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DISTANCE EDUCATION

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14.1   INTRODUCTION

The field of distance education has changed dramatically in the past ten years. Distance education, structured learning in which the student and instructor are separated by place, and sometimes by time is currently the fastest growing form of domestic and international education. What was once considered a special form of education using nontraditional delivery systems, is now becoming an important concept in mainstream education. Concepts such as networked learning, connected learning spaces, flexible learning and hybrid learning systems have enlarged the scope and changed the nature of earlier distance education models. Web-based and web-enhanced courses are appearing in traditional programs that are now racing to join the "anytime, anyplace" educational feeding frenzy. In a 2002 survey of 75 randomly chosen college distance learning programs, results revealed an astounding rate of growth in the higher education distance learning market (Primary Research Group, 2002). In a time of shrinking budgets, distance learning programs are reporting 41 percent average annual enrollment growth. Thirty percent of the programs are being developed to meet the needs of professional continuing education for adults. Twenty-four percent of distance students have high speed bandwidth at home. These developments signal a drastic redirection of traditional distance education.

With the rise and proliferation of distance learning systems has come the need to critically examine the strengths and weaknesses of various programs. A majority of new programs have been developed to meet the growing needs of higher education in responding to demands for flexible learning environments, continuing education and lifelong learning. David Noble, the Ralph Nader of Distance Education, has written a series of papers examining what he calls the private, commercial hijacking of higher education. He makes the case that the banner touting cheap online education waved in front of administrators has resulted in much higher costs than expected. The promotion of online courses, according to Noble, has resulted in a huge, expensive infrastructure that he describes as a technological tapeworm in the guts of higher education (Noble 1999, November). In a later piece, Noble describes the controversy in 1998 that developed at UCLA over its partnership with a private company, the Home Education Network (THEN). The controversy, over public and private partnerships and great expectation of financial returns, he says, is fueled by extravagant technological fantasies which underly much of today's enthusiasm for distance education. Noble describes this expectation as a pursuit of what appears increasingly to be little more than fool's gold (Noble 2001, March).

Noble is one of a growing group of scholars becoming increasingly disillusioned with the commercialization of distance learning, particularly in the United States. They call for educators to pause and examine the enthusiastic claims of distance educators from a critical perspective. With the recent developments in hybrid combinations of distance learning, flexible learning, distributed learning, web-based and web-enhanced instruction, the questions facing educators are how to examine new learning technologies from a wider perspective than we have in the past, and to examine how distance education fits into the changing educational environment. Scholars are exploring information technologies from the critical perspectives of politics, hidden curriculum, pedagogy, cost effectiveness, and the global impact of information technologies on collective intelligence (Vrasidas, & Glass, 2002).

Due to the rapid development of technology, courses using a variety of media are being delivered to students in various locations in an effort to serve the educational needs of growing populations. In many cases, developments in technology allow distance education programs to provide specialized courses to students in remote geographic areas with increasing interactivity between student and teacher. Although the ways in which distance education is implemented differ markedly from country to country, most distance learning programs rely on technologies which are either already in place or are being considered for their cost effectiveness. Such programs are particularly beneficial for the many people who are not financially, physically or geographically able to obtain traditional education. Although there is an increase in the number of distance services to elementary and secondary students, the main audience for distance courses continues to be the adult and higher education market. Most recently, Kaplan College launched the nation's first online certificate program for security manager and crime scene technicians under their certificate program for homeland security (Terry, 2002, August 27).

Distance education has experienced dramatic growth both nationally and internationally since the early 1980s. It has evolved from early correspondence education using primarily print based materials into a worldwide movement using various technologies. The goals of distance education, as an alternative to traditional education, have been to offer degree granting programs, to battle illiteracy in developing countries, to provide training opportunities for economic growth, and to offer curriculum enrichment in non traditional educational settings. A variety of technologies have been used as delivery systems to facilitate this learning at a distance.

In order to understand how research and research issues have developed in distance education, it is necessary to understand the context of the field. Distance education relies heavily on communications technologies as delivery media. Print materials, broadcast radio, broadcast television, computer conferencing, electronic mail, interactive video, satellite telecommunications and multimedia computer technology are all used to promote student-teacher interaction and provide necessary feedback to the learner at a distance. Because technologies as delivery systems have been so crucial to the growth of distance education, research has reflected rather than driven practice. Early distance education research focused on media comparison studies, descriptive studies, and evaluation reports. Researchers have examined those issues that have been of particular interest to administrators of distance education programs such as; student attrition rates, the design of instructional materials for large scale distribution, the appropriateness of certain technologies for delivery of instruction, and the cost effectiveness of programs.

However, the growth of flexible learning, networked learning and distributed learning models, is blurring the distinctions between distance and traditional education. These models and their related network technologies also have the capability of creating new environments for learning such as "virtual communities." For more than 8 years students in traditional settings have been given entire courses on CD-ROM multimedia disks through which they have progressed at their own pace, interacting with the instructor and other students on electronic mail or face to face according to their needs (Technology Based Learning, 1994). These materials are now available using web-based multimedia technologies. In earlier collaborative projects, students around the world participated in cooperative learning activities sharing information using computer networks (Riel, 1993). In these cases, global classrooms often have participants from various countries interacting with each other at a distance. Many mediated educational activities have allowed students to participate in collaborative, authentic, situated learning activities (Brown, Collins, & Duguid, 1989; Brown & Palincsar, 1989). In fact, the explosion of information technologies has brought learners together by erasing the boundaries of time and place for both site based and distance learners.

Research in distance education reflects the rapid technological changes in this field. Although early research was centered around media comparison studies, recent distance education research has examined four main underlying research issues: learner needs, media and the instructional process, issues of access, and the changing roles of teachers and students (Sherry, 1996). Educators have become more interested in examining pedagogical themes and strategies for learning in mediated environments (Berge & Mrozowski, 2001; Collis, deBoer, Vander-Jeen, 2001; Salomon, Perkins, & Gloperson, 1991; Vrasidas & McIsaac, 1999) Knowledge construction and mediated learning offer some of the most promising research in distance education (Barrett, 1992; Glaser, 1992; Harasim, 2001; Salomon, 1993).

This chapter traces the history of the distance education movement, discusses the definitions and theoretical principles which have marked the development of the field and explores the research in this field which is inextricably tied to the technology of course delivery. A critical analysis of research in distance education was conducted for this chapter. Material for the analysis came from four primary data sources. The first source was an ERIC search, which resulted in over 900 entries. This largely North American review was supplemented with international studies located in the International Centre for Distance Learning (ICDL) database. The entries were then categorized according to content and source. Second, conference papers were reviewed which represented current, completed work in the field of distance education. Third, dissertations were obtained from universities that produced the majority of doctoral dissertations in Educational Technology doctoral programs. Finally, five journals were chosen for further examination because of their recurrent frequency in the ERIC listing. Those journals were *Open Learning, American Journal of Distance Education, International Review of Research in Open and Distance Learning*, *Distance Education,* and *Journal of Distance Education.*

14.2 HISTORY OF DISTANCE EDUCATION

Distance Education is not a new concept. In the late 1800s, at the University of Chicago, the first major correspondence program in the United States was established in which the teacher and learner were at different locations. Before that time, particularly in preindustrial Europe, education had been available

primarily to males in higher levels of society. The most effective form of instruction in those days was to bring students together in one place and one time to learn from one of the masters. That form of traditional education remains the model today. The early efforts of educators like William Rainey Harper in 1890 to establish alternatives were laughed at. Correspondence study, which was designed to provide educational opportunities for those who were not among the elite and who could not afford full time residence at an educational institution, was looked down on as inferior education. Many educators regarded correspondence courses as simply business operations. Correspondence education offended the elitist, and extremely undemocratic educational system that characterized the early years in this country (Pittman, 1991). Indeed, many correspondence courses were viewed as simply poor excuses for the real thing. However, the need to provide equal access to educational opportunities has always been part of our democratic ideals, so correspondence study took a new turn.

As radio developed during the First World War and television in the 1950s, instruction outside of the traditional classroom had suddenly found new delivery systems. There are many examples of how early radio and television were used in schools to deliver instruction at a distance. Wisconsin's School of the Air was an early effort, in the 1920s, to affirm that the boundaries of the school were the boundaries of the state. More recently, audio and computer teleconferencing have influenced the delivery of instruction in public schools, higher education, the military, business and industry. Following the establishment of the Open University in Britain in 1970, and Charles Wedemeyer's innovative uses of media in 1986 at the University of Wisconsin, correspondence study began to use developing technologies to provide more effective distance education. The United States was slow to enter the distance education marketplace, and when it did, a form of distance education unique to its needs evolved. Not having the economic problems of some countries nor the massive illiteracy problems of developing nations, the United States nevertheless had problems of economy of delivery. Teacher shortages in areas of science, math, and foreign language combined with state mandates to rural schools produced a climate, in the late 1980s, conducive to the rapid growth of commercial courses such as those offered via satellite by the TI-IN network in Texas, and Oklahoma State University. In the United States, fewer than 10 states were promoting distance education in 1987. A year later that number had grown to two-thirds of the states and by 1989 virtually all states were involved in distance learning programs. Perhaps the most important political document describing the state of distance education in the 1980s was the report done for Congress by the Office of Technology Assessment in 1989 called *Linking for Learning* (Office of Technology Assessment, 1989). The report gives an overview of distance learning, the role of teachers, and reports of local, state and federal projects. It describes the state of distance education programs throughout the United States in 1989, and highlights how technology was being used in the schools. Model state networks and telecommunication delivery systems are outlined with recommendations given for setting up local and wide area networks to link schools. Some projects, such as the Panhandle Shared Video Network and the Iowa Educational

Telecommunications Network, have served as examples of operating video networks which are both efficient and cost effective. The 1990s saw a rapid rise in the number of institutions wanting to offer network-based flexible learning through traditional programs. As they looked at the potential market and at the growth of online degree programs using a commercial portal, a conceptual battle began between the for-profit and non-profit providers. The success of joint business ventures capitalizing on the information needs of the educational community in the digital age will depend on how these partnerships are viewed by educational institutions, commercial courseware providers and the students themselves.

In the United States, national interest and federal involvement in virtual learning is reflected in the creation of The Bipartisan Web-based Education Commission by Congress in 1998, as part of the reauthorization of the Higher Education Act under Title VIII. Chaired by former Nebraska Senator J. Robert Kerrey and co-chaired by Georgia Congressman Johnny Isakson, the 16-member commission was charged with studying how the Internet can be used in education—from pre-kindergarten to job retraining—and what barriers may be slowing its spread." The Commission's report, titled "*The Power of the Internet for Learning*" (2000) urges the new administration and 107th Congress to make E-learning a center-piece of the nation's education policy. "The Internet is perhaps the most transformative technology in history, reshaping business, media, entertainment, and society in astonishing ways. But for all its power, it is just now being tapped to transform education. . . . There is no going back. The traditional classroom has been transformed" (Web-Based Education Commission, 2000, p. 1).

The House Education and Workforce Committee and the Subcommittee on 21st Century Competitiveness approved H.R. 1992, a bill to expand Internet learning opportunities in higher education. The "Internet Equity and Education Act of 2001" (2001) would repeal the rule that requires schools to provide at least 50 percent of their instruction in person, as well as the "12-hour" rule that requires students enrolled in classes that do not span a typical quarter or semester to spend at least 12 hours per week in class. The bill would allow students to use federal loans to pay for a college education delivered entirely over the Internet. This bill is the first step toward making the Web-based Education Commission's recommendations a reality. By allowing students to use federal loans to pay for on-line courses, H.R. 1992 will make the on-line option available to more students.

14.2.1 Defining Distance Education

In 1982, the International Council for Correspondence Education changed its name to the International Council for Distance Education to reflect the developments in the field. With the rapid growth of new technologies and the evolution of systems for delivering information, distance education with its ideals of providing equality of access to education, became a reality. Today there are distance education courses offered by dozens of public and private organizations and institutions to school districts, universities, the military and large corporations. Direct satellite broadcasts are produced by more than 20 of the

country's major universities to provide over 500 courses in engineering delivered live by satellite as part of the National Technological University (NTU). In the corporate sector, more than 40 billion dollars a year are spent by IBM, Kodak, and the Fortune 500 companies on distance education programs. Distance education is the broad term that includes distance learning, open learning, networked learning, flexible learning, distributed learning and learning in connected space. Definitions vary with the distance education culture of each country, but there is some agreement on the fundamentals. Distance learning is generally recognized as a structured learning experience that can be done away from an academic institution, at home or at a workplace. Distance education often offers programs leading, to degrees or credentials. Colleges and universities in the United States offer existing courses through distance learning programs as an alternative to traditional attendance. Educators in the United Kingdom describe their distance strategies as flexible or open learning. They were the first to develop an Open University on a large scale. Open learning is flexible, negotiated and suited to each person's needs. It is characterized by open entry–open exit courses, and the courses begin and end when the student is ready.

The rapid growth of networks, particularly the Internet and the World Wide Web, have spawned an interest in networked learning, sometimes referred to as learning in connected space or learning in the virtual classroom. This type of instruction may take place in traditional classrooms with web-enhanced features such as online syllabus, readings and assignments but with major portions of discussion and assessment done in the traditional classroom. Or the network may facilitate web-based instruction in which the entire course is online. Networked learning is particularly useful in providing information resources to remote geographic areas. It has vast implications for educating large populations of people who have an adequate technology infrastructure.

