CHAPTER-I
INTRODUCTION
In the Name of Allah,
The Beneficent, the Merciful
INTRODUCTION

Developing countries are seeing emergent and convergent electronic technologies as driving forces in their national development. The importance placed on communication and information technologies in achieving national educational objectives is rising exponentially, especially in the area of higher education.

In this modern age of science, developing countries cannot afford to neglect the use of technology in the field of education. Modern media, methods and materials that constitute educational technology are used at all stages of education starting from pre-primary to the Open University. Educational technology has, therefore, not only emerged as a prospective subject but also proved to be a potential instrument for bringing about desirable changes, both qualitative and quantitative in the educational arena.

Educational technology has assumed greater importance for achieving desired goals for universalization of education, for preparation of teachers and for upgrading curricula at all levels of education. The Indian National Policy of Education (1986) has given special emphasis on the use of educational technology in the field of formal, non-formal and adult education; particularly it has given stress on the utilization of modern media and materials in the Open University system.

According to Eric Ashby (1967) we are now in the midst of the fourth revolution in education—the age of electronics. The first revolution took place when the human society began to differentiate adult roles, and, the task of educating the young was shifted partly from parents to teachers and from home to school. The second revolution occurred when the written word was adopted as a tool of education and the oral instruction, continued to co-exist with written materials in the classroom. The third revolution set in with the invention of printing technology and the subsequent mass-production of books and journals. The fourth revolution has commenced with the development in electronics, like radio, television, audio/video recorder and computer. The social scientists are also of the opinion that these electronic media should be utilized effectively for optimizing learning experiences.

For more than a century, the most predominant form of instruction in higher education has been classroom-based and instructor-led. Today, this traditional approach to
learning is being changed by new technologies such as multimedia, telecommunications and the Internet.

While new technologies provide powerful tools that could transform many aspects of our daily lives, Internet technologies used in the area of academic transactions are a relatively new phenomenon; thus the adoption and diffusion of educational technology particularly the new technologies into the higher education is a complex process.

Recent years have seen dramatic increases in the use of technology in higher education, particularly the use of the Internet and the World Wide Web. Recent technological developments in computers and telecommunications, especially in access to the storage and transfer of vast quantities of information, have included many possibilities for direct application to university classrooms.

The evolution of the Internet as a well established, accessible and commonplace technology has profoundly impacted the mode of instructional delivery at higher education level. Some faculty teachers are using the Web to instruct their students entirely online without the traditional face-to-face interactions, while, others are using the Internet to supplement traditional instruction. Some faculty members are using the Internet in increasing numbers, but there is little research to predict the impact of Internet use on faculty teaching, research, communication, professional development, personal productivity, social networks, and the way they fulfill their organization’s mission.

TECHNOLOGY AND EDUCATION

We are at the threshold of a new era, which presents momentous changes in the modalities of education. Science and technology have become elements of our culture perhaps the most effective factors of development. Education today aims at elevating itself to the level of a complete and comprehensive science with broader objectives. Such an enlarged view of education involves greater and more sophisticated use of instructional technology.

Technology has entered and enriched every area of human experience or walk of life and has made life comfortable, convenient and in fact worth living. It has assisted human beings in achieving their objectives in their respective spheres. It is high time that
education makes the best use of technology to facilitate and accelerate the realization of its objectives.

Technology is a tool for delivering and transmitting information. It is a means by which students gain experience of formulating problems, deciding on the reasonableness of situations; communicating their thoughts, findings, and interpretations; and collaborating with other students in this mission. Technology is a major partner in the process of improving the quality of education with which a student leaves the school.

We know that every technological development has been an extension of some human function. Whether man is mechanized or freed by this extension depends very much on how the technology is used.

EDUCATIONAL TECHNOLOGY

Educational technology emerged as a field of study and occupational category in the early 1960s. Entrants to educational technology during the 1960s usually arrived by one of two routes—audio-visual education or programmed learning. Each was associated with a number of possible conceptual frameworks, which practitioners adopted according to the nature of their job, their training, and their personal preference.

The concept of educational technology finds a place in the Indian National Policy of Education (1986), by the provision of a separate section entitled media and educational technology. The working committee on educational technology was appointed to find out the significance of technology in social change and development. Educational technology has emerged in the educational scenario as an instrument of total quality education as well as a means for solving education-related problems in India.

In general, educational technology refers to the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training. Educational technology has been viewed in terms of its two interactive components viz. Technology of education and technology in education. Technology of education includes the systems approach to solve educational problems, through interactive strategies corresponding to the psychology of human learning leading to multi-media approach, the multi-sensory approach, and individualization of instruction, which has to be an instrument of total quality education. Technology in education refers to the provision of hardware and hardware-related software provided to support the
instructional strategies. In general, it assumes that technology has the power to change the process of learning.

There are three underlying trends in the development of educational technology as detailed below:

- There is a gradual shift towards a more student-centered approach to learning - a shift that is manifesting itself in a steady increase in the use of individualized learning in all its various forms.
- There is an ever-widening realization that, there is more to education than teaching basic facts and principles and that serious attempt should be made to cultivate the various non-cognitive skills and attitudes that are so important for future oriented life.
- There is an explosive increase in the use of new information technology, viz. the application of new electronic and other technology to the creation, storage, selection, transformation of information of all kinds of education and training.

The period between 1967 and 1972 can be regarded as a period of consolidation. Educational technology became a recognized term and people began to accept it as an occupational definition, which covered a range of jobs in all sectors of education. Educational technology is a systematic way of designing, implementing and educating the students in the total process of learning.

The report of the National Center for programmed Learning, U.K., (1971) states that educational technology is the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training.

According to Silber (1972) educational technology is a field involved in the facilitation of human learning through the systematic identification, development, organization, and utilization of a full range of learning resources, and through the management of these resources. It includes, but is not limited to, the development of instructional systems, the identification of existing resources, the delivery of resources to learners and the management of these processes and the people who perform them.

According to Grayson (1972) the term of educational technology refers to hardware and software, including television, radio, electronic classroom instructional
devices, still and motion picture projectors, computer-assisted or managed instructional equipment and materials, communications equipment for educational application, and other equipment and materials necessary to assist the process of learning.

The report of the Technical Working Group for Educational Technology in Asia (1975) states that educational technology is seen both as a means as well as a service to effect and facilitate better and productive learning system. It is an integral part of both formal and non-formal education. One aspect of educational technology is related to the use of specific techniques such as educational television, radio, programmed learning and other audio visual aids. In another aspect, educational technology is seen as the application of scientific and other organized knowledge to the practical problems of education. In the particular contexts of developing countries, the emphasis is on the application of techniques and knowledge with a view to mobilizing and optimizing the available human as well as technological resources.

According to Association for Educational Communications and Technology (1977) educational technology is a complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems and devising, implementing, evaluating, and managing solutions to those problems, involved in all aspects of human learning. In educational technology, the solutions to problems take the form of all the learning resources that are designed and/or selected and/or utilized to bring about learning, these resources are identified as messages, people, materials, devices, techniques, and settings. The processes for analyzing problems, and devising, implementing and evaluating solutions are identified by the educational development functions of research-theory, design, production, evaluation-selection, logistics, utilization, and utilization-dissemination. The processes of directing or coordinating one or more of these functions are identified by the educational management functions of organization management and personnel management. The relationships among these elements are shown by the domain of educational technology model. Educational technology is a theory about how problems in human learning are identified and solved. Educational technology is a field involved in applying a complex, integrated process to analyze and solve problems in human learning. Educational technology is a profession made up of an organized effort to implement the theory, intellectual technique, and practical application of educational technology.
Introduction

Both technological and theoretical developments have brought interactionist concepts of educational technology into greater prominence during the 1980s and early 1990s, but while interactivity is applauded as desirable, there are divergent perspectives about what it means.

Davies (1981) refers to three archetypes—the audiovisual, the engineering, and the problem solving. Under audiovisual he includes both the use of learning resources and mass communications; engineering refers both to applied behavioral science and systematic instructional development; problem solving is a more creative approach to design that he identifies with the notion of instructional development as an art.

Romiszowski (1981) presented a similar threefold distinction. Like Davies, his third archetype is concerned with problem solving, though he also links it to the more holistic type of systems approach.

According the Report of Organizers of the Western Regional Conference of the Comparative and International Education Society (1986) the purpose of educational technology is to promote the efficiency of education by improving the quality of teaching, educational administration and educational research. New types of technology intended to accomplish these purposes appears at an ever accelerating pace, paralleling the rapid increase of innovations in the general society. As a result, educators face the constant challenge of understanding the nature of technologies, their potential uses and their strengths and weaknesses.

The Modern Encyclopedia of Educational Technology (1994) defines educational technology as continuing changes in educational procedures growing out of applied theory and practice meet and resulting in increasing precision in the control of environmental factors through the coordinated action of personal and instructional media in a man-machine system in the interest of more effective learning.

International Encyclopedia of Educational Technology (1996) explains educational technology as a problem solving process, concerning most aspects of teaching and learning through media and technology in the context of education and training. Problems may arise in sub-domains of education, such as curriculum, instruction and learning, methods and media or organization and management. In developing solutions, use will be made of many technologies in the narrower meaning of the world, educational aspect and applications of information and communication technology. A variety of education and instructional settings are presented as they determine potential solutions.
According to Ely (1997) educational technology is a term widely used in the field of education (and other areas), but it is often used with different meanings. The word technology is used by some to mean hardware—the devices that deliver information and serve as tools to accomplish a task—but those working in the field, use word technology to refer to a systematic process of solving problems by scientific means. Hence, educational technology properly refers to a particular approach to achieving the ends of education. Instructional technology refers to the use of such technological processes specifically for teaching and learning.

University of North Carolina Media Services (1997), states that educational technology is the application of research, learning theory, emergent technologies, and child and adult psychology to solving instructional and performance problems.

According to Educational Technology Committee (2002) educational technology may include the use of audio-video and related equipment and/or computer-based systems in the planning, design, development, delivery, management, and evaluation of educational resources and teaching-learning activities.

Five fundamental meanings of educational technology have been summarized and examined below. Although each might stand alone, they fuse together to represent the primary and central meanings of the concept of educational technology (Unwin, 1978).

• **EDUCATIONAL TECHNOLOGY I: EDUCATIONAL PSYCHO-TECHNOLOGY**

This first meaning of educational technology relies upon psycho-technology to enhance a student’s capability by manipulating sensory input directly (with a tangible event like a candy) or symbolically (by verbal, audiovisual or other communications). At the heart of educational psycho-technology are a number of related problems: diagnostic assessment of students' capability; clarification of educational objectives; selection or prescription of instructional communications, materials or activities; and evaluation. Where warranted by the client’s needs and available resources, mediated communications are presumed, as are the technologies of contingency management and stimulus control. This is consistent with Melton's conclusion that the technology of educational methods includes all methods of management of the learning processes of others in order to achieve certain prescribed behaviors or behavior capabilities.
Introduction

• EDUCATIONAL TECHNOLOGY II: EDUCATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY

Information and communications technology unite to form the basis of the second meaning, which emphasizes the design, production, and evaluation of instructional materials and communications for dissemination locally or at a distance. Attention is directed both to the generation, selection, processing and storage of information for education, and to information retrieval and communication so that knowledge is made available.

• EDUCATIONAL TECHNOLOGY III: EDUCATIONAL MANAGEMENT TECHNOLOGY

Another use of educational technology focuses upon the management of educational resources, including such related activities as planning, programming, budgeting, management decision making, operations research, and systems analysis. The management of resources is not simply an administrative function; it is inextricably bound to the problem-solving process whereby resources, including the organization itself, are allocated to produce educational results. As such it is central to the process of system development.

• EDUCATIONAL TECHNOLOGY IV: EDUCATIONAL SYSTEMS TECHNOLOGY

The core of this fourth set of activities denoted by educational technology is educational systems engineering; the planning, design, construction and evaluation of education systems. The educational systems developer is concerned with administrative systems, operating systems (such as television series, department or institution), or extra-mural and alternative educational systems.

• EDUCATIONAL TECHNOLOGY V: EDUCATIONAL PLANNING TECHNOLOGY

Educational planning is the final sphere of activity, which defines educational technology. Little more than a manifestation of educational systems technology at a more comprehensive level it emerges in the literature as a distinct and defensible interpretation.

Thus, the above five-fold meaning represents the primary and central uses of the concept of educational technology; each can stand alone, yet each is integral to the others. The unifying factor is their adherence to a concept of technology as an intellectual and
Introduction

practical pursuit concerned with all aspects of the design and control of systems for the purpose of achieving a potentially reproducible educational effect. Educational technology is an area of study and practice (within education) concerned with all aspects of the organization of educational systems and procedures whereby resources are allocated to achieve specified and potentially replicable educational outcomes.

INFORMATION TECHNOLOGY

According to Encyclopedic Dictionary of Information Technology, information is the human meaning given to data as a result of their analysis according to known conventions.

Collin (1994) defined information as:
• Knowledge presented to a person in a form which can be understood,
• Data that has been processed or arranged to provide facts that have a meaning.

Information technology is involved in acquiring, storing, processing and distributing information by electronic means including radio, television, telephone, and computers.

Information is data that has been collected and processed into an organized, useable form. Organized, usable information is accurate, relevant, complete, cost effective, verifiable, and reliable and is available when needed. Information can be presented in characters, numbers, pictures, images and sounds. Information can be divided in two general types: qualitative and quantitative. Each of these types can exist in analog or digital form.

According to Encyclopedic Dictionary of Information Technology, Information Technology is the technology associated with the handling of information. The UNESCO definition of this term is the scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computers and their interaction with men and machines; and associated social, economic and cultural matters. In the UK (1982) was designated as Information Technology year. In this context the term is abbreviated to IT.

Information technology (IT) is the application of appropriate technologies to transmit, store and manipulate information to solve problems and make decisions. At present IT blends computing, data and telecommunications and digital electronics.
Introduction

During the past few centuries great advances have been made in the human capability to record, store and reproduce information, beginning with the invention of printing from movable type in 1450, followed by the development of photography and telephony, and culminating in the mass production of electronic digital computers in the latter half of the 20th century. New technologies for preserving and transmitting aural and visual information (e.g., digital audio tape, optical disc storage, and optical fibers) have further enhanced information processing.

The high-speed digital computer, together with its peripheral equipment, provides an extremely efficient means of manipulation and modifying stored data. As a consequence, information systems based on such computers are able to carry out diverse tasks. They can, for example, perform scientific and engineering calculations, translate technical material from one natural language to another, conduct searches of bibliographic literature, provide tutorial instruction in various subjects, assist in design and manufacturing activities, or make decisions for solving complex no numerical problems (e.g., those related to medical diagnosis or mineral exploration) with so-called expert software systems. Moreover, the utility of computer system is greater enhanced by their ability to communication with one another through computer networks, provided that the proper communications connections have been established and the computer data files and programs have been modified to agree with a common communications protocol.

All of these technological advances together have made information a new basic resource, ranking alongside material and energy resources in importance. There are, in fact, those who believe that control of information stores and processing facilities may well become more important than natural resources as a source of social and economic power.

IT is becoming a strategic resource. As we look at the capabilities of IT, it is continually increasing and the political, social and economic context of its use is undergoing simultaneous radical changes. This combination of contextual forces for change and technological advance has created considerable rhetoric about the strategic potential of IT. Academics, consultants and practitioners are constantly searching for the latest example application of IT, which has yielded competitive advantage.
COMMUNICATION TECHNOLOGY

Communication, the exchange of meanings between individuals through a common system of symbols, concerns scholars since the time of ancient Greece. According to Sampath and others (1987), communis is a Latin word, meaning common, hence communication is having common experiences with other people.

Mohanty (1992) defined communication as the art of transmitting information, ideas, and attitudes from one person to another. It is a need for a human being to communicate with his fellow beings. It is a primal urge and in the modern civilization a necessity for survival. The following are some of the widely accepted definitions for communication:

- Communication means sharing of ideas and feelings in a mood of mutuality.
- Communication involves interaction, which encourages give and take.
- Communication is a process of sharing of experiences till it becomes common possession.

Until modern times, however, the topic was usually subsumed under other disciplines and taken for granted as a natural process inherent to each. The English Literary Critic and Richards (1928) offered one of the first and in some ways still the best definitions of communication as a discreet aspect of human enterprise: communication takes place when one mind so acts upon its environment that another mind is influenced, and in that other mind an experience occurs which is like the experience in the first mind, and is caused in part by that experience.

Richards’ definition is both general and rough, but it is applicable to nearly all kinds of communications including those between humans and animals (but excluding machines). By this, the concept of communication separated the contents of messages from the processes in human affairs by which these messages are transmitted. More recently, questions have been raised concerning the adequacy of any single definition of the term communication as it is currently employed. The American psychiatrist and scholar Jurgen Ruesch has identified 40 varieties of disciplinary approaches to the subject, including architectural, anthropological, psychological, political, and many other interpretations of the apparently simple interaction described by Richards. In total, if such informal communications as sexual attraction and play behavior are included, there exist at
least 50 modes of interpersonal communication that draw upon dozens of discrete intellectual disciplines and analytic approaches. Communication may therefore be analyzed in at least 50 different ways.

Interest in communication has been stimulated by advances in science and technology, which, by their nature, have called attention to man as a communicating creature. Among the first and most dramatic examples of the inventions resulting from technological ingenuity were the telegraph and telephone, followed by others like wireless radio and telephoto devices. The development of popular newspapers and periodicals, broadcasting, motion pictures, and television led to institutional and cultural innovations that permitted efficient and rapid communication between a few individuals and large populations; these media have been responsible for the rise and social power of the new phenomenon of mass communication.

Since about 1920 the growth and apparent influence of communication technology have attracted the attention of many specialists who have attempted to isolate communication as a specific facet of their particular interest. Psychologists, in their studies of behavior and mind, have evolved concepts of communication useful to their investigations as well as to certain forms of therapy. Social scientists have identified various forms of communication by which myths, styles of living, mores, and traditions are passed either from generation to generation or from one segment of society to another. Political scientists and economists have recognized that communication of many types lies at the heart of the regularities in the social order. Under the impetus of new technology—particularly high-speed computers—mathematicians and engineers have tried to quantify and measure components of communicated information and to develop methods for translating various types of messages into quantities or amounts amenable to both their procedures and instruments. Numerous and differently phrased questions have been posed by artists, architects, artisans, writers, and others concerning the overall influences of various types of communication. Many researchers, working within the relevant concerns of their disciplines, have also sought possible theories or laws of cause and effect to explain the ways in which human dispositions are affected by certain kinds of communication under certain circumstances, and the reasons for the change.
In the 1960s a Canadian educator, Marshall McLuhan, drew the threads of interest in the field of communication into a view that associated many contemporary psychological and sociological phenomena with the media employed in modern culture. McLuhan's often repeated idea, the medium is the message, stimulated numerous filmmakers, photographers, artists, and others, who adopted McLuhan's view that contemporary society had moved (or was moving) from a print culture to a visual one. The particular forms of greatest interest to McLuhan and his followers were those associated with the sophisticated technological instruments for which young people in particular display enthusiasm, namely motion pictures, television, and sound recordings.

