (Rumble, 1978).

Everyman's University of Israel was started in 1976. Its goals are similar to those of most distance projects: to serve the socially and educationally disadvantaged; to upgrade teachers; and supply a range of adult education courses (Seligman, 1979).

Athabasca University in Alberta, Canada, is modeled after BOU. A variety of locally produced and adapted BOA courses are offered. The local productions are designed by teams following the British Open University procedures. Most courses are designed for self instruction at home. TV programs are broadcast on open air or via cable companies which are complemented by printed materials and audio cassettes. Students have the option of telephone tutors free of charge or the option to meet them in local study centers (Zigerell, 1984). Adult students enrolled in the BOU and other similar programs have experienced some problems in adaptation. A competing home atmosphere presented the student with interruptions and disturbances which inhibited quiet study. Adults felt they were out of the learning habit so they feared failure. Other negative attitudes which had been developed previously also disrupted learning. New knowledge and relationships changed the individuals' outlook resulting in the necessity to accommodate them. Finding time to study from 10-20 hours a week was difficult. Students had to be strongly self-motivated to continue pursuit of solitary learning over months and years. Students were required to make radical readjustments from usual attitudes towards television watching (Perry, 1977).
Considerable attention was paid to the drop-out rate in distance education in the BOU. Four out of five students admitted did not finish their degrees. This high attrition rate is further evidence of the importance of student motivation in distance education. Motivation is the single most important characteristic adults can have in order to succeed which can be supported by definite occupational goals, as Perry (1977) said, "Ours is the most difficult way of getting a degree invented by the wit of man" (p. 167).

Microwave is a land-based transmission system moving the data signal from point to point. Its characteristic feature is that it needs a clear line of sight, thus the dish-shaped receivers and transpondors are mounted on mountain peaks.

California State University at Chico operates a microwave system in a service area of over 30,000 square miles with a population of more than half a million. Live classes and video taped materials are transmitted to learning centers as far away as 170 miles. The interactive audio and video have proven to be effective ways to provide educational opportunities to people unable to travel long distances to campus. Enough courses are presented so that adults studying at a distance can complete a significant portion of their degree program (Meuter, Wright & Urbanowicz, 1983).

Audiographic systems utilizing standard telephone lines generally combine two or more delivery devices. They are for the most part fully interactive. These networks are configured through a bridging device at the central office of a telephone company (Cowan, 1984).

The AT&T National Training Network (NTN) was established to meet the continuing educational needs of AT&T professional sales and personnel located throughout the United States. The network was established in 1981 and has proven to be a cost-effective alternative to face-to-face instruction.
Courses usually last from two days to two weeks, however in 1983 the sales and marketing division began offering weekly one-hour information updates to the field personnel throughout the states. In 1985 special seminar programs were added to the regularly scheduled NTN programs. NTN has grown into a large multi-face network of over 200 locations. The network consists of the latest, state of the art audiographic devices i.e., audio, electronic writing boards, color slow scan video and computers which utilize telephone lines and AT&T communication channels.

In 1985, 2,084 students attended teletraining courses in sales. The total travel cost avoidance through NTN use resulted in $435 per student. An additional $144 per student was saved by re-employment of non-productive employee time. Adding this savings to the cost avoidance figure resulted in savings of $579 per student. These data support the assumption that teletraining is a cost-effective way of delivering courses. The benefits include both direct travel expense avoidance, and increased productivity, resulting in reduced non-productive time.

AT&T claims that NTN has had an extremely positive impact on the sales force, allowing them the opportunity to keep current and increase their knowledge base of products and services in a very timely manner. Student acceptance of the programs and special seminars has been extremely positive (Chute, 1986).

Utah State University is the land-grant institution for the state, and was thus mandated by the Board of Regents in the 1960s to establish outreach centers in the various population bases throughout the rural areas of the state. These centers work as a means of interfacing the needs of the residents with the needs and capabilities of the institution in an effective and efficient manner.
The out-reach center concept is the backbone of the USU COM-NET system. Technological devices are tools to aid in the educational process. The selection of existing devices was based on the need to deliver the greatest number of interactive communicative modes with the limited resources available. The system contains devices which utilize two leased telephone circuits in "a star" configuration originating in the corporate office of Mountain Bell in Salt Lake City. "Legs" extend to each of the 13 outreach centers. Multiple use of the line is accomplished through electronic switching.

The following devices are included in each of the COM-NET centers:

1. A Drome public address system provides two-way audio;
2. AT&T Gemini writing boards provide two-way writing board capabilities;
3. Colorado Video slow scan equipment provides two-way slow scan video;
4. Cassette player is utilized to tape both audio and data for later replay; and
5. VHS recorders provide motion and color video through predesigned, produced, and mailed tapes.

Although the delivery devices appear to be the most noticeable at first, it has been found that after two and one half years of service, the human element is the major determinant of the success or failure of a given course. In order to bridge the gap between instructor and students, key individuals and positions have been identified and established to guarantee smooth functioning of the established devices. These positions are as follows:
1. The center directors are liaisons between rural community needs and the campus;

2. The COM-NET director synthesizes the needs of the varying outreach centers and the needs of the university;

3. Teaching assistants are the "eyes and ears" of the instructors in each of the remote locations, monitoring the needs of the students and communicating them to the instructor;

4. An instructional designer adapts and modifies the existing on-campus courses for EDE delivery resulting in the production of a course program manual in addition to inservicing appropriate individuals involved and the various aspects of the system;

5. A system engineer guarantees smooth functioning of the devices of the system;

6. A system manager oversees the logistical functioning of credit course delivery, i.e., test, assignments and grades; and

7. Faculty members committed to the outreach concept and empathetic to the needs of the information poor of rural Utah.

Four degrees offered over the system in two-year cycles are Bachelor of Psychology, Bachelor of Business Administration, Master of Education in Instructional Technology, Master of Social Science and Public Administration. Fall quarter, 1986 COM-NET offered 75 credits with resulting enrollments of 780 (Seamons, 1986).

Meuter (1985), an outside evaluator from California State University at Chico, suggested the strength of the USU system rested in the emphasis on the support infrastructure. He stated: "Utah State is in an advantage position because of the development of the current delivery system. The
experience gained in the past year would be invaluable for the development of slow motion video system in the future” (p. 6).

University of Illinois’ Department of Engineering Extension utilizes an audio drome microphone and speaker system, and electronic writing boards with 25 inch monitors to view the writing board communications. Two dedicated telephone lines, one for audio and one for data, link three external centers to the Urbana campus. The courses are video taped for sale to business and industry and are used by outreach students on an independent study basis (Sleight & Tueller, 1984).

The University of Wisconsin at Madison utilizes an audio drome microphone system and slow scan video delivery. Two dedicated telephone lines, one for voice and one for data, are used to deliver courses to outreach centers throughout the state (Sleight & Tueller, 1984).

Audio-Only systems use standard telephone lines to join speakers and panelists with participants at various locations. By using a telephone or simple microphone system, participants can ask questions of the panelists at the origination point. The strength of such courses appear to be based around a correspondence study-type program manual.

The University of Alaska is a land-grant university and thus mandated to serve the instructional needs of the students throughout the state. To provide these services, the University in cooperation with the Alaska Department of Education, maintains an instructional telecommunications network of audio conferencing called "Learn Alaska", which reaches 320 communities across the state. It is currently handling more instructional audio conferences per month than any other similar facility in the world. The network can be accessed by telephone from anywhere telephone lines exist. Calls are bridged using several twenty-
line bridges having the capability of interconnecting 80 sites in a single conference. Each site consists of a conviener (speaker) and microphones.

The system is based upon a strong print materials structure for presenting content, review, and further reading. Assignments and tests are delivered via the postal services. Instructor advising during special phone-in hours is also provided (UAITC, 1986).

The Kansas State University's system consists of audio conferencing, through the use of a microphone and speaker system and a dedicated telephone line. Information packets are developed by professors and sent to the students prior to the beginning of the courses taught (Sleight & Tueller, 1984).

**Tutored Video Instruction** consists of lectures taped on video cassette, edited, and adapted to the correspondent study print model. Students can progress through such courses in a fairly straight-forward, self-directed manner. With the addition of on-site tutors, or resident experts in the various locations, an interactive base is created.

An example of Tutored Video Instruction (TVI) is at Stanford University. The motive for this study grew out of the need by Hewlitt Packard corporation to obtain continuing education in the changing field of electronics for their employees. The televised classes were video taped and then mailed to the San Diego plant where the students gathered to watch the tape while an employee of Hewlitt Packard worked as a tutor. The tapes were stopped intermittently and the participants were encouraged to discuss important points. Any questions not answerable by the tutor were then directed back to the professor at Stanford (Gibbons, 1984).

There was no significant extra load for the TVI instructors because teaching assistants perform the testing and grading. The biggest overall
benefit appears to be the fact that it is extremely cost effective for both the university and the company because Hewlitt Packard picked up the tutors salary and provided the classroom.

TVI instruction appears to have at least equalled the on-campus instruction. Studies in varying settings and disciplines revealed consistently higher grade point averages for the TVI courses. Results of studies assessing group size and tutoring format revealed that the students favored the discussion format and smaller groups, the ideal size being 48 students (Middlebrooke, Gibbons, Kincheloe & Downs, 1978).

Bates (1983) investigated 12 institutions that practice distance learning to determine trends in media use. Among the institutions surveyed, seven were categorized as autonomous credit giving, multimedia systems established solely for distance learners. The investigation disclosed that broadcast radio and television were being used less and less. According to Bates, the best system design at that time, seemed to be print, audio cassettes, and the telephone. The range in combination of media available for distance education is somewhat bewildering. Adult educators now can choose devices that best serves the needs of home-based learners on the basis of accessibility, convenience, teacher control, interactive capability and immediate availability.

It has been seen through these reviews that print is still a primary medium for instruction in distance delivery. In all likelihood, it will continue to be so. It has been argued (Zigerell, 1984) that any distance educational project, no matter how extensively committed to the electronic media is correspondence education at heart. The Green Chair Group (1982) predicted that by the year 2001, print will still be the key component in distance education, with audio-visual devices used widely as supplements.
"There are no signs at present that print whether it appears on the pages of a book, a computer or TV screen, will be displaced as the medium whereby materials in the cognitive domain will be delivered in a linear sequence" (Zigerell, 1984, p. 14).

Texts or print packages are central to every distance educational project. Study guides do everything from present course content to leading the distance learner through the course in a step-by-step fashion. "The study guide is essential to student success in getting the most from all correspondence and telecourses" (Mittelstet, 1979, p. 53). Effective study guides are based on sound instructional design theory centering upon the learner and the process of learning at a distance, reflecting what one researcher calls "guided dialectic conversation". Their main function is to add structure, guidance, and encouragement. Print materials lay out the objectives clearly, present overviews of the lessons, explain student assignments and contain self-scoring quizzes, glossaries of terms and suggestions for further reading. American designers usually prescribe textbooks in conjunction with print materials for telecourses unlike the British designers who prepare course syllabi that in effect, are self instruction textbooks (Zigerell, 1979).

**Instructional Theories**

Due to the dynamic emergence of communications devices and the subsequent EDE methods which develop, questions of appropriate technique and device utilization arise. This portion of the literature review covers the current field of instructional theory laying a foundation for review of instructional techniques and instructional devices which may be applicable to EDE method.
The history of learning has been marked by controversies between groups with varying philosophies arguing for the same end result. A grand division would can be made between the behavioralists vs. the cognitive psychologists. Controversies of nature vs. nurture, rote learning vs. meaningful learning and aims of education vs. means of education can be traced back to these philosophical positions mentioned.

Today there is a growing realization that the questions are not resolvable in one way or another but that there is an element of validity in all of the positions. Both nature (heredity) and the nurture (experience) play important roles in the learning process. A variety of different aims or objectives for conveying a specific topic may require a variety of instructional techniques (Romiszowski, 1981). An analysis of the major theoretical viewpoints on instruction and learning will follow to help clarify and establish the position of this study.

Behaviorism is based on a definition that learning is an observable change in behavior, not caused by the physical maturation or growth of the individual. The internal cognitive structures of thinking and learning are not considered relevant to the process of instruction. Instruction is seen as structure in the environment so as to maximize the probability of the desired new behavior being learned. Desired behaviors are taught by a series of successive approximations beginning from an already established behavior and working towards the desired behavior. This process is based on the principle of reinforcement advanced by Skinner (1961). It is basically a restatement of Thorndike's (1937) "law of effect" which states that the observed phenomena and behavior which produces a desirable or pleasant effect tends to be repeated. The correlary being that behavior resulting in unpleasant effects tends not to be repeated. Skinner defined reinforcement
of behavior as the supplying of a reinforcer in order to increase the probability of a given behavior being exhibited. A reinforcer is defined as any object or event which can be found to strengthen a particular desired behavior.

Instruction is equated to the conditioning of desired behaviors or operant conditioning. An operant is a unit of behavior or response together with the stimulus or environment and the condition which triggers it. The instructor is in charge of (a) arranging the stimulus, (b) observing the learner's response, and (c) reinforcing the desired responses. The withholding of response reinforcement on non-desired responses is also an aspect of this level. Punishment for undesired responses is not as favorable as the withholding of reinforcement.

Complex behaviors are first "shaped" by reinforcing already learned behavior which approximate the desired behavior. Through gradual stages of reinforcing close approximations, behavior is changed. The Skinnerian theory of instruction allows no speculation concerning the internal learning process. The terminology used is input-output learning theory or the "black box" (Skinner, 1961).

Thinking, for behaviorists, is a connection of linear chains of desired behaviors linked together. Highly creative activities or masterpieces such as those produced by Rembrandt, Michaelangelo, and Beethoven are difficult to explain from a strict behaviorist viewpoint. The emphasis is on the significance of the learner's response and learning by doing. Frequency of repetition is important to skill acquisition as is space repetition and reinforcement (Travers, 1982).

Piaget (1952) is perhaps the most prolific researcher in the field of "cognitive psychology". His interests have generally centered on the study
and definitions of the stages of cognitive development of the child. He views the development of intelligence as part of the more general process of biological development.

Gallaher (1964) has identified five major themes running through the work of Piaget; they are:

1. Continuous and progressive changes take place in the structures of the behavior of the developing child;

2. Successive structures make their appearance in fixed orders as opposed to random;

3. The nature of accommodation, which is defined as adaptive changes to outer circumstances in the environment, suggests that the rate of development is to a degree a function of the child's encounters with his or her environment;

4. Thought processes originate through a series of internalized actions and intelligence increases as thought processes are loosened from their basis in perception and in action and thereby become reversible, transitive, and associative; and

5. A close relationship exists between thought process and the properties of formal logic.

Piaget views the child as a developing organism passing through biologically determined cognitive stages, structures, or "scheme". These stages are generally age-related although wide variations in cultures and environments yield great differences in the individual rates of development. The development of intelligence is seen as a sequence of successive disequilibria followed by adaptations and in turn rising to new states of equilibrium. Imbalance can occur because of a change occurring naturally as the organism matures. It can also occur in reaction to an input from the
environment. Since disequilibrium is unpleasant, the individual must accommodate to new situations through active modification of his or her present cognitive structures (Travers, 1982).

Instructional theory can be viewed as a continuum between behaviorism and cognitive development. Recent attempts to capitalize on the utility of both positions have emerged. One of the major proponents of the approach has been Gagne' (1985). The similarities of the two positions can be seen in his hierarchal list of eight stages of the categories of learning. The list is hierarchal in the sense that it proceeds from simple condition type learning to the more complex learning involved in problem solving. The list is also hierarchal in the sense that lower levels of learning are prerequisite to higher learning levels.

1. Signal Learning can be equated to the Pavlovian conditioned response. The subject learns that an event is the signal for another event. The stimulus and the response must be closely associated in time and the stimulus must precede the response.

2. Stimulus Response Learning is differentiated from signal learning in that the response is not a generalized emotional one, but is a very precise act. Learning is gradual, with some repetition of the association between the stimulus and the response usually necessary. Responses become more precise as the repetitions take place. Reinforcement is provided for exhibiting the required response, and there is no reward when the behavior is incorrect.

3. Chaining involves the connection of two behaviors or thoughts. Time becomes a factor in that the actual events of the chain must occur close together in time after the previous conditions are satisfied. The actual chaining can occur in a single occasion.
4. Verbal Chaining is a sub-variety of chaining where an object and word are matched. Each link must be established prior to the actual chaining in the individual's mind. Highly verbal people tend to have more codes available to them than less verbal people and thus are more adept at verbal chaining.

5. The Identification of Differences must exist between objects or behaviors. Necessary stimulus response chains must be already established, and inferences from conflicting stimulus must be reduced to a minimum.

6. Concept Learning enables individuals to identify an object on the basis of an internalized representation or idea. Gagne' tends to distinguish between a "concrete concept", which depends upon the observable properties of the object and a "defined concept" which identifies the class of the object whose common properties are determined by observation. For this type of learning to be accomplished, necessary stimulus response connections must be established and a variety of stimuli must be presented so that the conceptual properties common to all of them can be discriminated.

7. Rule Learning is a chain of two or more concepts. This is distinguished from a simple verbal fact to be memorized. The rule is correctly learned when the learner is able to apply it to all relevant conditions and situations.

8. Problem Solving involves combining single rules into higher order rules. In doing this, current independent problems may be solved (Gagne', 1985).

Gagne's eclectic nature embraces both philosophies of instruction, i.e. Skinner and Piaget. Classical and operant conditioning is precursers to
the higher order cognitive thinking skills. The end result of joining of these two philosophies is the development of independent problem solving skills (Gagne', 1985).

Instructional Techniques

Technique was defined as "the relationship established by an instructional agent to facilitate learning among a particular and precisely defined body of participants in a particular situation" (Verner, 1962, p. 9). Techniques are the identifiable and generally recognized procedures used by the instructor to achieve specific learning goals or objectives. These techniques are selected by analyzing the learner's needs which determine the educational method and consequently the most appropriate instructional techniques to be implemented. Overall instructional strategies appear to be the translation of the theoretical position regarding learning adopted by the instructor, i.e. behaviorism vs. cognitive development. These theoretical positions translate to a product/process controversy concerning the ultimate outcomes of learning and subsequent techniques utilized. Information processing instruction is product oriented and expository based. Experience processing instruction is cognitively based, resulting in a process orientation and a discovery base (Romiszowski, 1981).

Information Processing Instruction is typically labeled as "exposition". Specific information is presented to the learner who forms rules by active participation with the information. The learning activities appear to proceed from general rule formation to specific examples to rule application (Romiszowski, 1981).
Ausubel (1968) has been a powerful influence on instructional thinking and appears to support the exposition learning movement with his "reception learning" model. He claimed that the apparent superiority of discovery or process learning is due to the fact that these discovery techniques are compared merely to rote memorization. He argued that much instruction, targeted at the higher cognitive levels, was efficient if performed by a process of exposition leading to meaningful reception in learning. He stated:

In reception learning, rote or meaningful, the entire content of what is to be learned is presented to the learner in final form. The learning task does not involve any independent discovery on his part. He is required only to internalize or incorporate the material . . . that is presented to him so that it is available or reproduceable at some future date. In the case of meaningful reception learning the potentially meaningful task or material is comprehended or made meaningful in the process of internalization (Ausubel, 1968, p. 83-84).

Ausubel supports the use of "advanced organizers" to enable cognitive structures to be formed for organizing the new information. This intellectual scaffolding is established so that the most general ideas of the discipline are presented first, followed by increased detail, resulting in intellectual and integrative reconciliation. New ideas are formed when learners consciously relate new information to previously learned content.

Mager (1962) defined a methodology for stating objectives in behavioral terms which has had impact on education in general. Gilbert (1961) using the concept of behavioral objectives, developed a methodology for the analysis of behavior and design of training, termed Mathetics, which although not generally accepted intact, formed the basis of a highly successful approach to instructional problems, particularly in industrial training. He classified behaviors as being composed of combinations of three basic structures: (a) chains, (b) multiple discrimination, and (c)
generalizations. His instructional model involved three stages: (a) demonstrate, (b) promote, and (c) release.

Mathetics methodology in its original form did not live up to Gilbert's claims that it would become the technology of education. It did prove well adapted to training situations where final outcomes of instructions are observable behaviors. It was somewhat difficult to use in academic disciplines where subject matter rather than job performance was the starting point (Gilbert, 1969). Mathetics importance lies not so much in the current applicability or elegance, but in the catalytic effect upon the development of other instructional theories. (Gagne's categories of learning has its roots in Mathetics.)

The programmed instruction movement was the first instructional methodology which was opened to experimental verification at every stage. Empirical testing and revision were key points to the process of program development and instruction, and have since become the elements of the process of instructional design.

Bloom (1968) and Carroll (1963) were the principal developers of "mastery learning". It is distinguished from traditional learning theories in that differentiated achievement among students is not accepted as a necessary consequence of instruction. Carroll defined "aptitude" as being measured by the amount of time required to learn the task to a given level under ideal instructional conditions. The model proposes that if individuals are allowed adequate time based on their level or needs, that they could be expected to achieve a uniform level of performance. If students were not allowed sufficient time, then the degree to which they could be expected to learn was a function of the ratio of the time actually spent on learning and the time needed.
Bloom (1968) transformed this idea into a practical set of procedures for "mastery learning" and argued that if students were normally distributed with respect to aptitude for the subject, and if they were provided uniform instruction in terms of quantity of learning time, achievement and subject completion would be normally distributed. The relationship between attitude and achievement would be high. If the students were normally distributed on aptitude, received quality instruction and the optimum learning time they required, then a majority of the students would be expected to obtain mastery. Mastery was defined in terms of specific objectives which students were expected to exhibit upon completion of the learning activity. The subject matter was broken into a number of small learning units with unit objectives defining mastery for each specific unit. Instruction was supplemented by simple feedback correction procedures to ensure that each student's unit of instruction was being received. Feedback was diagnostic and informative to indicate whether the student had or had not learned the unit adequately. Those students not progressing were given supplemental instruction requiring more time on the learner's part. Progression was not allowed until the unit learning objectives were obtained.