These distance education strategies may form hybrid combinations of distance and traditional education in the form of distributed learning, networked learning or flexible learning in which multiple intelligences are addressed through various modes of information retrieval. What, then, are the definitions of distance education? Desmond Keegan (1980) identified six key elements of distance education:

• Separation of teacher and learner
• Influence of an educational organization
• Use of media to link teacher and learner
• Two-way exchange of communication
• Learners as individuals rather than grouped
• Education as an industrialized form

Distance education has traditionally been defined as instruction through print or electronic communications media to persons engaged in planned learning in a place or time different from that of the instructor or instructors.

The traditional definition of distance education is slowly being changed as new technological developments challenge

educators to reconceptualize the idea of schooling and lifelong learning. At the same time, interest in the unlimited possibilities of individualized distance learning is growing with the development of each new communication technology. Although educational technologists agree that it is the systematic design of instruction which should drive the development of distance learning, the rapid development of computer related technologies has captured the interest of the public and has been responsible for much of the limelight in which distance educators currently find themselves. Asynchronous or time-delayed computer conferencing has shown the capability to network groups of learners over a period of time thereby challenging Keegan's 1980 definition that learners need to be taught as individuals rather than in groups.

Holmberg refined the definition by stating that

Distance education is a concept that covers the learning-teaching activities in the cognitive and/or psycho-motor and affective domains of an individual learner and a supporting organization. It is characterized by non-contiguous communication and can be carried out anywhere and at any time, which makes it attractive to adults with professional and social commitments. (Holmberg, 1989 p. 168)

We have taken the position that the most inclusive and currently workable definition of distance education comes from Garrison and Shale (1987) who include in their essential criteria for formulation of a distance education theory, the elements of *noncontiguous communication, two-way interactive communication,* and the *use of technology to mediate the necessary two-way communication.*

14.2.2 Distance Education as a Global Movement

Distance education has developed very differently in the United States from the way it has in the rest of the world. Current international issues regarding the development of distance learning will be discussed at greater length later in this chapter, but it is important to recognize here the importance that many countries have played in the history of distance education and its corollaries, distance and open learning.

The establishment of the British Open University in the United Kingdom in 1969 marked the beginning of the use of technology to supplement print based instruction through well designed courses. Learning materials were delivered on a large scale to students in three programs; undergraduates, postgraduates and associate students. Although course materials were primarily print based, they were supported by a variety of technologies. No formal educational qualifications have been required to be admitted to the British Open University. Courses are closely monitored and have been successfully delivered to over 100,000 students. As a direct result of its success, the Open University model has been adopted by many countries in both the developed and developing world (Keegan, 1986). Researchers in the United Kingdom continue to be leaders in identifying problems and proposing solutions for practitioners in the field (Harry, Keegan, & Magnus, 1993). The International Centre for Distance Learning, at the British Open University, maintains the most

complete holdings of literature in both research and practice of international distance learning. Research studies, evaluation reports, course modules, books, journal articles and ephemeral material concerning distance education around the world are all available through quarterly accessions lists or online.

In Europe and other Western countries, a global concern was beginning to emerge. In a 1992 report, the 12 members of the European Association of Distance Teaching Universities proposed a European Open University to begin that year. This was in direct response to the European Parliament, the Council of Europe, and the European Community (Bates, 1990). In this report, articles from authors in nine European countries describe the use of media and technology in higher education in Europe and reflect upon the need for providing unified educational access in the form of a European Open University to a culturally diverse population.

Since that time, telecommunication networks have grown to circle the globe, linking people from many nations together in novel and exciting ways. As the borders of our global community continue to shrink, we search for new ways to improve communication by providing greater access to information on an international scale. Emerging communication technologies, and telecommunications in particular, are providing highly cost effective solutions to the problems of sharing information and promoting global understanding between people. In today's electronic age, it is predicted that the amount of information produced will increase exponentially every year. Since economic and political power is directly related to access to information, many educators like Takeshi Utsumi, President of GLOSAS (Global Systems Analysis and Simulation) have worked to develop models of the "Global University" and the "Global Lecture Hall" which provide resources allowing less affluent countries to keep up with advances in global research and education (Utsumi, Rossman, & Rosen, 1990). International issues will be discussed in more detail later in this chapter, so let us turn our attention now to the issue of theory in distance education.

There have been a variety of efforts to identify theoretical foundations for the study of distance education. Thus far, there has been little agreement about which theoretical principles are common to the field and even less agreement on how to proceed in conducting programmatic research.

14.3 THEORY OF DISTANCE EDUCATION

Theories serve to satisfy a very human "need" to order the experienced world (Dubin, 1978). This order will reflect the principles, standards and ideals that will influence and shape practice. Theories can be derived from efforts to explain or make sense of observed phenomena, or by reasoning through the implications of existing theories. Theories are necessary because they help us to understand, communicate and predict the nature of a discipline or a field of practice, its purpose, goals, and methods. Theories help to shape practice, and practice in turn contributes to the development of theory.

One of the critical challenges the field of distance education has faced is the need for the continuous development of theory necessitated by the rapid changes brought about by the development of new communications technologies used as delivery media. Theorists are challenged to adapt theories to understand the learning environments created by new technological developments or to develop new theories to explain or make sense of these new and emerging technologies. Another challenge that has faced theory development is whether theorists should borrow theories from other disciplines to explain distance education or develop unique theories that describe the nature of the field.

Distance education has come of age and matured as a field of education developing theoretical constructs that describe its unique nature. It has moved beyond debates about defining the field to focus on the systematic development of theoretical constructs and models. In a seminal article addressing the theoretical challenges for distance education in the 21st century, Garrison (Garrison, 2000) observes that in "surveying the core theoretical contributions of the last three decades, we see evidence of a sound theoretical foundation." (p. 11). He notes however, that it is less obvious as to whether the current state of knowledge development is adequate to explain and shape new practices for a broad range of emerging educational purposes and experiences. Garrison argues that the 21st century represents the postindustrial era where transactional issues (i.e., teaching and learning) will predominate over structural constraints (i.e., geographical distance). He observes that distance education in the 20th century was primarily focused on distance constraints and approaches that bridged geographical distance by way of organizational strategies such as the mass production and delivery of learning packages. This period has been identified as the industrial era of distance education consistent with Otto Peter's (1971, 1983) description of the field as an industrial form of education.

Garrison notes that more recently the focus in the study of distance education has shifted to educational issues associated with the teaching–learning process, specifically concerns regarding real, sustained communication, as well as emerging communications technology to support sustained communication anytime, anywhere. Therefore, issues that involve the learner, the instructor, the technology, and the process of teaching and learning are becoming increasingly important. Because distance education has moved away from the industrialization of teaching to learner-centered instruction, distance educators must move ahead to investigate how the learner, the instructor and the technology collaborate to generate knowledge.

In order to understand the theoretical issues that face the field today, it is important to reflect on the development of theoretical constructs in the last century. Traditionally, both theoretical constructs and research studies in distance education have been considered in the context of an educational enterprise which was entirely separate from the standard, classroom-based, classical instructional model. In part to justify, and in part to explain the phenomenon, theoreticians like Holmberg, Keegan, and Rumble explored the underlying assumptions of what it is that makes distance education different from traditional education. With an early vision of what it meant to be a non-traditional learner, these pioneers in distance education defined the distance learner as one who is physically separated from the teacher (Rumble, 1986) has a planned and guided learning

experience (Holmberg, 1986), and participates in a two-way structured form of distance education which is distinct from the traditional form of classroom instruction (Keegan, 1988). In order to justify the importance of this nontraditional form of education, early theoretical approaches attempted to define the important and unique attributes of distance education.

Keegan (1986) identifies three historical approaches to the development of a theory of distance education. Theories of autonomy and independence from the 1960s and 1970s, argued by Wedemeyer (1977) and Moore (1973), reflect the essential component of the independence of the learner. Otto Peters' (1971) work on a theory of industrialization in the 1960s reflects the attempt to view the field of distance education as an industrialized form of teaching and learning. The third approach integrates theories of interaction and communication formulated by Bääth (1982), Sewart (1987), and Daniel & Marquis (1979). Keegan presents these three approaches to the study and development of the academic discipline of distance education. The focus at this time was on the concept of industrialized, open, and nontraditional learning.

14.3.1 Theoretical Developments

In this section we discuss the major theoretical developments and contributions that have influenced the field of distance education.

14.3.1.1 The Industrial Model of Distance Education.
One of the most influential theoretical developments of the 20th century was the industrial production model of distance education described by Otto Peters (1971, 1983). Otto Peters characterized distance education as a method of imparting knowledge, skills and attitudes which is rationalized by the application of division of labor and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. Distance education was therefore described as an industrialized form of teaching and learning. This model emphasizes instructional units as products which can be mass-produced and distributed like cars or washing machines. This view and definition emerged during the time when behaviorism was at its height of popularity, together with the related approaches of programmed instruction and instructional systems design (ISD). The use of highly specific performance objectives, characteristic of the ISD approach, is probably essential to the true mass production and administration of instructional packages.

This industrial approach had a major impact on distance education specifically in the development of Open Universities such as the British Open University. As Moore and Kearsley (1996) and Garrison (2000) have pointed out, Peters' theory was an organizational theory and not a theory of teaching, nor of learning. It was an organizational model that talked about organizing the educational process to realize economies of scale. Garrison (2000) observes that this industrial model placed in clear contrast the need to choose between independence and inter-

action, which generated a debate about the worth of each approach in implementing distance education. Daniel and Marquis (1979) in their discussion of the pros and cons of interaction versus independence, point out the impact of these two approaches on the costing of distance education systems, as interactive activities were much more expensive to fund because of the personnel required, than independent activities. Garrison (2000) declares that with the advent of computer-mediated communication (CMC) this debate was rendered useless as this medium made both independent and interactive activities possible.

In his more recent writing on the possibilities and opportunities afforded by digital environments for distance education, Peters (2000) remains a proponent of independent self-study even within a networked learning environment. He observes that the "digital environment will probably be the most efficacious 'enabler' of independent and self-determined learning" (p. 16). He believes that this approach is promising because it does not modify the traditional methods of presentational teaching and receptive learning, but provides a completely different fundamental challenge for learning.

14.3.1.2 Guided Didactic Conversation.
Borje Holmberg has been recognized as a prominent theorist in distance education for the substantial contributions he has made to the field. Central to Holmberg's (1989) theory of distance education is the concept of "guided didactic conversation" (p. 43), which refers to both real and simulated conversation. Holmberg (1991) emphasized simulated conversation, which is the interaction of individual students with texts and the conversational style in which preproduced correspondence texts are written. According to his theory of didactic conversation, which he developed while seeking an empathy approach to distance education (Homberg, 1991), course developers are responsible for creating simulated conversation in self-instructional materials. The role of the teacher is largely simulated by written dialogue and comments. Garrison (2000) questions whether an inert learning package, regardless of how well it is written, is a sufficient substitute for real communication with the teacher. Homberg's theory of guided didactic conversation while closely associated with the correspondence movement and the industrial organization of distance education, introduces an empathy approach focusing on the importance of discourse both real and simulated.

14.3.1.3 Independence and Autonomy.
Charles Wedemeyer, considered by many to be the father of American distance education, moved away from the concept of correspondence study and emphasized independent study or independent learning. Wedemeyer (1977, 1981) identifies essential elements of independent learning as greater student responsibility, widely available instruction, effective mix of media and methods, adaptation to individual differences, and a wide variety of start, stop and learn times. He focused on freedom and choice for the learner, on equity and access. His vision of independent study was consistent with self-directed learning and self-regulation, and his thinking was in line with principles of Humanism and Andragogy. Garrison (2000) observes that Wedemeyer's focus

on the pedagogoical assumptions of independent study was a shift from the world of correspondence study dominated by organizational and administrative concerns to an emphasis on educational issues concerning learning at a distance. He notes that Wedemeyer's work is surprisingly relevant to a new era of theory development.

14.3.1.4 *Transactional Distance.*

Moore's theory of "transactional distance" which became known since 1986 combines both Peter's perspective of distance education as a highly structured mechanical system and Wedemeyer's perspective of a more learner-centered, interactive relationship with a tutor (Moore & Kearsley, 1996). As Garrison (2000) has noted, it incorporates the structure of the industrial approach with the interaction of the transactional approach. The major contribution of the theory of transactional distance is that it defined distance not as a geographical phenomenon but as a pedagogical phenomenon. Moore's (1990) concept of "transactional distance" encompasses the distance, which, he says, exists in all educational relationships. This distance is determined by the amount of dialog which occurs between the learner and the instructor, and the amount of structure which exists in the design of the course. Greater transactional distance occurs when an educational program has more structure and less student-teacher dialogue, as might be found in some traditional distance education courses. Moore acknowledges that even face-to-face teaching environments have high transactional distance such as a class of 100 students offered in a large, auditorium-style classroom where there is little or no opportunity for the individual student to interact directly with the instructor. Education offers a continuum of transactions from less distant, where there is greater interaction and less structure, to more distant where there may be less interaction and more structure.