By the late 20th century the main focus of interest in communication seemed to be drifting away from McLuhanism and to be centering upon:

- The mass communication industries, the people who run them, and the effects they have upon their audiences;
- Persuasive communication and the use of technology to influence dispositions;
- Processes of interpersonal communication as mediators of information;
- Dynamics of verbal and nonverbal (and perhaps extrasensory) communication between individuals;
- Perception of different kinds of communications;
- Uses of communication technology for social and artistic purposes, including education in and out of school; and
- Development of relevant criticism for artistic endeavours employing modern communications technology.

In short, a communication expert may be oriented to any of a number of disciplines in a field of inquiry that has, as yet, neither drawn for itself a conclusive roster of subject matter nor agreed upon specific methodologies of analysis.

THE PSYCHOLOGY OF COMMUNICATION

Contemporary psychologists have, since World War II, shown considerable interest in the ways in which communications occur. Behaviorists have been prone to view communication in terms of stimulus-response relationships between sources of
introduction

communications and individuals or groups that receive them. Those who subscribe to
Freud’s analysis of group psychology and ego theory, tend to regard interaction in
communication as reverberation of family group dynamics experienced early in life.

By the middle of 1950s, psychological interest settled largely on the persuasive
aspects of various types of messages. Psychologists have attempted to discover whether a
general factor of personality called persuasibility might be identified in people at large. It
would appear, though with qualifications, that individuals are indeed variably perusable
and that, at times, factors of personality are related to this quality.

Other psychologists have studied the recipients of communication, evolving
concepts of selective perception, selective attention, and selective retention in order to
explain not only the ways in which communication changed attitudes but also the reasons
for resistance to change. Among their interests were the dynamics of the communication
of rumours, the effects of scare messages, the degree of credulity that sources of prestige
value provide, and the pressure of group consensus upon individual perceptions of
communications.

Some of the suggestions that emerged from the work of certain modern
psychologists may be subsumed under a theory of what is called cognitive dissonance,
which is based upon the observation that most people cannot tolerate more than a specific
degree of inconsistency in the environments they perceive. An example of cognitive
dissonance may involve a person who considers himself a superb bowler but who on one
occasion earns an extremely low score. The dissonant or inconsistent elements include the
bowler’s knowledge of his skill and the fact of his poor score. This produces tension. To
reduce this tension / dissonance, the bowler may change his behavior or misinterpret or
reinterpret the dissonant elements in order to lessen the difference between the facts. For
example, he may blame his performance on the bowling ball, the alley, or the temperature
of the room. Thus he seeks a psychological equilibrium.

This modification of an individual’s perception of reality is of fundamental interest
to the psychologist of communications. Because the agreement or disagreement of a
communication with an individual’s cognitive structure not only affects his behavior but
his perception as well, the major criterion for the psychological analysis of communication
is neither the message nor the medium but the expectation of the person receiving the
message.
It must not be assumed that any of the theories of audience psychology offered to date (including those of Gestaltists, Freudians, Behaviorists, and others) lack relevance to an understanding of communication processes.

COMMUNICATION MODELS

The models of communication span a period of some 2300 years, beginning with Aristotle and moving to those constructed in the 1960s and 1970s by contemporary communication theorists. The purpose here is not to provide a complete account of each model, outlining their individual strengths and weaknesses, but rather to provide a general idea as to how various people, each approaching communication from a somewhat different perspective, conceptualized the essential concepts and processes involved in the communication act. Taken together they provide perhaps the best answer to the question, what is communication?

- **Aristotle's Model**: Probably Aristotle, the Greek philosopher, in his Rhetoric, which he completed some 2300 years ago, presented the earliest systematic model of communication. The model is extremely simple, as can be seen in Figure 1.1. Aristotle included five essential elements of communication: the speaker, the speech or message, the audience, the occasion, and the effect. In his Rhetoric, Aristotle advises the speaker on constructing a speech for different audiences on different occasions for different effects. This model is most applicable to public speaking.

Figure 1.1

*Aristotle’s Model of Communication*
• **Lasswell's Model:** The models devised by both Harold Lasswell (1948) and George Gerbner (1956), presented in Tables 1.1 and 1.2, attempt to explain the essential elements in communication and the areas of study concerned with them. The Gerbner model expands on the five general components originally defined by Lasswell. Notice that the Lasswell model is not very different from that proposed by Aristotle some 2300 years ago.

### Table 1.1

**Lasswell's Model of Communication**

<table>
<thead>
<tr>
<th>Communication Component</th>
<th>Research Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who</td>
<td>Control analysis</td>
</tr>
<tr>
<td>Says what</td>
<td>Control analysis</td>
</tr>
<tr>
<td>In what channel</td>
<td>Media analysis</td>
</tr>
<tr>
<td>To whom</td>
<td>Audience analysis</td>
</tr>
<tr>
<td>With what effect</td>
<td>Effect analysis</td>
</tr>
</tbody>
</table>

### Table 1.2

**Gerbner's Model of Communication**

<table>
<thead>
<tr>
<th>Communication Component</th>
<th>Research Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Someone</td>
<td>Communicator/audience research</td>
</tr>
<tr>
<td>Perceives an event</td>
<td>Perception research and theory</td>
</tr>
<tr>
<td>And reacts</td>
<td>Effectiveness measurement</td>
</tr>
<tr>
<td>In a situation</td>
<td>Physical/social setting research</td>
</tr>
<tr>
<td>Through some means</td>
<td>Media investigation</td>
</tr>
<tr>
<td>To make available materials</td>
<td>Administration; distribution</td>
</tr>
<tr>
<td>In some form</td>
<td>Structure; organization; style</td>
</tr>
<tr>
<td>And context</td>
<td>Communicative setting</td>
</tr>
<tr>
<td>Conveying content</td>
<td>Content analysis; study of meaning</td>
</tr>
<tr>
<td>Of some consequence</td>
<td>Overall changes study</td>
</tr>
</tbody>
</table>
• David Berlo’s (1960) model of communication attempts to explain the various components in the communication process (Table 1.3). The four basic components are source, message, channel, and receiver. For each of these four components there are five elements that need to be considered. The source and receiver are treated in essentially the same way. To study either of the two, we need to consider their communication skills (speaking and writing for the source, and listening and reading for the receiver), their attitudes, their knowledge, the social system of which they are a part, and the culture in which they operate. The message consists of both elements and structure, each of which may be broken down in to content, treatment, and code. For the channel, Berlo lists the five senses, emphasizing that messages may be sent and received through all of these senses.

Table 1.3
Berlo’s Model of Communication

<table>
<thead>
<tr>
<th>Source</th>
<th>Message</th>
<th>Channel</th>
<th>Receive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Skills</td>
<td>Elements</td>
<td>Seeing</td>
<td>Communication</td>
</tr>
<tr>
<td>Attitudes</td>
<td>Structure</td>
<td>Hearing</td>
<td>Attitudes</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Content</td>
<td>Touching</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Social system</td>
<td>Treatment</td>
<td>Smelling</td>
<td>Social system</td>
</tr>
<tr>
<td>Culture</td>
<td>Code</td>
<td>Tasting</td>
<td>Culture</td>
</tr>
</tbody>
</table>

• Helical Spiral Model: A model that appears relatively simple and yet says a great deal that is not obvious about the process of communication is the helical spiral proposed by Frank Dance (1957). This model emphasizes that communication has no clear observable beginning and no clear observable end; the spiral continues indefinitely. No communication transaction may be said to have fixed boundaries. Each transaction is, in part, a function of previous communications and each transaction in turn influences future communications as shown in the Figure 1.2.
• **Shannon and Weaver's Model:** Perhaps the most famous of all the models of communication is that proposed by **Claude Shannon and Warren Weaver (1949)**, termed as the mathematical theory of communication (**Figure 1.3**). Communication, according to this model, follows a simple left to right process. The information source, let's say a speaker, selects a desired message from all the possible messages. The message is sent through a transmitter, for example, a microphone, and is changed into signals. In telephone communication these signals would be electrical impulses and the communications channel, a wire. The signals are received by a receiver, for example, an earphone of some kind, changed back into a message and given over to the destination, a listener. In the process of transmission certain distortions are added to the signal, which were not part of the message sent by the source, and these are called noise.
• **Barnlund's Model**: A model of communication that most clearly emphasized the transactional nature of communication has been proposed by Dean Barnlund (1970).

**Barnlund's model** is based on six communication postulates:

- **Communication is dynamic**: communication is an ongoing event and not a static entity.
- **Communication is continuous**: communication has no beginning and no end. It is *a continuing condition of life*. Although we may, for convenience, stop the process and talk about when a particular communication act began, in reality the process can never be stopped and beginning never clearly distinguished.
- **Communication is circular**: When we consider communication as the passing of messages from speaker to listener we imply that the process begins with the speaker and ends with the listener. But communication is a circular process with each person serving each function, with each person influencing and beginning influenced by every other person.
- **Communication is unrepeatable**: No action and no reaction are exactly repeatable. No person even does the same thing in exactly the same way. All communications, to paraphrase the linguists, are novel communications.
• **Communication is irreversible:** The processes of only some systems can be reversed. For example, water may be turned into ice and the ice may be turned back into water again. This is a reversible process. Other systems, however, are irreversible; the process can only go in one direction. Communication is an irreversible process. We can never undo what has already been done. What has been communicated remains communicated, however we may attempt to qualify it or negate it.

• **Communication is complex:** The numerous types of communication, the numerous purposes communication serves, the numerous contexts in which communication may take place, and the numerous forms communication message may take, make a vast array of communication acts possible. There seems little question that communication is complex.

Barnlund's transactional model of communication is presented in Figure 1.4. In this model, P₁ and P₂ are the two persons involved in the communication act. The D and E stand for decoding and encoding, receiving and sending. No distinction is made here; between speaker and hearer; both parties send and both parties receive messages at the same time. $C_{PU}$ stands for cues-public. These are cues derived from the environment available to all potential communicators and are created prior to the communication act. In this way these cues are distinguished from the communication messages, which are naturally created during the communication act. Public cues may also be classified into natural cues, created by nature, and artificial cues, which are created by people. Cues-private ($C_{PR}$) are cues not available to other people; they are only available to one person. These cues would include, for example, a taste, a pain, or an itch that only one person perceives. Cues perceived with a microscope or an earphone to which others do not have access would also be considered as private cues. $C_{BEHV}$ denotes verbal behavioral cues and $C_{BEHNV}$ denotes nonverbal behavioral cues. The nonverbal cues are considered to include both deliberate nonverbal acts (combing one's hair) as well as unconscious nonverbal acts, such as biting one's lip or squinting. But the term message, M, according to Barnlund, is restricted to mean as set of cues that are purposely controlled by one person in order to communicate with another. Barnlund's model depicts communication between two people, but with minor modifications it can be altered to include small group
Introduction

communication, public speaking, or mass communication as well as communication with the self. The arrows emerge from \( P_1 \). The dotted arrows represent the perceptions of \( P_1 \). These perceptions are actually of two types: private (\( C_{PR} \)) and public (\( C_{PU} \)). The dotted arrows go not only to the public cues but also to the verbal and nonverbal messages of \( P_2 \), as well as to the nonverbal messages of \( P_1 \). The process is identical from the point of view of \( P_2 \).

Figure 1.4
Barnlund’s Transactional Model of Communication
Interpersonal Model: One of the most insightful models and most clearly a model of interpersonal communication is that proposed by Wendell Johnson (1951) (Figure 1.5). Although it may seem complex, the model is actually rather simple when compared to the truly complex process of communication. The surrounding rectangle indicates that the communication takes place in a context, which is external to both speaker and listener and to the communication process as well. The curved loop indicates that the various stages of communication are actually interrelated and interdependent.

The actual communication process begins at 1, which represents the occurrence of an event, anything that can be perceived. This event is the stimulus. Although not all communication occurs with reference to such external stimuli, communication makes sense, Johnson argues, only when it does in some way relate to the external world. At stage 2 the observer is stimulated through one or more sensory channels. The opening at 2 is purposely illustrated as relatively small to emphasize that out of all the possible stimuli in the world, only a small part of these actually stimulate the observer. At stage 3 organism evaluations occur. Here nerve impulses travel from the sense organs to the brain, which affect certain bodily changes in, for example, muscular tension. At 4 the feelings aroused at 3 are beginning to be translated into words, a process that takes place in accordance with the individual’s unique language habits. At stages 5, from all the possible linguistic symbols, certain ones are selected and arranged into some pattern.

At 1 the words that the speaker utters, by means of sound waves, or the words that are written, by means of light waves, serve as stimulation for the speaker. At 2 the hearer is stimulated, at 3 there are organism evaluation, at 4 feelings are beginning to be translated into words, at 5 certain of these symbols are selected and arranged, and at 1 these symbols, in the form of sound and / or light waves, are emitted and serve as stimulation for another hearer. The process is a continuous one.
• Westley and MacLean (1957) have proposed a model of communication, which is particularly appropriate to describe the essential elements and processes involved in mass communication. The model is presented in Figure 1.6.

In this model there are three essential persons, represented by A, B and C. A refers to the communicator; the person who selects and transmits messages purposively. B refers to the receiver or the public. C designates an agent that selects and transmits messages received from A or from his or her own environment to B. The X’s refer to the objects in the sensory field of the individual to whom they are connected by arrows. X^i refers to the messages that A transmits to C about the X’s in his or her sensory field. X^{ii} designates the messages transmitted by C to B about the X’s in his or her sensory field. The dotted lines going from right to left and designated F_{CA}, F_{BA}, and F_{BC} refer to the feedback messages which enable A and C to discover how B has reacted to their messages.

**Figure 1.6**
Westley and MacLean’s Model of Communication

One of sociology’s contributions to mass communication model building has been to point to the relationships between the mass communication process and other processes in society. An example of this is the 1959 model of U.S. sociologists John W. Riley and Mathilda White Riley. In the graphic presentation of this model in Figure 1.7, one sees the exchange of messages between communicator and receiver, both of whom are tied to primary groups and find themselves in a larger social structure surrounded by an
all-embracing social system. Communicating and receiving communications, the individual may find that this social web will mediate and influence the impact of the mass media.

Figure 1.7
John W. Riley and Mathilda White Riley's Communication System

The mass communication system (from a social-psychological standpoint may be quite complicated) is shown in a model from 1963 by German communication researcher Gerhard Maletzke, whose Schema of the Mass Communication can be seen as an effort to summarize much of the research completed up to that time. The factors that have to be taken into account are shown in Figure 1.8.

- **Trans-Per Model of Communication (1975):** Kenneth K. and Edward M. Bodken in 1975 proposed Trans-Per model of communication. The word is a combination of the first syllabus of the words Transaction and Perception. It is a transactional perceptual model. Transactional stresses that communication is more than a one-way action or on and off interaction. It means that all the components-perception, meaning creation, system and process are inter related and operate simultaneously in every communication. Perceptual suggests that the perceiver actively blends all internal stimuli (that which he brings with him to a communication situation) with all the external stimuli of the present (that which is out there in the surrounding environment) to create meaning.

24
These two terms are arbitrary; however they are dominant in their model. Transaction is their overall approach to study of human communication. It stresses the individuals’ inseparable involvement with the world. Perception emphasizes the means by which we attempt to create a meaningful world.

Trans-Per Model consists of two interrelated, independent systems; the internal system and the external system. The elements of internal system are: attitude element and personality element. External systems are: verbal cues and Non verbal cues.

• Devito’s Model of Communication (1978): Joseph Devito’s model of communication proposed this experimental vehicle to explore some of the elements and processes involved in the act of communicating. According to Devito, communication refers to the act, by one or more persons, of sending and receiving messages distorted by noise, within a context, with some effect and with opportunity of feedback. In the model of the universals of communication, communication is a process; it is ongoing, and it is forever in motion. In this model, each element in the communication act influences and is influenced by each other element. The elements of the communication in this model are: communication context, source(s) and receiver(s), message and channels, noise, encoding and decoding, competence and performance, feedback, field of experience, and communication effect. The model explains the process of communication as follows:

• Communication Context: Communication always takes place within a context. The context of communication has at least four dimensions: physical, social, psychological, and temporal. These four dimensions of context interact with each other; each influences and is influenced by the others.

• Sources and Receivers: In the model, communication is illustrated as taking place between two persons, a source and a receiver. Communication, by definition, demands that someone sends signals and someone receives them. One person, of course, might send and receive his or her own signals, as in talking to yourself.

• Message and Channels: The messages that are sent and received in communication may be of any form, that is, may be sent and received through any one or combination of sensory organs.

• Noise: Noise may enter into any communication system. Noise is anything that distorts or interferes with the message.
• **Encoding and Decoding**: In communication theory, the processes of speaking or writing and understanding or comprehending are referred to as encoding and decoding. The act of producing messages, for example speaking or writing, is termed encoding. By putting our ideas into sound waves, we are putting these ideas into a code, hence encoding. By translating sound waves into ideas, we are taking them out of the code they are in, hence decoding. Thus, we may refer to speakers or writers as encoders and to listeners or readers as decoders.

• **Competence and Performance**: Competence is knowledge of language, which is uninfluenced by any psychological or physical processes. Performance, on the other hand, is influenced not only by competence but also by such factors as fatigue, anxiety, boredom, attention span, and interest. When we fail to understand what someone says, it may be due to our competence. More likely, however, it is due to our failing to attend to what was said or perhaps to our lack of interest—that is, to performance.

• **Feedback**: Another type of message is feedback. When we send a message, say in speaking to another person, we also hear ourselves. We get feedback from our own messages—we hear what we say, we feel the way we move, we see what we write, and so on. Even more important than this self-feedback we get from others, in speaking with another individual, not only are we constantly sending messages, but also we are also constantly receiving messages.

• **Field of Experience**: Communication is ineffective or impossible to the extent that the participants have not shared the same experience. Parents have difficulty communicating with their children, according to this view, because the children cannot share the parent's experience and because the parents have forgotten what it is like to be a child or do not know what it is like to be a child today.

• **Communication Effect**: Communication always has some effect on one or more persons. For every communication act, there is some consequence. The effect may be on the source or on the receiver or on both. When communication affects the environment or context, this is done through people. Even when we cannot observe an effect (which is perhaps most of the time), we assume that for every communication act there is an effect. The schematic presentation of these universals of communication are presented in Figure 1.9.
Introduction

Figure 1.9
DeVito's Model of Communication
Introduction

- **Seiler, Schulekh and Brilhart's Model of Communication (1984):** According to Seiler, Schulekh and Brilhart (1984) the communication system consists of a number of essential components: source, message, channel, receiver, environment and feedback. Noise, which is anything that interferes with a message and thus potentially distort its intended meaning. The communication system can be compared to human digestive system, in which all parts interact and affect all other parts in the process of digesting food. The process of communication must be stopped and the system separated into various parts so that each component can be discussed separately.

- **The Tubbs Communication Model (1977):** The Tubbs communication model is primarily concerned with directly observable and measurable experience, what happens between communicators and how their interaction evolves and changes over time. Unlike other models of communication, presenting a cross section of one moment in a communication event, the present model tries to give a sense of movement of communication in time. This is called a process model of communication.

  This is a model of the most basic human communication event; it involves only two people. Initially, both are sources of communication and at different times each originates and receives communication stimuli. The sender / receiver may originate the first message and receiver / sender may be the first to perceive the transmitted stimuli but in most of our daily communication activities which are spontaneous and relatively unstructured, this order is dictated by chance. Transactions can be initiated from either the right or the left side.