In the Personalized System of Instruction (PSI) Keller (1968) approached the principle of mastery learning with some modifications. The major difference was the supplementation of a highly structured learning manual or extended syllabus and the use of trained "proctors". The bulk of instruction was delivered on a small group basis. Proctors monitored tests and helped with the majority of the necessary feedback and correction.
Experience Processing Instruction is typically labeled as "discovery teaching". An actual experience is created with generalizations being made from the example, resulting in the formation of processes or rules. The learning activity appears to proceed from a specific example to a general rule to actual application.

Bruner (1966) who is the foremost living proponent of the "discovery" approach in mathematical education has been significant. He is not by any means the inventor of the discovery approach for this was a well-known approach to mathematics education at the beginning of this century (Young, 1906).

Bruner's approach (1966) to discovery or experience learning is characterized by three stages which he calls (a) enactive, (b) iconic, and (c) symbolic. These stages are firmly based on the developmental psychology of Piaget (1952) as discussed previously.

Cybernetics is the study of regulation and control in complex systems both living and man-made. Its purpose is the discovery of general rule with which to govern the functioning of the system. The discovery of relationships between instructional processes and learning effects expressed mathematically becomes the objective of education cybernetics (Landa, 1974).

Highly oriented in the Gestalt school and in the study of internal thought processes, Landa's theories were based on the algorithmic and heuristic methods of instruction. In his first book, Landa (1976) summarized most of his work concerned with the intellectual process involved in the learning of mathematics and Russian grammar. His subsequent works concern the investigation of how to establish problem solving algorithms and how to teach the use of algorithms so that students
can develop their own, for the solution of new independent problems. Landa has little concern for the lower types of learning such as stimulus response and chaining. He is primarily interested in problem solving activities, proofs, and rule following.

Romiszowski (1981) suggested a continuum of the varying discovery/exposition strategies involved in instruction (see Figure 4). Theorists align upon this continuum and each address specific behavioral outcomes and segments of the learning process.

Ausubel (1968) stressed the need for many types of learning processes, each promoting different educational objectives. Discovery learning procedures are useful for some objectives and not for others. All are necessary for the process of education. Problems arise with each approach, not so much because a particular instructional technique is inherently bad, but because it is used for wrong purposes or poorly employed. "Learners who passively receive new material, organize themselves to memorize information, do not engage in meaningful learning" (Ausubel, 1968, p. 84).
<table>
<thead>
<tr>
<th>Degree of Student Participation</th>
<th>Instructional Model and Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill and Practice</td>
<td>Skinner's approach: rote reception learning: instruction demonstrates what to do and provides practice. No conceptual understanding is necessarily involved (memorization)</td>
</tr>
<tr>
<td>Passive</td>
<td>Ausubel's approach: the meaningful reception learning process (lectures)</td>
</tr>
<tr>
<td>Deductive Exposition</td>
<td>Gilbert's approach: guidance and feedback according to a pre-planned programme, based on the typical student (e.g. programmed inst. materials)</td>
</tr>
<tr>
<td>Limited participation</td>
<td>Bloom's approach: guidance and feedback correction is given on an individual basis, (e.g. mastery learning, computer-based learning systems)</td>
</tr>
<tr>
<td>Programmed</td>
<td>Gagne's approach: objectives are fixed; learner is guided as to appropriate methods, conclusions, etc.</td>
</tr>
<tr>
<td>Discovery</td>
<td>Bruner's approach: broad learning goals are fixed; otherwise the learner is free to choose (e.g. resource-based learning systems)</td>
</tr>
<tr>
<td>Provisions for</td>
<td>Unplanned learning: no instruction was involved directly (e.g. free use of a library/resource center)</td>
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<tr>
<td>participation made</td>
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<tr>
<td>Adaptive Programmed</td>
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<tr>
<td>Discovery</td>
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<tr>
<td>Participation necessary</td>
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<td>Guided Discovery</td>
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<tr>
<td>Participation encouraged</td>
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<tr>
<td>Free Exploratory Discovery</td>
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<tr>
<td>Extensive sustained participation required</td>
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<tr>
<td>Impromptu Discovery</td>
<td></td>
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<tr>
<td>Full participation</td>
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</tbody>
</table>

Figure 4. A continuum of instructional strategies based upon level of student participation evoked (Adapted from "Designing Instructional Systems" by A.J. Romiszowski, 1981).

Instructional Devices

Bruner (1966), in developing the model of instruction previously discussed suggested as a major tenet of instruction that the learner should proceed from a direct experience through representations of the experience to symbolic depictions. He stated: "The sequence in which a learner encounters materials has a direct effect on the achievement of mastery of
the task. The development of instruction should parallel the differentiation, integration of the learning process" (p. 49). He suggested that this applies to all learners and not just children. Learning is only relevant if it proceeds from actual experience through symbolic representation. Fleming and Levie's (1978) research seemed to coincide with Bruner's position that concrete experiences facilitate learning and the acquisition, retention and usability of the abstract symbols. The use of instructional devices not only provide the necessary concrete experiences for learners, but also help them integrate prior experiences. Devices help improve the relationships between concrete and abstract learning experiences.

As stated previously, "A device is a mechanical instrument or environmental factor which enhances the effectiveness and utility of techniques but cannot independently function as a technique for the acquisition of knowledge" (Verner, 1962, p. 10). Examples include writing boards, overhead projectors, diagrams, pictures, slides, television sets, films, and video tapes. The proper employment of a device in a learning experience adds dimensions of concreteness.

Hoban, Hoban and Zissman, (1937) in their textbook, Visualizing the Curriculum, promoted the use of audio-visual materials in schools stating that the value of these devices is a function of their degree of realism. They developed a concept of various teaching devices in a hierarchy of greater and greater abstraction, beginning with what they referred to as the "total situation", and culminating with the "word" at the top of the hierarchy representing abstraction.

Dale (1969) using Hoban's same construct developed what was referred to as the "Cone of Experience" (see Figure 5).
The degree of abstraction of the learning experience made possible by a given device. The closer the learning experience resembles a concrete experience, the greater the sensory dimensions possible (Adapted from "Audio-Visual Methods in Teaching", by E. Dale, 1969).

The Cone of Experience begins with the learner as a participant in the actual experience. This is a concrete multi-dimensional event where the learner synthesizes his or her own feelings and expressions utilizing all available senses. The ultimate abstraction is when the learner is observing symbols which represent an actual event. Dale contended that learners could make profitable use of abstract instructional activities to the extent they had built a stockpile of concrete experiences to give meaning to the more abstract representations of reality (Heinich, Molenda & Russell, 1982).

Decisions regarding tradeoffs between the concreteness of the experience inducing devices utilized has to do with incurred costs of both
money and time. By moving up Dale's cone to the more abstract oriented media, larger quantities of information can be presented in shorter periods of time. The more concrete multi-dimensional experiences at the lower end of the cone enable the students to engage in direct, purposeful experiences which are extremely costly with regard to both time and money. The printed or spoken word is the most abstract experience. If a student does not have the prerequisite experiential background and knowledge, these verbal and visual symbols, although saving presentation time will result in much loss or misdirected learning (Dale, 1969).

Instructional preference models are a new and emerging area in the study of student learning styles and classroom applications. Research interest is on student preference for media and format. Because these models are new and based on student preferences, there is not much empirical evidence to verify their support, advantage, or promotion.

Two inventories were identified which were designed to measure instructional preferences with regard to processes and devices i.e. the Learning Preference Inventory (Rezler & Rezmovic, 1981) and The Instructional Preference Questionnaire (Friedman & Stritter, 1981). The instruments are self assessments which ask respondents to rank order words or sentences according to learning preferences. The dimensions include assessments of degree of abstraction, self motivation and direction, degree of social interaction, degree of course structure, and degree of student participation evoked.

These instruments did address certain aspects desirous of this study although they were overly broad in scope. It was determined that a unique inventory be developed based in part upon these measures yet more specifically oriented to this study.
Cognitive Structure

The psychological aspects of information processing inherent in both teacher and learner are significant in any education setting. Given the demands of the emergent EDE methods, a review of these cognitive aspects is essential. Cognitive processes are examined in the following section as they relate to human information processing. The aspect of individual style is then discussed, followed by a review of recent style assessment tools.

Cognitive structures are the assemblies of elements and components of knowledge inherent to the individual. Cognitive processes are those activities in the individual from which knowledge is derived and responses are generated (Hamilton, 1983). Anderson and Bower (1973), Atkinson and Shiffrin (1968), Rumelhart, Lindsay and Norman (1972) all suggested that a number of internal structures in the human brain and the corresponding processes utilizing these structures could be represented in the form of a model of perception and memory.

Perception is a process by which living organisms maintain contact with their environment. It involves an immediate experience yet has a direct relation to what has already been stored in memory. Previous perceptions determine to a large degree individual awareness or sensitivity to certain details or patterns in the environment. Misconception is caused by filling in the gaps of a perceptual field inaccurately. Early perception theory suggested that it was extremely disorganized, but recent research indicated that perception is highly organized, leading to cognition, and in turn, memory (Carterette & Friedman, 1978). Expectancies determine to some degree how the perceptual inputs are structured. When few
expectations of what one is going to be perceived are present the process of developing a structured precept is slow (Solley & Murphy, 1960).

The human perceptual system can handle about five million bits of information per second, but the resolving, functioning power of the brain is approximately 500 bits per second, thus a selection process is inevitable (March & Simon, 1958).

**Memory** is linked directly to perception, for what is learned at a particular time is always related to what has already been learned. Perception and memory are both part of a single system and its development is characterized by steady increase in the amount of knowledge stored in memory (Travers, 1982). The trace memory is an extremely short term memory of not more than two to three seconds. Sensory inputs unconsciously flow through this memory like a river. Unless something is triggered, organized, or repeated it will be lost in two-to-three seconds (Travers, 1982). Short-term memory is the immediate memory in which information is stored while it is being used and is limited to about seven bits of information at a time. If not processed within about a minute it will be forgotten. Once it has been processed it is good for about 30 minutes (Watkins, 1974). Short-term memory is called the working memory, when it is functioning as a recall device from long-term memory (Gagne', 1985).

Long-term memory is relatively permanent. Learning curves show rapid increase during the early stages of practice and much less progress during the later periods. Curves of retention revealed a rapid decline after the original learning. Episodic memory refers to a record of events including both time and place which are stored in the order in which they occurred. Semantic memory, on the other hand, stores within a logical
structure discrete pieces of information that are not tied to events or experiences (Dooling & Christiansen, 1977; Kintsch & Keenan, 1973). The human brain has enormous capacity for memory in the billions of units, the more that is learned the more space there is for memory because there are more cognitive structures to relate to (Penfield, 1951). The basic information processing structure pre-described seems to be inherent in all individuals to varying degrees (Gagne’, 1985).

Control is the variability, flexibility, and ingenuity of the individual based on the varying ways an individual learner may approach and engage in a learning activity all display individual aspects of control over the basic information processing structure. Gagne’s (1985) information processing model labels these individualizing aspects of information processing as "expectancy" and "executive control". These aspects are developed from the individual’s previous learning and the interaction of selection, perception, and memory. Expectancy and executive control determine the particular style of information processing used by the learner. Control strategies determine how the individual will attend, store, code, and retrieve the information. These control processes also appear in the learning theory and memory models of Atkinson and Shiffrin (1968) and Greeno and Bjork (1973). Gagne’ suggested that these two functions of expectancy and executive control have the capability of affecting any and all of the phases of information flow.

Expectancies represent the specific motivations of the learners and what they expect to accomplish from the learning experience. Estes (1972) maintained that the feedback effects of reinforcement influence learning and memory. Information is conveyed back to the learner which relates to the degree to which the goals established in the expectancy process were
reached. The discrepancy between the feedback received to the learner and the original expectancy set results in the degree of learner satisfaction, the greater discrepancy in a positive direction the more satisfied the experience is remembered. The greater the discrepancy between the feedback and the expectancy in a negative direction the greater the dissatisfaction with the experience. Thus unmet expectations appear to produce negative experiences and in turn effect motivation.

Recognizing that physiological needs are strong motivators, Maslow (1954) referred to them as deficiencies, contending that they must be satisfied before the higher level, social needs would be sought. Social needs are those which enlarge the scope of human functioning and understanding.

Herzberg (1966) stated that needs can be both internal and external based upon the source of their gratification. If a need is a physical deficiency it is termed extrinsic, receiving its satisfaction from external operant reinforcement. Intrinsically-motivated behaviors are involved with human needs for feeling confident and self determined (Deci, 1981).

Another area of motivational research was that of individual "locus of control" or the degree of responsibility one accepts with regard to any activity or action. The level of responsibility generally falls on a continuum from "entirely external" to "entirely internal" with varying degrees in between. Thus for any activity the degree of locus of control of the individual is directly related to the degree of responsibility the individual accepts for the success of that activity. A self-directed learner has a high degree of internal locus of control (Even, 1985).

Executive control is equivalent to the self management behaviors referred to by Skinner (1961) and Bruner (1971). The executive control
process affects the individual's attention and the selective perception determining which features will be entered into the short-term memory. To a large degree what is rehearsed in short-term memory, and thus what is retained for longer storage, is determined by executive control. The choice of encoding scheme and method of information storage in long-term memory were found to be influenced by the control process (Gagne', 1985, p. 78).

**Cognitive Style**

Pask (1976) defined cognitive learning styles as the consistent way in which people differ in how they perceive, encode, store, and process information. The way an individual perceives the world governs how he or she thinks, makes judgments, and forms values about experiences and people. Personal perspective is the individual's window on the world. The unique aspect of humanness is what is termed "style". Based upon this perspective, Jung (1971) observed, "Besides the many individual differences in human psychology, there are also typical differences" (p. 3).

American psychologist, philosopher, and educator, James (1890) wrote in the *Principles of Psychology*:

Let A be some experience from which a number of thinkers start. Let Z be the practical conclusion rationally inferred from it. One gets to the conclusion by one line, another by another; one follows a course of English, another of German, verbal imagery. With one visual images predominate, with another tactile. Some trains are tinged with emotions, others not; some are very abridged, synthetic and rapid, others hesitating and broken into many steps. But when the penultimate term of all the trains, however differing interse, finally shoot into the same conclusion, we say, and rightly say, that all the thinkers have had substantially the same thought. It would probably astound each of them beyond measure to be let into his neighbor's mind and to find how different the scenery there was from that in his own (p. 11).
Style is a distinctive characteristic trait that has long been the concern of psychologists and educators as they seek to describe the many facets of an individual. It is not clear who was first to use the term style in this context. The Greek physician, Hypocrates, identified Sanguine, Choleric, Melancholy, and Phlegmatic personality types (Guild & Garger, 1985). During this century the research on individual style has been conducted primarily in the field of psychology. Psychologists were exploring cognitive style differences at the turn of the century. The word "style" was used to describe consistent patterns of behavior as early as 1930 (Allport, 1961). Jung (1975) proposed that to understand different human behavior, attention should be placed on the basic functions people perform in life. Every psychologically-healthy human being has to operate in a variety of different ways, depending on circumstances, people, and situations. He also expressed the idea that individuals eventually develop comfortable patterns that lead to predictable ways of performing.

Witkin and his associates in the latter half of the 1940s began exploring distinctive perceptual characteristics of people. They concluded that people vary in the extent to which they free themselves from the embedded context or field in which they exist. Two extreme indicators of this variation of observed perspective were (a) "field independence" (FI) or persons who experienced items as more or less separate from their surrounding field or context, and (b) "field dependence" (FD) or persons who experienced items as a relationship with their surrounding field or content (Witkin, Oldman, Cox, Ehrlichman, Hamm, & Ringer, 1973).

Getzel and Jackson (1962) conducted their research in the United States in the late '50s and early '60s. They were concerned that the conventional tests of IQ and aptitude only measured the capacity of the
individual to solve problems formulated by an authority which was defined as "convergence". They attempted to design instruments which assessed the capability to originate questions, issues, possibilities, and ideas which was defined as "divergence".

Since the 19th century, neurologists and brain surgeons have noted that tumors and excisions within the left hemisphere of the brain produce quite different effects on patients' mental abilities than tumors and excisions made on the left hemisphere. More recently patients with lesions in particular parts of their two hemispheres have been tested for mental functioning and dexterity. Damage to parts of the left hemisphere impedes speech, language, verbal memory, mathematics, and sense of time. It also tends to be specific to certain organs and functions. Damage to the right hemisphere impedes performance in understanding, visual, tactile, mazes, perception of depth of movement, visual-spatial organization, and tends to produce diffuse and general patterns of disturbance (Sperry, 1964; Gazzaniga, 1967).

Educational research into individual information processing differences diminished around 1950. Tyler (1965) attributed this decline to the fact that standardized cognitive style tests showed very little relationship between school success and individual differences. School success was measured in terms of good grades because it could be proven to be related to a student's IQ. It could not be proven that it was better to have certain perceptual sensitivities in the quest for success in school. In addition educators were either not aware of the cognitive style research or ignored it. "In both education and psychology the notion that individuals solved problems and formed concepts in quite different ways and that the
same situation might carry different meanings for them was something investigators did not generally take into account (Tyler, 1965, p. 211).

Since the mid-1960s educators have been readdressing the possibilities cited by Tyler above and some researchers followed Jung's original identification of psychological types (Gregorc, 1982; Kolb, 1976). Educators now appear to be drawing on the fields of psychology and neurobiology in order to explain the individuality of the learner. Studies of brain functioning and its relationships to learning have stimulated broader approaches to curriculum and instruction e.g., individualized instruction, focused instruction, mastery learning, synetics, etc. Keefe (1982) in an introduction to a collection of papers on research and the style of brain behavior stated:

Knowledge about learning styles and brain behavior is a fundamental new tool at the service of teachers and schools. It is clearly not the latest educational fad. It provides a deeper more profound view of the learner than previously perceived and is part of a basic framework upon which a sounder theory of practice of learning and instruction may be built (p. 1).

The remainder of this section reviews the varying learning style models that have grown out of original cognitive style research concluding with the popular teaching style models of similar origin.

Learning Style

It has been generally accepted that all students do not learn in the same way. There are many approaches that have been used to determine the individual learning differences. No single theory has been afforded wide-spread acceptance (Danielson & Seiler, 1979).

Learning style is defined as the individual's characteristic means of perceiving and processing information (Kolb, 1976). Learning style is quite similar to cognitive style in most respects, but the context is more specific.
Claxton and Ralston indicated that learning style is "the students consistent way of responding and using stimuli in the context of learning" (in Kerby, 1979, p. 8). In a broad sense learning style is concerned with those attributes which help to determine and characterize a person's preferred approach to the acquisition and use of knowledge as is reflected in problem solving. Different people have different personal preferences in the way they approach problem solving. The following review will address some of the major learning style instruments, their theoretical grounding, and potential implications to the field of adult education.

Learning Style Inventory (LSI). In the early 1970s, Kolb (1976) developed an experimental learning model. He identified two major dimensions of learning, in most normal individuals, those of perception and processing. He stated that learning results from the way people perceive and then process that which has been perceived. His model is based upon the experimental learning theory which is grounded in the Jungarian concept of style discussed previously. Two opposite kinds of perception are described. One extreme on the continuum represented individuals who perceive through concrete experience. At the other extreme were people who perceive through abstract conceptualization. The processing of the perceived information was another continuum described by Kolb. Some people process through active experimentation, others process through reflective observation. Figure 6 displays this four-quadrant model of learning style (Kolb, 1976).
These four previously described abilities combine to form four learning style clusters. Convergers use abstract conceptualization and active experimentation. Divergers use concrete experience and reflective observation. Assimilators use **abstract conceptualization** and reflective observation. Accommodators use **concrete experiences** and active experimentation (Kolb, 1976).

The Kolb Learning Style Inventory (LSI) measures the individual's position relative to the four styles. The inventory requires that a person rank order nine sets of four words, each according to the learner's perception of how well they describe his or her learning style. Students with profiles that are fairly evenly distributed present no real problems to
instruction. Those individuals with skewed preferences create the real challenge for educators.

Cognitive Style and Mapping Inventory  Hill and his colleagues (1976) developed a comprehensive approach to accessing the cognitive components of varying learning styles. This was an attempt to determine certain individual preferences for the processes used to gather information, think, make inferences, and arrive at decisions. An individual's cognitive map includes aspects from each of the following categories: (a) information gathering; (b) thinking and making references; (c) decision making; and (d) assessing interest in self, others, and objects. When these four categories are combined they can be used to assess a student's information processing preference. This analysis permits instruction, procedures, and courses to be made compatible with the student's style. Hill's Cognitive Style and Mapping Inventory is a measurement of the student information processing style (Hill, 1976).

Student Learning Style Scale (SLSS)  Riechmann and Grasha (1974) developed an approach to learning styles based on the role students play in the classroom. It was grounded on the assumption that the roles the students play shows the degree of preference they have for interacting with peers, teachers, and their approach to course content. Six roles were identified: competitive, collaborative, dependent, independent, participant and avoidant. The Student Learning Style Scale is a 90-item instrument used to assess the degree to which students see themselves assuming these six roles. Profiles were then obtained from scores on each of the six subscales covered by the instrument. Based on this information, the instructional procedures could be tailored to meet the styles of the students in the course (Riechmann & Grasha, 1974).
**Learning Interaction Inventory** Students do not learn in a vacuum. Teachers, peers, close friends, and family members all play roles in what is learned and how it is learned. Fuhriman and Jacobs (1980) attempted to measure the student's dependence on significant others in the classroom setting. Their model accentuated three classroom learning styles: the "dependent" style, the "collaborative" style, and the "independent" style. Any person may learn by using all three styles, but will frequently prefer a particular style in a given situation. This action is based on personal preference, the unique characteristics of the subject to be learned, and the activity to be engaged in.