Moore's theory of transactional distance takes into account learner autonomy which is a personal characteristic, in varying degrees. The learner's capacity and desire to determine the course of his or her own learning, which may be called learner "autonomy" implies a corresponding decrease in the degree of instructor control over the process. Moore classifies programs according to the degree of autonomy they offer the learner in three areas: planning, implementation and evaluation of instruction. The highest degree of autonomy is found in programs that allow the learner to participate in all three aspects of instruction; the lowest degree of autonomy is offered by those programs in which instruction is planned, implemented, and evaluated entirely according to the dictates of the course designer(s) and/or instructor(s).

The theory of transactional distance blurs the distinctions between conventional and distance programs because of the variety of transactions which occur between teachers and learners in both settings. Thus distance is not determined by geography but by the relationship between dialog and structure with learner autonomy taken into account in varying degrees. It is also worthwhile to explore other types of distance that exist in an educational transaction that contributes to the distance of understandings and perceptions. These distances can be described as intellectual distance (i.e., the level of knowledge, prerequisite learning) social distance (affinity, closeness, support), and cultural distance (language, class, ethnicity, age, gender and religion).

Saba and Shearer (1994) carry the concept of transactional distance a step farther by proposing a system dynamics model to examine the relationship between dialog and structure in transactional distance. In their study, they used a system modeling program called STELLA, to model the relationship between dialogue and structure using distance students' exchanges with instructors. Saba and Shearer conclude that as learner control and dialog increase, transactional distance decreases. The more control the teacher has, the higher the level of structure and the greater the transactional distance in the learning experience. Saba and Shearer claim that their results support the validity of Moore's theory of transactional distance. This concept has implications for traditional classrooms as well as distant ones. The use of integrated telecommunication systems may permit a greater variety of transactions to occur, thus improving dialogue to minimize transactional distance.

14.3.1.5 *Control.*

Focusing their attention on the teaching and learning process in education at a distance, Garrison and Baynton (1987), Garrison (1989), and Baynton (1992) developed a model to explain the concept of "control" in an educational transaction. Control was defined as the opportunity and ability to influence the educational transaction, and was intended to develop a more comprehensive view of independence, a core element of distance education. Garrison and Baynton (1987) argued that the concept of independence, alone, does not account for, nor address adequately, the complexity of interacting variables present in the communication process that occurs in distance education. They proposed moving beyond the concept of independence to the concept of control to encompass more fully the interactive aspects of distance education, particularly the interaction between the teacher, learner, and other resources in the distance education context. Their model proposed that control of the learning process results from the combination of three essential dimensions: a learner's independence (the opportunity to make choices), a learner's proficiency or competence (ability, skill, and motivation), and support (both human and nonhuman resources). They argued that independence must be examined in relation to competence and support and that it is the dynamic balance among these three components that enables the student to develop and maintain control over the learning process. Therefore, it is pointless to give the learner independence in selecting learning objectives, activities and evaluation procedures if the learner does not have the competence or the necessary support to make use of that independence.

14.3.1.6 *Interaction.*

A theoretical construct of recent interest to distance educators, and one that has received much attention in the literature, is that of interaction. Garrison (1989), and Garrison and Shale (1990) in their definition of distance education explicitly place sustained real two-way communication at the core of the educational experience, regardless of the separation of teacher and student. This was a clear attempt to place the teaching and learning transaction at the core of distance

education practice and to break loose from the organizational assumptions of the industrial model. The concept of interaction is fundamental to the effectiveness of distance education programs as well as traditional ones.

Examining instructional interaction in distance education, Moore (1989) makes a distinction between three types of interaction: learner–content interaction, learner–instructor interaction, and learner–learner interaction. Learner–content interaction is the process of intellectually interacting with lesson content that results in changes in the learner's understanding, and perspective. This is similar to Holmberg's (1989) didactic conversation where learners interact with printed text. In multimedia web-based learning formats, learner–content interaction can be associated with "system interactivity." This is when the technical system may interact with learner inputs or interactions. Web pages that interact with students by changing their form and displaying new information in response to the position of the cursor or mouse clicks are one form of learner–content interaction.

Learner–instructor interaction is that component of Moore's (1989) model that provides motivation, feedback, and dialog between the teacher and student. This type of interaction is regarded as essential by many educators and highly desired by many learners. Moore states that the instructor is especially valuable in responding to the learners' application of new knowledge.

Learner–learner interaction is the exchange of information, ideas and dialog that occur between students about the course whether this happens in a structured or nonstructured manner. It is this type of interaction that will challenge our thinking and practice in the 21st century as we move to designing networked learning communities. Facilitating this type of interaction would contribute immensely to a learner-centered view of learning, and provide the opportunity for the social negotiation of meaning and construction of knowledge between learners connected to each other. Dinucci, Giudice, and Stiles (1998), and Dede (1992) have shown that newer three-dimensional (3D) virtual reality environments can carry learner–learner interaction into another level of reality. These systems offer graphic stand-ins called "avatars" which students can use to represent themselves online. An avatar can actually walk up to other students (or to their avatars) and exchange conversation, usually as text strings displayed in the window.

Hillman, Willis, and Gunawardena (1994) have taken Moore's (1989) concept of interaction a step farther and added a fourth component to the model, learner–interface interaction, necessitated by the addition of high technology communications systems to mediate the communication process. They note that the interaction between the learner and the technology that delivers instruction is a critical component of the model that has been missing thus far in the literature. They propose a new paradigm that includes understanding the use of the interface in all transactions. Learners who do not have the basic skills required to use the interface of a communication medium spend inordinate amounts of time learning to interact with the technology in order to be able to communicate with others or learn the lesson. Hillman et al. (1994) state that it is important to make a distinction between the perception of interface as an independent, fourth mode of interaction, and the use of an interface as a mediating element in all interaction. With the increasing use of the Web for distance education and training user-friendly interface design is becoming extremely important. Instructional designers must include learner–interface interactions which enable the learner to have successful interactions with the mediating technology.

Fulford and Zhang (1993) have shown us that the perception of interaction is as important as actual interaction. They examined learner perceptions of interaction in a course delivered via instructional television and found that the critical predictor of student satisfaction was not the extent of personal interaction but the perception of overall or vicarious interaction. If students perceived that there had been a high level of student interaction in the course, they were satisfied regardless of how much personal interaction they had. Based on these results they conclude that instructors teaching through interactive TV probably should be concerned with overall group dynamics than with engaging every individual equally, or with soliciting overt individual responses.

In discussing the nature and value of interaction in distance education, Kearsley (1995) argues that a distinction needs to be made between immediate (real time) and delayed (asynchronous) interaction. The distinction is significant because it determines the logistic and "feel" of the distance learning experience. Delayed interaction provides more student control and flexibility, while immediate interaction may have a sense of excitement and spontaneity that is not present with delayed interaction. Another factor that needs to be considered is that individual learners differ in their propensity for interaction depending upon their personality, age, or cognitive/learning styles. For example, students who are more self-directed or autonomous may want /need less interaction than others. Therefore, Kearsley argues that the concept of interaction as it applies to distance education is more complicated than traditional face to face contexts, as it needs to be differentiated according to content versus teacher versus student, immediate versus delayed, and types of learners.

14.3.1.7 Sociocultural Context.

The sociocultural context in which distance learning takes place is emerging as a significant area for theory building and research. Theorists are examining how the sociocultural environment affects motivation, attitudes, teaching and learning. Evans and Nation (1992) contribute some of the most thoughtful and insightful comments on theory building when they suggest that we examine broader social and historic contexts in our efforts to extend previously narrow views of theories in open and distance education. They urge us to move toward deconstruction of the instructional industrialism of distance education, and toward the construction of a critical approach which, combined with an integration of theories from the humanities and social sciences, can enrich the theory building in the field.

It is particularly important to examine the sociocultural context in distance learning environments where the communication process is mediated and where social climates are created

that are very different from traditional settings. Spears and Lea (1992) stress the importance of studying the social environment to understand computer-mediated communication. Feenberg and Bellman (1990) propose a social factor model to examine computer networking environments that create specialized electronic social environments for students and collaborators working in groups. Computer-mediated communication attempts to reduce patterns of discrimination by providing equality of social interaction among participants who may be anonymous in terms of gender, race and physical features. However, there is evidence that the social equality factor may not extend, for example, to participants who are not good writers but who must communicate primarily in a text-based format (Gunawardena, 1993).

There is a widespread notion that technology is culturally neutral, and can be easily used in a variety of settings. However media, materials and services are often inappropriately transferred without attention being paid to the social setting or to the local recipient culture (McIsaac, 1993). Technology-based learning activities are frequently used without attention to the impact on the local social environment.

14.3.1.8 Social Presence. One social factor that is particularly significant to distance education that has been studied previously by communication researchers, is social presence. Social presence is the degree to which a person feels "socially present" in a mediated situation or the degree to which a person is perceived as a "real person" in mediated communication. (Short, Williams, & Christie, 1976). Social presence is described as a construct that comprises a number of dimensions relating to the degree of interpersonal contact. Two concepts associated with social presence are Argyle and Dean's 1965 concept of "intimacy," and Wiener and Mehrabian's 1968 concept of "immediacy" (cited in Short et al., 1976). Short et al. suggest that the social presence of the communications medium contributes to the level of intimacy that depends on factors such as physical distance, eye contact, and smiling. Therefore, television rather than audio-only communication makes for greater intimacy, other things being equal, because of its ability to convey nonverbal cues such as eye contact and smiling. Text-based CMC, devoid of nonverbal codes that are generally rich in relational information occupies a relatively low position as a medium that is capable of generating intimacy. On the other hand, immediacy is a measure of the psychological distance, which a communicator puts between himself or herself and the object of his/her communication. A person can convey immediacy or non-immediacy nonverbally (physical proximity, formality of dress, and facial expression) as well as verbally. Immediacy enhances social presence. Therefore, according to Short et al.'s argument, social presence is both a factor of the medium, as well as that of the communicators and their presence in a sequence of interaction.

In the distance education context, several studies (Gunawardena & Zittle, 1997; Hackman & Walker, 1990; Jelfs & Whitelock, 2000; Rourke, Anderson, Garrison, & Archer, 1999; Tu & McIsaac, 2002) have examined social presence and its relationship to learner satisfaction and learner perception of learning.

These studies are discussed in more detail in the research section of this chapter. Discussing the role of social presence in online learning, McIsaac and Gunawardena (1996) and Tammelin (1998) observe that it can be linked to the larger social context including motivation, interaction, group cohesion, verbal and nonverbal communication, and social equality. Constructs such as social presence, immediacy and intimacy are social factors which deserve further inquiry as we move toward theoretical formulations related to community building in networked learning environments.

14.3.2 Theoretical Challenges

As Garrison (2000) has observed, the challenge facing distance education theorists in the 21st century is to provide an understanding of the opportunities and limitations of facilitating teaching and learning at a distance with a variety of methods and technologies. This will demand theories that reflect a collaborative approach to distance education (i.e., as opposed to independent learning) and have at their core an adaptive teaching and learning transaction. "This adaptability in designing the educational transaction based upon sustained communication and collaborative experiences reflects the essence of the postindustrial era of distance education" (p. 13). He adds that asynchronous text-based collaborative learning may well be the defining technology of this era that will challenge theorists to recognize that this form of communication may impact the facilitation of learning outcomes in different ways.

Many distance educators are beginning to call for a theoretical model based on constructivist epistemology (Jegede, 1991). Technological advances have already begun to blur the distinction between traditional and distance education settings. Time and place qualifiers are no longer unique. The need to test assumptions and hypotheses about how and under what conditions individuals learn best, leads to research questions about learning, teaching, course design and the role of technology in the educational process. As traditional education integrates the use of interactive, multimedia technologies to enhance individual learning, the role of the teacher changes from knowledge source to knowledge facilitator. As networks become available in schools and homes to encourage individuals to become their own knowledge navigators, the structure of education will change and the need for separate theories for distance education will blend into the theoretical foundations for the mainstream of education.

In an effort to theoretically define the field of distance education, Deshler and Hagen (1989) advocate a multidisciplinary and interdisciplinary approach resulting in a diversity of perspectives. They caution that anything short of this approach may "Produce theory that suffers from a view that is narrow, incomplete, discipline-based and restricted . . . to a predominant view of reality"(p. 163). Gibson (1993) calls for a broader conceptualization of distance education using an ecological systems perspective. She argues that "as distance educators we are not only interested in learning, but also in the interaction of those properties of the person and their multiple environments which

produce constancy and change in the characteristics of that person over time" (p. 86).

A strategy for theory development from an international perspective has been proposed by Sophason and Prescott (1988). They caution that certain lines of questioning are more appropriate in some countries than in others, thus the emanating theory "may have a particular slant" (p. 17). A comparative analysis strategy would undoubtedly be influenced by cultural bias and language barriers (Pratt, 1989). Pratt further indicates that understanding different culturally related beliefs about the nature of the individual and society may be critical in defining appropriate distance education theories. Pratt clarifies his belief through a description of how differences in societies' historical traditions and philosophies can contribute to differing orientations toward self-expression and social interactions within educational settings.

We believe that the theoretical challenges for distance education will center on issues related to learning and pedagogy in technology mediated learning environments. One such issue is understanding and evaluating knowledge construction in online collaborative learning communities. Increasingly we are subscribing to a knowledge construction view of learning as opposed to an information acquisition view, as we design web-based distance learning environments. The knowledge construction perspective views computer networks not as a channel for information distribution, but primarily as a new medium for construction of meaning, providing new ways for students to learn through negotiation and collaboration with a group of peers. The challenge however, is to develop theory to explain how new construction of knowledge occurs through the process of social negotiation in such a knowledge-building community.