  Tubbs model suggest that it is arbitrary to call one either a sender or a receiver: one is both even while one is speaking, one is simultaneously observing the other person’s behaviour and reaching to it. This is also true of the receiver. Instead of noise, Tubbs model uses the term interference that is anything that distorts the information transmitted to the receiver or distracts him/her from receiving it. Interference is also distinguished in two kinds:

  **Technical Interference:** It refers to the factors that cause the receiver to perceive distortion in the intended information or stimuli. The interference is simply in the transmission of the sounds. **Semantic Interference:** Which occurs when the receiver does not attribute the same meaning to the signal that the sender does.
Tubbs model also introduces the element of Filters. Filter is a limit on our capacity to sense or perceive stimuli. They are of two kinds:

**Physiological or Perceptual Filters**: Biological limitation that are built into human being and cannot reverse one's ability to hear.

**Psychological or Sets**: It is word used to describe the expectancy or predisposition to respond. One of the most powerful determinants of set is culture.

Tubbs model clearly distinguishes between distortion in the stimuli and limitation on one’s capacity to sense or perceive stimuli (filter). Other elements in tubbs model of communication are channel, communication stimuli, receiver, sender and input. The arrangement of these elements is represented in Figure 1.10.

**Figure 1.10**
The Tubbs Communication Model
• Michael Eraut's Model of Communication (1996): Although communication models were frequently cited by media specialists during formative period of educational technology, they were discussed only in the most general terms. Since communication theory models have as many variants as a system models, Michael Eraut presented a composite model in 1996 to show main features of this approach. Though the basic elements are the same as other models of communication yet it offers some meaningful insight into communication system. His approach gives a glimpse of educational technology research, which focused primarily on the interaction between messages characteristics and receiver action, and was thus dependent on the constructs available for describing them. He noted that even in culturally familiar, settings the sender often lacks appreciation of the receiver’s environment and encodes the message in some inappropriate way or misinterprets the feedback he or she received and this problem is magnified as the cultural gap between sender and receiver’s environment widens. The often-unconscious influence of the sender’s attitudes and beliefs is being increasingly researched, as also is the influence of the politics of the sender environment on message selection. He raised the issue of who contracts the communication system and whose interest does it serve.
TYPES OF COMMUNICATION

There are mainly three types of communication:

- **Speaking – listening:** in this type of communication interaction is face-to-face. In this case the listener shares the feelings and ideas of the source as in case of eye-to-eye contact. This type of communication ranges from personal dialogues to distance broadcasting.

- **Visualizing - observing:** in this type of communication the sources and receiver are often physically separated but share the ideas and feelings as in viewing TV or films. Such communication also takes place effectively as in case of dramatization where gestures add postures and additional impact and support.

- **Writing-reading:** in this type of communication the sender and receiver are physically away from one another all the time, but they are able to enjoy and appreciate the ideas and feelings. Interactions occur although a distance is always maintained between the author and the reader in the process of communication.

In all of the three types of communication, communication is interaction, sharing and circular or cyclic process.

COMMUNICATION CYCLE

Communication is always made with some purpose. This purpose of communication is encoded in the message and transmitted to its destination where it is decoded and response is (feedback) made. Communication without any audience or designation is not generally made by a normal person. There are essentially following components in the process of communication:

- Sender or source, technically called as **encoder**.
- Message or signal.
- The medium or channel of communication, and
- The receiver or destination or **decoder**.

In this process, the source must have correct information and transmit accurately at optimum speed. The message may be designed for a single person or a group of people. It may be conveyed by expressions, gestures, spoken or written symbols or by hand-drawn or photographic pictures. Every medium exerts its influence and its peculiarities on the
message and in this sense becomes a part of the message. The receiver must understand the message or in other words, must decode it or interpret it and must react or produce desired response, which must be received by the sender. This is called the feedback channel.

**COMMUNICATION PROCESS IN TEACHING**

Translating Lasswell’s model into education situations it may be stated that:

- *Who* means the teacher, textbook writer, TV presenter, radio broadcaster and so on,
- *Say what* means contents of the lessons and textbook etc.,
- *By what means* denotes face-to-face speech, pictures, films, slides, radio, TV etc.
- *To whom* are the learners, and
- *With what effect* means to get reaction or feedback.

In this context, the situations in which the message or lesson in delivered are not less relevant. This means where the learners are, in groups or individuals, at home or in classrooms, greatly influences learning and teaching. Situations or learning mainly refer to external and internal conditions of the learner.

The external stimuli are purposefully selected by the teacher to impart knowledge, present facts, demonstrate skills, stimulate imagination, influence attitudes and so on. The internal conditions refer to age, interest, ability, intelligence, knowledge, physiological condition, experience of life and also experience of earning by means of books, pictures, radio etc.
• COMMUNICATION BARRIERS

These barriers are operative for both face-to-face communication and communication through media/networking or so.

Communications through network are becoming a part of day-to-day life of everyone. Teachers have not been spared of this experience. A teacher communicates with students both in a face-to-face situation and through Internet. The models of communication are best tools, which come to the rescue of the teacher.

Barriers to physical, intellectual and psychological perception may cause noise in the communication system or teaching learning process. That is, the transmission should be easily heard. Loudness, clarity and speed of delivery are also important. Clarity, simplicity, intelligibility of the message affects its reception and understanding. Thus, the too slow or too loud, too simple or too complex message may be regarded as noise presenting problems for understanding. Sounds, faint images, poor print, vibration, temperature, mechanical defects, body discomforts are also instances of noise.
Introduction

A skillful communicator or a teacher in that matter tries to overcome the effects of noise or any distractions between source and audience by attention getting devices and by careful use of the principle or redundancy, i.e., repetition of the main idea of the message to make sure that it gets through and even a part of the message is not lost in any way. Therefore, redundancy is known as good teaching.

There are different kinds of difficulties standing on the way of effective communication. The important of them are poor physical reception, inaccurate reading of feedback, jargon, verbalism pictoralism, dissimilar background experience, generation gap and differing conceptions of time and space. However various researchers have categorized five categories of barriers of communication. These are:

- Teacher related barriers.
- Message related barriers.
- Methods and Media related barriers.
- Student/learner related barriers.
- Learning Environment related barriers.

The barriers of each category have been presented diagrammatically as follows:
Figure 1.12
Barriers Related to Classroom Communication

BARRIERS TO CLASSROOM COMMUNICATION

- TEACHER RELATED
- MESSAGE RELATED
- METHODS AND MEDIA
- LEARNING ENVIRONMENT RELATED
- STUDENT/LEARNER RELATED
Figure 1.13: Barriers Related to Teachers

- Unrealistic Self Concept
- Inadequate Knowledge and Skills
- Inaccurate Perception of World
- Lack of Motivation
- Lack of Understanding of Learner/Inaccurate Assumptions Regarding Learners
- Inability to Understand Individual Differences
- Inappropriate Use of Verbal Skills (Language Pronunciation etc.)
- Inappropriate Use of Non-Verbal Skills
- Lack of Confidence
- Inappropriate Handling of Methods and Media
- Inability to Build Rapport With Student
- Biases and Prejudices
- Inability to Understand Others' Point of View
Figure 1.14: Barriers Related to Message

- Lack Clarity of Objectives
- Inappropriate Sequencing of Content-Matter
- Inappropriate Use of Language, symbols
- Irrelevant Information
- Technical Jargon
- Lack of Exercises and Activities
- Overcrowded
- Lack of Examples/ Analogies/Metaphors
- Lack of Supporting Materials
- Heavy Emphasis on Text/ Lack of Illustrations
Figure 1.15
Barriers Related to Methods and Media

METHODS AND MEDIA RELATED BARRIERS

- Inappropriate Selection (Relevance to Objectives, Learners, Context, Size etc.)
- Lack of Integration of Media in Teaching-Learning
- Poor Quality of Media
- Too Much Dependence on Media
- Emphasis on Conventional Methods/Media
Unrealistic Self Concept

Inaccurate Perception of World

Lack of Previous Knowledge and Skills

Lack of Intelligence, Aptitude, Interest etc.

Lack of Motivation

Inability to Attend

Inability to relate new Knowledge with Already Existing Knowledge

Lack of Skills-Note taking, Listening, Reading, Analysis, Synthesis, Learning to Learn etc.

Impairment/ Sensory Deprivation

Inappropriate Attitudes, Biases and Prejudices

Knowledge and Skills Lack of Previous

Inaccurate Perception of World

Unrealistic Self Concept

Introduction
Figure 1.17: Barriers Related to Learning Environment

LEARNING ENVIRONMENT RELATED BARRIERS

- Over Crowded Classes
- Improper Seating Arrangements
- Lack of Facilities
- Lack of Rapport Between Teacher and Student Among Students
- Poor Ventilation, Light etc.
- Too Much or Too Little Distance Between Teacher and Student and Media etc.
- Lack of Feedback
- Anxiety Producing
- Prejudices, Biases Inappropriate Attitudes
- Lack of Experimentation
- Fear of Punishments/Criticism
- Lack of Freedom
- Lack of Cooperation
- Lack of Healthy Competition
- Too Much or Too Little Distance Between Teacher and Student and Media etc.
- Over Crowded Classes

Introduction
Network is a way of linking several computers and other devices, such as hard disks and printers, so that they can share hardware, programs and files to interchange information between users. Sippl (1985) describes network as a system of interconnected computers, capable of exchanging information, which may take on such configuration as rings, stars, or chains; also, any set of component connected by channels.

According to Dictionary of Multimedia (1996) network is: series of computers, printers and peripherals linked together so that the resources and files can be shared by users.

- **Network Communications:** Sippl (1985) defined network communications as a set of stations connected together by various communication links. Messages may be sent from any station to any other station, and may pass through several stations along the way.
- **Internet:** One of the most common misconceptions about the Internet is that it is a recent development. It has, in fact, been around - in different forms - since the late 1960s.

The precursor of the Internet, **ARPANET, (Advanced Research Projects Agency)**, was originally designed by the U.S. Department of Defense, Advanced Research Projects Agency, in conjunction with universities and research facilities. In the beginning, ARPANET was used mainly for communications technology research and development, with scientists at various sites around the world connected to each so they could share information. It was also designed to maintain and protect a nationwide information system and was built to be strong enough to survive a nuclear attack.

Throughout the 1970s and 1980s, ARPANET evolved into several other networks dedicated mostly to military use. In 1989, an important evolutionary step occurred: those networks created for military use were dismantled and replaced by the National Science Foundation's (NSFNET). This marked a significant shift, as the Internet began serving not only the military but the civilian community as well. The replacement of the Department of Defense with the National Science Foundation meant that the infrastructure of these networks would now serve a new master: the public at large. Today, even as the Internet becomes more and more commercialized, the NSF still funds much of the Internet.

The Internet has grown significantly since 1990. According to the Internet Society, an organization that monitors the Internet, the number of computer networks that make up...
the Internet exceeds 100,000, and the number of computers that connect to these networks exceeds 50 million.

Internet is the largest network communication technology in the world, which makes it possible for people to communicate in new ways. According to Computer, Internet and Multimedia Dictionary (1998), Internet is a rapidly growing network of millions of computers around the world. The Internet is not an individual organization or network, but a collective term for hundreds of thousands of networks connected by millions of users in 165 countries. It has no central computer: each message bears an address code that lets any computer in the network forward it towards its destination.

Allen and Johnson (1997) defined Internet as an exciting arena where you can find information about almost every topic. The Internet is not a real place that has a building or employees. Instead, it is the result of a collaborative effort of people and connected computers throughout the world. The end result is an electronic link to the world of information and entertainment. In basic terms, the Internet is a system of connected computers that allows your desktop computer to exchange data, messages, and files with any of the millions of other computers with connections to the Internet.

Internet can carry many forms of information, examples of services currently available on the Internet are:

- Electronic mail (e-mail)
- Bulletin board service (Network News)
- File Transfer Protocol (FTP)
- Remote login (TELNET)
- Browsing the World Wide Web (WWW)
- World Wide Web documents (HTML)
- Advanced Web technologies
- Automated Web search (Search engines)
- Audio and Video communication
- The global digital library

The Internet is an exciting arena where you can find information about almost every topic. On the Internet, you have books, encyclopedias, magazine articles, and every
other type of reference material at your fingertips. In addition, you have access to expert
opinions on various topics and can communicate with people offering commentaries on all
ranges of subjects.

- **TYPES OF NETWORK COMMUNICATIONS**

  The Internet is a communication technology and makes it possible for people to
  communicate in new ways; the Internet is also a collection of different ways to
  communicate or store information in retrievable form. The types of online communications have been outlined below (Table 1.4).

<table>
<thead>
<tr>
<th><strong>Communication Method</strong></th>
<th><strong>Tools</strong></th>
<th><strong>Type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>One – to-one</td>
<td>E-mail; Talk.</td>
<td>Individual communication</td>
</tr>
<tr>
<td>One –to-many</td>
<td>Gopher; WAIS; WWW; Mailing lists.</td>
<td>Distributed communication</td>
</tr>
<tr>
<td>Many –to-many</td>
<td>Usenet news; IRC.</td>
<td>Collaborative communication</td>
</tr>
</tbody>
</table>

*Cady and McGregor (1996)* proposed an idea about communication description via the Internet, which may be, regarded as complete description; the idea has been given below in Table 1.5.
### Table 1.5

**Types of Communications Via the Internet**

<table>
<thead>
<tr>
<th>Type of communication</th>
<th>Non-simultaneous</th>
<th>Interactive- simultaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type I.</strong> Private; individual-to-individual recipient; may be authoritative.</td>
<td>E-mail; including prepared e-mail auto-responses; individual files placed for FTP; files displayed by Finger, WWW sites with prearranged passwords or accounts.</td>
<td>Talk; tell in Multi User Dungenous (MUDs).</td>
</tr>
<tr>
<td><strong>Type II.</strong> Public; many contributors to many recipients; non-authoritative</td>
<td>Unmoderated mailing lists; unmoderated Usenet newsgroups.</td>
<td>Internet Relay Chat (IRC); Multi User Dungenous (MUDs); and Multi User Simulation Environments (MUSEs).</td>
</tr>
<tr>
<td><strong>Type III.</strong> Public; many contributors to many recipients; maybe authoritative.</td>
<td>Moderate mailing lists; moderated Usenet newsgroups.</td>
<td>CU-See Me; Maven; Multicast Backbone (M Bone); and VAT.</td>
</tr>
<tr>
<td><strong>Type IV.</strong> Public; published contributions to many recipients; authoritative.</td>
<td>Web pages; Gopher servers, corporate-organizational files placed for FTP and Finger; searchable databases</td>
<td>Broadcast messages on systems and networks.</td>
</tr>
</tbody>
</table>

### Type I. Internet Communication: Private; Individual to Individual Recipient

E-mail, e-mail auto-responses, FTP, files displayed by Finger, private accounts on World Wide Web pages, and talk are all type I Internet communications.
**E-mail:**

Electronic mail (e-mail) is a system that enables users to send messages via modem, or over a network, from one computer to another. E-mail was originally designed to allow a pair of individuals to communicate via computer. The first electronic mail software provided only a basis facility: it allowed a person using one computer to type a message and send it across the Internet to a person using another computer.

Researchers working on early computer networks realized that networks could provide a form of communication among individuals that combines the speed of telephone communication with the permanence of postal mail. A computer can transfer small notes or large documents across a network almost instantaneously. The designers called this new form of communication as electronic mail (often abbreviated as e-mail). E-mail has become extremely popular on the Internet as well as on most other computer networks.

Current electronic mail systems provide services that permit complex communication and interaction. For example, electronic mail can be used to:

- Send a single message to many recipients.
- Send a message that includes text, voice, video, or graphics.
- Send a message to a user on a network outside the Internet.
- Send a message to which a computer program responds.

**E-mail auto responses:**

The email equivalent of the direct response postal card is the prepared e-mail auto-response. The message is a composed one, especially prepared as an automatic answer to any e-mail that gets sent to a particular address. There are two common uses for this type of message: the first is to notify the sender that the receiver may not answer the e-mail for sometime – like when you are away from your e-mail system. The other use is to distribute messages about products or services of a particular organization.

**File Transfer Protocol (FTP):**

FTP is an Internet tool that copies a file from one Internet site to another. FTP stands for both file transfer protocol and file transfer program, the specific program that implements the transfer.
According to Kraynak and Habraken (1997) File Transfer Protocol is a set of rules that dictate how files are exchanged between computers.

With the Internet address or domain name of a site, you can use FTP to connect to a specific location on that site (specific directory path and file name) and copy a file containing information to or from your computer for your own use. This activity is individual and private, although many FTP sites log (or register) file copy transactions either for market research or as security precautions. In the case of individuals sharing information, the file was prepared and stored specifically for you by the person distributing the information.

- **Files displayed by Finger:**
  The finger command displays the contents of a file associated with a particular user ID at a particular Internet site. Not all sites support access to information files via the Finger command; some sites don’t support Finger because they wish to preserve the privacy of their user community; some sites don’t support access via the Finger command for security reasons; and some sites don’t support it because the operating system they use makes it difficult to support this type of access.

- **Web pages with private access:**
  It is possible to create World Wide Web pages where only one individual has access to the information on a specific page.

- **Talk:**
  According to Crumlish (1998) talk is one to one synchronous chatting over the net; also, a Usenet hierarchy devoted to discussion, argument, and debate.

  Talk is also private communication between two individuals. The individuals can be connected through any two Internet sites and the content of the messages is not monitored. Talk is simultaneous: it does require that both parties be connected at the same time. Conversations, or Talk sessions, may be initiated by any party with a request. The recipient of the request may accept the invitation and begin a conversation. If you don’t want to talk, you simply don’t respond to the invitation. Talk is appropriate for ephemeral
conversations or for quick communications among co-workers and colleagues. Talk is for the sort of communication that doesn’t need to record for posterity.

**Type II. Internet Communication: Public; Many Contributors to Many Recipients**

Perhaps the most talked-about aspect of Internet communications is the very public communications that take place on unmoderated mailing lists or within unmoderated newsgroups. These communications come from many contributors and are distributed to many recipients. While the information contained in them may be very useful, in general the information is not very authentic. That means while the person giving the information may have the best of intentions, the information may not be true.

Unmoderated mailing lists, unmoderated UseNet newsgroup, IRC, and MUDs and MUSEs are all type II Internet communications.

- **Unmoderated Mailing Lists:**
  A mailing list is a list of e-mail addresses. A message sent to a mailing list is re-sent to each e-mail address on the list. Many of the mailing lists (groups of people who wish to receive the same information) are unmoderated and open. This means that you are welcome to join (or subscribe to) a list and to post your contributions to the list. You may also unsubscribe at will. Therefore, the people who read the list will vary widely from time to time.

- **Unmoderated Usenet Newsgroups:**
  A newsgroup is similar to a BBS or bulletin board system but one that has been copied to hundred of computers throughout the world. People read a newsgroup on some local site and post their contributions to that local site. The contributions are then copied to the other sites, which carry that particular newsgroup. Like unmoderated mailing lists, unmoderated newsgroups may be read and contributed to by any one who can receive the newsgroup.
• IRC:

IRC stands for Internet Relay Chat and it can best be compared to CB (Citizen's Band) radio. From an IRC server, you elect to join a channel. In IRC, each participant's contributions are displayed on the screens of all the others taking part in a conversation. In IRC, you can join an existing conversation or try to start one of your own.

• MUDs and MUSEs:

MUDs (Multi User Dungeons) and MUSEs (Multi User Simulation Environments) are contributions from the gaming community. When you participate in these shared worlds, you communicate with others who are simultaneously taking part.