**Canfield Learning Style Inventory (CLSI)** Many researchers suggested assessing a learner's style prior to the learning task (Cross, 1976; Smith, 1982). Disagreement arose as to what actually should be measured (Canfield, 1983; Dunn & Dunn, 1979; Kolb, 1984). The Canfield Learning Style Inventory (1983) is an assessment of a learner's style prior to the learning task. It consists of a 30-item instrument which conceptualizes learning styles. The elements of preferred (a) condition, (b) content, (c) mode of learning and (d) expected level of success make up the inventory. A total of 16 scores for each student are generated, four scores in each of the four different preference areas. The high score indicates the student's dominant style or mode (Canfield, 1983).

**Teaching Style**

Teaching represents an interaction between a learner and an instructor. The teaching style label is a "hypothetical construct" associated with the various identifiable sets of teacher behaviors used "to understand and perhaps explain certain important aspects of the teaching learning
process" (Fisher & Fisher, 1979, p. 254). "There is a commonly described belief that teachers teach the way they were taught, or teach the way they learn" (Fisher & Fisher, 1979, p. 245). Dunn and Dunn (1979) further suggested from many years of investigation that "instructors believe that the way they learn is the 'easy' or 'right' way and that they direct their students towards the same manner of acquiring knowledge" (p. 238). Although an individual's style was perceived to be as personal as his or her identity, it was believed that these differing styles could be categorized by similar constructs of behavior. Understanding how people learn is an integral aspect of instructional program success and ultimately student achievement.

Teaching style research focused on the behavior of teachers with the assumption that teaching behaviors were related to student achievement. By identifying systematically the student's learning style and the instructor's teaching style, it appeared that effective and efficient learning could be more efficiently tuned for achievement (Conti & Welborn, 1986). In a recent study assessing the influence of learning style and teaching style on the achievement of non-traditional health profession students, Welborn (1985) determined that teaching style was a major influence on student achievement. This reaffirmed Knowles (1980) assertion that "the teacher is the most important variable influencing learning climate" (p. 41).

The personality and individuality of each teacher is reflected in his or her professional behavior and has been observed in the way teachers relate to students, how teachers structure and manage classrooms, and the mode and tone the teacher sets in the classroom. Differences have also been seen in the techniques and materials selected to help the student learn, and in the expectations for student in addition to priority strategies for evaluation.
of student learning. Style governs the reality of the classroom. Goodlad (1984) called the teacher a "coach, quarterback, or a free and even rule-maker" (p. 108). In his extensive study of schools, he found that the classroom was indeed the teacher's domain, and thus teachers perceive themselves to be quite autonomous. "Our teachers saw themselves to be in control of what they taught and how. Approximately two-thirds of the teachers at all levels perceived they had complete control of their teaching techniques and student learning activities" (p. 188-189).

By accepting that teaching styles exist and that the individual teacher has a great deal of autonomy, decisions must be made to encourage or discourage individual learning style, and to encourage diversity or encourage uniformity. Decisions about when teachers need to be similar to student styles and when they need to be different must also be made (Sizer, 1984). The following discussion reviews the major instruments designed to measure teaching style.

**Gregorc Style Delineator (GSD)** Initially grounded in the area of learning style, Gregorc has expanded his work to include teaching style as well as the integrative concept of individual "mediation style". This includes the individual's reception, processing, and dispensing of information (Gregorc, 1986). The two aspects of the mediation process are "perception" and "ordering" (Gregorc, 1982). When perceiving, the mind has a tendency to see things in a mental, symbolic, intuitive, emotionally "abstract" way or to see things in a realistic, direct, physically "concrete" way. These different types of perception describe opposite ends of the first continuum. Every person is capable of using abstract as well as concrete perception, although preferences for one or the other generally persist. The mind also exhibits an ability to order information, knowledge,
ideas and concepts. At times it orders items in a linear, step-by-step, "sequential" way, and conversely may order information in a non-linear, tangible, "random," holistic way. These two kinds of ordering form opposite ends of the second continuum. While every person is able to use both sequential and random ordering, each individual possesses tendencies or preferences to one kind of ordering.

By combining both perception and ordering, four distinctive patterns or styles emerge as seen in Figure 7. The styles are the Concrete/Sequential (CS), Abstract/Sequential (AS), Concrete/Random (CR), and Abstract/Random (AR).

![Figure 7](image_url)

Figure 7. Gregorc's dualities of perception and ordering in relation to the resulting styles (from "An Adult Guide to Style" by A.F. Gregorc, 1982).

The Gregorc Style Delineator (Gregorc, 1982) is a self-analysis tool. The quartinary design has roots in Jungarian psychology. Built in part on the Kolb Learning Style Inventory (1976), words are used to delineate the
two sets of dualities. Ten sets of four words each are ranked and numerical scores are obtained for each of the four styles. Scores are then plotted on the Style Profile grid (see Figure 7). Strong preference for one style over the other three produces a distinct point towards that quadrant on the grid and indicates subsequent relationships to the remaining three.

Data for the initial inventory was gathered over a seven-year period through taped interviews and written protocols. Over 400 individuals were involved in the research which led to the development of the first instrument, the Transaction Ability Inventory (Gregorc, 1978). The removal of words that were considered jargon associated with the educational field resulted in the current Gregorc Style Delineator (Gregorc, 1982).

**Productivity Environmental Preference Survey (PEPS)** Dunn and Dunn (1975) described styles as "the manner in which at least 18 different elements of four basic stimuli effect a person's ability to absorb and retain information, values, facts and concepts" (p. 36). The four basic stimuli were identified as environmental, emotional, sociological, and physical. In order to measure the four stimuli and elements, the Dunns developed a simple, easy-to-administer self-test to identify the individual's teaching style and in turn reveal the areas that need expansion in order to be responsive to all student characteristics. In the PEPS a person is given five possible choices for responses to 104 questions. Respondents may strongly disagree, disagree, be unsure, agree, or strongly agree. The responses are computer scored and the printout indicates which of the elements are important factors in the person's learning. Used as a reference guide, the teacher can then focus on specific learning styles and begin teaching to different students. In a recent study, Dunn and Dunn
(1982) confirmed that students could identify their style preferences, and that teaching through learning style sensitivity increased academic achievement and improved student attitudes. Learning styles also appeared to be stable over time and consistent throughout subject area.

**Styles in Teaching and Learning** Fisher and Fisher (1979) stated that style was based on a commitment to individualization of instruction and the development of learner autonomy. Hours of direct observation and experience, enriched by discussions and interviews with numerous teachers, led to the generation of 11 distinct learning styles and 7 subsequent teaching styles.

The Fishers did not produce an instructional inventory, but based their categorization on observation and naturalistic inquiry. Their classifications of learner style and teacher style are more explanatory in nature with highly specific delineations. (Fisher & Fisher, 1979).

**Principles of Adult Learning Scale (PALS)** Conti (1984) advanced the notion that the way people perceive and assimilate information was also highly related to the way information was restructured and dispensed. Although the instrument by name is a learning style instrument, it has been used over the years with a relative degree of success as a teaching style assessment tool.

The instrument was based on a philosophy that better understanding of the effectiveness of different teaching styles in various settings resulted in higher quality delivery of services to the adult learner. In order for an instructor to be able to adequately assess his or her teaching style, a variety of factors had to be considered: (a) the teacher's personal style, (b) the teacher's educational philosophy, (c) the teacher's prior training, and (d) the teacher's age (Conti, 1984). Elias and Merriam (1980)
suggested that the differences between educators who are just practicing the profession and the "professionals" are the awareness of causal factors behind their base behaviors (p. 9).

The PALS scale is a 44-item instrument which is summative in nature using a modified Likert format. Respondents indicated the frequency with which they practiced the actions described in the items. Scores ranged from 1 to 220. The mean for the instrument was 146, with a standard deviation of 20 (Conti, 1983). The total PALS score provides an indication of the practitioner's overall preference for teaching behavior in an educational setting. High scores on PALS have been designed to reflect a learner-centered approach to teaching. A low-PALS score indicated a preference for a teacher-centered approach in which authority resides in the instructor. Scores near the median indicated a combination of teaching behaviors which try elements from both learner-centered and teacher-centered approaches. By analyzing the scores generated by the PALS test, teachers may identify specific teaching behaviors and can take steps to make decisions about them, modifying inconsistent behaviors (Conti, 1985, p. 11).

**Summary**

The growth of in understanding the effects of technological innovations on social institutions and on the development of the natural environment has not kept pace with the rapid growth in technology (Kransberg, 1985). In contemporary society, change occurs at a speed so great that drastic alterations may occur during an individual's lifetime. Through continuing education, individuals may equip themselves for the
everchanging job market. Institutional needs due to this increased demand for educational alternatives must address efficiency.

The growth of electronic distance education appears to be the result of historical coincidence of public demand for more adequate educational opportunities at a time when electronic devices are capable of delivering this instruction to people wherever they may reside. By coupling these devices with the approaches used in correspondence study, new methods of distance education developed (Zigerell, 1984, p. 26). Through television, radio, computers, and telephones, formerly unsurmountable barriers of time and distance have now been forced into submission.

Verner's (1962) conceptual scheme of instruction was founded on the selection and implementation of the most appropriate method based upon needs of both learner and institution. It seems appropriate, based upon this review, that instructional technique and device selection be modified to include the instructional variables of teacher and learner style in addition to method as a basis for creating a viable instructional system.

Alignment implies modifying or adjusting one or all variables so as to bring close correspondence or harmony between them (Webster, 1984). Alignment of the mediation styles of the learner and instructor can affect communications transfer in the learning experience. Alignment is based on the assumption that most human beings can change and therefore to some extent, both learning styles and teaching styles can be modified. Extensive observation and research verified significant improvements in both student achievement and motivation when learning and teaching styles are matched (Farr, 1971). The matching of individual learning style to the educational factors of method, teaching style, technique, and device
would appear to provide bases for the enhancement of learning. Students who align easily are able to interpret and adapt to their environments.

Alignment permits successful adaptation to varying environments, such as electronic distance education. Students who have difficulty in aligning themselves may be trapped, withdraw, become indifferent, and attempt to change their environments to suit their personal style of learning. The greater the dissonance between the teaching style of the instructor, the learning style of the student, and the unique devices employed in any educational method, the less profitable the learning activity is. Poor alignment between factors is aided by high student and teacher interest in the content regardless of their individual mediation styles.

The instructor who is conscious of the intricacies and subtleties of the varying mediation styles will possibly be more able to expand his or her ability to react to varying styles and methods. The result of this consciousness is the development of a reservoir of different styles and techniques equally valid when applied to specific educational methods and learner's needs. Issues of appropriate method, style, or utilities involved are actually reduced to one of meaningful learning and quality instruction.
3. The inventory was pretested using a group of instructors in the College of Education at Utah State University. The final inventory was constructed using recommendations collected from this pretest.

4. Instructional presentation data were collected from all instructors who taught on the COM-NET system from Fall quarter, 1985 through Summer quarter, 1986. The data were collected using the Gregorc Style Delineator (see Appendix F) and the Instructional Utilities Inventory. University course index numbers were used for record keeping so as to maintain subject anonymity.

5. Student satisfaction data were collected using the standard USU Course Evaluation form, items 1-10 (see Appendix E).

6. Student performance data were collected using the mean course grades.

7. The data were coded and then analyzed using correlation and multiple regression subroutines of the Statistical Package for the Social Sciences (SPSSX) computer program (SPSSX, 1983).

8. Qualitative data were analyzed by categorizing solicited instructor comments and synthesizing them with general statements.

9. Results, discussions, conclusions and recommendations were reported.

Population

The accessible populations for this study were the instructors and students who were associated with courses taught via the COM-NET telecommunication network from Fall Quarter, 1984, through Summer Quarter, 1986. Thirty-seven instructors taught a total of 45 courses in which a total of 1,333 students were enrolled. The generalizable population
or universe was all instructors who taught or will teach via electronic distance educational (EDE) methods.

Of the 37 instructors who taught the 45 courses included in the study, 35 were accessible at the time of data collection. Of the two instructors who were not represented, one had sought other employment out of the state, and the second was on leave outside the United States. Thus a response rate of 94.5 percent was achieved. Babbie (1972) wrote:

I feel that a response rate of at least 50 percent is adequate for analysis and reporting, a response rate of at least 60 percent is good, and a response rate of 70 percent or more is very good. The reader should bear in mind, however, that these are rough guides, they have no statistical basis and the demonstrated lack of response bias is far more important than a high response rate (p. 165).

Research Setting

Utah State University's COM-NET telecommunications network was the EDE method from which data for this study was collected. Currently there are 13 outreach centers throughout rural Utah (see Appendix C).

COM-NET has two major dimensions: (a) the delivery devices or hardware and (b) the infrastructure or human support system and staff. In harmony, these two systems work to enable the development of a unique educational method.

Delivery Devices

The following devices are located at each of the COM-NET sites allowing the delivery of coursework: (a) an audio public address system consisting of one amplifier/speaker and four push-to-talk microphones; (b) a facsimile network allowing for unattended subminute delivery and return of print materials; (c) electronic writing boards distributing written
information instantaneously and interactively; (d) slow-scan video equipment recording and sending black and white "freeze frame" video images; (e) audio cassette equipment recording the lectures and demonstrations for back-up or later playback; and (f) video tape equipment allowing for the playback of pre-produced color motion presentations either commercially or locally produced (for further information describing the COM-NET devices, refer to Appendix A).

Infrastructure

The human element is a major determinant of the success or failure of any given course. "The critical issue, is the quality of the human component at each end of the information pipeline - the technology is only the conduit" (Cowan, 1984, p. 15). In order to bridge the distance between instructor and student, key individuals and processes have been identified and established in order to guarantee the smooth functioning of the established devices.

1. Center directors located at each of the regional sites work directly with students, identifying needs and passing on recommendations to the COM-NET director for program implementation.

2. The COM-NET director functions as a liaison between the needs of the student and the needs of the institution coordinating programming, scheduling, technical maintenance, and system promotion.

3. The instructional designer works directly with the instructors, helping them adapt and modify both materials and techniques.

4. The system engineer located at the Logan UT. center acts as the lead troubleshooter for the technical aspects of the system. This individual talks over direct dial telephone lines with the teaching assistants at the
rural sites to solve technical problems without disturbing the flow of the course being presented.

5. Teaching assistants located at the outreach centers work directly with the system engineer, the system manager, and the center directors, assuring the operation of the devices and distribution of the print materials. In addition they assist the instructors in various aspects of the instructional presentation.

6. The system manager operates from the COM-NET office, performing logistical functions such as processing student enrollments, ordering books, duplicating and distributing course materials, and facilitating the processing of student tests and assignments. (For further information describing the COM-NET infrastructure, refer to Appendix B).

**Design**

This study was an exploration of relationships between, and effects of, teaching styles and techniques utilized in EDE methods on student satisfaction and student performance. Due the instructional emphasis of this study, learning style was not included although it is acknowledged that it plays an important part of the teaching learning process (see Figure 7). Contextual evidence was also gathered to gain added insights into other social variables involved in EDE methods.
Based on the review of the literature, it was found that there is a growing number of instruments available for assessing the various aspects of cognitive style. Most are self-reported measures with relatively poor reliability and validity. The Gregorc Style Delineator (GSD) (see Appendix F) was identified as one of the more completely developed instruments with regard to theoretical constructs as well as reliability (Sewell & Cogins, 1986).

The literature review revealed limited inventories available for the measurement of instructional techniques as well as devices. Those instruments identified measured multiple aspects of instruction in addition to techniques and devices. The Instructional Utility Inventory (IUI) was developed based in part upon these measures yet more specifically oriented to this study (see Appendix G).

Student satisfaction data were gathered using the standard Utah State University Course Evaluation form (see Appendix E). Student performance data (the mean final grade for each of the 45 courses taught
via the COM-NET telecommunications system) were gathered from Utah State University records.

Contextual data were gathered through written comments solicited from the instructor at the time of test administration. The openended, qualitative data of this aspect of the study added insight, explanations, understanding, and trends.

A brief review of the instruments along with a discussion of individual test validity and reliability are presented next. Borg and Gall (1983) defined validity as "the degree to which a test measures what it purports to measure" (p. 275). They defined reliability as "the level of internal consistency or stability of a measuring device over time" (p. 281).

**Measures**

Two instruments, the Gregorc Style Delineator (GSD) and the Instructional Utilities Inventory (IUI), were administered to each instructor included in the study, gaining data on specific instructional presentations for each course. The dependent variables were measured using existing school records. Contextual data were acquired by a solicited self-report procedure.

**Gregorc Style Delineator (GSD)**

The Gregorc Style Delineator (Gregorc, 1982) was developed as a self-analysis instrument to aid the individual in identifying specific cognitive abilities. These abilities can be represented in two distinct continuums, one representing the perceptual abilities of an individual ranging from abstract to concrete, the second representing the ordering ability, ranging from random to sequential. A composite of these two dualities results in one of
four constructs which are identified either as Concrete/Sequential, Abstract/Sequential, Abstract/Random, or Concrete/Random. As composites of these, the participant’s score is defined as style (Gregorc, 1982). Mediation refers to the information assimilation (learning) and dissemination (teaching) abilities of individuals. For the remainder of this study, teaching style refers to the individual information disseminating abilities of the instructors.

The delineator is based on a word association test in which a person responds to the words that occur to him or her. Dalton, during the turn of the century, was one of the first to use word association tests. Jung (1975) stated that the word association test is a powerful tool in diagnosing a person’s inner self.

The initial Transaction Ability Inventory (Gregorc, 1978) was developed from data gathered over a seven-year period through taped interviews and written protocols of more than 400 individuals. The words selected for use in the inventory came from the language patterns used by individuals involved in educational institutions. Attributes of the four constructs or categories emerged. In order to modify the instrument for general adult audiences, 60 individuals from private industry addressed the 1978 list and provided a perspective which resulted in the removal of words which could be considered jargon associated with the field of education. The Gregorc Style Delineator (1982) is the result of this process. The words are not parallel in construction, nor are they all adjectives or all nouns so as to reduce linear processing. Because the inventory is an attempt to tap the unconscious, the conscious use of linear logic had to be frustrated (Gregorc, 1982).
**Validity:** The validity of this measure was addressed by producing operational definitions of the given constructs Concrete/Sequential (CS), Concrete/Random (CR), Abstract/Sequential (AS), and Abstract/Random (AR) (For a review of these style instruments, see Appendix H).

In an attempt to validate the GSD over 475 subjects were classified according to the four constructs (CS, CR, AS, AR) based upon individual characteristics. About thirty-one percent or 146 subjects strongly agreed with their classifications, according to the delineator. Fifty-eight percent or 278 subjects agreed with their classifications. Only ten percent or 47 subjects were unsure, and one percent or four subjects disagreed. None strongly disagreed. Eighty-nine percent or 424 out of the 475 subjects agreed or strongly agreed with the characteristics theoretically attributed to them in the style delineator (Gregorc, 1982).

In another study, 110 adults were administered the GSD. In addition they were asked to respond to 40 selected characteristics theoretically attributed to them as classified by the delineator. Delineator scores and attributed scores were correlated resulting in significant relationships at the .001 level. Concrete/Random exhibited the lowest correlation \( r = .55 \) and Abstract/Sequential obtained the highest correlation \( r = .76 \).

**Reliability:** The internal consistency and stability of the GSD was addressed as follows. One hundred and ten individuals took the delineator (1982) on two occasions. The space between the occasions ranged from six hours to eight weeks. The test was administered identically on both occasions. A standardized alpha coefficient was calculated for each of the four scales in each of the two tests administered. The standardized alpha coefficients were all strong, ranging from 0.89-0.93 indicating a strong degree of internal consistency.
Instructional Utilities Inventory (IUI)

The initial Instructional Utilities Inventory (IUI) was created from extensive review of the literature on instructional techniques and devices. The inventory's function is to identify those utility constructs, i.e., techniques and devices, employed by an instructor in an educational method. "Techniques are defined as relationships established by the instructional agent to facilitate learning among a particular precisely defined body of participants in a specific situation" (Verner, 1962, p. 9). They are the identifiable generally recognized procedures used by an instructor to achieve specific educational goals or objectives. As discussed in the literature review, techniques range on a continuum from exposition to discovery in nature. Expository techniques include those activities in which the instructional presentations are highly structured and the students are relatively inactive recipients of information. Discovery techniques include the activities in which an instructor is a guide or creator of the learning situation and the students are active participants in their own learning experience (Gagne', 1985; Joyce & Weil, 1980; McKeachie, 1978; Romiszowski, 1981). The second variable or device "is a mechanical instrument or environmental factor which enhances the effectiveness and utility of the techniques but cannot independently function as a technique for the acquisition of knowledge" (Verner, 1962, p. 10). As identified in the literature review, devices are environmental elements with the potential of inducing subsequent learning experiences. The maximum experience obtainable by a given device ranges on a continuum from abstract to concrete. The concrete being the closer the experience produced resembles the actual experience (Dale, 1969).
Based upon the above stated format, the 35 instructional utilities identified were randomly listed so as to prevent any linear association. The list was then presented to ten professors of education who identified the items according to the degree of participant involvement, either Expository or Discovery, and to the degree of abstraction of the device induced learning experience, Abstract or Concrete. This categorized the 35 utilities included in the inventory into one of the four independent variables mentioned above. The final inventory was constructed based on the recommendations collected.

**Validity:** The validity of the measure was addressed by operationally defining the given constructs of the instrument, i.e, expository techniques, discovery techniques, abstract devices, concrete devices (for further information, see the Definitional Section, Chapter 1). A Utilities Definitional List was also developed for reference by test administrators during the time of data collection (see Appendix I). This list consists of operational definitions for the 35 utilities incorporated in the IUI. These definitions were derived from an extensive review of the literature addressing instructional techniques and devices.

The inventory was pretested on five experienced instructors for clarity, accuracy, conciseness, and appropriateness. Their reactions, in addition to the input received from the ten professors of education, resulted in the final inventory used for data collection.