A related area of theoretical challenge is to determine how the social dimension of an online learning environment influences learning. The online learning environment has been described as a sociotechnical system incorporating both technical and social aspects. Unique aspects such as the time-independent nature of an asynchronous environment can create communication anxiety, or the lack of visual cues in a text-based medium can give rise to the development of emoticons (icons that express emotion, such as ☺) to express feelings. This environment forces us to reformulate the way in which we view the social dimension and how learners actively influence each other's knowledge and reasoning processes through social networks.

With the expansion and acceptance of the Internet and the World Wide Web across the globe for education and training, the significance of culture and its impact on communication, and the teaching and learning process at a distance will provide an impetus for further research and theory building. If we design learner-centered learning environments, how do we build on the conceptual and cultural knowledge that learners bring with them? How does culture influence perception, cognition, communication, and the teaching–learning process in an online course? How do we as instructors engage in culturally responsive online teaching? These types of questions need to be addressed in research and in theoretical frameworks as we move toward making distance education a more equitable learning experience.

14.4 EVOLUTION OF DISTANCE EDUCATION MEDIA

As stated in Keegan's (1980), and more recent definitions of distance education, media plays a critical role in linking the teacher and learner and providing for the two-way exchange of communication that is so necessary for the teaching and learning process. Until the advent of telecommunications technologies, distance educators were hard pressed to provide for two-way real time interaction, or time-delayed interaction between students and the instructor or among peers. In the correspondence model of distance education, which emphasized learner independence, the main instructional medium was print and it was usually delivered using the postal service. Interaction between the student and the instructor usually took the form of correspondence of self-assessment exercises that the student completed and sent to the instructor for feedback. Formal group work or collaborative learning was very rare in distance education even though attempts have been made to facilitate group activities at local study centers. Also, traditionally, distance education courses were designed with a heavy emphasis on learner independence and were usually self-contained. With the development of synchronous (two-way, real time interactive technologies) such as audio teleconferencing, audiographics conferencing and videoconferencing it became possible to link learners and instructors who are geographically separated for real time interaction.

These technologies facilitated interaction between an instructor and a group of learners, or among learners. They are not very suitable for promoting collaborative learning among a group of learners over an extended period of time. Also, the synchronous nature of these technologies may not be suitable or convenient for many distance learners as it requires instantaneous responses when questions are asked, and often learners had to travel to a site to participate in an audio or video teleconference. The asynchronous (time-delayed) feature of computer-mediated communications (CMC), on the other hand, offers an advantage in that the CMC class is open 24 hours a day, 7 days a week to accommodate the time schedules of distance learners. Although CMC systems may be either synchronous (real-time), or asynchronous (time-delayed), it is asynchronous CMC, because of it's time independent feature that is an important medium for facilitating collaborative group work among distance learners.

Current developments in digital communications and the convergence of telecommunications technologies exemplified by international standards such as ISDN (Integrated Services Digital Network), make available audio, video, graphic and data communication through an ordinary telephone line on a desktop workstation. Therefore, as we look at distance learning technologies today and look to the future, it is important to think in terms of integrated telecommunication systems rather than simply video versus audio, versus data systems. More and more institutions that teach at a distance are moving toward multimedia systems integrating a combination of technologies both synchronous and asynchronous that meets learner needs. Therefore, while in the 1970s and 1980s many distance education

institutions throughout the world used print as a major delivery medium, by the year 2002 many institutions in the United States have adopted telecommunications-based systems for the delivery of distance education. This does not necessarily mean that print will no longer be used in distance education. It is still a very important medium as books, reading packets, study guides and even computer files are downloaded and used in printed format. However, in the future it is more likely that print will be used as a supplementary medium in most telecommunications-based systems, and better ways of communicating information through print will be investigated and incorporated into the design of study guides and other print-based media.

We have seen distance education evolve from highly individualized forms of instruction as in correspondence education, to formats that encourage teaching students as a group, to formats that facilitate extended dialogue and collaborative learning among peers. In this section we describe the advantages and limitations of various media that have been used in distance education. What is important to remember is that each medium whether it is low cost or high cost has advantages and limitations. It is critical to select media that is most appropriate for the task and compensate for a medium's weakness by using another medium. As we evolve to more multimedia and hybrid formats for distance education, we must also remember the importance of providing access to the learner using the medium or media that they can readily access.

14.4.1 Print

Until the beginning of the 1970s and the advent of two-way telecommunications technologies, print and the mail system were the predominant delivery medium for distance education. Correspondence study relied primarily on print to mediate the communication between the instructor and the learner. Currently many distance education institutions in developing countries use print based correspondence study as the main distance education medium as the use of communications technologies is often cost prohibitive. Garrison (1990) refers to print based correspondence study as the first generation of distance education technology. It is characterized by the mass production of educational materials that Peters (1983) describes as an industrial form of education. The difficulty with correspondence education has been the infrequent and inefficient form of communication between the instructor and the students. Further, it was difficult to arrange for peer interaction in correspondence based distance education. The development of broadcast technologies and two-way interactive media has mitigated the limitations of correspondence study, specially in relation to facilitating two-way communication. However, print remains a very important support medium for electronically delivered distance education. Printed study guides have become a very important component of electronic distance education.

In a survey of distance teaching institutions in the United States that use television as a main delivery medium, Gunawardena (1988) found that a majority of institutions cited the study guide which provides printed lesson materials and guidelines for studying, the most important form of support for distance learners. A study guide can steer and facilitate the study of correspondence texts, television programs, and other components in a distance education course. A study guide, if well designed, can provide the integration between various media components and activate students to read and or listen to presentations of various kinds, to compare and criticize them, and to try to come to conclusions of their own. In a study guide or correspondence text, simulated conversation can be brought about by the use of a conversational tone which Holmberg (1989) refers to as "guided didactic conversation." In addition, cognitive strategies such as advance organizers, mathemagenic devices such as directions and underlining, and self-assessment and self remediation exercises can be used to help students learn how to learn from printed material.

14.4.2 Broadcast Television and Radio

Broadcast television and radio can be used to instruct a vast number of students at the same time even though the students may not have the ability to call back and clarify a statement or ask a question in real time. Many distance education institutions in developing countries as well as institutions in developed countries such as the British Open University, use broadcast television and radio extensively to deliver programming to a large number of distant learners.

In the past two decades, television, both open-broadcast and cable and interactive instructional television (ITV) have been the most popular media for delivering distance education in the United States. Radio has remained an underutilized medium for distance education (Gunawardena, 1988). It is in the developing countries that radio programming has been used innovatively to either support and supplement print based materials or to carry the majority of the course content.

Bates (1984) observes that broadcasts are ephemeral, cannot be reviewed, are uninterruptible, and are presented at the same pace for all students. A student cannot reflect upon an idea or pursue a line of thought during a fast paced program, without losing the thread of the program itself. A student cannot go over the same material several times until it is understood. Access to a videotape of the broadcast, however, will alleviate these problems by giving the learner control over the medium with the ability to stop and rewind sections that were not clear.

Despite its ability to reach a large section of the student population, open-broadcast television has remained a one-way communication medium. To make the system interactive, open-broadcast distribution requires an added system to provide either an audio or audio-video return circuit. While many talk shows have utilized open-broadcast television and radio interactively with participants calling in from their home phones to interact with the talk show host, this application has hardly been utilized for distance education partly because of the difficulty of arranging for appropriate broadcast times.

14.4.3 Cable Television

In the United States, cable television began in remote rural areas, expanded into the suburbs, and has now penetrated into large

urban areas. Cable has evolved from a way of improving reception in rural areas to a technology that is capable of providing many television channels and even two-way video communication and high speed Internet access. Today, cable technology is readily available and reaches a large number of homes and apartment units in the United States.

Cable can be used to replay programming offered over open-broadcast television, usually at more convenient times for the students than open-broadcast schedules, or used as a means of delivering nationally distributed television programs, where terrestrial broadcasting facilities are not available.

14.4.4   Interactive Instructional Television

When State governments began to establish statewide distance education networks, interactive television became a popular medium. Interactive Instructional Television (ITV) systems usually use a combination of Instructional Television Fixed Service (ITFS) and point-to-point microwave. They can transmit either two-way video and two-way audio, or one-way video and two-way audio to several distant locations. The advantage of combining ITFS and microwave is that microwave is a point-to-point system while ITFS is a point-to-multipoint system. Therefore, large geographical areas can be covered by the combination of the two technologies. Microwave connects one location to another electronically with its point-to-point signals, while ITFS distributes that signal to several receiving stations around a 20-mile radius. In the United States, several states such as Iowa and Oklahoma support statewide networks that use a combination of ITFS, microwave, satellite, fiber optics, and coaxial cable.

14.4.5   Recorded Audio and Video Media

Both audiocassettes and videocassettes afford the learner control over the learning material because learners can stop, rewind, and fast forward the tape. Audiocassettes offer great flexibility in the way they can be used, either at home or while driving a car. Audiocassettes can be used to tape lectures or can be specially designed with clear stopping points in order to supplement print or video material. For example, audiocassettes can be used to describe diagrams and abstract concepts that students encounter in texts in order to facilitate student learning.

An audiocassette can be used to record the sound portion of a television program if a videocassette recorder is not available, and an audiocassette can provide a review of a television program in order to assist students to analyze the video material. They can also be used to provide feedback on student assignments and is a very useful medium to check student pronunciation when teaching languages at a distance. Audiocassettes can be an excellent supplementary medium to enrich print or other media and can provide resource material to distance learners. Since they can be produced and distributed without much cost, audiocassettes are also a very cost-effective medium for use in distance education.

Videocassettes are like broadcast television in that they combine moving pictures and sound but unlike broadcast television are distributed differently and viewed in different ways. An institution using videocassettes for distribution of video material to distant learners can use them as (a) a copy technology for open-broadcast, satellite, or cablecast programming; (b) a supplementary medium—for instance, providing the visual component for educational material carried over audio teleconferencing networks; (c) a specially designed video program that takes advantage of the cassette medium such as its stop/review functions, so that students can be directed at the end of sequences to stop and take notes on, or discuss, what they have seen and heard.

An important advantage in using videocassettes is that students can exercise "control" over the programming by using the stop, rewind, replay, and fast forward features to proceed at their own pace. Videocassettes are also a very flexible medium allowing students to use the cassettes at a time that is suitable to them. Bates (1987), observes that the "videocassette is to the broadcast what the book is to the lecture" (p. 13).

If videocassettes are designed to take advantage of their "control" characteristics and students are encouraged to use the "control" characteristics, then there is opportunity for students to interact with the lesson material. Students can repeat the material until they gain mastery of it by reflecting on and analyzing it. The control features that videocassettes afford the learner give course designers the ability to integrate video material more closely with other learning materials, so that learners can move between lesson material supplied by different media.

The ability to create "chunks" of learning material, or to edit and reconstruct video material, can help develop a more questioning approach to the presentation of video material. Recorded television therefore considerably increases the control of the learner (and the teacher) over the way video material can be used for learning purposes. (Bates, 1983, pp. 61–62)

Bates (1987) discusses the implications of the "control" characteristics for program design on videocassettes: (a) use of segments, (b) clear stopping points, (c) use of activities, (d) indexing, (e) close integration with other media (e.g., text, discussion), and (f) concentration on audiovisual aspects.

When videocassettes are used in a Tutored Video Instruction (TVI) program, where tutors attend video-playback sessions at work places or study centers to answer questions and to encourage student discussion, students can take advantage of the features of a lecture (on videocassette) and a small group discussion, which gives them the opportunity for personal interaction available in on-campus instruction.

14.4.6   Teleconferencing

Teleconferencing is a meeting through a telecommunications medium where participants who are separated by geographic distance can interact with each other simultaneously.

Teleconferencing can be classified into four separate categories depending on the technologies that they use: audio

teleconferencing, audiographics teleconferencing, video teleconferencing and computer conferencing. There are two types of computer conferencing systems: synchronous computer conferencing when two or more computers are linked at the same time so that participants can interact with each other, and asynchronous computer conferencing when participants interact with each other at a time and place convenient to them.

The four major types of teleconferencing vary in the types of technologies, complexity of use and cost. However, they have several features in common. All of them use a telecommunication channel to mediate the communication process, link individuals or groups of participants at multiple locations, and provide for live, two-way communication or interaction. One advantage of teleconferencing systems is that they can link a large number of people who are geographically separated. If satellite technology is used for the teleconference, then, there is no limit to the number of sites that can be linked through the combination of several communications satellites. In order to participate in a teleconference, participants usually have to assemble at a specific site in order to use the special equipment that is necessary for a group to participate in the conference. The only exceptions are audio teleconferences which can link up any individual who has access to a telephone, computer conferences that can link up individuals, their computers and modems at home, or direct broadcast satellites that can deliver information directly to participant's homes. However, if more than two people are present at a participating site then it is necessary for the participants to gather at a location which is equipped with teleconferencing equipment in order to participate in a teleconference. This may restrict access for some learners. In terms of control, participants will have control over the interaction that takes place in a teleconference only to the extent that the instructional design allows for it. However, if the teleconference is taped for later review, students will have more control in viewing the conference.