Type III. Internet Communication: Public; Many Contributors to Many Recipients

Moderated Mailing Lists, Moderated Usenet newsgroups, MBone, CU-See Me; Maven, and VAT are all type III Internet communications.

• Moderated Mailing Lists:

All messages sent to a moderated mailing list go directly to a moderator. The moderator then determines whether the message should be sent on to the list. The moderator will forward the message or return it with a message explaining that it was inappropriate. Moderated mailing lists, like their cousins the moderated newsgroups are one answer to repeated spamming.

• Moderated Usenet Newsgroups:

The moderators of newspapers make similar decisions. Moderators are found particularly in the announce newsgroups. Because these groups are intended for announcements, an effort is made to make certain that the posting are appropriate for the newsgroup.

49
• **MBone:**

MBone (Multicast Backbone) is an emerging technology. MBone is one type of audio and video transmission over the net. The group of engineers, scientists, and user services folks who are working on the structure of the Internet itself are experimenting with broadcasts of their conferences over MBone. Speeches, news conferences, and other informational events have also been broadcast. Listeners all over the world could hear the conference proceedings right at their workstations. When listening to an MBone conference, you can hear many people discussing their views in real time, and hundreds of other listeners are hearing it, too.

According to Comer (1999) multicast is the technique used to send a given packet to a selected set of other computer. Internet audio and video services use multicast delivery to send a packet from a single source to many computers on the Internet, or to allow a group of users to interact in an audio or video teleconference.

To enable face-to-face interaction, the Internet offers Video Teleconferencing Services (VTS). VTS is a service that allows a group of users to exchange video information over the Internet. Most video teleconferences include an audio teleconference facility. Each participant’s computer must have a camera, microphone, and earphones (or speaker). A video teleconference begins the same as a whiteboard session: a user runs a program that starts a video session. The software allows the user to enter information about other participants, and contacts each of them. When a new participant joins the teleconference, an image from the camera on their computer appears, similar to an ordinary television picture; when a participant smiles or frowns, everyone sees their expression.

Of course, video alone does not help people communicate. Therefore, most video teleconferencing services incorporate both video and audio into a single teleconference, they hear as well as see all other participants. Audio and video teleconference become more interacting when combined with a white board service. To understand the effect, imagine that each user’s computer has a display a large as a typical television screen. Small rectangles around the edge of the screen each display the video image from the camera of one remote participant, usually a close-up of their face. A whiteboard occupies the center of the screen. The combination of audio, video, and whiteboard makes it
possible for everyone to see and hear one another as well as view a common document. When the participants need to discuss an idea, they can use audio and video communication. When they need to specify a precise document modification, they can rely on whiteboard communication. In fact, because experience has shown that combining a whiteboard service with audio and video teleconferences provides the most flexibility. Many teleconference services include all of these.

- **CU-See Me; Maven, and VAT:**
  
  CU-See Me, a video client-server program, and its companion audio program, Maven (for the Macintosh), make possible Picture telephone over the Internet. CU-See Me can be used point to point (one machine connected to just one machine) or by using one of the reflector servers, you can get one-to-many or many-to-many conferences. With the CU-See Me client program, you can connect to a server and communicate. CU-See Me client programs can be senders or receivers or both. Maven audio capabilities are built into the later versions of the CU-See Me client programs for the Macintosh.

  Another available audio conferencing tool is VAT, available for some UNIX workstations. VAT supports both point-to-point and broadcast of audio using either multicast or unicast IP.

**Type IV. Internet Communication: Public; Published Contributions to Many Recipients**

The final type of communication that can be found on the Internet consists of the public, published contributions of individuals and companies that can be received by many recipients, and that may be thought of as authoritative. In effect, this is rather like a book, a directory, a magazine, or a radio or television broadcast.

  Broadcast messages, World Wide Web pages, Gopher servers, files placed for FTP, information displayed by finger and searchable databases are all type IV Internet communications.
**Introduction**

- **Broadcast Messages:**
  
  There is only one type of communication in this category that is truly simultaneous: the broadcast message that is used by a system or network operator to communicate about the state of the network or system itself with everyone currently using it. Broadcast messages are sent from an operator to every person using a system at that time. Broadcast messages are usually warnings about unusual activities such as system instabilities or outages. They are transmitted this way to reach the maximum number of affected people as quickly as possible.

- **World Wide Web (WWW):**
  
  WWW is an Internet service that organizes information using hypermedia. Each document can contain embedded references to image, audio or other documents. A user browses for information by following references.

  According to Comer (1999) the Internet includes a browsing service that extends the concept of hypermedia to include many computers. Known as the World Wide Web (WWW), the service is a mechanism that links together information stored on many computers. In essence, WWW allows the reference in a document on one computer to refer to textual or non-textual information stored on other computers. For example, a World Wide Web document on a computer in the United States can contain a reference to a stored video image on a computer in Switzerland.

  WWW pages have become the glossy catalogues and magazines of the Internet community. Some pages are published by colleges and universities and serve as interactive catalogues representing their institutions. And some pages are published materials that describe the person who designed and built the page.

- **Gopher Servers:**
  
  Several browsing services have been invented for use of the Internet. One of the earliest services was known as gopher. According to Comer (1999) gopher is the name of an Internet browsing service in which all information is organized into a hierarchy of
menus. Gopher displays a menu on the screen and allows the user to select an item. The selection either leads to a file of information or to another menu.

- **Searchable Databases:**
  Searchable Databases is a more specific kind of published information that can be provided with databases and search engines. Many databases on the Internet, including library catalogs, archives of articles, and books on-line, have their own specific interfaces. Using the on the other Internet tools (such as Gopher or WWW) or using a specific client tailored for that database, you can publish information that users specially request. Database publishing allows the user to access indexes materials, making sure that the user gets what he or she wants more quickly, with fewer false starts.

**What Would International Networks cover**

- These networks help in exchanging communication experience and solutions on an international level.
- Latest information's availability becomes easy.
- Sharing of communication strategies and methodologies becomes possible.
- Exchange of point and electronics media becomes speedy and economic.
- Exchange of experts, study teams and researchers becomes easy. It simplifies interinstitutional exchange experience.
- Interpersonal relations get established amongst communicators. This widens their understanding about problems handled by other nations. Many a time these relationships become lifelong.
- Grassroots level networks influence the national and international levels. At the same time international networks influence the grassroots level networks.
- International network interaction can percolate to grassroots levels of regional science networks.
ADVANTAGES NETWORKS OFFER

Some of the advantages networks offers are:

- Strength is built through united resources.
- Accesses to needed information and know how, becomes easy.
- Economic solutions of individual science communication problem become possible.
- Intra group technical researches can be exchanged
- Common software visualization and production becomes easy.
- Help network groups locate communality of knowledge communication problems.
- Exchange of knowledge takes place on equal level.
- Covers larger number of beneficiaries as network gets enlarged.

SOME OF THE PROBLEMS FACED ARE:

- Hurried setting up to of networks. This leaves several communication gaps between networks members thus glomming their communication flow.
- Hazy objectives develop hazy programmes.
- Uncertain division of roles and responsibilities between science communication network members, envelops the networks environment with uncertainties.
- Imaginary resources create vacuum at an unexpected juncture.
- When resource-providing agencies keep strings in their hands, the capable agencies gradually drop out.
- Lack of technical systems for setting up communication strategies creates limping movement for the network.
- Carefree treatment of strategy related timetable makes the projects disorganized.
- Last and very important is the lack of concernedness: With concernedness and sincerity communicators can certainly bring forth needed results.

NETWORKS’ SOLUTIONS TO PROBLEMS

Many of network problems can be solved by:

- Clear objectives.
- Experienced agencies.
Introduction

- Establishment of well worked out communication flow and feedback.
- Democratic operation.
- Realistic resource building.
- Human approach.
- Positive evaluation.
- Absence of string pulling and pepperling concernedness is the base of successful network for science communicators.

TEACHER AND NETWORK COMMUNICATIONS

The role of the teacher in our modern and complicated system of education today is indeed an important and complex one. Today role of the teacher needs to change from a dispenser of knowledge to a facilitator and director of learning. Thus, the teacher's task is to encourage and facilitate communication and cooperation (Becker and Selter, 1996; Selter, 1996).

In our world of increasing knowledge, and the growth and availability of multiple sources of knowledge, teaching and learning need to move away from the textbook being the only resource. Greater use of the society (museums, centers, libraries, the Internet and even its people) as a resource is required (Holbrook, 2001).

Today the teacher’s role needs to change from one of imparting knowledge to one of promoting skills and inter-relating with new partners, locally and globally. The teacher needs to promote the use of a wide variety of teaching methods and approaches. There should be variation in the pace at which new ideas are introduced. The teacher needs to realize that their students must be educated to cope with the future unknown. The teachers need to guide to move away from using the textbook as their only resource (Holbrook, 2001).

The Internet as a resource has become an inevitable inclusion in the process of teaching and learning. The information society is now ahead of any other advancement. Everything in the system of education is going digital. The teacher and student both have to keep a pace with modern technologies.
Traditional teaching and the informatization of traditional teaching practices are based upon the transmission of information. In this case, the teacher, as well as the computer, are owners of knowledge and assume that students are empty vases to be filled. The result of this teaching approach is a passive student, without capacity to criticize and with a vision of the world according to what was transmitted to her/him. The student gets very little chance to survive in the knowledge-based society we are about to enter. Indeed, traditional teaching or the informatization of it produces students that are obsolete. The knowledge society requires creative individuals with the capability to criticize, think, learn about learning, work in a group and know about her/his own potential. This individual will need to have a general vision about different educational and social problems that concern today's society as well as deep knowledge in specific domains. This requires an individual, who is attentive and aware about the changes happening in our society and who has the capability to constantly improve and debug her/his ideas and actions.

Certainly, this new attitude is the fruit of an educational process whose objective is the creation of learning environments in which students can experience and develop these capabilities. This knowledge cannot be transmitted but it has to be constructed and developed by the students.

Teachers need to be trained to assume the role of facilitator of the student's knowledge construction rather than the transmitter of information to the student. For this teacher need to be trained in terms of computer technology, educational software, and how to integrate this resource into the respective classroom activities. It must be clear to the teacher when and how to use the computer as a tool to stimulate learning. This type of knowledge needs to be constructed by the teachers and it occurs as they use computers with their students, with support from experts who can help teachers become more effective when using computers in their classrooms. Through this support teachers can improve their capabilities as facilitators of knowledge construction and gradually learn the role of information provider (Valente, 2001).

The resolution on Indian National Educational Policy (1986) has recognized vital importance of teachers in the following words: *of all the factors which determine the quality of education and its contribution to national development, the teacher is undoubtedly the most important.* His effective working will bring such important national
factors as social cohesions and movement towards socialistic society, economic and cultural development and national security. The nation's political resources are also in the ultimate analysis development to a great extent upon the kind of teachers, they have.

The crucial and vital importance of teacher's role cannot be over estimated. In a true sense, the teacher is a guide, who is directing the journey of those whom he teaches. Taking into consideration, the economic and social needs of the present situation of our country, effective or competent teachers appear to be essential for the hope and promise of our society, who will help the students, become self sufficient, useful and resourceful members of the nation. The effective teacher leaves a very strong impression upon the young minds of the pupils by his several traits like personality, creativity, intelligence, emotional maturity, self-concept attitude etc. Regarding the personality characteristics, the teacher can choose to be friendly, sympathetic, sarcastic, antagonistic, poised, tolerant, social adjustable or whatever he chooses. A happy, friendly, tolerant teacher is likely to have pupils who are happy, friendly and tolerant.

Other personality factors of a teacher also influence the classroom climate. The emotional maturity of teacher can also affect the classroom climate. Since the teacher is largely responsible for his adjustment to the world in which he lives and works, he should be familiar with some of the important aspects of good mental health. In the place, a teacher who is emotionally stable and well adjusted secures a large measure of satisfaction out of life. Certainly his relationship with pupils, school and community will be good and provide satisfaction.

Teaching learning process requires a high level of ability to think rationally and do effectively. Intelligence is required to think over the problems and to solve it. Those considering teaching as a career should be intellectually curious, they should be able to explore new areas of knowledge. Unless the teachers are equipped with high intellect, the problems, which arise everyday in classroom, can't be solved. Teacher is considered as future nation builder especially when the country is at the crucial stage of development and instrumental in bringing about a revolution in various factors of human life. This work is done only when teachers are effective and efficient. Teaching is effective to the extent that the teacher acts in ways that are favorable to the development of basis skills, understanding, work-habits, desirable attitudes, value judgment and adequate personal adjustment of the pupils (Gibson, 1976).
Academic Transactions

Academic transactions in this research would mean:

• Instruction;
• Research, and
• Extension.

Instruction and research are the two main functions of a university, and the computer technologies can help in these areas. If a university has to realize its objectives, the pursuit of research and technologies is essential. In fact, these functions are complementary to each other. Today no university can function at its best unless its research activities are integrated with instruction and teaching. It is also essential that the educational sector, especially the higher education segment, adopts and integrates computers in its system to improve quality and productivity. The computer technologies with its versatility, accelerates one's ability to solve many problems related to instruction, teaching, research and administration that are encountered in higher education.

LEARNING OUTCOMES

According to Encyclopedic Dictionary and Directory of Education (1971) learning outcome is a result of experience in or outside the school stated in terms of pupil behavior. The outcomes of learning resulting from learning activities may be skills and habits, social competence, abstract and creative thinking.

Corsini (1994) defined learning outcomes as:

• The primary means of indicating that learning has taken place is to show that some newly appearing human performances are possible, when required by appropriate circumstances. The inferences, which can be made from these changes in performance, are to the effect that individuals have acquired some new entities in their long-term memory store - entities not present before the learning took place. The outcomes of learning, then, are neural states that persist over considerable periods of time, as shown by tests of retention. Since the effects of these states are to make individuals persistently capable of exhibiting particular kinds of performance, it is reasonable to think of them as learned capabilities;
• The term outcome broadly refers to what an individual has learned as a result of having been engaged in a learning activity of some kind.

Within different research perspectives, however, the term takes on a more precise meaning, which varies in crucial ways from one perspective to another. These variations, and assumptions which underlie them, can be examined in relation to a traditional, a neo-Piagetian, and a phenomenographic research perspective. It may be argued that there are as many kinds of learned capabilities as there are individual learners and individual learning situations. On the other hand, investigators of human learning continually strive to demonstrate the common features of the learning process, and this tendency extends to learning outcomes. Many learning theorists attempt to account only for the common properties of learning phenomena, as found in the conditions of contiguity, exercise, and reinforcement (Bower and Hilgard, 1981). Despite this tendency, over a period of years one finds the persistence of certain distinctions among the varieties of learned capabilities. Perhaps the clearest is the generally recognized difference between verbal learning and motor learning.

From a broad and practical view, it is of considerable help in defining the boundaries of knowledge in the field of human learning to distinguish some principle types of learning outcomes. The latter clearly differs from one another in the performances they make possible. They differ too in important respects in the specific conditions optimal for their learning (Gagne, 1977). Presumably, they also differ in the nature of the cognitive structures that represent them in long-term memory. Cognitive learning theory deals in part with these differences (Anderson and Bower, 1973; Bower, 1975; Norman and Rumelhart, 1975).

VARIETIES OF LEARNING OUTCOMES

On the basis of the criteria previously described, five kinds of learned capabilities may be distinguished (Gagne, 1972, 1977).

• **Verbal knowledge (declarative knowledge).**

This kind of knowledge ranges from single names and labels through isolated *facts* to bodies of organized information. The kind of performance made possible by such knowledge is stating (declaring) either orally, in writing, or in some other medium.
• Intellectual skills (procedural knowledge)

These capabilities enable the individual, by manipulation of symbols, to demonstrate the application of concepts and rules to specific instances. Example: demonstrating the rule for finding the length of the hypotenuse of a right triangle. The distinction between knowing that (declarative knowledge) and knowing how (procedural knowledge) was given prominence by the philosopher Gilbert Ryle (1949). It now appears to be generally accepted by cognitive scientists (Newell, 1973; J.R. Anderson, 1976).

• Cognitive Strategies

These are skills used to direct and influence cognitive processes such as attending, perceiving, encoding, retrieving, and thinking. Cognitive strategies of problem solving were studies in concept identification tasks by Bruner, Goodnow, and Austin (1959). More recently, the effects of cognitive strategies in controlling or modifying other cognitive processes of learning and memory, such as attention, encoding, and retrieval, have been studied extensively (A. L. Brown, 1978). When taught to and deliberately employed by learners, such strategies constitute a major aspect of what is called metacognition (J.H Flavell, 1979). An example is categorizing the names of pictured objects to be learned by young children, a retrieval strategy that resulted in a substantial increase in recall (A.L. Brown, 1975).

• Attitudes

This fourth kind of learning outcome is generally considered to posses affective as well as cognitive memory components. Attitudes are learned states that influence the choices of personal action the individual makes toward person, objects, or events. Examples: the tendency of individuals to elect courses in mathematics indicate a positive attitude toward learning mathematics; the tendency to choose and listen to classical music, rather than other kinds, show a positive attitude toward listening to classical music. Since the choices actually made by the individual are often difficult to observe directly, attitudes are typically measured by means of self-reports of choices, as recorded in questionnaires.

• Motor Skills

Learning outcomes sometimes consist of actions accomplished by smoothly timed muscular movements called motor skills. Most motor skills (e.g., making a tennis serve,
using an adjustable wrench) involved carrying out procedures, sometimes-lengthy ones. The procedure itself may be simple or complex, and has been called the executive subroutine (Fitts and Posner, 1967). This procedure may be learned separately, or as an early stage of acquiring the motor skill. Learning the motor skill itself is a matter of acquiring increasing smoothness and precise timing of muscular movement. Often, the executive subroutine has the function of molding part skills into a total skill. One example of a motor skill is swimming the crawl.

The outcomes of learning are usually stated as curricular, composed of subject matter contents such as reading, writing, mathematics, science, history, and so forth. Each of these subjects usually includes more than one category of learning outcomes. Thus arithmetic is made up largely of intellectual skills, but includes also some essential verbal knowledge about situations in which quantitative concepts are applicable, such as those of time distance relationships, money changing, lengths, geometric areas, and the like. This verbal knowledge is used by the learner to define problem spaces (Newell and Simon, 1972), which are essential to the task of translating concretely described situations into mathematical form. Intellectual skills are fully involved in the next following task of applying the rules of mathematical operations to specific instances.

The subjects making up social studies (e.g., history includes verbal information as a major component. However, intellectual skills are also involved, as seen in such activities as table reading, graph construction and interpretation, map reading, and economic charting. Social studies curriculum also prominently include attitude. In the early grades the process of socialization consists largely of acquiring attitudes of fairness, politeness, respect for the feelings of others, tolerance of personal differences, and so forth. Later on, the curriculum may contain content, which seeks to establish attitudes such as avoidance of harmful drugs, keeping a clean environment, and patriotism.

Reading and writing are made up of intellectual skills termed basic. In reading, a tripartite group of skills in composed of decoding (Laberge and Samuels, 1974; J.P. Williams, 1980), printed word identification (J.F. Reid, 1966; Gibson and Levin, 1975), and sentence construction (P.A. Weaver, 1976). Writing compositions involves intellectual skills such as using the rules of English grammar and punctuation (Hennings and Grant, 1973), employing transitional phrases, topic sentences, and other rules of this general sort. In the early grades, the distinctive motor skills of handwriting (or printing)
Introduction

are commonly prescribed as precursors to the more substantive aspects of writing make it possible for learners to acquire verbal knowledge, which may ultimately come to make up their organized stores of world knowledge.