**Reliability:** The reliability of the IUI was not measured directly, due to the nature of the study requiring a one time usage.
Student Satisfaction

The student satisfaction score was one of two dependent variables in this study. There was an attempt to measure the degree to which a course adequately addressed the needs and expectations of the participants involved. For this study the mean student satisfaction score, for a given course, was obtained from the standard Utah State University Course Evaluation Form (see Appendix E). This instrument has been reviewed extensively by USU's Testing Center. The most recent evaluation was in September, 1986.

Validity: The USU Mortar Board, a student honor society consisting of ten outstanding juniors and seniors, analyzed the measure. Items 1-10 on the measure were extensively reviewed for content, clarity, precision and potential ambiguity. All involved agreed to the adequacy of the items for measuring a successful course.

Item 11 on the instrument measures the relative student rating of the instructor as compared to other courses. An extremely strong correlation \((r = .95)\) was obtained between Item 11 and the mean of items 1-10 at the .001 level of significance. It was concluded that what the Mortar Board felt defined a successful course was directly related to how the students rated the instructor (Checketts, 1986).

Reliability: The internal consistency and stability of items 1-10 of the course evaluation were assessed as follows. One hundred courses were randomly selected from all courses taught on campus Spring quarter, 1986. A standardized alpha coefficient was calculated for this quarter and compared to the previous 1985 study. A standardized alpha coefficient of 0.91 indicated strong internal consistency between items 1-10 over time (Checketts, 1986).
Student Performance

The second dependent variable, student performance, was an assessment of how well students met the objectives of a given course. For this study the mean student grades for the given courses taught over the EDE system were used to measure this variable.

Validity: The validity of the grades generated on COM-NET were assessed by reviewing the USU Blue Book (Utah State University Office of Instructional Research, 1986), which is an institutional review of university facts and statistics published annually. The review indicated slight grade point average (GPA) inflation for undergraduate courses among colleges (100-500 level courses). Science courses had an average GPA of 2.39, Business courses had an average GPA of 2.77, Humanities, Arts, and Social Sciences had an average GPA of 2.97, and Education courses had an average GPA of 3.2. The overall undergraduate courses (100-500 level) had an average GPA of 2.75. The overall graduate courses (600-700 level) had an average GPA of 3.55. Graduate course GPAs appeared much more stable among departments (p. 139-140). This was due primarily to the strenuous admission requirements for entrance into graduate work and maintenance of a 3.0 GPA or greater by all departments for continued graduate work. The overall course GPA for all level courses and all departments averaged 3.15 (see Appendix J).

Reliability: The consistency and stability of the GPAs were determined by reviewing the current year figures GPAs with past years using the USU Blue Book. Resulting standardized alpha coefficients were strong, ranging from 0.79-0.94 indicating high stability of the GPA over time (Utah State University Office of Instructional Research, 1986).
Data collection was completed over a span of three weeks, from December 1 through December 17, 1986 by three instrument administrators. Following a phone call, during which an appointment was made for the instrument administration, a packet with an assigned reference number was assembled for each instructor. The instruments were administered in the instructors' offices during the pre-scheduled 20-minute appointment.

Instrument administrators were trained in two phases. First, the trainees reviewed the literature on the style delineator and the Instructional Utilities Inventory with its supplemental utilities definitional list. Instrument administrators became familiar with the format, recording procedures, and administration of the instruments. During the second phase, the trainees took the instruments personally and also corrected them. They also practiced interviews by conducting them on one another. Verbal corrective feedback on their performance was provided by the principal investigator.

The instrument administrators were then sent to the pre-assigned 20-minute appointments. Upon arriving at an instructor's office, a few minutes were allowed for conversational exchanges and warm-up time. The instructor was then given an explanation of the testing procedures. At that time he or she was asked if there were any questions or comments. When the subjects indicated that the procedures were understood, they were asked to sign the Informed Consent form (see Appendix K).

The Gregorc Style Delineator (GSD) was presented first. Upon completion, the GSD was exchanged for the Instructional Utilities
Inventory (IUI). Scoring of the GSD by the administrator proceeded as the instructor was completing the IUI. Upon completion of the utilities inventory, the instructor was asked to assess his or her experience with COM-NET. A few moments were then allowed for discussion of GSD results and overall perspectives. The instructor was allowed to respond to all inventories in private.

**Gregorc Style Delineator**

Each subject completed the Gregorc Style Delineator during the test administration period. The instructions were written and appeared on the first page of the form (see Appendix F).

The administrators were trained to emphasize the following points. The delineator is an introspective instrument for reflection upon self, therefore the testing environment should be free from potential disturbances and talk. Respondents were asked to react quickly to the words on the matrix soliciting initial response. No words were defined on the matrix for the participants. Gregorc (1982) requires that individuals actively connect the words with personal thoughts and feelings. A four-minute time limit was allowed for the completion of the matrix. Scoring and drawing of the style profile were performed by the administrator. It was stressed that the categories are valueless and that the tool is merely an awareness instrument. The respondents were allowed, after completion of the instrument, to talk with the administrator about their style and profile.

**Instructional Utilities Inventory**

The instructors were presented with the Instructional Utilities Inventory form (See Appendix G). This one-page paper/pencil instrument
consisted of the previously described 35 instructional devices and techniques randomly placed in a column down the left side of the page. Instructors were asked to estimate their individual use of the device or technique in the electronic distance delivery experience on COM-NET. The instrument was based on a continuum of estimated use. Of the five categories (0-4), 0 indicated no use of the utility, 1 indicated infrequent use of the utility (once a course), 2 indicated occasional use of the utility (more than once a course), 3 indicated the utility was used often (once a meeting), and 4 indicated a constant use of the utility. Upon completion the 35 items were then tabulated according to the four independent variables identified in the method section of this chapter, i.e., expository techniques, discovery techniques, abstract devices, and concrete devices. Each of these four utilities produced a weighted individual use score.

Instrument administrators were given a copy of the IUI Definitional List (see Appendix I) and when clarification was needed on a specific technique or device it was referred to. Due to the introspective nature of the instrument and the time that had elapsed since teaching on the system, it was required that the room be free from potential outside disturbances. There was no time limit upon the task, but the average completion was within ten minutes, determined by the pretest studies on the instrument.

**Student Satisfaction**

Each student enrolled during the study period took the standard Utah State University Course Evaluation Form (see Appendix E). The on-site COM-NET teaching assistants administered the measure during the next to the last class period. During the administration the instructor was
not present on the system. Items 1-10 were then encoded by course by the U.S.U. Testing Center where access was then obtained.

**Student Performance**

Each student enrolled during the study was given a course grade by the appropriate instructor. The grades represented the degree to which the students met the objectives of the specific course. These grades were then recorded by the COM-NET office where they were then obtained.

**Data Analysis**

The Statistical Package for Social Sciences (SPSSX, 1983) was used to produce all the tables and subsequent analysis of the data for this study. Frequency distributions and percentages were obtained for all of the data collected in the study. In determining how the responses of the varying instruments were different, the following analyses were used to arrive at conclusions necessary to interpret the results of the study.

The variables were first correlated using the Pearson Product Moment Correlations. One-tailed significant tests resulted in a simple correlation matrix of the dependent variables: (a) Student Satisfaction and (b) Student Performance. The independent style variables were: (a) Concrete/Sequential, (b) Concrete/Random, (c) Abstract/Sequential, and (d) Abstract/Random, and the independent utilities variables were: (a) Expository Techniques, (b) Discovery Techniques (c) Abstract Devices and (d) Concrete Devices. The covariance between the variables was analyzed with regard to direction and magnitude. It is a common practice to describe the strength of the correlation by descriptive adjectives such as high, low, moderate, strong, weak, and so forth. According to Borg and
Gall (1983), correlation coefficients ranging from .20 to .35 show a slight relationship between the variables. Correlations around .50 indicate that crude group prediction may be achieved, yet only describing about a 25 percent common variance between the two variables. Correlation coefficients ranging from .65 to .85 make possible group predictions and are accurate enough for most purposes. "Correlation coefficients over .85 indicate a very close relationship between the two variables correlated" (p. 624).

Multiple Regression Analysis was used to determine possible magnitudes and directions of relationships between each dependent variable and the independent variables of the study. The independent variables were reviewed in a step-wise manner where each variable was examined at each statistical step for entry or removal. The first variable is selected if it meets the entry requirements, the second variable is selected based on the highest partial correlation. After each step the variables already in the equation are examined for removal. Variables are removed until none remain that meet the removal criteria (SPSSX, 1983). A simple T test was employed to analyze group percentages at an alpha level of 0.05 (where applicable higher levels of significance will be indicated).

Contextual qualitative data (see Appendix M) acquired from the instructors' written comments were analyzed for practical significance. The individual comments were coded and categorized by general topic. Of the given topics, frequency counts were taken and analyzed relative to the total number of comments.
Limitations of the Study

The results of this study must be interpreted in light of some notable limitations, i.e., the design, sampling, variable measurement, and research setting. A discussion of each follows.

Design

Correlational studies do not control for anything; they measure the variables in an after-the-fact manner, looking for relationships between them. Following a correlational study, inference is limited to the existence of relationships among the variables, but cannot infer that changes in one variable cause changes in a second. "It is possible to infer causality from the results of an experimental study, but not from the results of a correlational study" (Loftus & Loftus, 1982, p. 427). Correlation coefficients merely indicate the "strength of the mathematical relationships between X and Y. It is left to the researcher to determine the reasons for the correlation, R is merely the degree to which the two variables are related, the why of the relationship is a non-mathematical matter left up to the ingenuity of the researcher" (Bartz, 1981, p. 201). Due to the nature of this correlational study, it must be remembered that an indication of correlation merely indicates that there was insufficient evidence to accept the null hypothesis that a relationship existed.

In psychology and education, the presence of a correlation between two variables can rarely be interpreted as implying a direct causal relation. In many situations, two variables are correlated because both are correlated with an underlying variable or set of variables. Very simply X and Y may be correlated because both bear a direct causal relationship to an underlying variable (Ferguson, 1981, p. 137).
Sample

The sample for this study consisted of all instructors who taught on the COM-NET EDE network from Fall quarter, 1985 through Summer quarter, 1986. They were not selected randomly, their selection was based upon personal willingness to react to their experience.

The use of regression analysis for statistical inferences makes certain assumptions concerning random sampling and the existence of continuous interval data. "Since social scientific research seldom satisfies these assumptions, caution should be used in assigning ultimate meaning to the results of regression analysis" (Babbie, 1979, p. 502).

Most of the 35 instructors as well as the students involved during the study period encountered "first-time" experiences with COM-NET. It is not known whether teaching style or the first-time encounter with the system, effected the instructional presentation and subsequent satisfaction and performance.

Utah State University is a land-grant institution having an enrollment of about 10,000 students. The University is in an essentially rural area and is isolated from major population concentrations in the state. It is considered both politically and religiously conservative. The personality of this institution and cultural characteristics unique to its intermountain, rural, west location, could limit the generalizability of the results to other university populations.

Another limitation on the study which could possibly affect the validity, as well as the reliability of the findings, was that of course content. Of the 45 courses taught on the system, nine were physical science courses, and the remaining 36 were social science courses. Content adaptability to the system could be a significant factor affecting both student satisfaction
and student performance, as well as techniques and devices utilized by the instructor.

Measurement

Both of the instruments used in the study are self-report measures and are considered among the weaker research measures (Borg & Gall, 1983). Scoring for both instruments consisted of summing up the ranks. Neither has established an appropriate nomitive base for valid interpretation of these scores. An incomplete development of many of the theoretical concepts underlies both instruments.

In the Gregorc Style Delineator, Gregorc (1982) included the following limitations to its use: (a) the delineator shows relative, not absolute abilities and capabilities, (b) it should not be used as a sole criterion for educational diagnosis or prescription and, (c) the results may be incorrect due to failure to follow directions, desire to project a desired image, and the guessing of word meanings (p. 41). The relative student satisfaction scores derived from the student USU course evaluation form were indicators of successful instruction and in no way indicated indisputable evidence of absolute satisfaction.

Research Setting

Another possible limitation to the study may have been the adaptations which occurred in the research setting during the study period. The COM-NET EDE system is in constant change because of its relative newness. Midway through this study, the addition of facsimile machines for print material exchange were added to the system. This could have had a confounding effect on the courses taught after implementation as opposed to those prior to implementation of facsimile machines. Midway through
the study an increased emphasis was placed upon instructional design and inservice training for both instructors on the system and the teaching assistants at the various outreach center locations. The use of program manuals was also stressed at this point.
CHAPTER IV

RESULTS OF THE STUDY

Introduction

The primary purpose of this study was to learn more about certain aspects of instruction in Electronic Distance Education (EDE) methods. As a method, EDE exhibited characteristics that were different from the traditional face-to-face method incorporated in distance education. EDE limitations appeared to cluster around the communication links, both verbal and non-verbal, between the instructor and the student. The literature suggested that greater responsibility for learning was required by the student participating in the correspondence method of distance education. While assumptions have been made about the differences between electronic distance education and traditional distance education, few empirical studies have been conducted to investigate the student/instructor relations of this non-traditional method of delivery.

It was hypothesized in this study that EDE instructional presentations, i.e., the style and the utilities employed by the instructors, were related to student satisfaction and student performance for a given course. It was also hypothesized that instructional style predicted to a degree the techniques and devices utilized in electronic distance education methods.

The Gregorc Style Delineator (GSD) was used to ascertain the teaching style of the instructor for a given course and the Instructional Utilities Inventory (IUI) was used to categorize the techniques and devices employed by the instructor in that course. The dependent variables of
student satisfaction and student performance were measured using the Utah State University Course Evaluation form and the mean grade for the given course respectively. Contextual data were gathered from solicited instructor comments regarding their EDE experiences.

This chapter presented the results of the data analysis. The section presents (a) the characteristics identified by the Gregorc Style Delineator and their effect on student satisfaction and student performance, (b) Instructional Utilities Inventory scores and their correlation with student satisfaction and student performance, (c) relationships of teaching style to utilities employed, (d) a summary of the findings resulting from the six hypotheses tested, and (e) a summary of contextual qualitative data.

**Characteristics of the Study**

As indicated previously, the study included all courses taught on the COM-NET Electronic Distance Educational method from Fall quarter, 1985 through Summer quarter, 1986 (see Appendix L). Thirty-seven instructors taught the 45 courses delivered during this time period. Of the 37 instructors, 2 were unaccessible at the time of data collection. One instructor had sought different employment and was out of the region, the second instructor was out of the country temporarily. The 45 courses resulted in 150 total credits delivered in the four-quarter period which in turn constituted 37.5 credits per quarter, averaging 3.3 credits per course. An average of 45 hours were utilized on the system each week. One thousand one hundred thirty-three (1133) enrollments were generated from the courses, resulting in an average of 333 enrollments per quarter (see
Table 2). The courses delivered on the system included 9 courses in the physical sciences and 36 courses in the social sciences.

Table 2

<table>
<thead>
<tr>
<th>QUARTER</th>
<th>COURSES</th>
<th>CREDIT</th>
<th>REGISTRATIONS</th>
<th>HOURS ON SYSTEM WEEKLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 85</td>
<td>6</td>
<td>23</td>
<td>229</td>
<td>21</td>
</tr>
<tr>
<td>Winter 86</td>
<td>13</td>
<td>46</td>
<td>418</td>
<td>43.5</td>
</tr>
<tr>
<td>Spring 86</td>
<td>14</td>
<td>43</td>
<td>393</td>
<td>41</td>
</tr>
<tr>
<td>Summer 86</td>
<td>12</td>
<td>38</td>
<td>293</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>150</td>
<td>1333</td>
<td>141.5</td>
</tr>
<tr>
<td>Average</td>
<td>11.5</td>
<td>37.5</td>
<td>333</td>
<td>35.4</td>
</tr>
</tbody>
</table>

Table 3 reports the student satisfaction and performance aspects of this study. The average student satisfaction score for the study was 3.277 as compared to the on-campus score of 3.5 (Checketts, 1986). The USUCourse Evaluation form uses an index rating system from strongly disagree (0) to strongly agree (4) to indicate student satisfaction with a course. Thus the average COM-NET student satisfaction score falls between agree to strongly agree. The standard deviation was .35 with a range from 2.1 (disagree with the statement) to 3.8 (strongly agree with the statement).

The average student performance score (mean GPA for the course) on the system was 3.047, or a B average for all courses taught during the time period covered by this study. This is compared to an on-campus GPA of 3.14 (Utah State University Office of Instructional Research, 1986). The
standard deviation for COM-NET student performance was .567 with a range from 1.67 a C- grade to 4.0 an A grade (see Table 3).

Table 3

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>RANGE MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Satisfaction</td>
<td>3.277</td>
<td>.352</td>
<td>2.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Student Performance</td>
<td>3.047</td>
<td>.567</td>
<td>1.67</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Table 4 illustrates a summary of the teaching style data. Teaching styles were fairly evenly distributed although the Abstract/Random style was slightly predominant with an average rating of 27.023. This was the only style rated as "high" on Gregorc's style index (Gregorc, 1982, p.11).

The Instructional Utilities Inventory is designed to score an individual's estimate of personal utility usage. The scale consists of a continuum ranging from 0 (never used), 1 (infrequent or used once a course), 2 (occasionally or more than once a course), 3 (often, once a meeting), and 4 (constantly). Of the 35 utilities identified in the scale, each possessing a maximum rating of 4, any given instructor's identifiable utilities rating could range from 0-140. Table 5 reports the use of the measured utilities during the study period. It indicates that the average rating was 55.28. The factored mean utility score averaged 1.62, indicating that an identifiable utility was employed "more than once a course" (see Table 5).
Table 4

Teaching Style Summary

<table>
<thead>
<tr>
<th>RANK ORDER</th>
<th>STYLE</th>
<th>MEAN</th>
<th>RANGE MIN</th>
<th>RANGE MAX</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abstract Random</td>
<td>27.023</td>
<td>16</td>
<td>41</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Concrete Random</td>
<td>25.395</td>
<td>14</td>
<td>42</td>
<td>Intermediate</td>
</tr>
<tr>
<td>3</td>
<td>Abstract Sequential</td>
<td>24.674</td>
<td>12</td>
<td>42</td>
<td>Intermediate</td>
</tr>
<tr>
<td>4</td>
<td>Concrete Sequential</td>
<td>23.884</td>
<td>11</td>
<td>38</td>
<td>Intermediate</td>
</tr>
</tbody>
</table>


Table 5

Instructional Utilities Summary

<table>
<thead>
<tr>
<th>RANK ORDER</th>
<th>Utility</th>
<th>MEAN UTILITY SCORE</th>
<th>RANGE MIN</th>
<th>RANGE MAX**</th>
<th>FACTORED UTILITY SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Discovery Tech</td>
<td>24.512</td>
<td>9</td>
<td>38</td>
<td>1.75</td>
</tr>
<tr>
<td>2</td>
<td>Abstract Devices</td>
<td>16.326</td>
<td>9</td>
<td>24</td>
<td>1.82</td>
</tr>
<tr>
<td>3</td>
<td>Expository Tech.</td>
<td>12.258</td>
<td>3</td>
<td>21</td>
<td>2.33</td>
</tr>
<tr>
<td>4</td>
<td>Concrete Devices</td>
<td>2.186</td>
<td>.0</td>
<td>11</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Total: *55.280  21.0  94

* Total identifiable utility scoring range: 0 = No utilities used, 140 = Constant use of all 35 utilities.
** Mean use per utility scale: 0 = Never used, 1 = Infrequently used (once a course), 2 = Occasionally used (more than once a course), 3 = Often used (once a meeting), 4 = Constantly used.

The Instructional Utilities Inventory was pretested using ten professors of education at Utah State University. With their help, the utilities were categorized into the dualities of techniques and devices. The technique items were labeled from expository or discovery, based upon the degree of student participation evoked. The devices were labeled either
concrete or abstract based on the subsequent experience produced. The 35 discrete utilities were then reduced to four independent variables: 7 techniques were incorporated and categorized as Expository Techniques, 16 were labeled Discovery Techniques, 8 were labeled as Abstract Devices and 4 as Concrete Devices. Based upon these four classifications, the factored mean utility rating for expository techniques (1.57) indicated usage of "more than once a course". Discovery Techniques (1.8) were used "more than once a course also". Abstract Devices (2.33) were used "more than once a course", approaching "once a meeting". Concrete Devices on the other hand, (0.54) were used "never to infrequently" (see Table 5).

The instructional techniques in Table 6 were rank ordered based upon use as follows: (a) Lecture (3.528), used at least "once a meeting" approaching "constant use"; (b) Open-Ended Discussion (3.2) used "more than once a meeting"; (c) Directional Questioning (3.0) used "once a meeting"; (d) Directed Readings (2.8) used "more than once a course", almost "once a meeting"; (e) Written Activities (2.4) used "more than once a course"; (f) Inquiry Techniques (2.25) used "more than once a course"; (g) Independent Readings (2.23) used "more than once a course"; (h) Case Studies (2.0) used "more than once a course" (see Table 6).