The unique advantage of teleconferences is that they provide for two-way interaction between the originators and the participants. Teleconferences need to be designed to optimize the interaction that takes place during the conference. Interaction needs to be thought of not only as interaction that occurs during the teleconference but pre- and post conference activities that allow groups to interact. Monson (1978) describes four design components for teleconferences: humanizing, participation, message style and feedback. Humanizing is the process of creating an atmosphere which focuses on the importance of the individual and overcomes distance by generating group rapport. Participation is the process of getting beyond the technology by providing opportunities for the spontaneous interaction between participants. Message style is presenting what is to be said in such a way that it will be received, understood and remembered. Feedback is the process of getting information about the message which helps the instructor and the participants complete the communications loop. Monson (1978) offers excellent guidelines for incorporating these four elements into teleconferencing design. The symbolic characteristics and the interfaces that are unique to each medium are discussed with the description of each technology.

14.4.6.1 Audio Teleconferencing. Audio teleconferencing or audio conferencing is voice-only communication. Even though it lacks a visual dimension, audio teleconferencing has some major strengths: it uses the regular telephone system which is readily available and a familiar technology, it can connect a large number of locations for a conference using an audiobridge, the conferences can be set up at short notice, and it is relatively inexpensive to use when compared with other technologies.

Olgren and Parker (1983) observe that one should keep in mind that voice communication is the backbone of any teleconferencing system with the exception of computer conferencing. Sophisticated video or graphics equipment can be added to any audio system. But, it is the audio channel that is the primary mode of communication. If the audio is of poor quality it will have a negative impact on users of even the most sophisticated graphics and video technologies. Audio teleconferences can be enhanced by adding a visual component to the conference by mailing or e-mailing ahead of time printed graphics, transparencies or a video cassette to be used during the conference. Each site must be equipped with a projection device and a VCR if such graphical or video support is used.

14.4.6.2 Audiographics Conferencing. While popular a decade ago, audiographics systems have been gradually replaced by compressed video systems. Audiographics used ordinary telephone lines for two-way voice communication and the transmission of graphics and written material. Audiographics add a visual element to audio teleconferencing while maintaining the flexibility and economy of using telephone lines. Audio teleconferencing is now combined with written, print, graphics and still or full motion video information. Most audiographics systems use two telephone lines, one for audio and one for the transmission of written, graphic and video information.

The simplest audiographics system was the addition of a fax machine using a second telephone line to an audio teleconference. As a result of developments in computer, digital and video compression technology, fairly sophisticated computer-based audiographics systems were available in the market. These systems combine voice, data, graphics, and digitized still video to create a powerful communications medium. The PC-based systems have specially designed communications software that control a scanner; graphics tablet, pen, keyboard, video camera, printer, and a modem.

One of the key advantages of an audiographics system is the ability to use the screen-sharing feature of the system. Participants at different sites can use different colored pens to create a graphic on the same screen at the same time. This feature enables the use of collaborative learning methods that involve learners at the remote locations.

14.4.6.3 Video Teleconferencing. Video teleconferencing systems transmit voice, graphics and images of people. They have the advantage of being able to show an image of the speaker, three dimensional objects, motion, and preproduced video footage. The teleconference can be designed to take advantage of the three symbolic characteristics of the medium: iconic, digital and analog, where the iconic or the visual

properties of the medium which is television's foremost strength can be manipulated to convey a very convincing message. Because of its ability to show the images of people, video teleconferences can create a "social presence" that closely approximates face-to-face interaction. Video teleconferencing systems are fully interactive systems that either allow for two-way video and audio, where the presenters and the audience can see and hear each other, or one-way video and two-way audio, where the audience sees and hears the presenter, and the presenter only hears the audience. During a video teleconference, audio, video and data signals are transmitted to distant sites using a single combined channel as in the use of a fiber optic line. Audio only feedback is most often transmitted over a dial-up telephone line. The transmission channel can be analog or digital; signals can be sent via satellite, microwave, fiber optics or coaxial cable or a combination of these delivery systems.

The term video teleconferencing has become popular as an ad hoc one-time, special event conference that usually connects a vast number of sites in order to make the conference cost effective. A video teleconference is usually distinguished from interactive Instructional Television (ITV) that is generally used to extend the campus classroom and carries programming for a significant length of time such as a semester. ITV may use the same transmission channels as a video teleconference, but is distinguished from video teleconferencing because of its different applications; video teleconferencing, an ad hoc conference, and ITV extending the classroom over a longer period of time.

Video teleconferences can be classified into two broad areas according to the technology used for transmission: full-motion video teleconferencing or compressed (or near-motion) video teleconferencing. Full-motion video teleconferencing uses the normal TV broadcast method or an analog video channel which requires a wideband channel to transmit pictures. The range of frequencies needed to reproduce a high quality motion TV signal is at least 4.2 million Hz (4.2 MHZ). The cost of a full-motion video teleconference is therefore extremely high. In the 1970s, conversion of the analog video signal to a digital bit stream enabled the first significant reductions in video signal bandwidth, making compressed video conferencing less cost prohibitive. Therefore, in compressed video, full video information is compressed by a piece of technology known as a Codec in order to send it down the narrower bandwidth of a special telephone line. The compressed video method is cheaper and more flexible than the TV broadcast method.

14.4.6.3.1   Full-Motion Video Teleconferencing.   This became popular with the advent of satellite technology. For the past decade educational developers have provided credit courses via satellite television. Video compression standards and the introduction of fiber optic cable infrastructure by many telephone and cable companies has made terrestrial line transmission of video much cheaper. There are, however, at least two reasons that satellite television will probably remain available and, in fact, increase in the foreseeable future. First, there are still many remote areas of the world, even in North America, where telephone service, if it exists at all, is supported by antiquated technology barely able to provide a usable audio or data signal, let alone carry video. These remote areas simply need to point a relatively inexpensive satellite dish, powered by solar panels, batteries, or generators, at the appropriate satellite to receive its signal. The new generation of Ku-band satellite is already offering direct broadcast service (DBS) to households.The proliferation of smaller, less expensive satellite television reception technology, along with the continued launching of new, higher powered satellites will insure a continuing niche for this technology to deliver instructional video and data to even the remotest areas of the world that lack other information infrastructure.

Fiber optics is gaining in popularity as a transmission medium for video teleconferencing. Fiber optics offers several advantages: it can carry a tremendous amount of data at high transmission speeds; it does not experience signal degradation over distance as does coaxial cable, and it is a multipurpose system which can transmit video, audio, data, and graphics into a school through a single cable. A single fiber optic cable can carry over a billion bits per second, enabling several video teleconferences to run simultaneously. Many companies, universities and States in the United States are building fiber optic transmission networks to carry voice, data and video.

Video teleconferencing can also use digital or analog microwave systems, or dial-up digital transmission lines. Current developments center on converging the different transmission channels and using a combination of telecommunications channels, satellite, fiber optic, microwave, coaxial cable to deliver full-motion video teleconferencing.

14.4.6.3.2   Compressed Video Teleconferencing.   Video compression techniques have greatly reduced the amount of data needed to describe a video picture and have enabled the video signal to be transmitted at a lower, and less expensive data rate. The device used to digitize and compress an analog video signal is called a video codec, short for COder/DEcoder which is the opposite of a modem (MOdulator/DEModulator). Reduction of transmission rate means trade-offs in picture quality. As the transmission rate is reduced, less data can be sent to describe picture changes. Lower data rates yield less resolution and less ability to handle motion. Therefore, if an image moves quickly, the motion will "streak" or "jerk" on the screen.

Currently most compressed video systems use either T-1 or half a T-1 channel. In a T-1 channel, video is compressed at 1.536 Mbps which is the digital equivalent of 24 voice-grade lines. Digital video compression technology has allowed video teleconferencing to become less cost-prohibitive. However, it is not as cost effective as audio teleconferencing.

14.4.6.3.3   Desktop Video Teleconferencing.   Integrated desktop video teleconferencing combining audio, video and data is becoming increasingly popular. This technology allows users to see each other, speak to each other, transfer application files and work together on such files at a distance. Most systems do not require advanced digital communications technologies such as ISDN to operate. For those wanting to utilize ISDN, it is possible to purchase an ISDN card while most systems are now being designed to work with telecommunications standards such as ISDN.

Education can use this technology as a method of presenting class material and forming work groups even though students may be at a considerable distance from each other. An instructor could conceivably present material to the entire class either "live" or through delivery of an audio file to each students electronic mail account. Students could then work together in real time if they wished to share information over telephone lines.

As more technologies begin to dovetail desktop videoconferencing becomes laptop videoconferencing. The use of cellular telephone technology combined with high speed laptop modems will make it possible for people to hold meetings and work group sessions whether they are at home, in an office or on the beach.

14.4.6.3.4 Integrated Services Digital Network (ISDN). ISDN is an international telecommunications standard that offers a future worldwide network capable of transmitting voice, data, video, and graphics in digital form over standard telephone lines or fiber optic cable. ISDN transmits media using digital rather than analog signals. In order to move toward a global network, ISDN promises end-to-end digital connectivity, multiple services over the same transmission path and standard interfaces or conversion facilities for ubiquitous or transparent user access. ISDN's applications for distance education include convergence, multitasking and shared communications.

14.5 CURRENT TECHNOLOGY FOR DISTANCE EDUCATION

The technologies discussed in the previous section; print, broadcast television and radio continue to deliver instruction for much of the distance education that is delivered around the world. All of the mega universities, those distance teaching institutions with over 100,000 students, rely heavily on print, television, radio and videocassettes. However, in many countries newer technologies have been integrated into distance delivery systems.

The field of distance education is in the midst of dynamic growth and change. The directions that distance education takes depend on each country's technology infrastructure, pedagogy, and goals for education. In many countries, the development of new media and computing technologies, the different methods of group learning and information gathering, and the development of government telecommunications policies have promoted the use of new technologies, particularly computer based media. Computer-supported learning has been the fastest growing component of distance education.

14.5.1 Computers and Learning

The development of cheaper and faster computers and the proliferation of computer applications to education have encouraged a growing interest in exploring ways that pedagogy, flexible learning, and knowledge building can be integrated using computer and network based technology. Computers are not new as technology, but they are rapidly evolving into new areas. Personal computers have long been used in education to run tutorials and teach students to use word processing, database management, and spreadsheets. Now, new interest in learner-centered pedagogies has led educators to discover ways that learners can be given strategies and tools to help them construct their own knowledge bases using networked computers. Not only learning, but teaching is affected by the use of computers. Teaching in technology based environments is shifting away from the acquisition model to the participation model (Collis, deBoer, van der Veen 2001). Teacher training models are directing teachers to become facilitators of learning rather than simply expert authorities. A number of tools have made this possible.

14.5.1.1 Laptop Computers. Personal computers have been the mainstay of electronic information appliances. They have been used to control incoming video over cable and fiber optic lines, handle both incoming and outgoing electronic mail over the Internet and even search globally for text, audio, graphic, and video files needed by the user. Children in many schools have discovered such computer-based uses by navigating the Internet to find files, downloading information from the networks and electronically copying and pasting reference material from network resources to their papers. They have discovered the ease of communicating with their peers around the world using their computers. Conexiones is one of many projects that provide laptops to children of migrant workers. This project models innovative approaches to using network communications and educational computer applications by leveraging technology to actively engage educators, students, and the community to educate traditionally under served minority students (http://conexiones.asu.edu/).

Laptops provide the portability to carry all files, papers, financial records, and any other text based materials on a small machine. New software is making communication, writing, publishing and learning easier and more portable. Laptops are being used in classrooms at all levels of education to access the Web, to communicate with others around the world, and to stay in touch with teachers and fellow students. Increasing numbers of schools and colleges are finding them useful.

14.5.1.2 Personal Digital Assistants (PDAs). Further miniaturization and the increased power of microprocessors have resulted in the widespread growth and use of personal digital assistants (PDAs). Each year these handheld microprocessors are produced with more memory and smaller physical size. The smallest versions of personal computers, personal digital assistants are used in many schools just as the early laptops were used, to communicate with others, to retrieve information, and to keep databases. As protocols are standardized so that PDAs can work with various computers, one's personal network becomes seamless and processors can control fax, copying, and telecommunications functions as well as environment and power utilization from a very small machine. As PDAs become more powerful, incorporating data storage devices that store the same amount of information as CD-ROMs in a smaller

space, it becomes possible to create even more useful personal computing tools. Forsyth County Day School in North Carolina is one of a number of schools mandating that all of its high school students purchase a Palm IIIc and portable keyboard. According to school officials, the PDA, at around $300. is more affordable than a computer and will allow students to organize homework assignments, take notes, make vocabulary cards, and take quizzes through the integrated use of technology. Effective summer 2001,UCLA School of Medicine required PDAs for two reasons: to "enable point of contact access to information resources; and to prepare students for practicing medicine in the 21st century" (UCLA, 2001).

Through wireless connectivity PDA manufacturers already offer Web and telephone access. With the profusion of microprocessor technology in offices, homes, cars and all forms of electronics, PDAs can become the ultimate remote control allowing people to access records on home or office computers and control functions of electronics in these locations using cellular phone technology.

14.5.1.3 CD-ROM. Computer-based instruction (CBI), developed in the 1980s, has expanded to include multimedia available on CD-ROM, allowing students greater access to large digital audio and video files on individual computers. CD-ROMs have replaced videocassettes in many settings where computers are used, and the proliferation of integrated multimedia systems with electronic networks allows the greater individualization of instruction envisioned by early CBI developers. An ever-increasing amount of text, graphic and even full motion video data is being recorded and distributed on CD-ROM. There is also a constantly expanding hardware base for CD-ROM drives built into computers. As digital video compression improves, CD-ROM and similar optical storage formats such as DVD are replacing videocasettes as the most popular media for distributing full motion video programming, films, and telecourses.