Cognitive strategies are represented in the subjects of the curriculum, when segments of instruction are devoted to exercises designed to promote learning to learn and learning to think. Useful strategies of this sort develop as a result of frequent encounters of students with novel problem solving situations (J. Bruner, 1961). Cognitive strategies may also form a part of instruction that is specifically designed to teach them, as in the case of study skills (Thomas and Robinson, 1972) or courses in problem solving (J.R. Hayes, 1976).

Clearly, the five kinds of learning outcomes verbal knowledge, intellectual skills, cognitive strategies, attitudes, and motor skills cut across the subject matters of each curriculum. Each content subject typically seeks to establish more than one kind of capability in students. Even when intellectual skills such as verbal knowledge are primary objectives in the subject field, there is likely to be the additional goal of establishing a liking for the subject an attitudinal objective. To achieve optimally effective learning, as well as optimally efficient management of learning, the design of instruction in each subject matter field must take into account the different requirements of each type of learning outcome (Gagne and Briggs, 1979).

- Learning Outcomes as Taxonomy of Learning Objectives

Learning outcomes have also been represented through taxonomy of learning objectives. Perhaps the best-known taxonomy of learning objectives is that proposed by Bloom and his coworkers (B.S. Bloom, 1956; Krathwohl, Bloom, and Masia, 1964). The three major stands of the Bloom taxonomy are the cognitive domain, the affective domain, and the psychomotor domain. Subordinate categories within these broad domains seek to classify learning objectives so they can be used to develop achievement test items or (for the affective domain) attitude measures. Approximate correspondences of the learning outcomes described by Gagne (1977), by Bloom and his coworkers (B.S. Bloom, 1956), and by Krath Wohl, Bloom and Masia (1964) are shown in table 1.6. The table also includes other names for these outcomes, as suggested by cognitive learning theorists (e.g. Rumelhart, 1977; J.R. Anderson, 1980).
Introduction

Table 1.6
Approximate Correspondences of Learning Outcomes Proposed by Gagne, Bloom, Krathwohl, and Others

<table>
<thead>
<tr>
<th>Gagne</th>
<th>Bloom, and Coworkers</th>
<th>Cognitive Learning Theorists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal knowledge</td>
<td>Cognitive domain: Knowledge</td>
<td>Declarative knowledge</td>
</tr>
<tr>
<td>Intellectual skill:</td>
<td>Cognitive domain: Comprehension,</td>
<td>Procedural knowledge</td>
</tr>
<tr>
<td>concepts, rules</td>
<td>application</td>
<td></td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>Not separately identified: includes</td>
<td>Cognitive strategy, Cognitive skill</td>
</tr>
<tr>
<td></td>
<td>in the cognitive objectives of analysis, synthesis, and evaluation.</td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>Affective domain</td>
<td>---------------</td>
</tr>
<tr>
<td>Motor skill</td>
<td>Psychomotor domain</td>
<td>Motor skill</td>
</tr>
</tbody>
</table>

The outcomes themselves are inferences from learner performances, which are made possible by learning. Each kind of outcome implies a kind of performance, which can be exhibited by the learner once learning is complete. For example, the learning of verbal knowledge is observed to be completed when the learner is able to state (i.e., declare) the essence of what has been learned. Similar definitive assertions can be made regarding each of the other types of outcome (Gagne, 1977).
Introduction

• Conditions of Learning Favorable for Each Outcome

From learning research and theory, it is possible to specify with reasonable assurance of the conditions favorable to the learning, which leads to each outcome. These conditions differ somewhat in each case, and the existence of these differences provides a major reason for distinguishing among learning outcomes in designing instruction (Gagne and Briggs 1979).

LEARNING OUTCOMES AS SKILLS IN COMPUTERS

Hawes and Hawes (1982) defined skill as a well-developed capability of any kind, including intellectual, physical, or artistic capabilities.

Every higher education student needs a theoretical understanding of the computer, its auxiliary procedures, and its systems as intellectual tools; an understanding of the significance and breadth of computer applications in today society; and a demonstration of the ability to use the computer in the solution of a significant intellectual problem. There is general agreement that computer literacy is the ability of an individual to understand and deal with computers, but there is no consensus on the precise knowledge, skills or attitudes that an individual need to function adequately in a technological society, though all three aspects are involved.

According to J.M. Day (1986) an individual may be deemed computer literate when the level necessary to perform the work role is reached. Level 1) knowledge; knowing common computer terms, methods, principles and procedures and ability to use an electronic keyboard and respond to pre-programmed instructions. Level 2) comprehension; Level 3) application; Level 4) analysis; Level 5) synthesis; Level 6) evaluation.

In the present investigation knowledge and application in computers is the focus of learning outcomes. The learners are expected to exhibit their performance with regard to:

• General information about the Computers,
• Operations involved in Microsoft Word,
• Operations involved in Microsoft Excel,
• Operations involved in Microsoft PowerPoint,
• Operations involved in Internet.

Scope of each one of these aspects has been discussed in chapter II.
REVIEW OF RESEARCH LITERATURE

In all scientific endeavors, research workers have recognized their interdependence in the identification and solution of problems. On the other hand, it must be admitted that certain able scientists and scholars have considered it undesirable or even unwise to study closely the related literature dealing with the particular problem under study, fearing that these earlier studies would condition the investigator's mind to see the problem in the same way and thus overlook a new or more promising approach. It would seem essential and reasonable to read critically in the related literature as a stimulus to thinking.

In the field of research an investigator needs to acquire up-to-date information about what has been thought and done in the particular area from which he intends to take up a problem for research. Some other purposes of survey of related literature are:

- To show whether the evidence already available solves the problem adequately without further investigation, and thus to avoid the risk of duplication.
- To provide ideas, theories, explanations or hypotheses valuable in formulating the problem.
- To suggest methods of research appropriate to the problem.
- To locate comparative data useful in the interpretation of results, and
- To contribute to the general scholarship of the investigator.

Sources of information, existing in any field of research, found in the library may be of two types:
- Direct (i.e. educational literature: periodicals, journals, books, bulletins, yearbooks, theses, government publications, etc.), and
- Indirect (i.e. guides to educational literature: encyclopaedias, indexes, abstracts, bibliographies and directories, biographical references, etc.).

The investigator has studied both the direct and indirect resources related to variables under study. The review of related studies, thus, has been presented in the following paragraphs.
RESEARCH STUDIES RELATED WITH FACULTY USE OF NETWORK COMMUNICATIONS

Royston (1989) investigated the extent of use of microcomputer technology in the instructional process in Missouri secondary schools. One purpose of the study was to ascertain the extent of microcomputer use in Missouri’s secondary schools. Another purpose was to examine relationships between the extent of usage and selected principal and teacher characteristics. Emphasis was placed on the extent of incorporation of microcomputers into the everyday curriculum. The survey instruments were mailed to 200 randomly chosen Missouri public high schools. The study found that about half of the principals had not received training related to microcomputers. The teachers indicated a slightly higher rate of training, but still about 40% had not received such training. Nearly half of the principals do not use microcomputers or use them very infrequently. Over 60% of the teachers use microcomputers fairly often. Teachers do not indicate great use of microcomputers in 16 specific areas. Schools with more microcomputers have principals with more education and experience who have received microcomputer training and offer inservice microcomputer training in more areas. The extent of usage was related to having taken courses or having received training about the use of microcomputers in the educational setting and to the number of purposes for which microcomputer training had provided.

Eldridge (1990) studied the discovering telecommunications as an instructional media tool in teaching: training and implementation strategies. This study tested the effectiveness of an in-service training program or teaching telecommunication skills to teachers who were relatively inexperienced in the use of computers, and assisting teachers on designing and implementing telecommunications activities in their curriculum. Nine elementary teachers participated in an innovative telecommunications project between two local schools. This study has considerable implications for policy makers responsible for the incorporation of technological innovations in school curricula. The results indicated
that teachers given an extensive system of training and implementation support are able to
effectively integrate telecommunications activities in their curriculum.

Bichelmeyer (1991) studied the pilot implementation of an educational computer resource network. This study was a naturalistic study of the pilot implementation of a computer resource and electronic mail network into 16 schools in six districts. Interviews of 31 educators were conducted during a three-month period, including teachers, student teachers, administrators and librarians. Conclusions indicated that teachers were more likely to embrace technologies that meet their criteria of simplicity, versatility, reliability, durability and practicality. Hardware, software, training format, and support personnel are identified as four key factors that may affect computer integration; specific issues in each area are discussed. The major findings are:

- Teachers differ from instructional technologists in that they are primarily interested in teaching and they view technology as a tool, not for technology’s sake, but for education’s sake.

- Teachers should be involved in planning and design phases of technology development so that results applications software will have practical value in their professional activities because if an application does not meet teachers’ perceived needs then the program simply will not be used.

- Word processing is the most sought-after computer application by teachers. Teaching is about the sophisticated processes of thinking, creating and communicating; because word processing facilitates these processes, teachers believe that word processing is a sophisticated and valuable tool for their professional use.

Hawes (1993) studied the academic computing from a technological innovation of perspective-faculty concerns. The conceptual model and the research design of this study were based on the premise that the needs and concerns of user must be understood and addressed in order to achieve a desired level of utilization of computer resources. This study examined the perceptions of faculty members about a new-networked system of microcomputers. An administrative decision had been made to provide all full-time faculty members with a microcomputer networked to share laser printers with communications capabilities.
Statistical analysis indicated that faculty members' characteristics like age and gender were not indicators of the concerns reported. However, a statistically significant relationship was found between computer software experience and reported stages of concern. The results also showed that the more self-reported computer software experience, the higher the scores on the later stages of concern, consequence, collaboration and refocusing. There was also a statistically significant relationship between computer experience and discipline and interest in learning new software and discipline. The disciplines where it would be expected that faculty might make greater use of computer resources (i.e. Science) did show greater self-reported experience amongst the faculty.

Brovey (1994) examined the microcomputers in the College classroom: a critical incident analysis of selected community college faculty. This study investigated the nature of critical incidents, which were reported by community college faculty as influencing their application of computers in the classroom. The purpose of the project was to integrate computers into the teaching and learning process. The data indicated that some small differences existed due to teaching experience for the student and faculty categories. No notable differences were seen for microcomputer experience. The study recommended greater emphasis on developing faculty skills to collect and utilize student feedback on computer-based teaching and learning activities. Additional recommendations included improved project management to ensure timely delivery and installation of faculty resources, and technical assistance for faculty during classroom implementation. The study also recommended additional research with community college and university faculty on the importance of student factors in the faculty innovation decision process, as well as the role of administrators in the latter stages of the diffusion of educational innovations.

Levin (1994) studied the realization of telecommunications in high school science classrooms: an evaluation of teachers using technology. This study combined two research methodologies, case study and survey research. The case study examined the use of telecommunications by twelve high school science teachers from five schools in a single southern California school district and looked at how they implemented this new technology into their classrooms during the 1993-1994 school year. A survey examining the use of technology and telecommunications was sent to all high school science teachers
Introduction

in the same school district. The findings suggest that a few selected teachers have gone through extensive telecommunication training and the school district is in the process of building a telecommunication infrastructure, the use of telecommunications in high school science classrooms is in its infancy. It was suggested that while there is a positive outlook and administrative support concerning the implementation of telecommunications by the individuals involved, and constituencies are being formed outside the school system, it is still too soon to predict the success or failure of implementing this new technology across the school district.

Alexander (1995) investigated the Internet listservs as post-teleconference support to faculty at community colleges and two-year institutions. This case study examined three listservs as follow-up activities for State of Texas Academic Resources Link satellite teleconference for community college faculty development during the 1993-94 seasons. The study involved 211 sites throughout the United States and Canada of which 183 were community or technical colleges.

Results indicated between 37% (in Texas) and 47% (nationally) of the community college State of Texas Academic Resources Link teleconference participants had access to the Internet and between 24% (in Texas) and 30% (nationally) knew how to use e-mail. Eighty-two percent of subjects completing the post-listserv survey said they were best satisfied by the combination of teleconferences and the listserv. Ninety-two percent of these subjects said they would subscribe again to a State of Texas Academic Resources Link listserv.

Listservs were reported to be effective for teleconference follow-up activities if certain factors exit viz: access to Internet, knowledge of Internet e-mail, belief in potential benefits, time to participate, motivation to subscribe, participation by experts on listserv, and a supportive moderator.

Adams (1995) studied the professional collaboration through computer-mediated communication. This study was an exploratory investigation of a group of educators who subscribed to the Iris educational computer network. The structure of the network, the functional interactions, and the impact of use were described from an occupational rather than an organizational perspective. A multi-method approach included an electronic survey, on-line interviews, content analysis of archival data, and a member check. The structure of Iris was a many to many information exchange.
Surveys and interviews indicated that the computer network was being used to enhance classroom practices, professional development, and as a vehicle to accumulate professional knowledge. The major findings were that teachers had more opportunity to collaborate with other professionals, increased collegiality, and support from peers with the protection of anonymity. Occupational benefits included students learning in a self-directed mode, increased independent work, problem solving in small groups, learning with greater autonomy, and an increase in authentic learning experiences, through work on problem-oriented projects with other teleconnected students throughout the world.

Clemens (1995) investigated the utilization of computers as a professional tool among early childhood teachers. Through interviews and observations, data was collected and analyzed, case studies were developed providing a description of each teacher and their perspectives on computer use, and finally a cross case summary of themes was complied. The outcomes of this study provide assistance for professionals in service trainers, technology coordinators, teacher educators, and policy makers who are struggling with the issues of how to best prepare and encourage practicing teachers to integrate the use of computers into their professional world. The results of the study provide insight for improving training to in-service teachers and contribute to enhancing an environment where teachers are supported in their use of computers as a tool.

Plant (1997) studied instructional uses of computer-based communications in selected university learning environments and he found that vocational educators strongly believed the utilization of computer-based communications to be of value to the future of their university programs. In addition, vocational education faculty believed having time to develop educational materials was an important factor in supporting computer-based distance learning activities. The Internet served as the primary computer-based communications technology to support traditional lecture based courses; all eighteen-university programs utilized e-mail as a means of computer-based communication with peers and students. Approximately ninety four percent of vocational education faculty utilized the technology in some manner to support distance learning. Clearly, vocational educational educators believed that the utilization of e-mail and on-line list serve discussion groups, were beneficial in supporting new forms of computer-based distance learning.
Introduction

Porter (1997) examined level of use of the Internet by Ohio state university extension educators and observed that extension educators rarely or occasionally use the Internet. Ninety-four percent of the extension educators have Internet access at work; 47% of the educators had access at home. Extension educators were a little or somewhat proficient with the skills needed to use the Internet. Educators were most proficient at e-mail with a somewhat positive perception of the Internet. Data showed significant substantial associations for home access, computer literacy and proficiency, and Internet literacy. Very strong association existed for Internet proficiency and perception of the Internet. Extension educators have taken the first step in forming a decision to use the Internet. However, extension educators typically don't use the Internet because they lack the proficiency in the skills needed to use the Internet. With a positive perception of the Internet, a potential exists to persuade others within extension to use the Internet. Extension educators who are very proficient in the Internet are the educators who use the Internet.

Christy (1997) studied the future developments of computer network technologies in K-12 educational environments. This study attempted to create a link between computer network technologies experts and school technology directors in order to determine which of the predicated computer network technologies developments were appropriate and feasible for the K-12 educational environment.

This study found that much of the computer network technologies developments predicated by computer network technologies experts were rated as highly appropriate and highly feasible by school technology directors.

McLennan (1997) investigated the teachers, Internet and schools: case studies of challenges and change. The purpose of the study was to observe how teachers responded to the challenge of incorporating Internet resources into their classroom. Through participant-observation methods and e-mail dialog, data was obtained on the 13 teachers plus schools in rural Wyoming and Canada that were not part of the creating connections project. The study found that 4 of the 13 teachers never obtained Internet access during the data collection period (academic years 1994-1996). One teacher had access but did not want to use Internet. The remaining teachers used Internet to only a limited degree and in a traditional manner. A rationale was sought for the limited and traditional use of Internet by those teachers in the datasets who did have access. The study concluded that the
complexity and logistic problems inherent in obtaining and maintaining Internet access was underestimated.

Tao (1997) studied the carrying out e-mail communication: a study of the on-line strategies used by university faculty. This study examined the strategies university faculty used when they read and composed e-mail messages. The first question was what strategies university faculty used in carrying out e-mail communication. The second question was what were the literacy requirements associated with e-mail communication. The study was exploratory employing a qualitative research design. Participants were nine-education faculty at the University of Georgia.

The study found that three categories of strategies participants used: strategies for extracting information, strategies for establishing communication and its contexts, and strategies beyond communication. Results indicated that basic literacy skills associated with reading and writing were taken for granted, and high-level literacy skill such as the capacity of being selective and purposive in reading and being sensitive towards an audience were required in e-mail situation. The results of the present study suggest that e-mail was a unique literacy situation in which users were using various strategies to carry out the reading and writing activities. E-mail using experience levels might also have some effect on their strategy use.

The results of Wang (1998) for the effects of Internet on educational research of faculty members in the U.S and in China were:

- The Internet has great effects on educational research of faculty members both in the U.S and in China. For instance, using the Internet can promote cooperation among colleagues in educational research, can save much time, can improve the quality of educational research, can be much faster than traditional methods, can increase the efficiency of educational research, can save much money, and increase enjoyment and interest in conducting educational research;
- More than 60% of the respondents in the U.S and more than 84% of the respondents in China were very interested or interested in taking a course or attending a workshop to learn how to use the Internet for educational research;
- The two major uses of the internet for educational research both in the U.S and in China were exchange of electronic mail (e-mail) and searching via the world wide web (WWW);
• Significant differences in Internet skills, training, interests and attitudes existed according to age, gender, degree, years, rank, and countries;

• Most respondents both in the U.S and in China reported anticipating that they and others will increase their use of the Internet for educational researches;

• Major problems and disadvantages in using the Internet in educational research were identified, such as it is time-consuming, and there are searching problems.

**Henry (1998)** investigated the faculty use of network communications as a media for scholarly work (Internet, technology adoption) and found that the greatest percentage of respondents (31.3%) indicated a majority of their scholarly activities employed traditional communications (such as face-to-face, mail, phone, and fax), though 27.3% reported equal use of network and traditional media. E-mail was the most used type of network communications on a daily basis. Measured across five scholarly activities, contacting colleagues was performed the most via network communications and publishing results was the least used. Tenured faculty members did not use network communications for publishing results of their scholarly work more than non-tenured faculty members; however, faculty with natural science as their academic field and faculty with computer-based academic specialties did make more use of network communications across five scholarly activities than did faculty who did not possess these status.

**Doyle (1998)** investigated the importance of information technology in higher education. The study gathered data from three research institutions on eleven indicators of importance within three indicator groupings. Data on the indicators were collected through personal interviews from academic administrators and technical personnel at the three institutions. The study found that, overall; information technology was in a transitional role at the study institutions. Both academic administrators and technical personnel ratings arrived at the same conclusion, but with slightly different perspectives on the indicators of importance.