The instructional devices in Table 7 were scored based upon use as follows: (a) Books (3.33) used "more than once a meeting", (b) Writing Boards (3.25) used "more than once a meeting", (c) Diagrams (2.76) used "more than once a course" approaching "once a meeting", (d) Overhead Projectors (2.23) used "more than once a course", and (e) Program Manuals (1.98) used "more than once a course". No concrete devices on were used "once a course" (see Table 7).
Table 6

**Technique Use Summary**

<table>
<thead>
<tr>
<th>RANK ORDER</th>
<th>TYPE</th>
<th>*MEAN USE</th>
<th>TECHNIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expository</td>
<td>3.581</td>
<td>Lecture</td>
</tr>
<tr>
<td>2</td>
<td>Discovery</td>
<td>3.209</td>
<td>Open Discussion</td>
</tr>
<tr>
<td>3</td>
<td>Discovery</td>
<td>3.023</td>
<td>Directional Questioning</td>
</tr>
<tr>
<td>4</td>
<td>Expository</td>
<td>2.814</td>
<td>Directional Reading</td>
</tr>
<tr>
<td>5</td>
<td>Discovery</td>
<td>2.395</td>
<td>Written Activities</td>
</tr>
<tr>
<td>6</td>
<td>Discovery</td>
<td>2.256</td>
<td>Inquiry Teaching</td>
</tr>
<tr>
<td>7</td>
<td>Discovery</td>
<td>2.233</td>
<td>Independent Reading</td>
</tr>
<tr>
<td>8</td>
<td>Discovery</td>
<td>2.000</td>
<td>Case Studies</td>
</tr>
</tbody>
</table>

Totals

<table>
<thead>
<tr>
<th>TYPE</th>
<th>*MEAN USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expository</td>
<td>1.75</td>
</tr>
<tr>
<td>Discovery</td>
<td>1.80</td>
</tr>
</tbody>
</table>

* 0 = Never, 1 = Infrequently, 2 = Occasionally, 3 = Often, 4 = Constantly
Table 7

**Device Use Summary**

<table>
<thead>
<tr>
<th>RANK ORDER</th>
<th>TYPE</th>
<th>DEVICE</th>
<th>*MEAN USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abstract</td>
<td>Books</td>
<td>3.326</td>
</tr>
<tr>
<td>2</td>
<td>Abstract</td>
<td>Writing Boards</td>
<td>3.256</td>
</tr>
<tr>
<td>3</td>
<td>Abstract</td>
<td>Diagrams</td>
<td>2.767</td>
</tr>
<tr>
<td>4</td>
<td>Abstract</td>
<td>Overheads</td>
<td>2.233</td>
</tr>
<tr>
<td>5</td>
<td>Abstract</td>
<td>Program Manuals</td>
<td>1.977</td>
</tr>
</tbody>
</table>

**Total** | Abstract | | 2.33     |

**Concrete** | | | 0.54     |

* 0 = Never, 1 = Infrequently, 2 = Occasionally, 3 = Often, 4 = Constantly

**Gregorc Style Delineator**

The Gregorc Style Delineator (1982) is a self-test instrument used to identify individual teaching styles (See Appendix F). It is a word association test consisting of ten columns of four words each. Completion of the delineator measures an individual’s perceptual tendencies in addition to the information ordering tendencies. The quartinary design results in some combination of four characteristics: Abstract/Random (AR), Abstract/Sequential (AS), Concrete/Random (CR), and Concrete/Sequential (CS). In order to be considered high in an area, a score of over 27 must be obtained (Gregorc, 1982).
Hypotheses

Hypothesis one stated that there was no significant relationship between teaching style employed during a given EDE course and student satisfaction with that same course. A review of the simple correlations between student satisfaction and teaching style in Table 8 revealed a moderate to low, positive correlation between the style Abstract/Random and student satisfaction ($r = 0.34$ at the .05 level of significance).

In the step-wise multiple regression between teaching style and student satisfaction the only variable that meets the insertion requirements is also Abstract/Random (see Table 8). Although it is statistically significant at the 0.05 level, it only predicts approximately 11.6 percent of the variability in student satisfaction (see Table 9). Hypothesis one, that there was no relationship between teaching style and student satisfaction, was rejected at the .05 level of significance.

Table 8
Correlation Coefficient Matrix Between Teaching Styles and Student Satisfaction and Student Performance.

<table>
<thead>
<tr>
<th>TEACHING STYLE</th>
<th>STUDENT SATISFACTION</th>
<th>STUDENT PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete/Sequential</td>
<td>$r = -0.109$</td>
<td>$p = 0.266$</td>
</tr>
<tr>
<td>Concrete/Random</td>
<td>$r = -0.241$</td>
<td>$p = 0.820$</td>
</tr>
<tr>
<td>Abstract/Sequential</td>
<td>$r = 0.154$</td>
<td>$p = 0.188$</td>
</tr>
<tr>
<td>Abstract/Random</td>
<td>$r = 0.340$</td>
<td>$p = 0.023$</td>
</tr>
</tbody>
</table>

a. Significant at .05 level
b. Significant at .01 level
Hypothesis two stated that there was no significant relationship between teaching style employed during a given EDE course and student performance in that course. Referring back to the simple correlation matrix (see Table 8), the Concrete/Random teaching style, covaried moderately in a negative direction with student performance \((r = -0.416)\) at the \(0.01\) level of significance. There was a very slight positive relationship between Abstract/Random teaching style and student satisfaction \((r = 0.29)\) at the \(0.05\) level of significance.

When performing the step-wise multiple regression of student performance versus teaching style, no significant variables helped to predict student performance. The insertion requirements for step-wise regression were not met. Hypothesis two, that there was no significant relationship between teaching style and student performance, was not rejected at the \(0.05\) level of significance due to the lack of predictibility of style on performance.

Referring back to the simple correlation matrix in Table 8, although not statistically significant, there is a tendency toward an inverse relationship between both concrete teaching styles and student satisfaction as well as student performance. There was also a tendency for abstract
teaching styles to covary in a positive direction with both student performance and student satisfaction.

**Instructional Utilities Inventory**

The Instructional Utilities Inventory is a self-test instrument used to measure the types and degree of use of the varying instructional utilities available for classroom use. The 35 discrete utilities are categorized as either Expository Techniques, Discovery Techniques, Abstract Devices or Concrete Devices. The instructor indicated frequency of use of the varying utilities by circling the appropriate rating: 0 = never, 1 = infrequently (once a course), 2 = occasionally (more than once a course), 3 = often (once a meeting), and 4 = (constantly). The utilities each possessed a maximum rating of 4, the resulting in an indication of both magnitude and preference of utilities used in an instructional setting.

**Hypotheses**

Hypothesis three stated that there was no significant relationship between instructional utilities employed during a given EDE course and the student satisfaction with that course. Referring to the simple correlation matrix in Table 10, the covariance of utilities versus student satisfaction revealed that no significant relationship existed.
It appeared that the techniques and devices utilized did not effect student satisfaction to a significant degree. The step-wise multiple regression consequently revealed no significant relationships and thus the variables of utility did not predict a significant portion of the dependent variables of student satisfaction. Hypothesis three, that there was no significant relationship between utilities employed in the course and the student satisfaction with that course was not rejected.

Hypothesis four stated that there was no significant relationship between instructional utilities employed during a given EDE course and the student performance in that course. Referring to the simple correlation matrix in Table 10, discovery techniques appear to covary in a positive moderately high degree with student performance at the .001 level of significance (r = .514). Using the step-wise multiple regression model, it was predicted that the independent variable, discovery techniques, would account for 26.4 percent of the variability in the dependent variable, student performance at the .001 level (see Table 11). The prediction model was also run using the enter method as opposed to step-wise, all of the independent
variables named were entered in a single step. The default variable was all independent variables (SPSSX, 1983). Of all the variables computed in this method, the only significant independent variable was discovery techniques for predicting student performance at a .005 significance level. As seen in Table 12, this variable predicted 43 percent of the variability of student performance. No other variable predicted a significant portion of the dependent variables of either student satisfaction or student performance in using the enter method. Therefore hypothesis four, that there was no significant relationship between instructional utilities employed during a given EDE course and the student performance in that course, was rejected at the .001 level of significance.

Table 11

**Multiple Regression Summary Between Student Performance and Discovery Techniques...Step Wise**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>B</th>
<th>SEB</th>
<th>MULTIPLE R</th>
<th>R SQUARE</th>
<th>T</th>
<th>SIG T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery Tech.</td>
<td>.03317</td>
<td>.00963</td>
<td>.51419</td>
<td>.26439</td>
<td>2.444</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note: Significant at .001 level

Table 12

**Multiple Regression Summary Between Student Performance and Discovery Techniques...Enter**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>B</th>
<th>SEB</th>
<th>MULTIPLE R</th>
<th>R SQUARE</th>
<th>T</th>
<th>SIG T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery Tech.</td>
<td>.03891</td>
<td>.01327</td>
<td>.65634</td>
<td>.43090</td>
<td>2.931</td>
<td>.007</td>
</tr>
</tbody>
</table>

Note: Significant at .01 level
**Relationship of Teaching Style to Utilities**

The findings from the review of the literature on instructional techniques and teaching style suggested a potential relationship between the two variables. The results of the Gregorc Style Delineator were compared to those of the Instructional Utilities Inventory producing the following findings.

**Hypotheses**

Hypothesis five stated that there was no significant relationship between teaching style and instructional techniques employed in EDE methods. The simple correlation matrix in Table 13 was developed depicting the variable of "expository technique" and how it relates to teaching style. It covaried to a slight degree with the Concrete/Random teaching style at the .05 level of significance (r = .259). Using the step-wise multiple regression prediction model, no significant variables predicted exposition technique use.

**Table 13**

**Correlation Coefficient Matrix Between Teaching Styles and Expository Techniques and Discovery Techniques**

<table>
<thead>
<tr>
<th>MEDIATION STYLE</th>
<th>EXPOSITORY TECHNIQUE</th>
<th>DISCOVERY TECHNIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete/Sequential</td>
<td>r = .078</td>
<td>.165</td>
</tr>
<tr>
<td></td>
<td>p = 3.09</td>
<td>.146</td>
</tr>
<tr>
<td>Concrete/Random</td>
<td>r = .259</td>
<td>a-.303</td>
</tr>
<tr>
<td></td>
<td>p = .047</td>
<td>.024</td>
</tr>
<tr>
<td>Abstract/Sequential</td>
<td>r = .132</td>
<td>.035</td>
</tr>
<tr>
<td></td>
<td>p = .200</td>
<td>.412</td>
</tr>
<tr>
<td>Abstract/Random</td>
<td>r = -.181</td>
<td>b.357</td>
</tr>
<tr>
<td></td>
<td>p = .122</td>
<td>.009</td>
</tr>
</tbody>
</table>

a. Significant at .05 level
b. Significant at .01 level
Referring again to Table 13, the dependent variable "discovery technique" appeared to covary inversely to a slight degree ($r = -.303$) with the Concrete/Random style, at the .05 level of significance. Discovery technique also to covary in a positive direction with the Abstract/Random style in a moderate magnitude also at the .01 level of significance ($r = .357$).

In reviewing the step-wise multiple regression model in Table 14, the independent variable Abstract/Random teaching style predicted 21.7 percent of the variability of discovery techniques at the .05 level of significance. Thus hypothesis five, that there was no significant relationship between teaching style and the instructional techniques employed was rejected.

Table 14

**Multiple Regression Summary Between Discovery Techniques and the Abstract/Random Teaching Style...Step Wise**

<table>
<thead>
<tr>
<th>VARIABLE(S) ENTERED ON STEP #1...</th>
<th>ABSTRACT RANDOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLE</td>
<td>B</td>
</tr>
<tr>
<td>Abstract/Random</td>
<td>.41626</td>
</tr>
</tbody>
</table>

a. Significant at .05 level

Hypothesis six stated that there was no significant relationship between teaching style and the instructional devices employed in EDE methods. The simple correlation matrix in Table 15 was generated. In reviewing the variable of Concrete/Sequential teaching style, there was a significant negative covariance at the .01 level of significance with abstract devices ($r = -.373$). Concrete/Random teaching style appeared to also covary marginally in a negative direction at the .05 level of significance with
abstract devices \( (r = .255) \). Abstract/Sequential teaching style tended to covary in a moderately positive direction at the .05 level of significance with abstract devices \( (r = .418) \). The Concrete/Random teaching style had a very slight, although significant effect upon concrete devices in an inverse direction \( (r = -.260) \) at the .05 level of significance.

Table 15

**Correlation Coefficient Matrix Between Teaching Styles, Abstract Devices and Concrete Devices**

<table>
<thead>
<tr>
<th>MEDIATION STYLE</th>
<th>ABSTRACT DEVICES</th>
<th>CONCRETE DEVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete/Sequential</td>
<td>( r = b .373 )</td>
<td>( p = .007 )</td>
</tr>
<tr>
<td>Concrete/Random</td>
<td>( r = .007 )</td>
<td>( p = -.255 )</td>
</tr>
<tr>
<td>Abstract/Sequential</td>
<td>( r = c .050 )</td>
<td>( p = .418 )</td>
</tr>
<tr>
<td>Abstract/Random</td>
<td>( r = .003 )</td>
<td>( p = .269 )</td>
</tr>
</tbody>
</table>

a. Significant at .05 level
b. Significant at .01 level
c. Significant at .005 level

When analyzed with step-wise multiple regression, the only independent variable that had a significant effect on the dependent variable of abstract devices was that of Abstract/Sequential teaching style. It explained 17.4 percent of the variability in abstract devices at the .005 level of significance (see Table 16). Thus hypothesis six, that there was no significant relationship between the teaching style and the instructional devices employed in EDE methods was rejected.
Table 16

**Multiple Regression Summary Between Abstract Devices and the Abstract/Sequential Teaching Style...Step Wise**

**VARIABLE(S) ENTERED ON STEP #1... ABSTRACT/SEQUENTIAL**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>B</th>
<th>SEB</th>
<th>MULTIPLE R</th>
<th>R SQUARE</th>
<th>T</th>
<th>SIG T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract/Sequential</td>
<td>.23064</td>
<td>.07831</td>
<td>.41786</td>
<td>.17461</td>
<td>2.945</td>
<td>.005</td>
</tr>
</tbody>
</table>

* c. Significant at .005 level

**Quantitative Summary**

The results of this study were varied. Although there was no cause and effect relationship which could be assumed, there appeared to be tendencies in certain directions, of varying strength. Hypothesis one, that teaching style does not effect student satisfaction was rejected. There appeared to be one significant relationship between the Abstract/Random teaching style and student satisfaction. They tended to covary in a very slight positive direction ($r = .34$) at the .05 level of significance. Abstract/Random teaching style also predicted approximately 11.6 percent of the variability of student satisfaction.

Hypothesis two, that there was no significant relationship between teaching style and the student performance, was not rejected due to nonsignificant results from the multiple regression test. The Concrete/Random teaching style covaried in a moderately negative direction with student performance ($r = -.416$) at the .01 level of significance. There also was a very slight correlation between Abstract/Random teaching style and student performance ($r = .288$) at the .05 level of significance. There was no predictive utility or significance.
Hypothesis three, that instructor utilities had no relationships with student satisfaction, was not rejected. This was due to the fact that there were no significant utility variables affecting student satisfaction.

Hypothesis four, that instructional utilities had no relationship with student performance, was rejected. There seemed to be a moderate correlation between discovery techniques and student performance ($r = .514$) at the .001 level of significance. Discovery technique also predicted 26.4 percent of the variability of the student performance under the step-wise method of variable entry. When run under the enter method, it predicted 43 percent of the dependent variable student performance.

Hypothesis five, that there was no significant relationship between teaching style and instructional techniques employed in the EDE method, was rejected. There appeared to be a slight positive relationship between Abstract/Random teaching style and discovery techniques ($r = .357$) at the .01 level of significance. Abstract/Random style also predicted 12.7 percent of the variability of discovery techniques. Other correlations, although possessing no predictive validity, yet still covarying slightly included the Concrete/Random style and discovery as well as expository techniques. A slight negative correlation ($r = -.303$) was found with discovery techniques along with a slight positive correlation ($r = .259$) with expository techniques both at the .05 level of significance.

Hypothesis six, that there was no significant relationship between teaching style and the instructional devices employed in EDE methods, was also rejected. Abstract/Sequential style covaried with slight to moderate magnitude ($r = .418$) with abstract devices at the .005 level of significance. It also predicted 17.5 percent of the variability in abstract devices. Other relationships, although statistically significant yet not predictive, were
Concrete/Random style and concrete devices in a slight negative direction ($r = -.260$) at the .05 level of significance and Concrete/Sequential style with abstract devices in a slight negative direction ($r = -.373$) at the .05 level of significance.

In reviewing the correlation matrix between styles and utilities other relationships, although not significant, appeared to exist. It seemed that concrete perceptual teaching styles appeared to have inverse negative tendencies with discovery techniques, abstract devices, and concrete devices. The converse was true with abstract perceptual teaching styles, they appeared to have positive tendencies with discovery techniques, abstract devices and concrete devices. Concrete perceptual styles also appeared to have positive tendencies with expository techniques.

In summary, the results of this study seemed to stress the use of the discovery approaches to instruction. It also stressed the use of devices to aid in the learning activities. The abstract perceptual teaching style appeared to adapt well to the EDE method, due to the demand for flexibility, adaptability and spontaneity required by this innovative venture. This did not infer that the more concrete-oriented individuals could not learn to adapt and subsequently function at a high level of proficiency, it merely implied ease of adaptation. Quality instruction is quality instruction, any style, technique or device applied properly could be effective in any educational method. The EDE method appeared to allow less margin for error than the traditional face-to-face method.

**Contextual Evidence**

Upon completion of the formal portion of the testing, instructors were encouraged to comment on their experiences on the COM-NET system.
Table 17 is a summary of the 166 distinct comments received from all 35 instructors, resulting in an average of 4.7 comments from each instructor. The comments were categorized as either Category I Infrastructure-oriented or Category II Device-oriented (for a complete list of the actual comments see Appendix M).

Table 17

**Frequency of Contextual Comments by Category**

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>FREQUENCY OF COMMENTS</th>
<th>% OF CATEGORY</th>
<th>% OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Instructors</td>
<td>120</td>
<td>100</td>
<td>72.3</td>
</tr>
<tr>
<td>1. Satisfaction</td>
<td>74</td>
<td>61.6</td>
<td>44.6</td>
</tr>
<tr>
<td>2. Disatisfaction</td>
<td>40</td>
<td>33.3</td>
<td>24</td>
</tr>
<tr>
<td>a. Course Redesign</td>
<td>28</td>
<td>23.3</td>
<td>16.9</td>
</tr>
<tr>
<td>b. Course Participation</td>
<td>12</td>
<td>10</td>
<td>7.2</td>
</tr>
<tr>
<td>B. Support Staff</td>
<td>12</td>
<td>10</td>
<td>7.2</td>
</tr>
<tr>
<td>C. Students</td>
<td>11</td>
<td>9</td>
<td>6.6</td>
</tr>
<tr>
<td>D. Recommendations</td>
<td>23</td>
<td>19</td>
<td>13.7</td>
</tr>
<tr>
<td>1. Inservice</td>
<td>13</td>
<td>10.8</td>
<td>7.8</td>
</tr>
<tr>
<td>2. Programming</td>
<td>10</td>
<td>8.3</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY II</th>
<th>FREQUENCY OF COMMENTS</th>
<th>% OF CATEGORY</th>
<th>% OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVICES</td>
<td>46</td>
<td>100</td>
<td>27.7</td>
</tr>
<tr>
<td>A. Facsimile</td>
<td>12</td>
<td>26</td>
<td>7.2</td>
</tr>
<tr>
<td>B. Audio</td>
<td>9</td>
<td>19.5</td>
<td>5.4</td>
</tr>
<tr>
<td>C. Motion Video</td>
<td>9</td>
<td>19.5</td>
<td>5.4</td>
</tr>
<tr>
<td>D. Writing Board</td>
<td>6</td>
<td>13</td>
<td>3.6</td>
</tr>
<tr>
<td>E. Slow Scan Video</td>
<td>5</td>
<td>10.8</td>
<td>3</td>
</tr>
<tr>
<td>F. Computer</td>
<td>3</td>
<td>6.5</td>
<td>1.8</td>
</tr>
<tr>
<td>G. Color Video</td>
<td>2</td>
<td>4.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Infrastructure referred to the human elements of the EDE system (see Appendix B). Of the 166 comments received, 120 addressed
infrastructure and represented 72.3 percent of the total comments. This category consisted of comments related to instructor satisfaction/dissatisfaction, support staff, students, and recommendations. Table 17 reveals 74 comments were received about instructors' personal perspectives on COM-NET representing 61.6 percent of the total infrastructure comments or 44.6 percent of the overall total comments. These comments expressed either satisfaction or dissatisfaction with the experience.

Thirty four comments were received expressing instructor satisfaction, representing 28.3 percent of the infrastructure comments or 16.9 percent of the total comments. These suggested satisfaction with the experience. The comments could be categorized as good to excellent. There were no negative comments received about COM-NET in general. To summarize, COM-NET was praised as being cost-effective, stimulating, educational, successful, interesting, challenging, and rewarding, and requests to teach annually were received. COM-NET's future was predicted to be positive and growing.

Forty comments were received addressing instructor dissatisfaction, representing 33.3 percent of the total infrastructure comments or 24 percent of the overall total comments. These comments addressed two concerns: course redesign and student participation. Twenty eight comments were received concerning course redesign, representing 23.3 percent of the infrastructure comments and 16.9 percent of the total comments. These comments emphasized the time and effort required to redesign the course for EDE delivery method. Instructor time and effort are not being adequately recognized or supported financially. Insights gained on COM-NET have been carried over to on-campus courses. For some courses the
absence of film usage was stressed as a major deficiency with the system and thus requiring additional course redesign. Twelve comments addressed student participation, representing 10 percent of the total infrastructure comments and 7.2 percent of the overall total comments. It was suggested that adequate course design would overcome the major limitation of the system, that being student performance, getting, maintaining, and encouraging participation was cited as a major task. The use of interactive teaching techniques was suggested as a means for encouraging participation.

Twelve comments were received addressing the COM-NET support staff, representing 10 percent of the infrastructure comments and a 7.2 percent of the overall total comments. The majority were very positive, stressing their importance in the system. The teaching assistants received much acclaim. It was suggested that the centers needed better internal communications.

Seventeen comments were received addressing the rural students, representing 9 percent of the infrastructure comments and 6.6 percent of the total comments. They were identified as being different from the on-campus student, however the majority did as well as on-campus students. The high "non-completion" rate was a concern that surfaced.

Twenty three comments received were recommendations, representing 19 percent of the infrastructure comments or 13.7 percent of the total comments. These recommendations were in two general areas, inservice and programming. Thirteen recommendations were received addressing inservice needs, representing 10.8 percent of the infrastructure comments or 7.8 percent of the overall total comments. The faculty asked for support seminars and idea sharing to aid in the quality of their
presentation. Inservice for students was suggested to aid in their adaptation to the system as well as to college course work. Instructional flexibility and technique use was stressed as invaluable to the EDE experience. Ten recommendations were received addressing programming, representing 8.3 percent of the infrastructure comments or 6 percent of the total comments. It was suggested that certain courses have special requirements. Greater advanced notice of future courses would aid in the adaptation process. Counseling time over the system would also aid in the quality of the system.