Current versions of CD-ROMs hold over 600 mb of digitized information. Most multimedia applications are CD-ROM-based since video, audio, and graphic files require enormous amounts of storage space. An example of a popular CD-ROM title is the Compton's Multimedia Encyclopedia that provides both the traditional text and still images along with animation and video. Essentially a hypermedia database, the encyclopedia allows random access to any of its material guided by the interests of the user.

An early example of how CD-ROMs have affected education was the creation of a graduate media design course developed by the College of Education at Arizona State University. With the help of a grant from the Intel Corporation, this course was redesigned and transferred to CD-ROM (Technology Based Learning, 1994).

There are currently nearly 10,000 CD-ROM titles listed in media directories. Although heralded as the wave of the future for years, CD-ROM was slow in developing as a technology while suffering a "chicken-or-the-egg" problem. CD-ROM titles grew slowly because there was only a small installed hardware base. Meanwhile many people were hesitant to buy CD-ROM drives until more titles were offered. Recently, however, the market has

begun to snowball as faster, less expensive drives are available in virtually all computers.

14.5.1.4 Course   Management   Tools. The earlier computer-managed instruction (CMI) has evolved into course management tools used on the Web. These tools have begun to shift the focus away from the presentation of content to the integration of student contributions, building communities of learners and constructing a community of knowledge using Web-based templates.

WebCT and Blackboard, are examples of course management tools. They offer a well developed structure for teachers who are unfamiliar with Web-based teaching, and they make putting courses online fairly easy.

But there are other course management tools such as Tele-TOP that are built around the central concept of a new, Web-based pedagogy (Collis et al. 2001). Course management tools such as these shift the focus from teacher presented to learner constructed materials and are leading the way toward truly collaborative communities of learning.

14.5.2 Computer-Mediated Communication (CMC)

CMC supports three types of online services: electronic mail (e-mail), computer conferencing, and online databases. These services are useful to educators in building learning communities around course content. E-mail among students and between student and instructor form the fundamental online form of communication. Online databases enhance students' abilities to retrieve information, construct their own knowledge bases, and contribute to the community. The computer conference, based on the use of networks, is the collaborative working environment in which learning takes place through discussion and exchange of ideas.

14.5.2.1 Electronic Networks. The past few years have produced an explosion of electronic information resources available to students, teachers, library patrons, and anyone with a computer. Millions of pages of graphics and text-based information can be accessed directly online through hundreds of public, private and commercial networks, including the biggest network of all: the Internet. The Internet is, in fact, a collection of independent academic, scientific, government and commercial networks providing electronic mail, and access to file servers with free software and millions of pages of text and graphic data that even thousands of elementary and secondary students are now using.

Students in developing countries with limited assets may have very little access to these technologies and thus fall further behind in terms of information infrastructure. On the other hand, new telecommunications avenues such as satellite telephone service are opening channels at reasonable cost to even the remotest areas of the world. One very encouraging sign from the Internet's rapidly developing history is not only the willingness, but the eagerness with which networkers share information and areas of expertise. Networks have the potential of providing a broad knowledge base to

citizens around the world, and will offer opportunities for expanded applications of distance education. Research is just beginning to indicate how these newer technologies can benefit learners. The most widespread use of electronic networks is the World Wide Web.

The World Wide Web project is a distributed hypermedia environment that originated at CERN with the collaboration of a large international design and development team. World Wide Web applications are Internet-based global hypermedia browsers that allow one to discover, retrieve, and display documents and data from all over the Internet. For example, using these interfaces, learners can search the databases in museums all over the world that are connected to the Internet by navigating in a hypermedia format. Browsing tools such as these help learners explore a huge and rapidly expanding universe of information and gives them the powerful new capabilities for interacting with information.

The Clinton–Gore administration developed the first comprehensive U.S. high-speed electronic network that extended the capabilities of Internet services to learners through an information superhighway. The plan, *The National Information Infrastructure: Agenda for Action* (U.S. Department of Commerce, 1993) had far-reaching effects on education by expanding access to information. Since that time, electronic networks have continued to expand. Today there are more than 105 million Internet users, and an increasing number each year comes from minority groups (Cyberatlas, 2002). Partially responsible for this growth in access are recent efforts to help schools acquire the hardware necessary to access the Internet.

The fiber optic infrastructure in the United States that provides the backbone of the NII has expanded through both public and commercial efforts. Fiber optics are capable of carrying much greater bandwidth technologies such as full motion video. These lines can provide two-way videoconferencing, online multimedia, and video programming on demand. Iowa was one of the early adopters and installed nearly 3000 miles of fiber optic cable linking 15 community colleges and three public universities with a 48-channel interactive video capability (Suwinski, 1993). The next wave of developments in electronic networks will center on applications designed for Internet II, a research-based high-speed network that will link higher education institutions in the United States and Overseas.

14.5.2.2 Wireless Networks.
Laptops with Airport connections and PDAs with wireless connectivity are the forerunners of greater satellite-based wireless tools. Although PDAs are used mainly for writing notes and keeping track of schedules, their growing value may be more in the order of complete wireless telecommunications devices.

Combined with the rapid proliferation of cellular telephone service in the United States, wireless technologies can free learners from the need to be tied to a particular hard-wired location to access information. Additionally, a consortium of major telecommunications, electronics, and aerospace companies has worked on global satellites to offer direct telephone service without the need for satellite dishes to literally any location on Earth. This could provide not only voice but direct data and fax access to anyone anywhere utilizing PDA technology. How viable this is for remote populations depends on the cost for this service, but the technology is in place. What we see in all of these technologies is that once separate devices are now merging to form information appliances that eventually will allow users to seamlessly communicate with each other, control home and office environments, and, most importantly of all, access most of the world's information whether in text, audio, or visual forms, at any place and any time.

14.5.2.3 Computer Conferencing.
Computer conferencing systems use computer-mediated communication (CMC) to support group and many-to-many communication. In these systems, messages are linked to form chains of communication and these messages are stored on the host computer until an individual logs on to read and reply to messages. Most conferencing systems offer a range of facilities for enhancing group communication and information retrieval. These include directories of users and conferences, conference management tools, search facilities, polling options, cooperative authoring, the ability to customize the system with special commands for particular groups, and access to databases. Recent developments in groupware, the design of software that facilitates group processes especially in the CMC environment will have a tremendous impact on facilitating group work between participants who are separated in time and place. Webcourse authoring tools such as WebCT and Blackboard provide a computer conferencing feature to enhance group dialogue. Computer conferencing is also available on stand alone systems such as WebBoard.

The key features of computer conferencing systems that have an impact on distance education are the ability to support many-to-many interactive communication, the asynchronous (time-independent), and place-independent features. It offers the flexibility of assembling groups at times and places convenient to participants. The disadvantage, however, is that since online groups depend on text-based communication, they lack the benefit of nonverbal cues that facilitates interaction in a face-to-face meeting. Levinson (1990) notes that research into education via computer conferencing must be sensitive to the ways in which subtle differences in the technology can impact the social educational environment. Harasim (1989, 2001) emphasizes the necessity to approach on-line education as a distinct and unique domain. "The group nature of computer conferencing may be the most fundamental or critical component underpinning theory-building and the design and implementation of on-line educational activities" (1989, p. 51). Gunawardena (1991, 1993) reviews research related to the essentially group or socially interactive nature of computer conferences focusing on factors that impact collaborative learning and group dynamics.

Computer conferencing provides an environment for collaborative learning and the social construction of knowledge. Researchers are using conferencing platforms to examine social presence, cognitive presence and interaction. Using the model of learning as socially situated, scholars are examining collaboration, knowledge construction and learner satisfaction in computer conferences (Gunawardena & Duphorne 2000). Research indicates that student satisfaction is strongly related

to the learner's perception of social presence (Gunawardena & Zittle, 1997). Garrison and colleagues (2001) suggest that cognitive presence, (critical, practical inquiry) is an essential part of a critical community of inquiry, and can be supported in a computer conference environment that models effective teaching and contains activities for encouraging social presence. Communities of practice are developing in computer-mediated environments using strategies based on distributed models of learning (Lea & Nicoll, 2002).

14.5.3   Virtual Reality

Virtual reality offers the promise of training future students in ways that currently are far too dangerous or expensive. Virtual reality combines the power of computer generated graphics with the computer's ability to monitor massive data inflows in real time to create an enclosed man/machine interactive feedback loop. VR participants wearing visors projecting the computer images react to what they see while sensors in the visor and body suit send information on position and the head and eye movement of the wearer. The computer changes the scene to follow the wearer and give the impression of actually moving within an artificial environment.

Medical students wearing a virtual reality visor and data suit can perform any operation on a computer generated patient and actually see the results of what they are doing. Pilots can practice maneuvers, as they do now in trainers but with far more realism. The U.S. Defense Department has already used primitive networked versions in their SIMNET training. This network was one of the first to connect and control training simulators in the U.S. and Europe so that hundreds of soldiers could practice armored maneuvers while the computer reacted to their judgments and allowed them to see each other's moves as if they were all together (Alluisi, 1991).

Beyond practical training needs, virtual reality can put students on a street in ancient Rome, floating inside of a molecule, or flying the length of our galaxy. Many scientists are now beginning to understand the power of visualization in understanding the raw data they receive. Virtual reality can be used by students and professionals alike to interpret and understand the universe.

Individuals interacting in a virtual world will undoubtedly create unanticipated communities and possibly even new and unique cultures. There are concerns, however. Dede (1992) warns that "the cultural consequences of technology-mediated physical social environments are mixed." While providing a wider range of human experience and knowledge bases, these environments can also be used for manipulation and to create misleading depictions of the world.

Recent investigations into student learning in virtual environments is examining whether students can use immersive Virtual Reality and other advanced technologies for learning complex tasks, and retain that learning longer than in traditional classrooms (Winn, 1997). Research has shown that learning in artificial environments allows students to learn in ways that are different from those that occur in the regular classroom, and virtual reality offers an alternative or supplemental tool for learning.

14.6   COURSE DESIGN AND COMMUNICATION

A number of research studies have been conducted around the issues of designing course material for distance education. A brief review of the literature reveals that the most frequently expressed concern in courses designed for distance learners has to do with providing the learner with adequate feedback (Howard, 1987; McCleary & Eagan, 1989). Learner feedback is listed as one of the five most important considerations in course design and instruction, and it is identified by Howard (1987) as the most significant component in his model for effective course design.

Other major issues that relate to course design are effective instructional design, selection of appropriate media based on instructional needs, basic evaluation, and programmatic research. There appears to be little reported systematic research in this area because of the time and costs involved in conducting such large scale projects. McCleary and Egan (1989) examined course design and found that their second and third courses received higher ratings as a result of improving three elements of course design, one of which was feedback. In a review of the research, Dwyer (1991) proposes the use of instructional consistency/congruency paradigms when designing distance education materials in order to pair content of material with level of learners' ability. Others suggest models combining cognitive complexity, intellectual activity and forms of instruction for integrating the use of technology in course delivery.

Although consideration is given in the literature to elements of course design such as interactivity, student support, media selection, instructional design issues and feedback, little research has been reported other than evaluative studies. Few are generalizable to global situations. Although course design is a primary component of large scale international distance education programs, little attention has been paid to the underlying social and cultural assumptions within which such instruction is designed. Critical theorists have examined how teaching materials and classroom practices reflect social assumptions of validity, authority and empowerment. Although the thread of critical theory has woven its way through the fabric of the literature in education, nowhere is it more important to examine educational assumptions underlying course design than in distance education.

Courses designed for distance delivery often cost thousands of dollars to produce and reach hundreds of thousands of students. Not only are hidden curricula in the classroom well documented, there is a growing body of evidence in the literature which critically analyzes the impact of social norms on the production of educational media. In their book, Ellsworth and Whatley (1990) examine the ways in which particular historical and social perspectives combine to produce images in educational media that serve the interests of a particular social and historical interpretation of values. Distance learning materials are designed to rely heavily on visual materials to maintain student interest. Film, video and still photography should no longer be viewed as neutral carriers of information. In a seminal book of readings Hlynka and Belland (1991) explore critical inquiry in the field of Educational Technology as a third paradigm,

equally as important as the qualitative and quantitative perspectives. This collection of essays encourages instructional designers to examine issues in educational media and technology using paradigms drawn from the humanities and social sciences, sociology and anthropology.

The examination of issues concerning the use of technology is especially important when designing courses for distance education. There are many factors that are particularly critical and need to be considered. In order to distinguish the characteristics of the communications technologies currently being used in distance education it is necessary to adopt a classification system, although any classification system may not remain current for very long with the constant development of new technologies.