**Falba (1998)** studied the technology use by a college of education faculty and factors influencing integration of technology in an undergraduate teacher preparation program. This study describes current levels of technology use by a College of Education faculty and use of technology in teaching classes. In addition, the formation of a systematic plan for integrating technology throughout the teacher preparation program was explored. Both quantitative and qualitative methods were used in this two-phase study.
Phase I survey results suggested that although 93% of faculty believed technology in teacher education was very important or somewhat important, use of technology in teaching was limited. Consistent with previous findings on university faculty use of technology, College of Education faculty rated themselves as having high levels of knowledge and skill with using various computer-based technologies (i.e., word processing, computer spreadsheets, statistical computing, e-mail, educational software, presentation software, Internet/World Wide Web, and multimedia). Over 50% of tenured/tenure-track faculty reported use of technology in teaching at least once during the Spring 1997 semester while no more than 30% of affiliate faculty reported using it in teaching.

Phase II case study data were collected from interviews, observations, and documents. Findings describe the manner in which case study participants used technology in their teaching as an add-on, a communication medium, a resource, and a teaching/learning tool. Commitment, a factor within teacher as person was found to be a critical element in adopting use of technology in teaching regardless of an individual’s technology expertise. Efforts to plan for systematic integration of technology throughout the College of Education teacher preparation programs were met by resistance due to the issue of academic freedom and more pressing concerns such as reorganization of the College of Education.

Jacobsen (1998) studied the adoption patterns and characteristics of faculty who integrate computer technology for teaching and learning in higher education. A mixed-method research design, both quantitative and qualitative methodologies, was employed to investigate the difference between those who readily adopt technology for teaching and learning, and those who do not. Seventy-six faculties from across disciplines at two large North American Universities completed a 195-item survey about computer use patterns, self-rated expertise, technology adoption patterns, generalized self-efficacy, changes to classroom environments, incentives and barriers, preferred methods for learning about technology, and methods for integrating technology and evaluating the outcomes. Some differences were found between early adopters and mainstream faculty for self-rated computer expertise and total adoption of technology for teaching and learning. Some differences were found between faculty who used the Web-based and paper-based survey.
Introduction

According to Lennertz (1999) a significant number of faculty believe their communication has changed and that they keep in touch with more people because of Internet use; faculty believe that Internet can provide more relevant data and faster access to information and people; that Internet has increased their productivity and made work more fun; and that there are fewer barriers to joining electronic groups. Faculty who have used the Internet more, believe that their personal productivity has changed and that they have changed the way they conduct a class; those who have used the internet longer believe that Internet has changed the way students look for jobs; faculty agree that Internet can enhance continuing education opportunities, has changed their communication with other scholars and the methods they use to do research, as well as allowing them to explore more new ideas and gain access to more current data.

Owen (1999) found that most of faculty felt that they are encouraged to use the Internet; only a small number of faculty feel that excellence in technology use is often or always rewarded; gender, age, level of formal education, tenure, computer experience, ease of access, Jungian personality type, learning approach, and computer support were significantly related to use of Internet. Job responsibility, supervisory support, and the reward system was not found to be significantly related to use of Internet. A significant difference in Internet use among rural and non-rural field faculty was also found.

Langhorst (1999) studied the relationship of computer-mediated communication usage and collegial behaviors of faculty at research universities. The research objective was to determine if computer-mediated communication usage is related to the practice of collegial behaviors by faculty in research universities. The study examined and recorded faculty perceptions about collegial roles and relationships, perceptions of collegial role complexity, and perceptions of departmental, institutional, and disciplinary affiliation as related to use of computer-mediated communication. The research findings support a positive relationship between computer-mediated communication usage and the practice of collegial behaviors. Computer-mediated communication is perceived as having generally positive effects on collegiality, especially as related to collaborative interchanges among faculty affiliated by disciplinary interests. The findings suggest that computer-mediated communication is perceived as having a greater effect on inter-institutional collegiality than on intra-institutional collegiality.
Kumari (1999) studied the higher education faculty implementing Web-based teaching. This study gathered responses from faculty members in the field of education who are using Web-based learning environments. Through purposive sampling techniques a cross-sectional survey was conducted. The faculty members represented varying degrees of expertise with Web-based implementation. A questionnaire was created to explore and evaluate whether faculties are attending to and implementing the three dimensions of interactions (teacher-to-student; student-to-student; and student-to-resource). The results describe the implementations of these dimensions and the educational value as perceived by faculty.

Ravitz (1999) examined the conditions that facilitate teacher Internet use in schools with high Internet connectivity. This dissertation study concerns implementation conditions related to technology use by teachers. The focus was on the extent of Internet use by teachers, who were identified as being among the strongest Internet-using teachers in their school, i.e., teachers who had clearly made efforts to use the Internet, both in their own professional work and as a part of their classes with students. The primary vehicle for data collection was a survey completed by 238 Internet-using teachers in 124 schools that varied in setting, grade level and location throughout the United States.

Exploratory analysis concerns plausible interaction effects where the utility of one condition may depend on the presence of another condition. The study suggested that it is necessary to focus attention on providing a supportive environment for class-related use with students, as opposed to developing teacher attitudes and skills independent of broader curricular and school-level issues. There seem to be challenges associated with implementation of Internet use with students, even after teachers have developed skills and favorable attitudes toward Internet use. These include curriculum-integration resources and time for teachers to develop and carry out Internet-based activities.

Raji (1999) studied the computer-mediated communication in international education: a case study of the University of Houston. The purpose of this study was to identify the various uses of telecommunications and computer-mediated communication in the delivery of international education at the University of Houston. The results of the study indicated that currently international education is not a priority at the University of Houston, and that change is necessary if University of Houston is to have a strong voice in international issues. The results also demonstrated that faculty needs training and technical
support in using computer-mediated communication to deliver instruction locally and globally.

Willson (2000) examined attitudes of university faculty in relation to actual utilization of instructional technology. He found that no significant relationships existed between attitude or use and degree, years of teaching, or student classification. No significant difference was found between attitude and college. Significant relationships were found between attitude and use. A significant relationship also existed between college and use. The college of Nursing had the highest use and the colleges of the Arts and Liberal Arts reported low-use. Neither age nor gender predicted attitudes towards or use of instructional technology.

Fortune (2000) investigated the teachers and technology: a study of use and empowerment. This project investigated teachers’ perceptions of technology. Specifically, it focuses on teachers, use of technology and how their perceptions of their own ability to become empowered affects the educational lives of their students. Results showed that teacher empowerment through technology are minimal when certain barriers exist. These barriers are inoperable and unavailable computers, a lack of staff development and training, and a lack of a shared vision.

Naquin (2001) studied the educational technology integration: administrator, full-time faculty, and part-time faculty perspectives as viewed through gender and position type. This study examined the relationship between an individual’s level of technology integration and his perspective of technology, as viewed through the lenses of gender and role at the college. The analysis of the participants by group revealed that position at the campus seemed to influence one’s perspective of technology, particularly with reference to the campus technology and decision-making process. On the other hand, gender did seem to be as much of a determining factor in one’s perspective of technology, while level of technology integration did. The influence of level of technology integration could be seen in what was perceived as a facilitator or a barrier to technology integration.
RESEARCH STUDIES RELATED WITH FACULTY BACKGROUND (RANK, SUBJECT AREA, AGE, GENDER, COMPUTER KNOWLEDGE ETC.) AND USE OF NETWORK COMMUNICATIONS

Forsythe (1989) studied the accepters and resisters to computer technology in education. The purpose of the study was to identify characteristics of computer accepters to enhance the possibility of successful computer implementation within a district. The study sample consisted of 293 educators enrolled in graduate courses. The study found a significant relationship between computer acceptance and computer anxiety, computer confidence, computer knowledge and skills, accessibility to computer hardware, hands-on experience, frequency of computer use, and duration of computer use.

Gao (1992) examined the factors affecting use of Computer-Assisted Instruction (CAI) by selected Chinese university educators. The purpose of this study was to contribute to a better understanding of factors affecting use of CAI by selected Chinese University educators. This study attempted to examine whether identified factors have an effect on use of CAI by selected Chinese University educators. These five factors were investigated: attitudes toward CAI; language factor; lack of adequate CAI course; lack of availability of CAI educators training; and lack of availability of computer systems. The study also sought to identify the current status and attitudes toward the use of CAI and the relationship between the use of CAI and educators’ gender, age, university rank, computer experience, and English level. Subjects were 124 Chinese University educators from 24 different institutions.

Results of this study indicated that most educators had positive attitudes toward CAI and more than half of them used CAI in their teaching. The study also found statistically significant differences between use of CAI and age and level of English; age, rank, and computer experience were also correlated with the use of CAI. All five factors examined in this study were significantly related to use of CAI.

Chi (1993) designed the study to computer knowledge, interests, attitudes, and uses among faculty in two teachers’ universities in China. He found that Chinese teachers’ interests and attitudes towards computers, are much like those of American teachers. The majority of teachers show positive computer attitudes, and there is potential to increase computer use among them. The high cost of computer in China and the lack of time to
learn and use the computer seem to be the two most significant factors that prevent them from using or learning more about computers. There seems to be a strong link between one's subject area and computer involvement.

Al-Amir (1993) investigated the factors influencing the decision to use microcomputers by the faculty of King Saudi University in Saudi Arabia. The study revealed that:

- Microcomputer users adopted and continued using microcomputers because of their innate characteristics that help factory members to organize, store and retrieve information, rapidly increase productivity, save time, and allow them to keep up with changes in education.
- There was a significant relationship between the factors that related to the adoption and those factors related to the continued use of microcomputers.
- A lack of time, knowledge and accessibility was cited most often by non-microcomputer users.
- Microcomputer users have higher levels of perceived departmental support than non-users.
- The language used in the classroom was closely related to microcomputer use.
- The degree held by a faculty member and his or her gender did not affect the microcomputer use.
- Faculty members' self-perceptions of innovativeness were strongly related to the adoption of microcomputer.

Lan (1993) studied the educational computing at Northern Illinois University: academic staff use, knowledge, skills, interests, attitudes, and perceptions. The study found that:

- The respondents were most interested in learning computer skills and topics that were related to the use of computers.
- Significant differences in computer knowledge, skills, interests, and attitudes existed according to age, gender, and whether to use computers or not.
- There were no significant correlations between computer knowledge and attitudes, or between skills and attitudes, while significant positive correlations were found among knowledge, skills, and interest.
Introduction

Aworuwa (1994) studied the faculty’s perceptions of computer use for teaching and the impact on teaching and learning. The results of this study were:

- Professors use computers for different teaching purposes including enhancing their own efficiency and effectiveness in the classroom, providing computer experience for their students and extending their office hours;
- Computer use among the professors studied was idiosyncratic, influenced by personal and institutional factors;
- Computers are not likely to replace teachers in the classroom.

Davenport (1995) investigated the factors related to the Tennessee K-12 educators’ implementation of the Internet into classroom activities. The purpose of this study was to determine what factors influence educators to use the Internet in classroom activities or in their own professional development. A random sample of 325 educators was selected from a population of Tennessee K-12 educators who were identified as having completed Internet training. Findings include the determination that the Internet is being used by educators who have attended Internet workshops or seminars. There is little organized staff development about the Internet available in Tennessee K-12 schools. There is a significant difference between those educators who use the Internet and those who do not use the Internet in relation to their beliefs about Internet training. There is also a significant difference in relation to beliefs about school support for Internet activities. E-mail and Gopher are the Internet tools most often used by Tennessee K-12 educators. Tennessee K-12 educators would like to receive more training on how to use the Internet for both classroom activities and professional development.

Lee (1996) conducted a study entitled the information technology at the gate: faculty perceptions and attitudes about technology-mediated instruction innovation higher education. This study examined why technology-mediated instruction and learning has not been widely adopted by faculty members despite the growing familiarity with technology and the numerous efforts to integrate information technology into teaching. The results of the study were:

- The technology use pattern of survey participants showed that Internet applications were the most highly used technology category with 78% of respondents reporting use of the Internet. However, only 30% responded that technology used the Internet for teaching purposes;
Introduction

• Such demographic variables as institution, age, academic ranks, and number and size of classes taught did not show significant differences among the five groups.

Chen (1997) studied the attitudes towards microcomputer use of university business instructors in Taiwan, Republic of China. He found that:

• Computer ownership, length of computer use and computer knowledge/skills, colleague relationships, teaching methods for technology training, and administrative support contributed to the positive attitudes about computers;

• Feelings of intimidation about computers were affected by gender, age, computer ownership; length of computer use, academic background, programming language experience, and computer knowledge/ skills. Colleague relationship and teaching methods for technology training were also related to feelings of intimidation about computers;

• Age, computer ownership, length of computer use, academic background and computer knowledge/skills affected the usefulness of computers. Colleague relationship and teaching methods used in technology training were also related to the usefulness of the computer; and

• Different groups of gender, computer ownership, length of computer use, in-service technology training backgrounds and computer knowledge/skills demonstrated different negative attitudes. Colleague relationships and teaching methods for technology training were also found to be related to negative computer attitudes.

Lebediker (1997) conducted a study entitled the computer attitudes and usage: an exploratory survey of higher education faculty. This study explored the nature of computer technology usage and attitudes existing at universities nationwide, and interpreted the results from psychological, sociological, and educational administration and policy perspectives. The research took the form of a nationwide survey of faculty conducted at universities. He found there were distinct differences in computer usage, training and attitude variables by faculty discipline, gender, and age.

Toms (1997) studied instructional use of the Internet: stages of concern among faculty at the university of Florida. The results of the study were:
Introduction

• Significant correlations were found between the peak or most intense stage of concern and level of use of the Internet for instructional purposes, level of use of the Internet for all other purposes, and attention to how students learn;

• Significant correlations were also found between level of use of the Internet for instructional purposes and gender.

Lee (1998) conducted a study entitled the faculty utilization, attitudes, and perceptions regarding computer technology at Mississippi State University. The purpose of the study was to investigate Mississippi State University faculty members’ use of university-provided computer technology. He found that there were significant relationships between age, gender, education level, and position/rank, years in the current position, college field and their perceived skill levels using software application programs.

Spotts (1998) studied the faculty use of instructional technology in higher education: profiles of contributing and deterring factors. This study found that a variety of factors are involved in a faculty member’s decision to use or not to use instructional technologies. Changes in content factors were not as important as at attitude and perceived value in influencing the use of instructional technologies. To encourage the use of instructional technologies in higher education, technologies must be convenient and beneficial to the faculty members. The instructional technology must help the faculty member do a better job of what they define as important.

McCarthy (1998) studied teacher attitudes toward computers and the relationship between attitudes toward computers and level of involvement with computers among New York City special education teachers. The researcher constructed a demographic survey sheet along with a Likert Scale-based survey instrument to gather data on the sample and their attitudes towards computers. He observed that there was a significant relationship between the attitude towards computers and the level of involvement with computers.

Tate (1998) investigated the value of technical assistance networks as a factor in the diffusion of technological innovations in schools. This study investigated the importance of technical assistance networks as a factor, which encourages teachers to adopt computers as an educational technology in classrooms. Significant differences were found between schools, which had full-time, on-site personnel designated as information...
technology specialists and those, which did not. In every measure of usage, schools with such specialists outperformed the schools without these specialists.

Lennertz (1999) conducted a study entitled the perceptions about Internet use by teaching faculty at small, Christian Colleges and Universities (Small Colleagues). This study investigated the self-reported effects of Internet use on faculty at small, Christian Colleges and Universities by age, years of Internet use, academic field, and on communication style, pedagogical style, personal productivity, fulfillment of the organization’s mission, social networks, research, and professional development. He found that faculty who has used the Internet more believes that their personal productivity has changed and that they have changed the way they conduct a class. Also faculty agreed that Internet can enhance continuing education opportunities, has changed their communication with other scholars and the methods they use to do research.

Barker (1999) studied the effect of faculty background, organizational environment, instructional style, and attitudinal factors on female faculty commitment to use computer-based technologies for instruction in higher education. Respondents included faculty with academic rank employed full-time in public and private colleges and universities. Two models of computer use for faculty in higher education emerged. Both models supported the fact that ability to use computers and related software was a strong predictor of future computer use. The findings also supported the multidimensionality of attitudes and the contribution of each component, cognitive and affective, to the future use of computers. This research suggests that theories and models of computer utilization among various user groups are still evolving. Other factors related to media use will need to be researched to further the development of the utilization domain.

Al-Mwadieh (1999) investigated the use of computer technology among the higher education administrators at the University of Jordan. This study investigated the relationship between the current utilization of computer technology among the higher education administrators, and their previous computer training in order to determine the adequate training methods that may enhance their computer skills. The study found that variables such as years of professional experience at the university, and amount of computer education, demonstrate a positive relationship with Jordanian higher education administrators’ use of computers. However, administrators’ position resulted in undifferentiated findings. Jordanian administrators expressed great interest in computer
technology since they realized its importance in a developing institution. They indicated a strong desire to have and develop skills in computers. Overall, the findings of the study as they relate to the computer experience indicated that 65.9% of the administrators had no computer experience, 15.3% had low computer experience, 14.1% had high computer experience, and finally 4.7% had medium computer experience. Also, the results of this study revealed information that only 29 out of 85 administrators surveyed knew how to use computers. Regarding those 29 administrators, 51.7% indicated that they use computers for instructional purposes. Conversely, 100% of the administrators stated that they use computers for a management and a personal tool.

Macdonald (1999) studied the faculty development in educational technology. This qualitative study examined how educational technology was adopted and diffused in a nursing college and the faculty’s concerns about educational technology. Fifty-four faculty and staff members from a nursing college participated in this study. The results indicated that leadership, training, technical support, funding and access to computer equipment impact the adoption and diffusion of educational technology in the college studies. The results also found differences and similarities among the five groups.

Philson (1999) examined the factors affecting academic collaboration via communication technologies. This study examined the convergence of technology and collaboration, with a major focus on international perspectives. Major independent variables examined the impact of access, disciplinary focus, age, sex, language, income level, skill and training, and institutional characteristics. The results indicated that access was the most significant predictor of collaboration, followed by the individual’s language, the discipline, experience using e-mail, the number of years in the discipline, and self-rating on skill level.

Several factors were significantly correlated with access, including discipline, language, skill, problems with the technology, and experience. A strong relationship was also found between access and per capita income level in the country of the participant. The results suggested that the new technologies, particularly the Internet, are providing access to collaborative efforts for academics in countries around the world, but that such access is directly tied to income levels representing overall national development and also affected by several other variables. The study also proved the viability of conducting a web-based survey utilizing random sampling.
**Introduction**

Beazley (2000) examined understanding of the basis for gender differences in course Web site usage at a university. The results demonstrated that the uses and contexts for computing activities are important for understanding what motivates students to engage with educational technologies. Women were more positive and reported greater usage than men when computing was connected to academics, whereas men held more favorable opinions and showed greater experience when more global, context-independent, and higher-end computing was measured.

Nunley (2001) in his study *a national on-line survey of education faculties’ use of technology in preservice teacher education courses*, found several positive moderate correlations between the dependent variable of software proficiency levels and reported hours per month using software. The results were found significant at .05 probability level. Relationships between teacher education faculties proficiency levels using educational technology and the following demographic variables were found to be significant at .05 probability level: age, gender, home computer ownership, types of education courses taught by the faculty members, and hours per month using software applications.