Devices are the hardware of the EDE system (see Appendix A). Of the 166 comments, 46 were received addressing these devices, representing 27.7 percent of the total comments. More specifically, the aspects of facsimile, audio, motion video, writing board, slow-scan video, computer and color video were discussed.

Twelve comments were received concerning the problem of print materials delay, representing 26 percent of the device comments or 7.2 percent of the total comments. The facsimile machines were not implemented until Spring quarter, 1986, midway through the study. Inspite of this, it appeared from the comments that these machines were addressing one of the major problems of the system, that of timely print materials exchange.

Nine comments were received addressing the audio aspects of the system, representing 19.5 percent of the total device comments or 5.4 percent of the overall total comments. It was stressed as being the "backbone" of any system. It was suggested that "Without two-way audio, it is not education" and that all other elements of the system only enhance the audio.
Nine comments were received dealing with motion video representing 19.5 percent of the total device comments or 5.4 percent of the overall total comments. Non-verbal feedback was stressed as one of the major motivations for motion video. Visual cues are an important aspect of communication. Each course has different needs with regard to motion. Certain courses cannot function without it. Another need expressed for the support of motion video was that of motion picture dissemination.

Six comments were received addressing the writing boards, representing 13 percent of the total device comments or 3.6 percent of the overall total comments. They stressed the importance of the writing board in conjunction with the audio. The flexibility and interactivity of the writing board were the major strengths identified with this device.

Five comments were received concerning slow-scan video, representing 10.8 percent of the total device comments or 3 percent of the overall total comments. The characteristics of slow-scan were discussed indicating that, "It is better than no video", or that "It is useful for sending overhead visual material", and "It aids in student motivation". Faster scan rates were also recommended.

Three comments were received suggesting the use of computers, representing 6.5 percent of the total device comments or 1.8 percent of the overall total comments. Implementation of a computer network for instructional presentation in addition to student projects was suggested. The use of electronic mail between students and instructor would speed up turn around time on tests and assignments.

Two comments were received addressing color video, representing 4.3 percent of the total device comments or 1.2 percent of the overall total
comments. It was suggested that the importance of color video was content specific and not overly important for most courses.

**Contextual Summary**

Reviewing the frequencies of the various comments in Table 17, the instructors emphasized certain common issues with regard to their experiences on COM-NET. They stressed the importance of instructional presentation as the most important variable effecting performance over the EDE system. Dissatisfaction was expressed due to insufficient on-campus support for the needed course redesign. Student participation was also identified as a direct by-product of adequate course design. In general, the comments indicated that COM-NET is a viable educational delivery method and that the human support structure is the critical element of the system. Devices created the setting but without appropriate and sufficient support, they remained merely devices. This point was emphasized by the disproportionate number of comments addressing the infrastructure.

The audio network was stressed as the backbone of any EDE system. The rest of the devices were of varying importance in assistance to the audio. Timely materials distribution was stressed as a major limitation to the system. The interactive facsimile network was identified as a possible solution to this problem. Interactive motion video was found to be a major element so as to more adequately represent the on-campus classroom. Color video, on the other hand, was suggested to be course content specific. The writing boards received favorable review due to their flexibility and interactivity.

It was suggested that the students possessed diverse backgrounds and experiences which aided greatly in overcoming the limitations of the
system. The strength of EDE was deemed viable due to the strength of the students. The high "non-completion" rate was a concern of a few instructors.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this investigation was to gain insight into teaching/learning styles and instructional utility use as they pertained to an electronic distance educational method. Over the last 100 years, the traditional face-to-face instructional method has been the state of the art in delivering instruction to individuals. With the advent of new electronic communications devices and emergent Electronic Distance Educational (EDE) methods, questions of instructional quality, presentation, and delivery have been asked.

This study classified communication hardware as devices, in that they do not teach in and of themselves. It is the interaction of the human element with these devices which created sound educational methods. The development of a solid infrastructure with which to support the chosen devices becomes a mandate for those who plan to implement EDE methods.

EDE methods have become a viable means of course delivery. It was suggested that the most appropriate educational method and subsequent techniques be matched to the needs of the learner. Given the rural adult learner's informational needs and their inability to travel to campus universities because of employment and family responsibilities (Kidd, 1973; Knowles, 1973; Knox, 1977), EDE methods are very appropriate (Hammer & Shale, 1981; Mueller, 1983; Norwood, 1982). The support infrastructure are
a critical aspect with regard to any of these methods because devices functioned only as vehicles of delivery.

This investigation studied the non-technical aspects of EDE electronic distance education instructional presentation and its effect on student satisfaction and student performance. Its design was based upon simple correlation coefficient matrices with ensuing prediction models of multiple regression analysis. Contextual data were gathered from a self-reporting instrument completed by instructors whose courses were delivered via an EDE system, specifically the COM-NET system at Utah State University. The objective of the study was to determine to what degree the varying teaching styles, in conjunction with the instructional utilities employed in EDE methods, influenced student satisfaction and student performance. The teaching style data were gathered using the Gregorc Style Delineator (Gregorc, 1982). Instructional utilities data were gathered using the Instructional Utilities Inventory. Student satisfaction was ascertained by using the standard University Course Evaluation Form. Student performance was assessed by using the mean final grades of the 44 courses taught on the COM-NET System between Fall quarter 1985 and Summer quarter, 1986.

There were six hypotheses tested in this study. The results were varied and although no cause-effect relationships were determined due to the correlational nature of the study, certain tendencies did exist. Hypothesis one, that teaching style had no effect on student satisfaction, was rejected. The Abstract/Random (AR) teaching style covaried slightly in a positive direction with student satisfaction predicting 11.6 percent of the relationship. Hypothesis two, that teaching style had no effect on student performance, was not rejected. Hypothesis three, that instructional
utilities had no effect on student satisfaction, was not rejected. Hypothesis four, that instructional utilities have no relationship with student performance, was rejected. Discovery techniques explained 26.4 percent of the variable student satisfaction. Hypothesis five, that teaching style had no effect on instructional technique employed, was rejected. The Abstract/Random (AR) teaching style predicted 12.7 percent of the variability of discovery techniques. Hypothesis six, that teaching styles had no effect on the instructional devices utilized, was also rejected. The Abstract/Sequential (AS) teaching style covaried with abstract devices in a slight to moderate magnitude predicting 17.5 percent of the variability.

Through the instructor self-reporting procedure the importance of instructional presentation and course redesign in EDE delivery was stressed. Insufficient on-campus administrative support with regard to time and materials for course redesign was identified as the major deterrent to course success. The lack of student participation also surfaced as a concern of instructors. The general chronological age and experiential maturity of the students were believed to contribute to course success. Devices make the distance delivery of the instruction possible; yet the human element of the system was emphasized as the crucial determinant for success. The interactive devices of audio, facsimile machines, and writing boards were considered essential items for EDE networks. Motion video was recommended for the presentation of motion pictures.

Empirical Conclusions

Upon completion of data compilation, tabulating, and analysis, it was possible to respond to the research hypotheses which served as the basis for this investigation. They were related to the previously described dependent
variables of student satisfaction and student performance and the effect of instructional presentation upon them. The independent variables which pertained to instructional presentation were the four types of teaching styles: Concrete/Sequential (CS), Concrete/Random (CR), Abstract/Sequential (AS), and Abstract/Random (AR). Two types of techniques, expository and discovery, and two types of device-assisted experiences, abstract and concrete, comprised the other independent variables.

The following descriptive statistics emerged from the analysis of the courses taught. Of note was a mean student satisfaction score of 3.27 for all COM-NET courses studied as compared to a mean on-campus student satisfaction score of 3.5 for the same period (Checketts, 1986). The student satisfaction score was a measure of students' agreement with the statements, descriptive of quality courses, as stated on the standard USU course evaluation form. The 3.27 score indicated a mean rating of "agree" to "strongly agree" with the course evaluation form statements, suggesting that the COM-NET courses had been successful. A mean 3.04 grade point average (GPA) was earned by students who were in the COM-NET courses studied. During the same time period a mean GPA of 3.14 was earned by students in on-campus courses (Utah State University Office of Instructional Research 1986).

Of the instructional styles measured, the Abstract/Random teaching style had a mean rating of 27.023 which indicated a "high"rating on Gregorc's scoring index. Of the instructional techniques utilized over the system, lecture was used most frequently and occurred "constantly" in all classes. The second most-used technique was open discussion. A rating of 3.2 indicated that discussion occurred "once or more" during a class
period. Directional questioning rated third and directional reading placed fourth, each occurred "more than once a course". Both expository/discovery techniques appeared to be uniformly used. Of the instructional devices implemented, books were most highly utilized and were followed by writing boards, diagrams, and overhead transparencies, each of which was used "more than once a course". No concrete devices were implemented "constantly" and only the more traditional abstract devices, i.e. books, writing boards, diagrams, overhead projectors and program manuals were utilized more frequently.

Simple correlations between the variables indicated many "slight" to "moderate" statistically significant relationships both in positive as well as negative directions. As with most correlational studies, simple correlation alone, without reaching a "moderate" to "good" level, had little or no practical significance in and of itself. Therefore, in reviewing the outcomes of the project goals and the known hypotheses, only those which found significance in the prediction model of multiple regression were considered practically significant.

The first hypothesis, that there was no significant relationship between teaching style employed during the given EDE course and student satisfaction with that course, was rejected. Abstract/Random teaching style was statistically significant at the .05 level with regard to the variable of student satisfaction, predicting 11.6 percent of the variability of student satisfaction. The Abstract/Random individual, as defined by Gregorc (1982), as one whose world is abstract and non-physical. Ordering is based on a non-linear, multi-dimensional model of events and procedures occurring in waves of experience. Abstract/Random individuals are most comfortable when they can change direction as moods, feelings, interactions, etc.
change. They characterize themselves as spontaneous and adaptive to circumstances depending on the goal, plans, and objectives which may also change. Pacing or structure is often uncomfortable and confining to the Abstract/Random learners. They enjoy verbage and they are concerned with the details of their work. Due to the non-conventional nature of electronic distance education, the need for spontaneity, adaptability, and flexibility on the part of all concerned seems inevitable.

The second hypothesis, that there is no significant relationship between teaching style employed during a given EDE course and student performance in that course, was not rejected. Although many of the simple correlations did show slight-to-moderate statistical significance (Borg & Gall, 1983), none showed significant outcomes from the multiple regression model.

The third hypothesis, that there is no significant relationship between instructional utilities employed during a given EDE course and student satisfaction with that course, was also not rejected. This was based upon the same premise and logic as stated in hypothesis two.

The fourth hypothesis, that there is no significant relationship between instructional utilities employed during a given EDE course and student performance in that course, was rejected. The independent variable of "discovery technique" predicted 26.4 percent of the dependent variable student performance at the .001 level of significance. The discovery teaching approach is based on the philosophy wherein the learner is engaged in problem solving and solution-seeking activities thereby developing subsequent skills. The content of the course is viewed as a by-product of this problem solving skill development. Directed questioning, inquiry learning, and open discussion rely on high student involvement.
Adult learners on EDE systems, bring into the learning setting many different, rich learning experiences. Discovery techniques seem appropriate in facilitating interactive conversation and problem solving.

The fifth hypothesis, that there is no significant relationship between the teaching style and the instructional techniques employed in EDE methods, was rejected. The Abstract/Random teaching style predicted a significant portion of the variability of the dependent variable, discovery technique, explaining 12.7 percent at the .05 significance level. Faculty who used Abstract/Random teaching styles spontaneously dealt with, and adapted to, the environment by using discovery techniques and encouraging student involvement.

The sixth hypothesis, that there is no significant relationship between teaching style and the instructional devices employed in EDE methods, was rejected. The Abstract/Sequential teaching style predicted a significant portion of the variability of abstract devices explaining 17.5 percent at the .005 level of significance. Devices are communication channels which aid in the relaying of the experience. A major difference between the Abstract/Random individual as discussed previously and the Abstract/Sequential individual is the evidence of more structure in the information ordering process. Although still seeing their world as a very abstract, non-physical realm of thoughts and mental constructions, the ordering pattern in sequential individuals is represented by two-dimensional geometry. Through tree-like branching, starting with the common stem, the specific elements are sequentially linked to a base (Gregorc, 1986). A possible explanation for the moderately-significant relationship determined in this study, may have been the need for structure provided by preplanning and carefully considered utilization of
devices prior to engaging in the learning experience while still maintaining the flexibility of the abstract perceptual style.

Contextual Conclusions

As mentioned previously, the main function of any electronic distance delivery is to provide instruction and bridge the distance between students and instructors. With distance as the major compounding variable, a system of devices must be implemented and an infrastructure must be established to support and utilize that system so that it can legitimately be called a method. The discussion which follows is based on four areas of review, i.e., (a) instructor satisfaction and dissatisfaction, (b) support staff, (c) students, and (d) devices.

Instructors' comments and opinions were collected in written form. There were no negative comments toward the system in general. One of the major strengths identified was the ability to serve the informational needs of learners in remote locations without the instructor having to travel long distances. The COM-NET system challenged instructors and their comments suggested an appreciation for the opportunity to learn about the system. Instructional insight and materials generated in the COM-NET experience have been utilized by many in on-campus classes. Instructors suggested that a second experience on COM-NET would result in better instructional presentation. Increased inservice education for instructors was proposed as a means to improve course adaptation and technique development to the available modes of COM-NET. Flexibility of instructional style was stressed as an important factor of COM-NET course success which facilitated spontaneous adaptation to the non-traditional nature of the system.
The major limitations of the experience as viewed by the instructors were not directed at the system. They focused on the lack of on-campus financial support given to the system. Major modification of on-campus courses is necessary to adapt them to this method. To do so requires time and money. As a result of the lack of administrative support, instructors confessed to devoting less than desired amounts of preparation time. Another major limitation identified was the lack of student participation in courses taught over COM-NET. This could be overcome through proper course redesign highlighting interactive techniques. Devices were also mentioned as aids which encouraged participation and involvement. The absence of motion pictures was also identified as a major limitation of the system. Given sufficient support, copyright releases on films, conversion to video format, and the subsequent pre-delivery of these video tapes could resolve the this problem associated with the use of motion picture film. Another major limitation of the experience was the lack of video motion for seeing interactive non-verbal cues from students at remote centers.

Comments that the COM-NET office was performing well and that the staff was extremely enthusiastic were volunteered by the respondents. This supports Cowan's (1984) claim that any unsuccessful telecommunication-based endeavors are directly related to the attitudes of those involved. The teaching assistants (TA) were identified as major strengths of the system, yet it was suggested that a closer interaction with the COM-NET office and center directors might improve course delivery. Materials distribution caused some problems for instructors and students. Scheduling was noted as a concern because some course content did not fit in the existing scheduling blocks. Inservice education for instructors, teaching assistants, and student orientation was recommended. Inservice
programs might help the TAs, in particular, to be more active, enthusiastic, and improve the ways in which they supported the instructor.

The instructor comments regarding the students who took courses over COM-NET were positive. Students were described as being different from the on-campus students in a positive way. Comments regarding grades, suggested similarity with on-campus performance, with one exception, indicating lower student performance via COM-NET. In general, the instructors were appreciative of the students' willingness and motivation. The high student "non-completion" rate was a concern of a few instructors.

Of the devices which are used to form the COM-NET EDE method, the audio and the writing board appeared to be fundamentally essential from instructors' perspective. Comments suggested that methods of information delivery which are not based upon a two-way interactive model cannot be education. One of the major limitations of the system was the lack of timely exchange of print materials between instructor and student. It is important to note that the initial implementation of facsimile machines occurred half-way through the study. Full utilization was not carried on during the time period covered in this study. Inspite of this, many comments speculated that the facsimile machines would be a major element in the delivery of coursework in EDE methods and would assure the timely exchange of tests and materials. It was suggested that color video was not significant for most courses.
Recommendations

Based upon the comparison of on-campus average GPA of 3.14 with the COM-NET students average GPA of 3.024 and the instructor comments indicating similar student performance in COM-NET and on-campus classes, COM-NET is as viable an instructional method as on-campus methods. An average COM-NET student satisfaction score for the study of 3.27 indicated student agreement with those factors important to good instruction and again indicated support for the COM-NET System.

The results of this study indicated that consideration be given to employing and implementing the following recommendations:

1. Both empirical as well as contextual data, suggested the importance of instructor flexibility and spontaneous adaptibility. Instructors with abstract teaching styles utilize participation-oriented techniques and devices. Instructors should be introduced to results of this study to aid in their adaptation to this method. As institutions implement EDE networks, the human factors need to be addressed.

2. The use of devices such as electronic writing boards, slow-scan overhead projection, and motion pictures is encouraged in any EDE project to stimulate student involvement and motivation. It is recommended that copyright release of selected motion pictures be obtained in order to allow their conversion to video tape for ease of dissemination.

3. Print material is a major element of any EDE project. The layout of objectives, lesson overviews, student assignments, glossaries, and suggestions for further readings each provide the distance learner with the structure to progress individually. The timely exchange of materials is
mandatory in any EDE network therefore increased emphasis must be placed on the use of facsimile machines.

4. Instructional presentations for EDE projects require significant course redesign to meet the distinctive needs of the distance learner and the EDE system involved. Therefore resources must be provided to aid instructors in course redesign. The employment of trained instructional designers and faculty incentives in the form of released time and honoraria must receive demonstrated administrative support.

5. The strength of any EDE project is determined by the quality of the instructors, students, and support staff involved. Therefore strong support services must be provided for staff development, on-going inservice, and project evaluation.

It is not unusual that the results of a research project produce more questions than answers. Such is the case with this study. For example, is the pre-screening of instructors, with regard to their teaching styles, an approach for improving satisfaction when learning via an EDE system? Can measures be developed which adequately screen the characteristics of teaching style? With the compounding of EDE system sites, are course ceilings which limit student enrollments necessary? Does all course content adapt and transmit equally well over the system or does the non-face-to-face nature of EDE methods preclude some? Can new techniques and devices be developed and employed to adequately address instructional issues? Questions of technology dominance surfaced from the study. The issue of alignment between the various elements of teaching/learning style and educational method also arose.

The challenge of the future for EDE delivery becomes the challenge of the educational technologist who must first identify the subtleties and
differences between the varying methods created by these new devices. Educational technologists then identify, analyze, and test a multitude of compound variables inherent in EDE-delivery methods. The more well-publicized programs, i.e., British Open University, National University Consortium and Learn Alaska use teams of specialists comprised of content experts, delivery mode specialists, and instructional technologists to develop the basic course print package. EDE systems have grown beyond the placement of a camera on a lecturer or professor who simply addresses a student audience. The overall function of any interactive EDE system is to be cost efficient with regard to resources of time and money, while at the same time duplicating, as best as is possible, the learning experiences of on-campus courses. As instructor travel time is eliminated and instructional duplication minimized, many resources are thus saved. The misconception is believing that hardware alone provides an answer to educational efficiency. This study strongly refutes this misconception, both empirically as well as contextually. Devices are a means of overcoming time and distance variables associated with EDE. Without an organizational infrastructure supporting both instructor and student, EDE may never succeed as a method. Although the managing, directing, organizing, and maintaining of devices can not be underestimated, a successful EDE instructional system requires an articulated philosophical statement of need. Responses to needs, concerns, and problems must still be addressed through human ingenuity.
REFERENCES


Conti, G. J. (1984). Analysis of scores of principals of adult learning scale for part-time faculty and recommendations for staff development activities. College Station, TX: Texas A & M University.


Dunn, R. S. & Dunn, K. J. (1979). Learning styles/teaching styles: Should they...can they...be matched? *Educational Leadership, 36*, 238-244.


Western Rural Development Center. (1985). *Intermountain community learning and information services. The delivery of continuing education training programs and informational resources to rural America.* Corvallis, Oregon: Western Rural Development Center


APPENDICES
Appendix A

COM-NET Delivery Devices
COM-NET Delivery Devices

The following hardware is located at each COM-NET site:

1. Darome public address system. The Darome system consists of one convener, two push-to-talk table microphones, and one lapel microphone. All centers have a Darome system fed in a star configuration via 4-wire dedicated phone lines through a bridge, located at the Mountain Bell central office in Salt Lake City, to outreach centers. By pressing the push-to-talk bar on the table microphones, one student at a time may talk over the system. In addition, the instructor wears a lapel microphone which allows mobility to access the writing board and overhead projector. This system allows the instructor to transmit lectures throughout the state as well as giving the students the opportunity to discuss topics with the professor and students at other centers.

2. AT&T Gemini electronic writing board. Each telecommunication center is equipped with an electronic writing board that distributes written information to all other centers. The writing board shares the data grade telephone line with the slow-scan video unit. As the instructor writes on the board, the information is digitized and appears simultaneously on all center writing board monitors.

3. Colorado Video Slow-Scan equipment. Equipment utilized in each classroom records and sends 35-second black and white slow-scan freeze frames to the centers over the data telephone lines. The picture is frozen in the memory of a model 250 video transceiver. It is then sent over the phone lines to the various centers and is regenerated on video monitors. The video camera is an RCA black-and-white unit with typical iris, focus, and zoom. At the base of the camera tripod is a camera monitor to aid in pre-framing and adjustment of the picture prior to transmission. The slow-scan video acts as an overhead and slide projector for the professor's pre-made materials. This device also allows the students to see the professor as he/she teaches. A small video printer is incorporated into the center located at the University. This printer is used to receive digitized pictures of students from other COM-NET sites. The instructor is encouraged to use these pictures in a portfolio fashion to get better acquainted with the students.