14.6.1 Media and Course Design

Several classification models have been developed to describe the technologies used in distance education (Barker, Frisbie, & Patrick, 1989; Bates, 1991; Johansen, Martin, Mittman, & Saffo, 1991). In an early attempt to classify the media used in distance education, Bates (1993) noted that there should be two distinctions. The first is that it is important to make a distinction between "media" and "technology." Media are the forms of communication associated with particular ways of representing knowledge. Therefore, each medium has its own unique way of presenting knowledge, and organizing it that is reflected in particular formats or styles of presentation. Bates (1993) notes that in distance education, the most important four media are: text, audio, television, and computing. Each medium, however, can usually be carried by more than one technology. For example, the audio medium can be carried by audiocassettes, radio, and telephone, while the television medium can be carried by broadcasting, videocassettes, DVD, cable, satellite, fiber optics, ITFS and microwave. Therefore, a variety of different technologies may be used to deliver one medium. The second distinction is the one between primarily one-way and primarily two-way technologies. One way technologies such as radio and broadcast television, do not provide opportunities for interaction, while two-way technologies such as videoconferencing or interactive television, allow for interaction between learners and instructors and among learners themselves.

For the purpose of this chapter, we would like to expand on a definition adopted by Willen (1988) who noted that where distance teaching and learning is concerned, three characteristics have proved critical to the optimization of the study situation: (a) the ability of the medium to reach all learners, or provide access, (b) the flexibility of the medium; and (c) the two-way communication capability of the medium. We feel that it is necessary to expand these three characteristics to include three others: the symbolic characteristics of the medium, the social presence conveyed by the medium, and the human–machine interface for a particular technology. Whatever classification system is used to describe the technologies, we feel that six important characteristics need to be kept in mind in the adoption and use of these technologies for distance education:

1. Delivery and access—the way in which the technology distributes the learning material to distance learners and the location to which it is distributed: homes, places of work, or local study centers. Student access to technologies in order to participate in the learning process is an important consideration.

2. Control—the extent to which the learner has control over the medium (the extent to which the medium provides flexibility in allowing the students to use it at a time and place and in a manner which suits them best). For example, the advantage of using videocassettes over broadcast television is that students can exercise "control" over the programming by using the stop, rewind, replay, and fast forward features to proceed at their own pace. Videocassettes are also a very flexible medium allowing students to use the cassettes at a time that is suitable to them.

3. Interaction—the degree to which the technology permits interaction (two-way communication) between the teacher and the student, and among students. Technologies utilized for distance education can be classified as one-way transmission, or two-way interactive technologies. One-way transmission media include printed texts and materials, radio programs, open broadcast or cablecast television programs, audiocassettes and videocassettes. Technologies that permit two-way interaction can be classified as either synchronous (real time communication) or asynchronous (time-delayed communication) systems. Audio teleconferencing, audiographics teleconferencing, video teleconferencing, interactive television, and real-time computer chatting when two or more computers are linked so that participants can talk to each other at the same time, are synchronous technologies that permit real time two-way communication. Computer-Mediated Communications (CMC) including electronic mail (e-mail), bulletin boards, and computer conferencing when used in a time-delayed fashion are asynchronous technologies that permit two-way communication.

4. Symbolic (or audiovisual) characteristics of the medium. Salomon (1979) distinguishes between three kinds of symbol systems: iconic, digital, and analog. Iconic systems use pictorial representation; digital systems convey meaning by written language, musical notation, and mathematical symbols; and analog systems are made up of continuous elements which nevertheless have reorganized meaning and forms, such as voice quality, performed music, and dance. Television, or multimedia, for example, use all three coding systems to convey a message. Salomon (1979) observes that it is the symbol system that a medium embodies rather than its other characteristics that may relate more directly to cognition and learning. "A code can activate a skill, it can short-circuit it, or it can overtly supplant it" (Salomon, 1979 p.134).

5. The social presence created by the medium. Telecommunication systems, even two-way video and audio systems that permit the transmission of facial expressions and gestures, create social climates which are very different from the traditional classroom. Short et.al. (1976) define social presence as the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal

relationships . . . " (p. 65). This means the degree to which a person is perceived as a "real person" in mediated communication. Social presence can be conveyed both by the medium (video can convey a higher degree of social presence than audio) and by the people who are involved in using the medium for interaction (instructors who humanize the classroom climate may convey a higher degree of social presence than those who do not). Gunawardena and Zittle (1997) showed that social presence is an important predictor of learner satisfaction.

6. Human–machine interface for a particular technology that takes into consideration how the equipment interfaces with the end users. The learner must interact with the interface or the technological medium in order to interact with the content, instructor, and other learners. This may include an activity such as using a keyboard to interact with a web interface. With the rapid growth of new telecommunications technologies, ergonomics or the design of human–machine interfaces has become an important area of research and development within the broader area of research related to human factors. The kinds of interfaces the technology employs has implications for the kind of training or orientation that both teachers and students must receive in order to be competent users of the medium.

When selecting technologies for a distance learning program, or when designing instruction for distance learning, these six factors need to be kept in mind (see Fig. 14.1). They are not entities in and of themselves but interact with each other to make up the total environment in which a specific medium operates. The diagram below indicates this interaction.

The evolution of geographic space into cyberspace has profound implications for communication, instruction and the design of the instructional message. One recent trend in course design is the shift from a teacher-centered to a learner-centered paradigm based on constructivist and social constructivist learning principles. Using the features of networked learning technologies, designers are exploring how to build communities of inquiry to facilitate collaborative learning and knowledge construction in online learning designs. Current research on course design issues such as learner control, interaction and
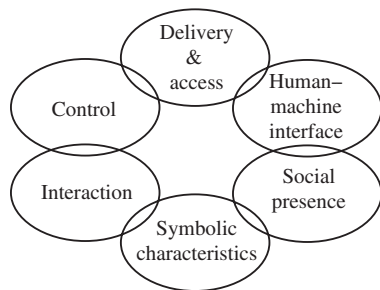

FIGURE 14.1. Factors impacting selection and use of distance education technologies.

social presence are discussed under the section (14.10) on Research in Distance Education.

14.6.2 Course Design and the International Market

Issues that examine course design in distance education cross geographic boundaries. Courses that are produced in North America are exported across the world. There is a widespread belief that Western technologies, particularly the computer, are culturally neutral and can be used to modernize traditional societies. When distance education programs are delivered to developing countries, cultural differences are often dealt with by simply translating the existing software, or by writing new software in the local language. What remains is still instruction based on a set of cultural assumptions emphasizing the view that Western technology and science represent the most advanced stage in cultural evolution. This rationalist, secularist and individualist philosophy remains at the tacit level and suggests that, for any country, true modernization relies on the scientific method and the adoption of culture-free technology. The imported technology boasts capabilities based on assumptions that are frequently in direct opposition to traditions and social practices in the local culture.

Critical theorists, and others, have engaged in the debate over obvious discrepancies between the ideal Western view of life and the reality of deteriorating social fabric, loss of traditional values, high crime and drug rates and other visible social ills. The Western view of modernization and progress has not been universally accepted as ideal. However by embracing new communication technologies, non-Western countries are buying into a new set of cultural assumptions. The danger is that this may occur at the cost of their own indigenous traditions.

UNESCO has argued that when urban, individualistic, images of life are part of the cultural agendas of Western media, people in developing countries will aspire to these to be modern. The long-term effects of technological innovations on cultural traditions have not yet been well documented. It may be, that in racing to embrace modernism and technological innovations, social and traditional patterns of life will be altered to the extent that local traditions may be irrevocably changed. The cultural values of individualism, secularism, and feminism are not all recognized as desirable in other cultures that place higher values on religion, group efforts and well defined gender roles (McIsaac, 1993). Course materials designed with a particular cultural bias embedded in the instruction may have a negative effect on learning.

Moral issues surrounding loss of local culture can result from wholesale importation of foreign values. At the minimum, educators engaged in technology transfer should analyze local social customs and consider those customs, whenever possible. Such social conventions as extended hospitality, differing perceptions of time and the perceived importance of the technology project can all affect the credibility of the program and, ultimately, its success (McIsaac & Koymen, 1988).

Course designers should first determine the underlying assumptions conveyed by the educational message being

designed. Designers should consider the social and political setting in which the lessons will be used. They should determine whether the instructional design model has implicit cultural and social bias. And finally tacit messages and hidden agendas should be examined and eliminated wherever possible so that course materials do not reflect particular ideological points of view. Distance education research in course design should include programs of social research that explore the effects of technological innovations on cultural traditions.

14.7 INSTRUCTION AND LEARNER SUPPORT

The issue of learner support has received wide attention in distance education. The research, however, has been varied and inconclusive. After examining one hundred seven articles to determine whether there were predictors of successful student support, Dillon and Blanchard (1991) conclude that the reported research was mixed. They propose a model to examine the support needs of the distance student, related to institutional characteristics, course content and the technology. In a study analyzing learner support services in a state-wide distance education system, Dillon, Gunawardena and Parker (1992) outline the function and effectiveness of one learner support system and make recommendations for examining student–program interactions. Feasley (1991) comments that although research on student support falls largely into the evaluation category, there are some very useful case studies and institutional surveys such as reports issued by FernUniversitat, National Home Study Council which summarize statistics about student services for a number of institutions. Wright (1991) comments that the largest number of studies related to student support have been conducted outside the United States with large distance education programs. The student support activities reported are preenrollment activities, tutorial services, and counseling and advising services.

In addition to student support, several ethical and administrative issues related to students are repeated in the literature as well. The mediation of technology coupled with the distance between instructor and student poses questions related to admission, counseling and retention. Reed and Sork (1990) provide evidence that admission criteria and intake systems should take into account the unique demands of the adult learner (i.e., motivation, anxiety, interactions and learning style). Nelson (1988) states that admission requirements should consider the effects of the individual's cognitive styles as these often affect student achievement in programs characterized by mediated communications and limited personal contact.

Combined with the institutions' responsibilities related to admissions procedures is the responsibility of counseling students into and out of programs where the learner and advisor are physically separated (Reed & Sork, 1990). Herein two issues arise. First, the nearly impossible task of understanding the life situation of the learner when distance and time interfere with communication, makes counseling a difficult task at best. Second, the monetary requirements of the distance education institution and the well-being of the student who may or may not be advised into a distance education environment must be considered. Reed and Sork (1990) observe that students counseled out of distance education represent a loss of revenue. Counseling in a traditional setting requires expertise in a number of psychological and academic areas. However, counseling from a distance is a highly complex process which calls for a variety of methods, materials, and a knowledge of adult learner characteristics (Verduin & Clark, 1991). The literature has offered various profiles of the distance education student. Counseling professionals should review the research on student needs and develop new methodologies for assisting students at a distance. Additional research is called for in all areas of student interaction with the learning environment.

14.7.1 Learning and Characteristics of Learners

The study of learning and characteristics of learners engages the largest number of researchers and includes studies of learning styles, attitudes, personality, locus of control, motivation, and attrition. Included are general studies about cognition and metacognition as well as specific studies related to the particular needs of the distance learner. Many studies have been single group evaluations, few with randomization of subjects or programmatic investigations. Some exploratory research has involved a small number of participants in short interventions. Although these efforts yield interesting insights, they have not helped solve the problem of isolating and testing variables which might predict academic success. Often, experimental studies use thin descriptions and do not provide deep contextual information. Similarly, descriptive studies often lack generalizability and are not qualitatively rich.

Research reports that do appear in the literature are often inconclusive. Reports in the literature suggest that some combination of cognitive style, personality characteristics, and self-expectations can be predictors of success in distance education programs. It appears that those students who are most successful in distance learning situations tend to be independent, autonomous learners who prefer to control their own learning situations.

Characteristics besides independence which appears to be predictors of success are high self-expectations and self-confidence (Laube, 1992), academic accomplishment (Coggins, 1988; Dille & Mezack, 1991) and external locus of control (Baynton, 1992). Another motivation which reportedly influences academic persistence is the desire to improve employment possibilities (von Prummer, 1990). Research findings suggest that it is the combination of personal (such as learning style), environmental and social factors which must be taken into account when predicting academic success in distance learning programs.

Verduin and Clark (1991) examined learning styles within the distance education setting and reviewed the research done on learning styles by Canfield in 1983. Canfield developed a learning style inventory that conceptualized learning styles as composed of preferred conditions, content, mode and expectancy scores. Verduin and Clark (1991) believe this information can be helpful to educators in planning courses for students who will receive the instruction from a distance. They indicate that

an understanding of how individual learners approach learning may make it possible for the distance educator to see a pattern of learning styles and plan or adjust course presentations accordingly. They conclude by saying that adults may or may not learn more easily when the style of presentation matches the students learning style, but when the two do match, the students report being more satisfied with the course.

Perhaps the most interesting work in cognition appears outside the traditional confines of the distance education literature. Research that examines the interaction of learners and delivery media is currently being conducted with multimedia. These studies examine learning and problem solving in asynchronous, virtual environments in which the learner is encouraged to progress and interact with learning materials in a very individual way. In the Jasper experiment, for example, math problems are anchored in authentic real world situations portrayed on videodisc (Van Haneghan et.al., 1992). It was hypothesized that the attributes of videodisc, which allow the portrayal of rich audio and visual images of a problem situation, would enhance the problem solving abilities of learners. Research results showed significant gains for the video-based group over the text based group, not only in solving the original Jasper problems, but in identifying and solving similar and related problems. The rich video-based format context was found to simulate a real world context for problem solving (Van Haneghan et al., 1992). In a similar vein, the Young Children's literacy project uses a Vygotsky scaffolding approach to support the construction of mental model building skills for listening and storytelling (Cognition and Technology Group at Vanderbilt, 1991). Programs like Jasper and the Young Children's literacy project provide robust sensory environments for developing metacognitive strategies and participating in critical thinking. These cognitive approaches to teaching abstract thinking skills have found fertile ground in the design and development of multimedia programs.