Ensminger and Surry (2002) studied the faculty perceptions of factors that facilitate the implementation of online programs. This study originated from an earlier study on the employment of the following eight conditions during the instructional design process: dissatisfaction with the status quo; skills and knowledge; adequate resources; rewards or incentives; adequate time; participation; commitment; and leadership. This study employed an online survey to assess faculty members' perceptions of the relative importance of these eight conditions when implementing an online degree program. The current study used case based scenario questions in order to operationalize the eight conditions. The purpose of this study was to determine which of the eight conditions faculty in higher education perceived as the most influential when implementing an online degree program. The results provide information concerning the perceived importance of the eight conditions that facilitate implementation.
Repman (1989) studied the cognitive and affective outcomes of varying levels of structured collaboration in a computer-based learning environment. This study investigated cognitive and affective outcomes resulting from the use of varying levels of structured peer collaboration in a computer-based learning environment. The study was designed to apply research findings showing a positive relationship between giving explanations and achievement into classroom practice. The sample consisted of 190 students enrolled in nine sections of seventh grade social studies at two middle schools.

It was found that:

- Training was an effective means of increasing the frequency of giving explanations within collaborative learning groups.
- Students who received structured collaboration (with or without training) scored higher on the social studies achievement test than students in the unstructured groups.
- Students who received training scored higher than students receiving only structure on the posttest of self-esteem.

Cottle (1992) studied the effect of local area network computer linkage on student performance during computer-based instruction. This study investigated various performance and achievement effects of an experimental system that was designed to enhance social interaction during computer-based instruction. Using a local area network in which subjects used individual computers, each computer and program was linked to all other computers in the network. Actions of individual students were echoed to the computers of all other students within the group, allowing every student to choose whether to echo the other responses or to pursue a unique solution to the problem presented by the program. He found that the system was effective in allowing students to share information through the medium of the network. Performance improvement as measured by task completion time was significant at the .001 levels. Achievement gains as measured by verbal and spatial recall were insignificant, primarily due to a practice effect. In dividing the subjects into high and low groups based on scores above and below the mean on
pretest performance, the low performance groups showed significant improvement at or above the .001 level.

Clayton (1992) studied the relationship between computer-assisted instruction in reading and mathematics achievement and selected student variable. This study was designed to determine the effectiveness of computer-assisted instruction on reading and mathematics achievement, attitude towards reading and mathematics, and the effect of computer-assisted instruction on reading and mathematics achievement and attitude for low socio-economic students. The study involved students in grades 2-5 in five elementary schools. Findings indicated that computer-assisted instruction improved reading for students at the fourth-grade level, and increased positive attitude toward reading for third and fourth-grade students in the low socio-economic category. The computer-assisted instruction in grades 2, 4, and 5 made significant gains in mathematics achievement. A more positive attitude toward mathematics was shown by students in grades 3 and 4 following computer-assisted instruction.

Riegle (1993) studied the relationship of visualization, spatial analysis and prior experiences to computer-aided drafting and design system performance levels for students in industrial technology undergraduate programs. This study involves the analysis of some of the variables that contributes to higher achievement in an introductory course in computer-aided drafting and design at institutions that have four-year degree programs and have full national accreditation by the national association of industrial technology. The student data showed that computer science coursework was just as important to achievement in introductory computer-aided drafting and design as drafting coursework. The result indicates that when basic literacies are compared in the two subject areas, computer science is considerably more significant than drafting. Spatial orientation and visualization aptitudes were found to have a positive relationship to computer-aided drafting and design achievement.

Aworuwa (1994) investigated a qualitative study of the faculty’s perceptions of computer use for teaching and the impact on teaching and learning. This study was a qualitative study of how a group of professors perceive computer use in their teaching and its impact on teaching and learning. Among the findings of this study are that professors use computers for different teaching purposes including their own efficiency and providing computer experience for their students. Impact of computer use on teaching
perceived by professors include the opportunity to expand the range of teaching strategies, efficiency in managing teaching tasks, and more control of teaching. Perceived impacts of computer use on learning include increase in students’ class participation, increase in quality and quantity of learning, positive attitudes towards learning, and marketability.

Mann (1994) studied the effects of temporal sound on computer-based learning. This research addressed the problem of inattention to critical information from the computer interface by focusing on software solutions using sound. Temporal sound was designated for empirical study. Temporal sound is spoken information provided about a future or past event that presents highlights and details about static or moving visuals. Two studies were conducted using a sequential hypermedia-learning environment based on feedback from a formative evaluation with 27 post-secondary students. In the first study, 56 subjects were randomly assigned to one of three treatment conditions: sound, sound/text or text. Multivariate analyses indicated that subjects in the sound and sound/text conditions summarized more highlights and details than those in the text condition. The expectation that subjects using sound would be more motivated was not confirmed. The second study applied the same treatment conditions with 12 subjects. A protocol analysis indicated that temporal sound affected their constructive ability. Subjects in the sound/text treatment summarized more highlights and details than those in the sound or text treatments.

Hubschman (1996) examined the effect of mentoring electronic mail on student achievement and attitudes in a graduate course in educational research. The results of the study showed no significant differences between the treatment groups in achievement or in attitudes toward educational research. Introverts had lower attitudes and lower final exam grades in both groups, although introverts in the mentored group scored higher than those introverts in the neutral group; at test of the means of total response to e-mail from the researcher, showed a significant difference between the mentored and neutral e-mail groups. Introverts responded more often than extraverts in both groups; teacher effect was significant in determining class response to e-mail messages; responses were most frequent in the researcher’s classes.

Engle (1996) conducted a study entitled the use of e-mail-mediated instructional conversations in content area reading and writing courses. The study examined and described e-mail-mediated instructional conversations conducted during a content area
reading and writing course. Participants in this study included undergraduate students from three different content speciality areas as well as an instructor who mediated the conversational instructions via e-mail communications. Students and the instructor were engaged in extended conversational interactions in which they considered and discussed numerous topics related to content area, reading and writing. The results of the study were:

- The mapping techniques employed in the study effectively aided in the identification of patterns of interactions;
- Each of the conversational groups included in the study responded to instructor moves in a distinct manner;
- Different content area conversation groups established distinct patterns of discourse;
- Several factors were identified that appear to have an impact on levels of participation in e-mail-mediated instructional conversations; and
- E-mail-mediated instructional conversations appear to facilitate the appropriation of formal concepts.

Taylor (1996) conducted a pilot study of an instructional technology intervention for student achievement and parent involvement. This study investigated the implementation and impact of a program initiated in one school district, which combined take-home computers with strategies for parent assistance to improve academic achievement for basic skills of elementary students. Overall, the qualitative findings offered greater support for program implementation, utilization and impact than did the quantitative findings. Teacher and student implementation and use were moderate. According to parents, teachers and students, the program impacted positively on student attitudes and behavior. In addition, parents and teachers highlighted positive aspects of the program.

Bills (1997) studied the effects of structure and interactivity on Internet-based instruction. This study confirmed that good instructional design of Internet-based instruction improves student achievement of learning outcomes. The effects of structure were the only significant outcomes. This study was an important first step in laying the foundation for future research in instructional design for Internet-based instruction.

Krane (1997) investigated the impact of individual characteristics on telecommunication distance learning cognitive outcomes in adult/nontraditional students.
Introduction

The purpose of this study was to ascertain whether individual traits and demography were predictive factors of cognitive performance as measured by a posttest instrument in an interactive telecommunication distance learning setting. The study revealed that while learning styles and attitudes of individuals were not predictive of cognitive outcomes, interesting trends were revealed:

- As exposure to technology increased, cognitive performance increased.
- Learning styles may be predictive of attitudes toward methods of instruction, while it may not be predictive of cognitive outcome in the telecommunication setting.
- Ethnicity and education level seem to have a significant, but undetermined, effect on success in the telecommunication distance learning setting that may reveal underlying factors of cultural bias.
- In the telecommunications setting, students do as well as, or better than, traditional lecture students in cognitive performance.

Price (1998) studied the relationships between learning context, student approach to learning and student learning outcomes in distance education. The purpose of the present study was to explore qualitative differences in student learning outcomes in distance education courses. The design of this study employed a mixture of both qualitative and quantitative data collection and analysis procedures. The data set included instructor interviews, a qualitative measure of instructor’s student learning expectations for their course, qualitative measures of students’ course learning expectations, and quantitative measures of student’s general learning approach, students, specific approach to learning in their course, and students’ positive and negative impressions of their course.

Zheng (1998) investigated the effects of using hypermedia as an instructional intervention to improve ESL learners’ metacognition, motivation, and academic achievement. This study focused on cognitive learning process from the perspective of metacognition based on the belief that learners’ metacognition could play an important role in learning. The study examined the relationship between metacognition and educational technology and tried to find whether the use of educational technology like hypermedia could help improve learners’ metacognition and consequently enhance learners’ ability in cognitive learning. The major conclusions of this study include the following:
• In an educational technology-learning environment such as hypermedia, the learner displays a tendency to use higher order thinking skills in learning.

• In an educational technology-learning environment, the learner demonstrates self-confidence and self-initiativeness in learning.

• In an educational technology-learning environment, the learner is exposed to multiple information sources and develops a good knowledge of the learning task that he is taking. With educational technology such as hypermedia, the learner becomes better informed of the task and of himself, and is able to take effective strategies to make learning successful.

Chrite (1998) studied the knowledge, transfer and learning outcomes in university-based executive education. The purpose of this study was to gain a better understanding of the basic conditions and variables affecting the transfer of knowledge from university-based management development programs. The data suggested that the dependent variables (acquisition and application of various skill sets) are in fact impacted by an organization's commitment to managerial development. In addition, the data indicate that executives who participated in the Executive program and expected to transfer knowledge back in the work environment had a higher propensity to believe that they were better able to contribute to their organizations as a result of the program. The data confirm that the organizational work environments significantly impact the extent to which knowledge gained in the learning environment will transfer back to that environment.

Nahigombeye (1999) investigated the effects of hypermedia instructional materials on student's learning of the French perfect tense. Subjects were 45 students enrolled in 5 sections of elementary, French I in the Department of Foreign Languages, College of Arts and Sciences, at the University of Toledo during Spring Semester 1999. Results of the study indicated that students who learned the French perfect tense conjugation of verbs ending in-ER using hypermedia instructional material achieved higher test scores, had greater retention of these verbs perfect tense conjugation, and had a positive attitude toward the use of hypermedia instructional material to learn the French perfect tense conjugation.

Smith (1999) studied the effectiveness of traditional methods in an online learning environment. In this study all students participated in both traditional (control) and online (experimental) interventions. Interventions were created in which the intact traditional
instruction was delivered through an online learning environment created specifically for this study. The results of this study showed that overall, there were no significant differences between experimental and control groups. That is, student performance was the same whether instruction was delivered in a traditional classroom or through an online learning environment. Traditional instructional methods, such as those used in this study, produce similar academic outcomes when delivered through online learning environments.

Bennett (1999) studied the Internet technologies and learning outcomes in post secondary settings. The purpose of this study was to understand the impact of Internet technologies on graduate student learning. This study found two significant results that provide evidence to support the use of technology in the classroom. A significant positive relationship between the use of technology in the classroom and student satisfaction was found. Also, a significant positive relationship was found between the use of technology in the classroom and the amount of collaborative learning in which students are engaged. No significant results were found with learning strategies or meta-cognitive strategies.

According to Anderson (1999) students and faculty reported that the Internet-based courses facilitated learner autonomy; for some students, the level of autonomy was clearly uncomfortable, and a few cited loneliness and a desire for more communication with instructors. On the whole, however, students said they were satisfied. Also advances in computer technology and Tele-communications may have created a virtual space for teachers and learners of mathematics that is in many important respects equivalent to the precincts of the university seminar room. Most students and all teachers who responded to the survey said their internet-based calculus courses were as good as classes taught on campus or even better.

Toriskie (1999) examined the effects of Internet usage on student achievement and student attitudes. The purpose of the study was to determine whether the use of the Internet, integrated in to an eight week social studies unit at the fourth grade level of elementary school, would affect students’ achievement in social studies or students’ attitudes toward school, reading, writing, geography, history, maps, computers, and typing. The results of the study suggested that Internet usage has a positive impact on both student achievement in social studies and on student attitudes toward geography, history, and maps. Notably, Internet usage had significant achievement benefits for Hispanics and significant attitude benefits for students of lower socio-economic status.
Webb (1999) studied the moderating effects of information technology on knowledge delivery: an examination of interaction processes and learning outcomes. This research was conducted to address the need to examine the effects of information technology on learning interaction and learning outcomes in an environment controlled for the effects of other constructs. It examines the effects of information technology on interaction processes occurring in the computer-equipped classroom where electronic delivery can support a human instructor or serve as a surrogate for the human instructor. The research demonstrated that information technology had effects only on some sub-constructs of learning interaction. Information technology was shown to have a significant positive effect on an objective measure of learning outcomes. Findings reported in this dissertation provide new knowledge about the impact of information technology on learning as well as an instrument that can serve as a tool to support future research endeavors.

Brogan and Kong (2000) evaluated student achievement and attitudes using different learning modes to understand how applications of technology based learning approaches can be improved to address several contemporary issues regarding learning outcomes. The results included evidence that computers can deliver successful learning outcomes based on pass rates and grades, as well as student satisfaction. Strong linkages between attitudes and successful learning outcomes got the need to focus on enabling positive attitudes.

Walsh (2000) studied the relationship between computer-assisted instruction, instructor-led instruction, and learning achievement for teaching statistical process control. The research was designed to study learning outcomes, duration of tutorial time, retention, relationship between duration of tutorial time and post-test and content retention test scores for the computer-assisted instruction group, and attitudes towards computers as an effect of the treatment given to subjects. The results showed no significant difference between the treatment groups with respect to pre-tutorial knowledge levels, initial learning, and content retention. The computer-assisted instruction group had a shorter duration of tutorial time, completing their tutorials by 46 minutes faster on the average when compared against the instructor-led group. There was no relationship between duration of tutorial time and performance on post-test and content retention scores for the computer-assisted instruction group.
Taechamaneestit (2000) conducted a study entitled the computer-mediated communication: attitude and learning proficiency of Thai undergraduate business students. The study investigated whether students’ attitude change towards the use of computers and specifically electronic mail (e-mail) function after taking a required course in computer usage. He found that e-mail discussions facilitate learning and therefore may be suitable to be used in place of traditional classroom discussions. E-mail as a discussion tool is an alternative that may result in higher level of student learning for many higher education courses, especially for those who are reluctant to discuss course concepts in face-to-face settings.

Rothman (2000) studied the impact of computer-based versus traditional textbook science instruction on selected student learning outcomes. The study was designed to examine the impact of computer-based science instruction on elementary school level students’ science content achieve, their attitude about science learning, their level of critical thinking-inquiry skills, and their level of cognitive and English language development. The study compared these learning outcomes resulting from a computer-based approach compared to the learning outcomes from a traditional, textbook-based approach to science instruction. He found that non-traditional, computer-based instruction in science significantly improved students’ attitudes towards science learning and their level of English language development.

Gueldenzoph (2000) investigated the College students’ use of computer technology and its relationship to constructivist learning. This research was based on the question of whether students perceive the use of computer technology as affecting their abilities to construct meaning and enhance their ways of knowledge and learning. With regard to students’ frequency of use of computers, percentages indicated that students use email and the Web for personal purposes on a daily basis much more frequently than for class use. In addition, significant relationships were found between gender and students’ personal use of the Web as well as their personal use of computer applications. Students’ enrollment status was found to be significantly related to both their class use of computer applications and their personal use of computer applications.

Brogan (2000) evaluated student achievement and attitudes using different learning modes. This study was designed to evaluate a form of computer-based educational technology in order to understand how applications of technology-based
learning approaches can be improved to address several contemporary issues regarding learning outcomes. Findings included evidence that computers can deliver successful learning outcomes based on pass rates and grades, as well as student satisfaction. Progress is being made in bridging gender-related issues with females and math, and females and computers. Strong linkages between attitudes and successful learning outcomes beget the need to focus on enabling positive attitudes.

Page (2000) studied the integration of on-line instruction into a Kansas community College: a naturalistic study. The study revealed that while many of the issues affecting the integration and future of online instruction at the community college are the same as those impacting four-year colleges and universities, there are major differences in how these issues affect and are being managed by the community college. The study found that on-line instruction at the community college involved in the study has developed through an experimental approach. The study also found that many faculties base their judgment of the quality of on-line instruction on its ability to replicate a traditional classroom experience rather than a more objective outcome of teaching effectiveness.

Cottrell (2001) examined scholarly teaching: exploring how diverse faculty investigates course changes to improve student learning. The purpose of this study was to learn how faculties are addressing these concerns by approaching teaching as a scholarly activity. The case studies and qualitative analyses of the data revealed that diverse educational institutions and faculty from different disciplines are approaching teaching as an investigative process. The faculties are developing active learning approaches to help students realize the courses’ learning outcomes. The faculties are also using multiple assessment strategies to make informed changes in the classroom, which helps maximize student learning.

Miller (2001) investigated the technology and learning in the undergraduate classroom. The current research begins an investigation to identify the effect of technology on undergraduate student learning, as well as on student attitude towards the learning experience when Internet Technology is added to a face-to-face pedagogical strategy in undergraduate survey course sections. The findings of this research were that using technology in instruction of the course did have an effect on student achievement and attitudes towards instruction. First, students receiving instructional treatment in the dynamic dual instructional mode had significantly higher achievement scores than
students in either traditional or static dual treatment modes. Furthermore, students receiving instruction in the dynamic dual mode had significantly greater positive attitudes towards the instruction received than students in either the traditional or static dual treatment groups. Finally, students receiving instruction in the flexible online mode showed similar outcomes in achievement and attitude as were found in the dynamic dual instructional group.

Morales Urbina (2001) studied how a computer software program reinforces reading comprehension skills in limited English proficient 7th grade students. It also investigated whether there were any differences between the experimental and control groups’ outcomes after the treatment was applied and explored what specific reading comprehension skills the computer program improved. He found, in general, learners’ experience with computerized lessons was positive, although not all students enjoyed or learned with this strategy.

RESEARCH STUDIES RELATED WITH TEACHER-STUDENT ATTITUDE TOWARDS NETWORK COMMUNICATIONS

Gorman (1992) investigated the evaluation of the Florida model technology program on teachers and students in high school. The problem investigated in this study concerned whether the Florida model technology program at high school was having an effect on students and teachers. The study focused on teachers’ perceptions. Participants in this study volunteered and included teachers, a district administrator and school administrators. The study found that:

- Teachers did not feel that technology had a significant effect on attendance.
- Although only 38 % of teachers responded that technology influenced student discipline, other factors point to technology having a positive influence on discipline.
- Most teachers interviewed, felt that technology had a positive influence on academic performance, but not necessarily on pass/fail rates.
All teachers who used technology-based testing systems agreed that technology improved the process of testing and record keeping.

All teachers perceived that the model technology program improved teaching and instructional practices.

All teachers reported that model technology improved curriculum within disciplines and course content.

Tobias (1993) studied the attitudes of inmates toward the use of computers in Tennessee correctional institutions. Specific attention was given to the relationship between attitudes and gender, race, age, education, and prior computer experience. The results of data analysis revealed the following:

• There was a statistically significant difference between the experimental group and the control group in their attitude difference score in terms of computer anxiety.
• There was no statistically significant difference between the experimental group and the control group in their attitude difference score in terms of computer confidence, computer liking, and computer usefulness.
• Gender, race, age and education were not found to be significantly related to changes in attitudes toward computers.
• Prior computer experience appeared to make statistically significant difference in inmates' attitudes toward computer.