4. Canon FAX L-910 plain paper laser jet facsimile. The facsimile network provides unattended delayed polling from the outreach sites during off-hours over the existing 4-wire data lines. Transmission time for copies range from 20-30 seconds per page depending on the amount of information on each page. The network provides (a) hard copy feedback to and from students,( b) the system with the ability to adapt spontaneously to the needs of the instructors, and (c) the classroom with a plain paper copier for duplication purposes.
5. **VHS recorder.** A VHS recorder is located at each center allowing playback of pre-recorded materials for courses requiring full-motion video. The VHS tapes are recorded on campus and sent to all centers prior to class sessions requiring full-motion video instruction.

6. **Audio cassette recorder.** An audio recorder is located at each center and used to record the lectures, with one-track of the cassette recording the audio and the other the data. Students missing a class session can play back the session to hear the professor’s lecture and student-instructor discussion and to see the electronic writing board and slow-scan frames sent during the live session (Seamons & Sleight, 1986, p. 2).
Appendix B

COM-NET Infrastructure
COM-NET Infrastructure

The support system consists of both technical and human aspects. Although the hardware technology appears to be most noticeable at first, it has been found that the human element is a great determinant of the success or failure of any given program. In order to bridge the gap between the instructor and student, key individuals and processes were identified and established in order to guarantee the smooth functioning of the established hardware.

Center Directors. Center directors located at each of the regional sites throughout the state work directly with students. The directors identify student needs, synthesize those needs, and pass on recommendations to the COM-NET director who will implement a program if a critical mass is identified.

COM-NET Director. The director works as a liaison between the needs of the student, instructors, and the information being transmitted throughout the system. This is accomplished by coordinating all aspects of the system such as program development, scheduling, technical maintenance, and system promotion.

Teaching Assistants. Working directly with the center directors are teaching assistants (TAs). They have a minimum of a bachelor's degree with educational experience. Their function is to operate the equipment, distribute materials, handle in-class registrations, book sales, and aid the instructor in various aspects of the educational delivery. They become the "eyes and ears" of the instructors, monitoring the non-verbal cues and general atmosphere of the class as well as pass on information to the instructor before, during, and after the class. Coordination between the instructor and the center TAs is crucial.

Systems Engineer. A systems engineer at the on-campus COM-NET center acts as the head troubleshooter for the technical aspects of the system. He talks over special 2-wire direct dial telephone lines with the teaching assistants at the rural sites to solve technical problems without distributing the content or flow of the course being taught. The technical specialist also functions as liaison with Mountain Bell and equipment vendors to solve problems that arise during class transmission.

Systems Manager. A systems manager operates from the COM-NET office, performing logistical functions such as processing directors' estimates of student enrollments in future classes, ordering books, and duplicating and distributing course materials. The manager also functions as the facilitator and processor of student feedback through the facsimile machines.
**Instructional Designer.** Also located on the USU campus is an instructional designer who works directly with the instructors, helping them to adapt and modify their existing course materials to fit the nature, strengths, and limitations of the system. Many of the instructors' teaching materials must be redesigned to be used for telecommunication delivery. The instructional designer provides inservice each quarter for instructors who will teach on the COM-NET system the next quarter. Inservice workshops are also conducted for the teaching assistants with the help of the technical specialist. Advertising and promotional aspects of the system programs are also the responsibilities of the instructional designer.

**Faculty.** The most significant aspect of the COM-NET EDE network is a willing, capable, and flexible teaching staff. The system is dependent on their expertise.
Appendix C

COM-NET Centers
Appendix D

EDE Device and Device Related Definitions
EDE Device and Device Related Definitions

Audio refers to the various means of recording and transmitting the human voice and other accompanying sounds (Heinich, Molenda & Russell, 1982).

Audiographics is an audio conferencing system with the capability of remotely controlling graphic equipment such as slide projectors, telewriters, and electronic blackboards (Cowan, 1984).

Audio Teleconferencing consists of multiple locations linked via microphones and loudspeakers (Cowan, 1984).

Band Width is the maximum amount of information that is carried by a communications link, or required by a communications device expressed in cycles per second or Herz (Hz) (Cowan, 1984).

Bridge is a device enabling a number of telephone lines to be connected together so that all parties can hear each other (Cowan, 1984).

Broadcast Video constitutes the area of both commercially and publicly-owned television stations for the purpose of delivering one-way audio and video programs through the use of satellites, links, and cable connections (Zigerell, 1984).

Dedicated Line is a telephone line that can only be used to communicate with one other location (point to point) These can be used in networks (point to multi-point).

Electronic Writing Board is a device consisting of a chalkboard component which is pressure sensitive and monitors which then display pressure movements on the board (Cowan, 1984).

Facsimile is a device which scans a printed page, converts the image to electrical signals, and transmits the information to one or more locations where it is duplicated on a piece of paper (Cowan, 1984).
Full Motion Video is characterized by 60 video scans per second creating the illusion of fluid motion as characterized by broadcast television.

Hybred Networks are those communication systems consisting of multiple devices. They are usually two-way systems utilizing telephone lines for delivery.

Infrastructure is the human support system consisting of key individuals and subsequent processes helping to bridge the gap between instructor and student, in addition to guaranteeing the smooth functioning of the devices (Seamons & Sleight, 1986).

Microwave is a land-based, two-way, full-motion video transmission system requiring a clear line-of-sight for delivery (USDA, 1986).

Monitor is a professional quality television set designed for direct display of video information with no provision for the reception of regular television channels (Cowan, 1984).

Networking is the tying together of multiple sites for the reception and/or transmission of communication signals (USDA, 1986).

One-Way Systems consist of one channel or path which results in one site being able to transmit the signal and the remaining sites receive only, thus greatly inhibiting the interactivity (Olgren & Parker, 1983).

Slow Scan/Freeze Frame Video is a process for transmitting video pictures over telephone lines for display on a video monitor. The picture is captured or "frozen" in time and subsequently sent with delays of 30-90 seconds depending upon resolution and color versus gray scale (Zigerell, 1984).

Telecommunications is a two-way integrated network of electronic communications combining three or more groups at two or more locations.
providing interactive learning experiences between all participants involved (Cowan, 1984).

**Teleconferencing** is a two-way integrated audio system combining two or more groups at two or more locations providing interactive learning experiences between all participants involved (USDA, 1986).

**Telecourse** is a one-way instructional course delivered over broadcast television usually supplemented with printed materials (Gripp, 1977).

**Teletraining** is a integrated system for the planning, delivery and management of corporate training programs through the use of advanced communications services (Chute, 1984).

**Two-Way Systems** contains two channels or paths allowing the users the ability to transmit and receive information, i.e., audio, video, data, simultaneously thus providing the opportunity for interactivity (Olgren & Parker, 1983).

**Video** is the picture portion of a television communication (Cowan, 1984).
Appendix E

USU Course Evaluation Form
# UTAH STATE UNIVERSITY COURSE EVALUATION

**INSTRUCTIONS:** In the spaces provided write the name of the instructor evaluated and the course number. Use a soft lead pencil to mark your answers in the appropriate space.

**INSTRUCTOR**

**COURSE NUMBER**

Use the following alternatives for questions 1-10:

- **NA** = statement is not applicable to the course
- **D** = disagree with the statement
- **SA** = strongly agree with the statement
- **SD** = strongly disagree with the statement
- **A** = agree with the statement

1. The course corresponds closely to clearly stated objectives.
2. The instructor effectively conveyed knowledge of the subject.
3. The instructor's presentations were clear and well-organized.
4. The instructor's presentations were enthusiastic.
5. Class time was well spent.
6. The instructor was responsive to student needs and opinions.
7. Students were informed of grading procedures and these procedures were followed.
8. The instructor stimulated interest in this subject matter.
9. This course provided a valuable learning experience.
10. Exams are representative to assignments, materials, and lectures of the course.
11. Please compare this instructor with others you have had on a scale from 10 being the very best, 5 being the middle, 1 the poorest.

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Appendix F

Gregorc Style Delineator (GSD)
DIRECTIONS

Before starting with the word matrix on the next page, carefully read all seven of the following directions and suggestions:

1. Reference Point. You must assess the relative value of the words in each group using your SELF as a reference point; that is, who you are deep down. NOT who you are at home, at work, at school or who you would like to be or feel you ought to be. THE REAL YOU MUST BE THE REFERENCE POINT.

2. Words. The words used in the Gregorc Style Delineator matrix are not parallel in construction nor are they all adjectives or all nouns. This was done on purpose. Just react to the words as they are presented.

3. Rank. Rank in order the ten sets of four words. Put a “4” in the box above the word in each set which is the best and most powerful descriptor of your SELF. Give a “3” to the word which is the next most like you, a “2” to the next and a “1” to the word which is the least descriptive of your SELF. Each word in a set must have a ranking of 4, 3, 2 or 1. No two words in a set can have the same rank.

   4 = MOST descriptive of you
   1 = LEAST descriptive of you

4. React. To rank the words in a set, react to your first impression. There are no “right” or “wrong” answers. The real, deep-down you is best revealed through a first impression. Go with it. Analyzing each group will obscure the qualities of SELF sought by the Delineator.

5. Proceed. Continue to rank all ten vertical columns of words, one set at a time.

6. Time. Recommended time for word ranking: 4 minutes.

7. Start. Turn the page and start now.

Example

```
   4
   X

   3
   2

   1
```

```
   sun
   moon
   stars
   clouds
```

*For an explanation on how and why these words were chosen, see the “Development” section of An Adult’s Guide To Style.*
After ranking all ten sets, read how to determine your score on the next page.
Scoring

1. Add Across. Add across the "a" row of words in the first five sets. Put that total in the top "a" column box. Do the same for the "b", "c" and "d" rows of the first set. Next, do the last group of five sets, putting the row totals in the bottom group of boxes.

Example:

\[ a: 4 + 4 + 1 + 3 + 2 = 14 \]
\[ b: 1 + 3 + 4 + 2 + 1 = 11 \]

2. Add Down. Add the top and bottom box in each scoring column to get the total for that column.

3. Check. If your combined total scores of CS (a), AS (b), AR (c) and CR (d) is greater or less than 100, please recheck your addition. All four columns should total exactly 100.

Graphing

Use the Style Profile below to graph your scores.

1. On the vertical axis leading toward 12 o'clock (Concrete Sequential) place a large dot by the number which corresponds to your total CS (col.a) score.

Example:

2. On the horizontal axis leading toward 3 o'clock (Abstract Sequential), place a large dot by the number which corresponds to your total AS (col.b) score.

Example:

3. On the vertical axis leading toward 6 o'clock (Abstract Random) place a large dot by the number which corresponds to your total AR (col.c) score.

Example:

4. On the horizontal axis leading toward 9 o'clock (Concrete Random) place a large dot by the number which corresponds to your total CR (col.d) score.

Example:

5. Now join the dots with straight lines to form a four-sided figure. You now have a graphic representation of your dominate (27-40 points), intermediate (16-26 points) and low (10-15 points) style, or "mediation," channels.
INTERPRETING YOUR SCORE

Now that you have completed the Style Delineator it is important for you to understand what your scores indicate. To facilitate this understanding, please remember:
(a) The Delineator is designed to reveal only two mediation abilities: perception and ordering.
(b) Every individual is naturally endowed with all four qualities of concreteness, abstraction, sequence, and randomness.
(c) Every individual has the ability to orient himself toward all four style channels (CS, AR, AS, and CR), but will be strongly oriented toward one, two, or even three; an individual’s qualities will seldom be distributed equally.

SCORES

1. If your numerical score on the Delineator is high (27-40) in one of the channels, this is an indication that those mediation qualities are powerful means of transaction for you. This orientation is termed the “pointy-head” dominance because the extended point conveys specialized penetration abilities and the capacity for great momentum and concentration.

2. A low numerical score (10-15) in one of the channels is termed the “short, stubby-point.” This low score indicates your least powerful mediation qualities. The short extension conveys reduced and/or minimal penetration and concentration capacity.

3. An intermediate score (16-26) means that you have moderate mediation ability and capacity to transact in the channel indicated.

4. If you received balanced scores (25-25-25-25) in all four channels, a “square” will be graphically depicted on the Style Profile. This square indicates one of the following:
   a) You have equally distributed powerful penetration ability and the capacity for great momentum and concentration in all four channels, or
   b) You have equal and moderately distributed penetration ability and capacity for momentum and concentration in all four channels.

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Appendix G

Instructional Utility Inventory
Instructional Utility Inventory

For each of the instructional utilities listed below circle the number which best represents your usage of that item on the COM-NET telecommunication system.

<table>
<thead>
<tr>
<th>Technical Aid Devices</th>
<th>never</th>
<th>infrequently</th>
<th>occasionally</th>
<th>often</th>
<th>constantly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Simulation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Program manuals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Lecture</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Independent Reading</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Directional Reading</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Computer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Field Trips</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Programmed Discovery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Audio player</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Video player</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Book</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Role Play</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. Drill and Practice</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. Discussion Groups</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. Directional Questioning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. Open Discussion</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. Television set</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. Student Presentations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. Student Projects</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. Gaming</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. Film Projector</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. Case Studies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. Demonstrations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. Slide Projector</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. Pictures</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26. Overhead Projector</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. Programmed Instruction</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. Inquiry Teaching</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29. Diagrams</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30. Brainstorming</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31. Writing Board</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>32. Role Memorization</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>33. Written Activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>34. Practicum</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>35. Internship</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

*Please provide a brief assessment of your COM-NET experience on the back of this form.*
Instructional Utility Inventory Independent Variable Indetification Form
administered to the 10 Professors of Education

Label the following techniques as either Expository or Discovery based upon the degree of student participation evoked.

Techniques

1. Rote Memorization
2. Brainstorming
3. Directional Reading
4. Inquiry Teaching
5. Case Studies
6. Role Playing
7. Directional Questioning
8. Student Projects
9. Written Activities
10. Programming Instruction
11. Independent Reading
12. Demonstration
13. Gaming
14. Lecture
15. Programmed Discovery
16. Open Discussion
17. Student Presentations
18. Simulation
19. Drill and Practice
20. Discussion Groups
21. Practicum
22. Field Trips
23. Internship

Label the following devices either Abstract or Concrete with regards to the maximum learning experience possible.

Devices

1. Writing Board
2. Video Player
3. Picture
4. Slide Projector
5. Book
6. Overhead Projector
7. Audio Player
8. Computer
10. Television Set
11. Diagram
12. Film Projector
Appendix H

GSD Dominant Characteristics
### STYLE COMPARISON

Following are brief synopses of the style characteristics of the four dominant channels.

<table>
<thead>
<tr>
<th>Category</th>
<th>CS Concrete Sequential</th>
<th>AS Abstract Sequential</th>
<th>AR Abstract Random</th>
<th>CR Concrete Random</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WORLD OF REALITY</strong></td>
<td>Concrete world of the physical senses</td>
<td>Abstract world of the intellect based upon concrete world</td>
<td>Abstract world of feeling and emotion</td>
<td>Concrete world of activity and abstract world of intuition</td>
</tr>
<tr>
<td><strong>ORDERING ABILITY</strong></td>
<td>Sequential step-by-step linear progression</td>
<td>Sequential and two-dimensional; linear, tree-like</td>
<td>Random non-linear and multi-dimensional</td>
<td>Random three-dimensional patterns</td>
</tr>
<tr>
<td><strong>VIEW OF TIME</strong></td>
<td>Discrete units of past, present, future</td>
<td>The present, historical past, and projected future</td>
<td>The moment; time is artificial and restrictive</td>
<td>Now; total of the past, interactive present, and seed for the future</td>
</tr>
<tr>
<td><strong>THINKING PROCESSES</strong></td>
<td>Instinctive, methodical, deliberate, structured</td>
<td>Intellectual, logical, analytical, rational</td>
<td>Emotional, perceptive, critical</td>
<td>Intuitive, instinctive, impulsive, independent</td>
</tr>
<tr>
<td><strong>VALIDATION PROCESS</strong></td>
<td>Personal proof via the senses; accredited experts</td>
<td>Personal intellectual formulae; conventionally accredited experts</td>
<td>Inner guidance system</td>
<td>Practical demonstration; personal proof; rarely accepting of outside authority</td>
</tr>
<tr>
<td><strong>FOCUS OF ATTENTION</strong></td>
<td>Material reality; objects of value</td>
<td>Knowledge facts, documentation</td>
<td>Emotional attachments, relationships, and memories</td>
<td>Applications, methods, processes and ideals</td>
</tr>
<tr>
<td><strong>CREATIVITY</strong></td>
<td>Product, prototype, refinement, duplication</td>
<td>Synthesis, theories, models and matrices</td>
<td>Imagination, the arts, refinement, relationships</td>
<td>Intuition, originality, inventiveness, and futuristism</td>
</tr>
<tr>
<td><strong>APPROACH TO CHANGE</strong></td>
<td>Slightly adverse; speculative, hesitant and slow</td>
<td>Notoriously indecisive, cross-checks, deliberation, fence-straddler</td>
<td>Subject to emotions, level of interest, critical or impressionable</td>
<td>Open and amenable, often investigator, “rolling stone,” “trouble shooter”</td>
</tr>
<tr>
<td><strong>APPROACH TO LIFE</strong></td>
<td>Realist, patient, conservative, and perfection-oriented</td>
<td>Realist; serious, determined, logical, and intellectual</td>
<td>Idealist; emotional, exuberant, transcendent, and intense</td>
<td>Realist/idealist; telescopic attitudinal, inquisitive, and independent</td>
</tr>
<tr>
<td><strong>ENVIRONMENTAL PREFERENCE</strong></td>
<td>Ordered, practical, quiet, stable</td>
<td>Mentally stimulating; ordered and quiet, non-authoritative</td>
<td>Emotional and physical freedom; rich, active and colorful</td>
<td>Stimulus-rich, competitive, free from restriction, amenable</td>
</tr>
<tr>
<td><strong>USE OF LANGUAGE</strong></td>
<td>Literal meaning and labels; succinct, logical</td>
<td>Polysyllabic words; precise, rational; highly verbal</td>
<td>Metaphoric, use of gestures and body language; colorful</td>
<td>Informative, lively, colorful; “words do not convey true meaning”</td>
</tr>
<tr>
<td><strong>PRIMARY EVALUATIVE WORD(S)</strong></td>
<td>Good</td>
<td>Excellent</td>
<td>Super, Fantastic</td>
<td>Superior, Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Out Of Sight, Dynamite</td>
<td></td>
</tr>
</tbody>
</table>
DOMINANT STYLE CHARACTERISTICS

The scores you received on the Style Delineator are related to specific clusters of distinguishable characteristics. These clusters of characteristics constitute STYLE.

This section of the booklet contains style characteristics associated with each channel. They are presented for your own self-analysis and for gaining insight into another person's "point of view."

Knowledge of these characteristics may further prompt an analysis of the demands that are presently being placed upon you by people, objects, and processes in your environment(s). A careful study of style characteristics may also provide a framework with which you can assess mind qualities and environmental demands without the use of an "objective" instrument such as the Style Delineator.

To help explain the broad scope of the dominant stylistic characteristics, each channel has been divided into fifteen categories. A description of each category is as follows:

CATEGORIES

World of Reality
The "space" acknowledged as reality by an individual wherein and through which the mind receives, creates, projects, and experiences thoughts, ideas, and forms. This space may be physical, material, and concrete or metaphysical, formless, and abstract.

Ordering Ability
The method(s) used by an individual to organize and structure his world of reality.

View of Time
An individual's perception of the past, present, and future used to measure, locate, and place experiences in his world of reality.

Thinking Processes
The activity of examining whatever happens to pass or to attract attention regardless of results and specific content. (Hannah Arendt)

Validation Process
The particular thought process and activity which takes place in the mind of an individual in order to identify, judge, substantiate, and confirm "truth."

Focus of Attention
The dominant "object" which an individual concentrates upon, cares for, pays regard to, respects, and, at times, identifies with and chooses to possess and appropriate.

Creativity
The ability and process used to bring an idea into manifestation and/or existence as a product.

Approach to Change
The attitudes, activities, and courses used by an individual to make something's nature, purpose, content, form, etc., different from what it is or from what it would have been if left to its own evolution.

Approach to Life
The attitudes, activities, and courses used by an individual to command and direct experiences in his "world of reality."

Environmental Preference
The outer world conditions which an individual finds most attractive and conducive to facilitating the fulfillment of his needs, wants, and desires.

Use of Language
The employment of specific words which give tangible evidence that different types of thinking processes are occurring within a person's mind.

Primary Evaluative Word
The word(s) most often used by an individual in reporting a value judgment of the highest rank.

Major Intolerances
Perceived attitudes, behaviors, and environmental conditions which irritate an individual to the point where he refuses to allow them to exist.

Negative Characteristics
Peculiar qualities and tendencies of an individual which cause alienation and block constructiveness, helpfulness, cooperativeness, and interfere with the psychic well-being of both himself and others.

Observable Traits
Sample distinguishable behaviors that can be observed by other individuals.

NOTE: As you proceed through the style characteristics found on the following pages, bear in mind that no individual is a "pure type" due to the holistic nature of the human personality itself.
Appendix I

Instructional Utility Inventory

Definitional List
Audio Player is a one-dimensional aid providing concrete auditory experiences, used for sound reproduction, improvement of listening and communication skills, independent study, foreign language, storytelling, self-appraisal, rescue, and student stimulus.

Books are one-dimensional aids for the dispensing of knowledge and fact. The rate of presentation is user controlled, allowing for the reading and re-reading at will. Critical thinking skills are strengthened along with the higher level cognitive skills or analyze synthesis and evaluation.

Brain Storming is a form of the group discussion technique where the instructor becomes a mediator and officiator. Student involvement is maximized and the teaching of creative awareness to problems and problem solving is the goal.

Case Studies are the use and evaluation of real life events and happenings to portray a concept, fact, idea, or position. They can be used either evaluatively or informatively with groups or individuals depending upon the instructional need.

Computers are multi-dimensional aids allowing students to receive instantaneous responses to inputs. Extensive capacities of storage and manipulation of information are controlled by the student or user. They also possess the potential for media control.

Demonstrations are instructional activities where procedures, experiments, task preference techniques, and skills are presented to the students. The emphasis is an explanation rather than representation revealing tasks, elements, relationships, and parts. Students are usually asked to model the demonstrations to assess learning retention.