Bloom (1993) studied the effect of participation in the administrators' technology academy on participants' perceptions of the usefulness of technology in education. The purpose of this study was to determine the effect of participation in the administrators' technology academy on participants' perceptions of the usefulness of technology in education. An identical survey was mailed to the 130 administrators who constituted a 10 percent random sample of the administrators who did not participate in the administrators' technology academy. Results of the study were statistically significant at the .05 level of confidence and indicated that participation in the administrators' technology academy did affect participants' perceptions of the usefulness of technology in education. Administrators' technology academy participants made significantly more use of computers both in the office and at home than did administrators' technology academy non-participants. Administrators' technology academy participant responses indicated they perceived technology as being more useful in education and society than did...
administrators' technology academy non-participants. Finally, administrators' technology academy participants more strongly perceived the computer as a tool that can assist administrators in performing specific school and district management tasks than did administrators' technology academy non-participants.

Morris (1994) investigated the perceptions of college students toward computers as delivery media and a self-instructional environment. The setting for this case study was an undergraduate self-instructional course, which incorporated teaching strategies such as individualized instruction, active learner participation, mastery learning and peer tutoring. Perceptions of the college students toward computers as delivery media, and the self-instructional environment were investigated. The study found that the college students, who participated in the survey, preferred using textbook than computers. This finding differs from previous studies. They perceived that using textbook would be learning more that supports the assumption of one's preference enhancing achievement gain through media.

Gunter (1994) studied the attitudes of Mississippi State University education and business students toward learning and working with computers. The purpose of this study was to examine variables that could possibly influence attitudes toward learning and working with computers of College of Education and College of Business and Industry students at Mississippi State University. The findings in this study indicated statistically significant differences between College of Education and College of Business and Industry after completion of a computer literacy course. College of Education students had a more positive attitude, lower anxiety, more confidence, and found computers more useful than college of Business and Industry. There was a significant change in attitudes between College of Education and College of Business and Industry students over the 16-week semester. Moreover, the findings revealed statistically significant differences between students' attitudes and selected variables: access to a home computer, computer experience level, age of the student, and collegiate classification of the student.

Smith (1994) examined the relationships between the attitudes of secondary teachers toward educational technology and their actual use of educational technology and seven independent factors. The primary purpose of this study was to determine the relationships between the attitudes of secondary teachers toward educational technology and their actual use of educational technology and the demographic variables of gender.
Introduction

and age and the educational variables of highest degree obtained, total number of years of teaching experience, educational technology background, academic area and course level. He found statistical relationships between educational technology training and both attitude towards educational technology and the use of educational technology. Additionally, a relationship was found between the amount of training and both attitude and use of technology. However, no significant differences were evident in regard to gender, age, degree, teaching experience, academic area, or course level and attitude toward technology or the use of technology.

Lowther (1994) studied the perceptions of educational technology among classroom teachers and educational technologists. This study was conducted to investigate the perceptions of K-12 teachers and of educational technology faculty and graduate students about the following areas associated with educational technology: instructional design, cooperative learning, learner control, school reform and computers and media. He found that K-8 teachers had significantly more positive perceptions than one or both of the educational technology groups on all five items in the cooperative learning area and on three of the five items in the learner control area.

Russett (1994) investigated the telecommunications and pre-service teachers: the effects of using electronic mail and a direct exploration of Internet on attitudes. This study is designed to evaluate the impact resulting from the use of electronic mail and Internet access on undergraduate education students' attitudes toward telecommunications, as well as their attitudes toward educational technologies in general. The most prominent finding is that there must be an integration of the educational technologies into the methods/curriculum courses. This integration must include the practicum and student teaching sites. Practicum and student teaching sites need to be found where teachers are using educational technology appropriately.

The second theme deals with the use of e-mail between student and instructor. Students voiced very polar views on this topic. Some students felt that e-mail took away the personal aspect of communication, while others felt that e-mail allowed them to express themselves in ways not otherwise possible. Just as methods/curriculum instructors must take into account different learning styles, they also must take into account different communication styles. While not unanimous, students from all groups voiced opinions that electronic communications between students and professors could be very useful. All
students emphasized that e-mail should neither be the sole means of communication, nor should it take the place of personal discussions.

**Kindel (1995)** studied the computer attitudes and use of public secondary school teachers in Kentucky. In this study, secondary teachers in Kentucky public schools were randomly selected to participate in a survey about their attitudes concerning computers and their use of computer technology. In comparing mean scores for teachers using computers in the classroom, no statistically significant differences were found for gender or educational level. In the area of number of years of teaching experience, the differences existing were not statistically significant, but they came quite close to being so. The characteristics of age and primary subject of teaching responsibility showed statistically significant differences. Furthermore, teachers who used computers in the classroom for record keeping and at home had mean scores indicating more positive attitudes about computers. The majority of teachers surveyed agree that technology can increase student achievement.

**Ibrahim (1995)** investigated the attitude towards computers among teachers. This study examined whether field dependence/field independence and experience in using computers had any relation with attitudes of teachers toward computers. He found significant differences among field dependence/field independence groups and computer experience groups for all computer attitude scale subscales (anxiety, confidence, liking and usefulness). Significant differences were found also between field dependent and field independent teachers, less experienced and experienced teachers, less experienced and more experienced teachers, and experienced and more experienced teachers.

**Bernhardt (1995)** studied the utilization of and attitude towards networking technology at Lehigh University. The purpose of this study was to determine how networking technology was being utilized for education and research at Lehigh University as well as to determine user attitude towards this technology. An analysis of an on-line survey found extensive utilization of networking technology. Through utilizing networking technology, the majority of respondents felt that they could constantly find new information and, by utilizing different search techniques, had much more information available to them. Over half of the respondents felt that through utilizing networking technology their abilities to distinguish the value of information and their skills in assembling information had increased.
As how user attitudes affected their utilization of networking technology, most respondents enjoyed utilizing networking technology, had little anxiety toward utilizing networking technology, and were confident in their abilities to utilize networking technology. Faculty members had the lowest level of enjoyment and the lowest level of confidence in their abilities to utilize networking technology, but they also had the lowest level of utilization of this technology with most rarely using the technology for anything but work-related purposes.

Harned (1996) examined the integration of computer-mediated communication in the public schools: a phenomenological study of teacher attitudes and beliefs towards technology. This study has sought to learn the reasons and attitudes of teachers towards technology. Specifically, the study examined the differences in attitudes and beliefs of teachers who were using such technology and teachers who have not used it to any extent even though they have some access to it. Findings indicated a combination of human problem solving and social interaction theories that addressed such issues as teacher ownership of the change, the loss of classroom control to the technology, and the willingness to try new ideas appeared, to best fit.

Lebediker (1997) investigated the computer attitudes and usage: an exploratory survey of higher education faculty. This study explored the nature of computer technology usage and attitudes existing at universities nationwide, and interpreted the results from psychological, sociological, and educational administration and policy perspectives. The results of the study suggest that there are distinct differences in computer usage, training and attitude variables by faculty discipline, gender, and age.

Bullard (1998) studied the university professors’ attitudes towards educational technology. This study was conducted to determine the attitude of college professors in teacher education programs towards teaching with technology, the flexibility in using technology for instruction, and the status provided by using educational technology. This study also was conducted to ascertain data to indicate if the professors’ attitudes were related to selected variables. The results obtained from testing the hypotheses of this study indicated that the attitude of university professors towards teaching with technology and the flexibility of using educational technology for instruction were significantly affected by the composite set of variables; rank efficacy, and length of teaching experience. No difference, however, was found between male and female professors’ attitude towards
Introduction

educational technology. The current study did not indicate that there was a difference in the attitude towards educational technology among the institutions surveyed.

The status provided by knowing how to use computers was not significantly affected by the same composite set of independent variables nor was there a difference in computer utilization between genders. Likewise, this study did not indicate that the attitudes of university professors towards educational technology differed at institutions that encouraged the use of computer instruction from those that did not encourage instructional use.

The current study did show that professors use technology more for preparation for teaching rather than in the actual classroom. Faculty members indicated that they would like to use computers more for instruction and believed that computers used in instruction would improve student learning. Although not directly tested, the professors' use of the Internet, World Wide Web and e-mail proved to be far more superior than the use of other computer related instructional materials.

Moore (1998) examined the implementation of an electronic performance support system for teachers: an examination of usage, performance, and attitudes. The purpose of this study was to investigate how the usage of an electronic performance support system can impact the teacher's work performance, and attitudes towards computer technology. Furthermore, this study provides a framework for the implementation of an electronic performance support system in an educational setting, specifically at a middle school.

The study found that teachers used the electronic performance support system primarily for completing student progress reports. The progress-reporting task was performed in less time. Furthermore, the teachers' attitudes toward using the electronic performance support system were influenced by their performances. Computer usage, performance, and attitudes were interconnected and were affected by environmental factors, such as work responsibilities and accessibility to computer. The characteristics of the technology innovation, change agent, technology support personnel, and the innovation users were additional factors that affected usage, performance, and attitudes. Attitudes towards the electronic performance support system and technology in general were affected by the interactions with the person responsible for technology support and by the ability to customize the computer program employing a user-centered design.
Montgomery (1999) investigated the faculty attitudes towards technology-based distance education at the University of Nevada, Las Vegas. The purpose of this study was to survey the attitudes of the teaching faculty of the University of Nevada, Las Vegas towards technology-based distance education. The study found that the faculty held a slightly positive attitude towards distance education without regard to age, gender, number of years teaching or tenure. Membership in a particular college was significant, at .05 alpha. The College of Education (most positive attitude) was significantly different from the College of Liberal Arts (more negative attitude) and the College of Science (most negative attitude).

Redmond (1999) studied the teacher perceptions of the implementation of multimedia technology. The purpose of this study was to describe teachers’ decision-making role in using Tomorrow’s Promise multimedia and their perception of the training they received to use the multimedia in classroom and laboratory settings. Teachers’ perception of the instructional effectiveness of the software on the curriculum was also assessed. Tomorrow’s Promise multimedia is a computer software program, which provides lessons in reading, math, and language arts for students in grades K-12. The quantitative data was analyzed using frequencies and percentages. The results of the Chi-Square analyses showed no significant differences between the perceptions of classroom teachers and lab teachers about their input in the decisions, which placed Tomorrow’s Promise in their schools. Also, the data showed no significant differences between classroom and laboratory teachers’ perceptions on usefulness of training and their overall perceptions toward the effectiveness of Tomorrow’s Promise in the instructional program.

Almahboub (2000) investigated the attitudes towards computer use and gender differences among Kuwait sixth-grade students. This study investigated that attitudes toward computers and gender differences of sixth-grade Kuwait students and examined the relationships between students’ attitudes towards computers and school, motivation/persistence, study habits, empathy, creative tendencies, and achievement in the informatics field. This study found positive attitudes towards computer use; however, girls had significantly more positive attitudes towards computers than did boys. It also found statistically significant correlations between attitudes towards computers and school, motivation/ persistence, study habits, empathy, creative tendencies, and achievement in the informatics field. A statistically significant gender difference was found in the
correlations between attitudes towards computers and empathy. Girls had a stronger correlation than boys. This study also found that students who use computers at home have more positive attitudes towards computers than did students who do not.

Liau (2000) investigated the information technology and education: student perceptions of computer and Web-based environments. This study focused on surveying the attitudes towards computers and Web-based technology. This study also examined the relationship between students' perceptions of computers and Web-based environments. The benefit of this study was to provide faculty to understand students' feelings about computers and Web-based technologies for enhancing learning performance. This study found that the success of computer utilization is largely dependent upon the attitudes toward computer of faculty and students.

Cook (2000) studied the effects of Web-based instruction on preservice teachers' attitude, confidence, and perceived value regarding Internet-based learning resources. Sixty undergraduate preservice teachers from an urban university were the subjects in this study designed to determine the effects of Web-based instruction on attitude, confidence, value, and achievement regarding Internet-based learning resources. It was discovered that a positive attitude towards the use of computers could benefit the student greatly as it helps to build confidence in computer use, which leads to more computer use and higher overall achievement.

Figg (2000) studied the relationships between selected elementary teachers' beliefs and educational technology use. The purpose of this study was to investigate how selected teachers' beliefs and their uses of technology within their teaching practices are related, customizing training according to teachers' beliefs about and practices of teaching. The study found that:

- Teachers' preferred educational uses of computer-based technologies might be related to their notions of the relative importance of students' interest and preferences vs. teachers' perceptions of student learning needs when planning for instruction.
- Beliefs expressed by participants about learning and teaching are related to teachers' use of technology in four ways: why technological tools are perceived as valuable to instructional activities; how technologies are incorporated into activity
structures; how technologies are used to support curriculum; and why technologies do not support all instructional activities.

- These teachers expressed three reasons why they chose to acquire and integrate specific technology applications into their instruction: access to modeling in classrooms, their present curricular needs, and personal interest in using applications.

Howery (2001) studied the teacher technology training: a study of the impact of educational technology on teacher attitude and student achievement. The principal purpose of this study was to investigate teacher training in technology with its effect on teacher attitude and the use of technology in the classroom. Additionally, this study sought to determine the impact of these factors on student achievement as evidenced by standardized test scores. Teacher attitudes and use of computers were measured by the computer technology survey. The results of the study revealed an increase in teacher attitude and use of computers. Significant difference was found also between the control and experimental groups on the differences of the scores. The experimental group mean difference of the math and reading Stanford Scores was significantly higher than the math and reading Stanford Scores for the control group. The results suggest that through the technology literacy challenge grant, teachers have become comfortable with the use of technology and their positive attitude towards technology have increased. They have begun to use technology to enhance the learning environment for students and have had an impact on student achievement.

Jao (2001) studied an investigation of preservice teachers’ attitudes and confidence levels towards educational technology standards and selected instructional software applications. This study was conducted to investigate preservice teachers’ attitudes and confidence levels towards technology standards and towards selected instructional software applications. Within the field of educational technology, this study provided additional evidence that participants had more positive attitudes after the intervention. The study revealed that:

- Preservice teachers had more positive attitudes towards educational technology.
- Preservice teachers had an increase of confidence level in performing the surveyed skills and in teaching them at the grade levels they planned to teach.
- Preservice teachers had more positive attitudes towards a variety of instructional tools.
EMERGENCE OF THE PROBLEM

The review of related literature reveals that an extensive application of new technologies are making their way in all aspects of life. The teachers are no exception to this. The total scenario is changing causing many kinds of restructuring at classroom and institutional levels.

Higher education, especially in developing countries, is facing numerous challenges; one of them is the rapid expansion of computer technologies and their usage in all areas of education. Thus, understanding factors that will explain computer technologies' use among faculty will be critical if utilization of technology for academic transactions is to be enhanced.

These days the network communications, particularly Internet, seems to be everywhere; a revolution is taking place. It started quietly and has grown to involve whole of the world.

While new technologies provide powerful tools that could transform many aspects of our daily lives, Internet technologies (the largest network communication technology in the world) used in the area of academic transactions are relatively new phenomenon, particularly in developing countries.

There is no doubt that the interest in educational technology is high. Unfortunately, strong research to guide teachers in using new technologies in the classroom is largely lacking. It is unclear how different Internet technologies affect diverse aspects of students' learning and development. The picture is in a fluid state but results seem to be quite encouraging.

Surveys have shown that not much research has been done in developing countries in this regard. There is no doubt that slowly educational technology has already made its way into the classrooms and has become a powerful tool with teachers. Yet no consolidated work has been reported particularly in India, to show level of use of network communications (Internet technologies) in academic transactions at higher education level and its impact on students' learning outcomes. The present investigation is therefore an humble attempt to study use of network communications in academic transactions by university teachers and its impact on learning outcomes of postgraduate students.
Introduction

It is expected that the results of the present research on the subject will prove to be useful for planners of university curricula, in expansion of network communications technologies and their usage in all areas of higher education.

STATEMENT OF THE PROBLEM

USE OF NETWORK COMMUNICATIONS IN ACADEMIC TRANSACTIONS BY UNIVERSITY TEACHERS AND ITS IMPACT ON LEARNING OUTCOMES OF POSTGRADUATE STUDENTS.

DELIMITATIONS OF THE STUDY

The study will be delimited to:

- Both Regular and Distance mode faculty. Faculty members from both channels will be included in the study.
- Network communications will be confined to the Internet technologies (e-mail, bulletin board service, file transfer protocol, remote login, browsing the World Wide Web, World Wide Web documents, advanced Web technologies, automated Web search, audio and video communication and the global digital library).
- Both Male and Female faculty members will be included.
- Professor, Reader and Lecturer will form the sample of study.
- The study will be conducted on teachers of faculties of Science, Social Science and Commerce.

OBJECTIVES OF THE STUDY

This exploratory study has been designed to attain the following objectives:

For Developing and Validating Tools:

- To plan, design and validate scale of attitude towards network communications, to be used by university teachers.
- To develop and validate a questionnaire of computer and Internet usage in academic transactions by faculty teachers.
- To develop and validate a multiple-choice test for knowledge and application in computers for students learning outcomes.
Introduction

For Qualitative Analyses:

- To study background characteristics of faculty teachers: age, gender, mode of instruction, rank, area of specialization or discipline, and research experience.
- To explore reasons of no/inadequate use of network communications by the faculty teachers.
- To examine level of use of computer/Internet technologies in teaching, research and extension activities by faculty teachers.

For Quantitative Analyses:

- To study difference in attitude of user/non user faculty teachers towards Internet technologies.
- To study association of level of use of Internet technology and:
  - Age.
  - Gender.
  - Mode of instruction.
  - Rank.
  - Subject areas.
  - Research experience.

For Impact Analyses:

- To study relationship between level of use of Internet technology by faculty teachers and learning outcomes of students:
  - General information about computers.
  - Information about the Microsoft word.
  - Information about the Microsoft Excel.
  - Information about PowerPoint.
  - Information about Internet.
- To study relationship between level of use of Internet technology by faculty teachers and attitude of students towards Internet technology.
HYPOTHESES

The study has been designed to test the following hypotheses:

**H₀. 1.** There is no significant difference between user and non-user faculty teachers' attitude towards Internet technology in higher education.

**H₀. 2.** There is no association between age of faculty teachers and the level of use of the network communications.

**H₀. 3.** There is no association between gender of faculty teachers and level of use of the network communications.

**H₀. 4.** There is no correspondence between regular and distance mode faculty teachers and their level of use of the network communications.

**H₀. 5.** There is no correspondence between Ranks of faculty teachers and level of use of network communications.

**H₀. 6.** There is no association between subject areas of faculty teachers and their level of use of the network communications.

**H₀. 7.** There is no association between research experience of faculty teachers and level of use of network communications.

**H₀. 8.** There is no significant difference in the level of use of the network communications by faculty teachers and students' learning outcomes (total scores).

**H₀. 9.** There is no significant difference in the level of use of the network communications by faculty teachers and students' general information about the computers.

**H₀. 10.** There is no significant difference in the level of use of the network communications by faculty teachers and students' information about the Microsoft Word.

**H₀. 11.** There is no significant difference in the level of use of the network communications by faculty teachers and students' information about the Excel.

**H₀. 12.** There is no significant difference in the level of use of the network communications by faculty teachers and students' information about the PowerPoint.

**H₀. 13.** There is no significant difference in the level of use of the network communications by faculty teachers and students' information about the Internet.

**H₀. 14.** There is no significant difference in the level of use of the network communications by faculty teachers and attitude of their students towards the Internet technology.