Diagrams are one-dimensional graphic designs that explain rather than represent. Drawings that show arrangements and relationships of parts. They can be portrayed by writing boards, charts, or slides. Instruction can be presented in the form of factual information, simulation, gaming, and tutorials are individual or basis.

Directional Reading is an instructional technique where the learner is required as part of the evaluative process of a course to obtain and read certain prescribed materials. Evaluation of the successful completion of this experience is usually monitored as part of the course grade.

Directional Questioning a more structured form of open discussion where the instruction has specific objectives and outcomes which are
desired. Specific questions and comments are presented so as to guide the students into the appropriate predetermined body of information.

Discussion Groups are identified bodies of students arranged so as to provide the opportunity to interact with each other to a greater degree than in the existing larger group. Questions, problems, situations, or cases are presented to these groups, the end result being group consensus solution or recommendation presented to the large group.

Drill and Practice is an instructional technique for aiding in the retention of factual information, skills or procedures. Repetition of the activity results in increased ability to retain and recall it at a later time.

Field Trips are multi-dimensional experiences where the students go to the place of observation and participate in the actual event. The learning is by direct participation and the responsibility for the outcome lies with the student.

Film Projectors are multi-dimensional aids used for the stimulation, motivation, and attention of recipients. They go beyond the barriers of human capability with time lapse photography, slow motion, animation, microphotography, x-ray photography, and telephotography. Film may be either of a documentary, provocative, instructional, or feature film nature.

Gaming is an activity in which players strive toward the attainment of a goal within prescribed rules. Its technique is usually associated with that of motivation and enjoyment.

Independent Reading is an instructional activity where the learner is motivated to search out and read materials applicable to his/her interest or need. Motivation is internal with little or no subsequent evaluation.

Internships are cooperative experiences between business and education designed to allow students to alternate classroom study with paid professional work experiences related to the field of study. These experiences increase in complexity as the student's background in a given field increases.

Inquiry Teaching is a form of information presentations where facts are presented, problems are identified, data are gathered, explanations are formulated, and evaluation of the entire process if reviewed as analyzed. The end result is the retention of the inquiry process rather than facts themselves.

Lecture is the instructional technique where the instructor becomes a dispenser of facts and knowledge in a scholarly fashion. Students become inactive receptacles of the information presented and critical thinking is by example.
**Open Discussion** is the instructional technique where the instructor becomes a guide for learning and a stimulator for experience. Students are active members of the experience. Knowledge is related to student experiences and applications. Active critical thinking is encouraged.

**Overhead Projectors** are one-dimensional aids used for still projection of instructional materials either predesigned and produced or produced instantaneously. The user may present the message while still maintaining eye contact, directing learner attention and in turn controlling the rate of presentation. Three-dimensional silhouettes and over-lay transparencies are also forms of this medium.

**Pictures** are one-dimensional aids translating abstract ideas into concrete visual experiences. They are still representations of people, places, and things. They are readily available, inexpensive, and easy to use.

**Practicum** are product-oriented projects based upon an identified, defined problem. It includes formative testing and revision of the developed product, resulting in an adequate final stage or solution.

**Program Manuals** are used to aid in the structure, organization, and learning of materials. The application of knowledge is stressed. These are complementary to the existing text and reinforce the instructors point of view.

**Programmed Discovery** is the technique of presenting questions in a predetermined sequence, with the intent of learner discovery of predetermined outcomes. This is less rigid than programmed instruction.

**Programmed Instruction** is a technique where knowledge, skills, and learning, especially those requiring repetition and immediate feedback, is presented in a step-by-step fashion with branched remediation following testing. Generally learner controlled, this is most appropriate for knowledge level information deliveries.

**Role Play** is a technique where real-life experiences are enacted developing human relation skills and understanding it is to give perspective, to motivate, and to stimulate.

**Rote Memorization** is a memory technique where facts and knowledge are gained by the learner with little or no thought as to how the information fits into currently possessed bodies of information, concepts, experiences, and ideas of the learner. The emphasis is on recall, not understanding.

**Simulation** is an abstraction or simplification of some real life situation or process. Participants usually play a role that involves them in interactions with other people and elements of the simulated environment.
Slide Projectors are one-dimensional aids for the projection of 2" x 2" slides for information and motivation. They are readily available, project excellent color, can be made locally, relatively inexpensively, or commercial sets may also be purchased. Sequencing is flexible. Rate of projection may be controlled by the instructor and with the combination of sound, an additional dimension is added. They permit visual materials to be enlarged and held in view for explanation.

Student Presentations are an evaluative technique for assessing student knowledge, organization, and informational delivery skills. Information generated must be analyzed, synthesized and evaluated, based upon a logical organized plan.

Student Projects are an evaluative technique for the in-depth study of an activity, event, time, or phenomenon that is of interest to the student. Due to this interest factor the student is often motivated to go beyond the required level of study.

Television Sets are two-dimensional aids used for broadcasting live news events, educational programs either viewed as a group or individually out of class for information, perspective, insight, and motivation.

Video Players are two-dimensional aids for recording off-the-air video productions or for producing original works for stimulating student involvement, discussion, and motivation. Uses include in-class demonstrations necessitating motion, color, and sound, documentation of visiting authorities, student presentations, and performances, and micro teaching.

Written Activities are an evaluative activity requiring the learner to perform at higher levels of cognitive thought such as analyzing, synthesizing, and evaluating current topics of importance, practical application is encouraged. Written communication skills are improved and logic and organizational skills are developed.

Writing Boards are one-dimensional electronic devices for instantaneous presentation of facts, ideas, concepts, diagrams, charts, and figures.
Appendix J

USU Survey of GPA by Course Level
<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>Course Level</th>
<th>1-99</th>
<th>100's</th>
<th>200's</th>
<th>300's</th>
<th>400's</th>
<th>500's</th>
<th>600's</th>
<th>700's</th>
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Appendix K

Informed Consent Form
Dear Colleague:

We are interested in examining the effects of varying teaching styles and techniques implemented on the COM-NET telecommunications system. Since you have taught on the system within the last year, your experience and impressions are essential to this study.

The Utah State COM-NET system is currently delivering more continuous credit course work on a regular basis to more students than any other similar system to date. We are pleased with the growth and success thus far, yet the consistent issue of course quality can never be given too much attention. We know that the key to real success in this method of educational delivery lies in our outstanding faculty. The devices which create the system are mere tools to aid in the distance delivery process. Our foremost goal is that of determining how best to overcome limitations of this system and accent its strengths.

As with any new technology, adaptations, and constant evaluation are as important as the initial innovation. Constant evaluation, modification and implementation become imperative in order to improve the instructional program. The data collected will aid in the evaluation process. A representative from COM-NET will contact you for a 15 minute appointment to fill out two brief questionnaires.

Please sign below to indicate your willingness to assist in this study. I assure you personal anonymity. Thank you for your willingness to help.

Sincerely

R. Alan Seamons
COM-NET Director

Signed ___________________________ Participant ___________________________ Date ___________________________

Please return to: Name ___________________________ UMC ___________________________

_________ Check here if you would like to receive a copy of the results of this study.
Appendix L.

COM-NET Courses

From Fall 1985 to Summer 1986
**Fall 1985 - Summer 1986**

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**WINTER 86**

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| SUMMER 86 | BA 443 | REAL ESTATE FINANCE    | 3      | 10                 | C          |
|           | ECON 566 | THEORIES & TECHNIQUES | 3      | 24                 | A-         |
|           | EDUC 666 | RESEARCH FOR CLASSROOM | 3     | 17                 | B+         |
|           | EDUC 666 | TRAINING ORGANIZATIONS |       |                    |            |
|           | ELED 646 | EDUCATION OF GIFTED AND TALENTED | 3 | 18 | A- |
|           | HIST 170 | AMERICAN CIVILIZATION  | 5      | 21                 | B+         |
|           | INST 625 | INSTRUCTIONAL DEVELOPMENT | 3     | 17                 | B+         |
|           | MATH 215 | CALCULUS I              | 3      | 14                 | B          |
|           | PSY 101  | GENERAL PSYCHOLOGY      | 5      | 25                 | B+         |
|           | PSY 173  | PERSONAL STUDY EFFICIENCY | 3     | 16                 | B-         |
|           | PSY 421  | PERSONALITY THEORY      | 3      | 34                 | B+         |
|           | PSY 650  | IMPROVING CONCENTRATION, MEMORY, & LISTENING | 3 | 52 | A- |
|           | SW 595   | CHILDREN OF ALCOHOLISM  | 1      | 45                 | B          |
|           | **TOTALS** |                      | **38** | **293**             | fte 60.9   |

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Appendix M

Contextual Evidence
Upon completion of the formal portion of the testing, instructors were encouraged to comment on their experiences on the COM-NET system. One hundred sixty-six distinct comments received from all 35 instructors resulted in an average of 4.7 comments from each instructor. The comments were categorized as either Infrastructure-oriented or Device-oriented.

**Infrastructure** - 120 comments were received representing 72.3 percent of the total comments. This category consists of instructor satisfaction/dissatisfaction, support staff, students, and recommendations.

A. **Instructors** - 74 comments were received representing 61.6 percent of the infrastructure comments or 44.6 percent of the total comments.

1) **Instructor Satisfaction** - 34 comments were received representing 28.3 percent of the infrastructure comments or 16.9 percent of the total comments.

"It is a very effective means of disseminating information at a relatively low cost."

"Teaching on COM-NET has been a fun experience. It is different enough from the regular classroom to stimulate my interest."

"A professionally enriching experience."

"COM-NET can become a very viable, effective teaching delivery mode."

"The experience was pleasant, successful, and rewarding to me as an instructor."

"My experience with COM-NET was positive and interesting and I learned a lot from it."

"It is an excellent experience because it keeps you in touch with students who have a totally different perspective. I prefer to do it annually so that I can stay sharp on the various techniques."

"COM-NET is a great media for teaching and I can see its increasing in the future."

"COM-NET is an excellent method of reaching people at distant places and making them part of a classroom experience."
"I look forward to working with you again."

"NO TRAVEL!"

"My experience was very positive given the limitations which are unavoidable, like not seeing the students at the centers."

"I appreciate the challenge, it interests me."

"The strengths and limitations are different than the traditional classroom."

"I had frustration at first, but as class developed, I enjoyed it more. I am waiting to teach over the system again."

"Overall, I found the COM-NET system less restrictive than I expected."

"The planning and redesign of materials and experience was useful and carried over to other campus courses."

"I liked the system."

"I appreciate the challenge of the new mode. I was far more comfortable the second time around."

"Interesting and challenging thus far."

"I have much to learn, but have made much progress."

"It was an interesting learning experience for me. Particularly, I was amazed at the assumptions I tended to make about teaching that didn't fit with the COM-NET system."

"Positive experience."

"I like the system and have enjoyed teaching over COM-NET."

"It seems to be a very effective means of disseminating information at a relatively low cost."

"I liked the flexibility of the system."

"My experience was fine. I had no trouble with the medium."

"I liked having the ability to reach outlying areas."
"COM-NET can be the most powerful teaching tool for people in outlying areas. It brings the classroom to areas and people who would not be able to have the opportunity for college courses otherwise."

"I have enjoyed my experiences on COM-NET. I would hope we can continue to have that relationship."

"I thought the teaching experience was not too bad."

"I feel that the pluses and minuses have a different set of factors than in conventional teaching settings. I like the greater emphasis on visual aids forced by the system."

"It clearly is inferior to teaching in a classroom with eye-contact and immediate response capabilities."

"Overall, very positive."

"My experience was positive because I made an effort to reach out to the students at the centers."

2) Instructor Dissatisfaction - 40 comments were received representing 33.3 percent of the infrastructure comments and 24 percent of the total comments. These comments were in two areas: course redesign and student participation.

a) Course Redesign - 28 comments were received representing 23.3 percent of the Infrastructure comments and 16.9 percent of the total comments.

"There is no on-campus reward structure for COM-NET."

"The course needs to be very well organized in order to work on the system."

"COM-NET requires more preparation than traditional campus courses. However, the planning and redesign of materials was useful and carried over to campus courses."

"Due to the greater emphasis on visual aids forced by the system, development time and resources need to be provided."

"Lack of Time!"

"I needed time to use the help which was provided."

"I liked the system but it needs more campus support (money) for pre-preparation."
"I believe COM-NET should have the $ resources to provide front end course development for the system. It is different than on-campus regular classroom instruction."

"More planning and development is required and should be compensated."

"Investments in advanced work, preparation and instructional materials is needed."

"It was difficult to structure the course in a way that would be meaningful and challenging to the students."

"The lack of films in a course has been a major difficulty."

"My difficulty in the two classes I have taught focused around the showing of movies."

"Films have of course been a major difficulty."

"The use of film was an important part of my instruction which meant my course was even more difficult to adapt."

"My difficulty for two classes were centered around showing movies and overhead information."

"If (or when) I teach using COM-NET again, I believe I could use the technology better. I believe COM-NET requires more preparation than any other type of teaching."

"There was a scarcity of informational resources for the students."

"Prior preparation would help so new teachers don't bomb their first time."

"Lack of time allocation for course development or faculty inservice - to say nothing of recognition on campus reward structure."

"I believe with more advance work/preparation and experience, along with a greater investment in instructional materials, COM-NET can be a very viable and effective teaching delivery method."

"The biggest weakness is the time to develop simulations and student interaction material which would improve the overall quality of interaction over the system."

"Some overlays I use in regular class were too small to focus on."
"Resources to search for developmental processes, the curricular topics."

"The second time around in teaching on COM-NET would be easier and more comfortable. The interaction with students would improve and the full capabilities of the system could be better used following my initial experience."

"It was difficult to find the adequate time to prepare as far in advance as would be best."

"What I did is quite different from what I should do given some development time and resources needed."

"I'm wanting to teach over the system again because I really think I can do much better a second time through the same course using the system."

b) Participation - 12 comments were received, representing 10 percent of the infrastructure comments and 7.2 percent of the total comments.

"Due to the sensory deprivation associated with the system, games, simulations, and student presentations were necessary."

"I found myself teaching to the on-campus students. We need to find ways to get spontaneous involvement and feedback."

"I found myself teaching to the air."

"Getting the discussion going is a monumental task made worse with no eye contact."

"There was a reduced sense of communications and meaningful feedback and interaction. You have to work harder at opening communications and exchanges."

"Getting, maintaining and encouraging student participation is a constant concern."

"My personal teaching style is quite interactive and it was very difficult for me without the visual cues I generally use."

"The course moves slower than I like."

"I would prefer to have rooms set up with a camera angle that shows the students as much as the teacher. This would provide greater viewing diversity for the students in the field than they currently get and encourage student participation."
"A method of pictorial identification between name, face and voice recognition would be helpful."

"I believe allowing 'receive only' video is a mistake because it precludes me from origination of that site and students cannot present findings, give reports or participate fully."

"Counseling time for students needing help or for committee meetings. On-line office hours."

B. Support Staff - 12 comments were received representing 10 percent of the infrastructure comments and 7.2 percent of the total comments.

"There is a solid personal support service for the teaching function."

"The support staff was very positive and encouraging."

"The Teaching Assistants have been the best improvement to the system so far."

"The instructional aids provided were very useful."

"The center assistants needs to work for COM-NET rather than the local center so as to ensure control."

"It would be helpful if each center had better internal communications (TAs to TAs and TAs to Director)."

"Some centers seem to baby people along."

"I liked the Teaching Assistants."

"Some of the major problem areas include: control and getting center personnel to work for COM-NET rather than the local center."

"The COM-NET support system was helpful."

"It's a pleasure working with COM-NET staff."

"The support staff was extremely helpful."

C. Students - 11 comments were received, representing 9 percent of the infrastructure comments and 6.6 percent of the total comments.

"I was struck with the eagerness of the non-traditional learners. They were fine students for the most part."

"I felt that the students were different from on-campus and very accepting of the weaknesses in the system."
"I feel that the level of real life experiences of the participants is much higher than the on-campus courses, thus enhancing the teaching environment."

"COM-NET can be the most powerful teaching tool for people in outlying areas by bringing the classroom to areas and people who would not be able to have the opportunity for college coursework otherwise."

"Students expressed their appreciation for COM-NET, they like it."

"I was surprised to see how well the students had adapted to the system."

The drop-out rate of students was great but those who remained were good.

"I liked the diversity of students."

"Exam results and overall results compare well with similar learners taught on campus."

"I observed that overall, students in the on-site class in Logan did better grade-wise and understanding wise than in the outlying areas."

"The students preference was as good as face-to-face. To accommodate this I presented from every site."

D. Recommendations - 23 comments were received representing 19 percent of the infrastructure comments or 13.7 percent of the total comments. These comments were in two general areas: Inservice and programming.

1) Inservice - 13 recommendations were received representing 10.8 percent of the infrastructure comments or 7.8 percent of the total comments.

"Faculty inservicing for course development."

"Samples of successful course manuals should be available to instructors."

"A tutorial course for instructors showing innovative techniques used and discussing possible research."

"Produce a self-help manual for instructors to use."

"Sharing of insights between instructors either formally or informally."
"There was little sharing of insights from one faculty member to another."

"A course for instructors showing what innovative techniques can be used."

"The difficult part of COM-NET has been in keeping the quality of the class as high as a typical day class. It would help if each center had a system to prepare some of these students for the rigor of college classes."

"Develop more self help materials for students to cope."

"Instructional flexibility was needed."

"Use of alternate styles helped."

"A successful experience with this medium is directly related to the instructors ability to be flexible and understanding."

"The use of many teaching techniques helped to stimulate the students."

2) Programming - 10 recommendations were received representing 8.3 percent of the infrastructure comments or 6 percent of the total comments.

"Statistics should not be taught once a week without additional tutoring somewhere."

"More upper division classes should be offered."

"Some suggestions: high school connection should be made, resulting in better relationships and more classes."

"One or two quarters of advance notice, late Saturdays have turned out not to be the best time to offer a class."

"More classes on the same level and complexity."

"Two quarters of advance notice would aid in the preparation dilemma."

"More cross-sectional advertising so all who want a given course know when it is offered."

"Counseling times for students needing help, on-line office hours."

"On-line office hours for committee interaction."
Devices - 46 comments were received representing 27.7 percent of the total comments. More specifically the aspects of facsimile, audio motion video, writing board, slow-scan video, computer and color video were discussed.

A. Facsimile - 12 comments were received representing 26 percent of the device comments or 7.2 percent of the total comments.

"The fax machines will address one of the major problems of the system."

"The benefit of the facsimile process will be invaluable, I could have benefitted from its use."

"Fax is very good for more immediate feedback."

"I didn't have access to the facsimile and it would have helped."

"Facsimile is much more convenient than shuffling papers through the mail and it allows for greater flexibility and spontaneity."

"The greatest difficulty associated with the course was mail delay to and from the center."

"Turn around time on tests and assignments was my biggest problem."

"My major difficulty lies in the materials."

"Materials handling was a considerable problem."

"Turn around time for grades and an occasionally lost materials were a major difficulty."

"The major difficulty associated with the course was mail delay in getting materials to and from the center. There was some delay in processing materials once they were received in the on-campus COM-NET office also."

"Rapid transmission of assigned materials to instructor and back to the student is needed."

B. Audio - 9 comments were received representing 19.5 percent of the device comments or 5.4 percent of the total comments.
"Interactive audio is the backbone of the system, each of the other items make it better by degrees. The best way to deliver is a combination of factors."

"You cannot communicate without two-way audio. One-way is not education!"

"Audio communication (two-way) is essential in coursework. Without it, you cannot teach!"

"Audio and the writing board are necessities, the rest are frills, motion and color being least important."

"There was a hesitation of the students to use the microphones."

"Audio is essential."

"Audio carries the course."

"Oral communication provides the best means of elaborating on material. The others are important, but in a supplemental way, enhancing one’s ability to communicate."

"I would not teach on the system unless I had as a minimum (a) audio, (b) facsimile, (c) chalkboard, and (d) slow-scan. Motion video is nice if affordable.

C. **Motion Video** - 9 comments were received representing 19.5 percent of the Device comments or 5.4 percent of the total comments.

"The material I present needs more than one-way factual materials presentation."

"If possible movement would be good."

"COM-NET would benefit from two-way interactive video projections."

"The system needs two-way video to see if the students are there."

"Seeing each other is a very important part of the communications required in effective teaching."

"Some of our fields need motion."

"If possible, movement on the screen would be good so as to receive picture feedback from the units in the field."
"My personal teaching style is quite interactive and it was very difficult for me to communicate without the visual cues I generally use."

"Video motion and color might make the learning experience more like the classroom."

D. Writing Board - 6 comments were received representing 13 percent of the device comments or 3.6 percent of the total comments.

"The writing board is great for working problems and responding to questions."

"I found the writing board a very effective teaching tool, it was very flexible."

"I found the board most useful."

"I must interact with the students so audio is the most basic component. I also make much use of the writing board for diagramming ideas and giving extra cues to facilitate learning."

"Audio and the writing board are essential and equal in importance."

E. Slow-Scan Video - 5 comments were received representing 10.8 percent of the device comments or 3 percent of the total comments.

"Slow-scan is difficult to use but better than no video."

"Slow-scan was useful for sending information."

"The slow-scan adds 'personality' to the course and improves student teacher interaction and student motivation."

"A faster scan rate would be useful."

"Slow-scan should only be used for overheads and visual materials, not people."

"Clarity of transmission for overheads was not up to my expectation level."

F. Computer - 3 comments were received representing 6.5 percent of the device comments or 1.8 percent of the total comments.

"I would like to see a computer based network with electronic mail and demonstration capabilities. Student projects and tests could be handled this way."
"If a computer were interfaced with the system, it would make greater use of it in the preparation of materials and in interaction with the students."

F. Color Video - 2 comments were received representing 4.3 percent of the device comments or 1.2 percent of the total comments.

"Color and motion are not important for my course."

"Color video is generally not important."
VITA

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