Individualized instruction delivered in multimedia settings has begun to blur the distinction between distance education and traditional education. The use of computer technologies to enhance thinking has generated interest in all areas of the curriculum. Researchers are examining ways to decontextualize classroom learning by anchoring and situating problems to be solved as real life events (Brown, Collins, & Duguid, 1989). Collaborative interactions between learner and technology have caused cognitive psychologists to reexamine the effects of computer technology on intellectual performance. Salomon, Perkins, and Globerson (1991) call on educators to investigate the learning activities which new technologies promote. They argue that it is this collaborative cognitive processing between intelligent technology and learner that may have the potential for affecting human intellectual performance.

The authors make the distinction between effects *with* technology in which the learner enters into a partnership where the technology assumes part of the intellectual burden of processing information (calculator), and effects *of* technology and related transfer of skills. The former role of technology is what has been referred to by Pea (1993) as distributed cognition. The distributed model of cognition has its roots in the cultural-historical tradition and is reflected in the work of Luria (1979) and Vygotsky (1978). This view of the distribution of cognition from a cultural-historical perspective maintains that learning is not an individual process but is part of a larger activity which involves the teacher, pupil and cultural artifacts of the classroom. Knowledge does not reside with an individual alone but is distributed among the tools and artifacts of the culture. The technologies of today have created graphic interfaces which offer symbiotic and virtual environments distributed between human and machine.

One example of such a symbiotic environment is a computer conference network called The WELL. It is a "virtual community" where people meet, converse and socialize. This "digital watering hole for information-age hunters and gatherers" has developed into a unique social and communication phenomenon (Rheingold, 1993). It functions as cafe, beauty shop, town square, pub, lecture hall, library. In short it is network of communications in cyberspace; a true virtual community. The social and cultural ramifications of this type of community which functions in cognitive and social space rather than geographic space has vast implications for research in distance education.

These new learning environments are distance learning settings and they prompt researchers to ask further questions. How do these environments enhance cognitive activities? Which personal learning style factors are important to consider in designing interactive materials for effective instruction? Can we predict which program elements are likely to enhance student learning? Current research on the distance learner is discussed under the section (14.10.3.1) on Research in Distance Education.

14.8   ISSUES RELATED TO TEACHING

Studies that examine teaching in distance education address the developing role of the instructor, the need for decreasing resistance as traditional educators begin to use distance delivery systems and finally, faculty attitude toward the use of technology. Altered roles for faculty who teach in distance education settings is a common thread found throughout the literature. Sammons (1989) saw a need for definition of the role of teacher. He stresses that without this definition, prepackaged, mass distribution of education will result. Holmberg's (1989) theory of guided didactic conversation suggests that a relationship exists between the faculty's role in the conversation and student performance. Smith's (1991) qualitative study places students' involvement at the center of the foundation for distance education teaching activities. The extent to which faculty roles are modified by the distance education environment is related to how the technology is used (Dillon & Walsh, 1992). Some educators express concern that the use of packaged television courses creates negative consequences for mediated instruction. Sammons (1989) notes that the teaching role is an interactive, social process and questions whether presenting a telecourse or mass producing learning material for presentation at a distance is teaching. Peters (1983) lends an organizational perspective in his comparison of distance teaching to an industrial

enterprise. He reports on the mass production of learning materials, mechanization, automation, quality control and other operational activities. According to Peters, the teacher need not teach in a personal, face-to-face mode, but rather should provide cost-effective instruction which can reach large numbers of students.

The emergence of increasingly student-centered learning activities of the 1970s, facilitated by technology in the 1980s, contributed to an evolution of the role of faculty in the 1990s (Beaudoin, 1990). In particular, the increase in distance education enrollment will profoundly impact faculty members' instructional roles. Rather than transmit information in person, many faculty have to make the adjustment to monitoring and facilitating the work of geographically distant learners (Bates, 1991). Faculty accustomed to the more conventional teaching roles are required to accommodate new skills and assume expanding roles (Kember & Murphy, 1990).

This role shift from the European model of teacher as the exclusive source of information to one of facilitator is a difficult and threatening situation for most teachers. The role of teacher is not becoming obsolete but instead is being transformed (Beaudoin, 1990). Educators, and in particular those in distance educational environments, must be proficient at both delivery of content and the operation of the technology. Beaudoin goes on to point out that the teacher's role in the 1990s is becoming one of facilitator and bridge between student and the learning source (i.e., computer, television).

With new technologies being capable of delivering instruction, teachers are entering into a partnership with the technology. Garrison (1989) notes that while the teacher must be aware of the external aspects of learning, those related to the technology, it is the internal cognitive aspects of the learning experience that remain in the hands of the teacher. Ramsden (1988) sees the role of the distance education instructor as including the challenge of dialogue and interaction. "Machines," Ramsden says, "transmit information as if it were an unquestionable truth" (1988, p. 52). The teacher's role, which must include dialogue, is to challenge the seemingly unquestionable truths and to elicit meaning for the student.

Dillon and Walsh (1992) see a lack of research focus on the role adaptations of faculty, and they recommend future research on this topic. In their review of literature, Dillon and Walsh (1992) found only 24 of 225 articles on faculty roles. Research by Garrison (1990) indicated that educators are resistant to adaptation and to introduction of technology into previously designed classes. The literature suggests that faculty attitudes improve as experience with distance education increases, and as faculty become more familiar with the technology. Taylor and White (1991) support this idea in their findings of positive attitudes from faculty who have completed the first distance education class, but their study also indicates a faculty preference for face-to-face traditional teaching. The reason most often cited in their qualitative study is lack of student interaction. Additionally Taylor and White (1991) found through interviews and surveys that faculty agree that distance teaching is not appropriate for all content areas or for all students. In a recent study of faculty participation in distance education, Wolcott (2003) points out that although faculty participation has been an issue of interest among distance education administrators, research has been sparse over the past two decades. Studies have focused on mostly obstacles to participation and incentives to participate. She points out that from a research perspective, there has been less interest in faculty motivation.

There is a lack of training opportunity in distance education, which could help faculty to overcome anxieties about technology and might improve teacher attitudes. Most teacher inservice programs that deal with technology teach how to operate equipment, with little attention paid to the more important aspects of how to incorporate technology into instruction. Virtually none address the concept and practice of distance education as a unique enterprise with different techniques of instruction from the traditional classroom.

In addition to conducting research on the emerging roles of faculty involved in distance education activities, studies are needed to examine faculty attitudes. Many teachers have a natural concern that technology will replace them in the classroom. It is important, says Hawkridge (1991), for teachers in training to be stimulated to a positive attitude toward technology as a means of enhancing the quality of the human interaction, and not to see technology as a dehumanizing influence. Hawkridge is joined by current researchers who call for future study in the area of instructor role development. As technology becomes a means for future educational delivery, a new view of the profession of teaching may need to be developed.

14.9 POLICY AND MANAGEMENT

State and national policies on the use of telecommunication technologies for distance education have been slow to develop in the United States. Many other countries have had well-developed national plans for the implementation of distance education delivery systems over large geographic areas. Countries in which education is centralized at the national level are often those with the largest distance education enterprises. Countries in Asia, the Middle East, Latin America, and Europe that have national policies for the development of distance education often use communication infrastructures which are already in place to deliver massive programs over broadcast media (McIsaac, Murphy, & Demiray, 1988).

In the United States, the most significant early study to be done on a large scale was Linking for Learning (Office of Technology Assessment, 1989). This report was the first to examine national and state telecommunication initiatives, and make recommendations for a plan of action, based on needs of state and local schools. Because distance education in the United States is not supported by a central educational authority as in other countries, development of national and state policy has been slow. Key policy issues that have received attention include: funding, equal access to high quality education, effectiveness of educational systems, licensing of distance education programs, and equal access to delivery systems (Dirr, 1991). Donaldson (1991) called for application of organization theory to issues of management and administration in distance education. Simonson & Bauck (2003) and Dirr (2003) discuss recent trends in distance education policy and management.

Most recently, distance educators have been concerned about quality assurance and setting policies that assure quality both from the standpoint of students and faculty. The Pew Symposium in Learning and Technology produced a seminal report on issues surrounding policy formulation and quality assurance from the perspectives of institutions and agencies (Twigg, 2001). Another report, prepared for the Canadian Association for Community Education, established quality guidelines for online training and education in Canada (Barker, 2001). In 2000, the Web-based Education Commission focused their attention on policy issues that would help educators use the Web to transform learning. Policies were drafted for technology trends, pedagogy, access and equity, technology costs, teacher training and support, regulatory barriers, standards and assessment, accreditation and certification, intellectual property protection, online privacy and research and development (*http://www.hpcnet.org/wbec/issues*). The commission continues to collect data and examine research to better understand how the Web can best be used for learning.

It seems evident that research has been conducted from many perspectives and in many disciplines. As the body of research studies grows, methods such as meta-analysis can help us analyze the growing body of information. Meta-analysis, the application of qualitative and quantitative procedures for the purpose of integrating, synthesizing and analyzing various studies, would be particularly useful (McIsaac, 1990). Sophason and Prescott, (1988), believe that single studies cannot expect to provide definitive answers to theoretical questions. Instead a method such as meta-analysis is needed to identify underlying trends and principles emerging from the research.

14.10 RESEARCH IN DISTANCE EDUCATION

This section provides an overview of early research studies in distance education, explores issues related to the development of research in the field, and discusses current trends in distance education research.

14.10.1 Early Research Studies

Much of the early research in distance education since the 1960s has focused on comparisons between delivery media such as television, video, or computer and traditional face-to-face teaching. Other research compared the effectiveness of one distance delivery medium over another. Most of these media comparison studies found no significant differences (NSD) in learning (Boswell, Mocker, & Hamlin, 1968; Chu & Schramm, 1967; Chute, Bruning, & Hulick, 1984; Hoyt & Frye, 1972; Kruh, 1983; Whittington, 1987). Critiquing these early media comparison studies, Spenser (1991) points out that they tended to report comparative statistics which gave no indication of the size of differences, if any, between the types of instruction. Conclusions tended to be based on the presence or absence of a statistically significant result. "When groups of research were reviewed there was a tendency to use a 'box score' tally approach,

frequently resulting in a small number of studies favoring the innovation, a similar number favoring the traditional approach, and the vast majority showing NSD" (p. 13). Problems associated with research design and methods in these early comparison studies are discussed at length by Lockee, Burton, and Cross (1999), Smith and Dillon (1999), and Saba (2000).

Whatever methods have been used to report the results of media comparison studies and their instructional impact, these studies have yielded very little useful guidance for distance education practice. This prompted Clark (1984) to make the following observation: "Learning gains come from adequate instructional design theory and practice, not from the medium used to deliver instruction" (p. 3). Although Clark's statement has been debated (Kozma, 1994), educational technologists agree that the quality of the instructional design has a significant impact on learning. Winn (1990) suggests that the technology chosen for instruction may not affect the eventual achievement outcome but "it greatly affects the efficiency with which instruction can be delivered" (p. 53). Distance education developers, worldwide, face the challenge of selecting the most efficient medium for delivery of instruction. Wagner (1990) believes that as technologies become more complex (i.e., interactive television, computer-based instruction, and teleconferencing), the need to be more accountable and effective when selecting and utilizing instructional delivery systems becomes increasingly more important.

It is time, therefore, to move away from media comparison studies that often yield no significant differences, and begin to examine factors such as instructional design, learning and instructional theory, and theoretical frameworks in distance education, which when applied to learning, might account for significant differences in levels of performance. The questions that need to be asked are not which medium works best, but rather how best to incorporate media attributes into the design of effective instruction for learning. Studies which compare two different instructional designs using the same medium may yield more useful results for practice than simple media comparisons. Little research has been done to examine what happens in the learning process when students interact with various technologies.

Early research literature in distance education was brief and inconclusive. Both quantitative and qualitative studies have generally lacked rigor. Suen and Stevens (1993) identified several common problems associated with the analysis of data in quantitative distance education research. Driven by practice, much research has taken the form of program evaluation, descriptions of individual distance education programs, brief case studies, institutional surveys, and speculative reports. Although well reported case studies offer valuable insights for further investigation, the early literature in distance education lacked rich qualitative information or programmatic experimental research which would lead to testing of research hypotheses. Many studies were reported in journals that were not peer reviewed. A number of research reports were generated by governmental agencies and institutions responsible for large scale distance delivery programs. These were often proprietary and not readily available.

14.10.2   Issues in Research

One significant issue in early research studies in distance education is the lack of a sound theoretical foundation. This reflected an emerging field where theoreticians spent their energy trying to define the field and advance constructs that described its unique nature. Shale (1990) commented that research within the field is not productive because the field has limited itself to studies of past and present practice that look at "distance" as the significant concept. He calls for an examination of broader issues in education which look at the educational transaction mediated by communication technologies. Coldeway (1990) notes that researchers in the field have not tested the various theories which have been advanced, and hypotheses have not been identified for experimental research. Saba (2000) points out that most comparative research in distance education lacks a discussion of theoretical foundations of the field. He observes:

Research questions are rarely posed within a theoretical framework or based on its fundamental concepts and constructs. Although research within a theoretical framework is not a requirement for inductive inquiry, a post facto theoretical discussion of research results would be helpful in making studies relevant to the work of other researchers, and possibly even to the practitioners in the field. Comparative researchers, however, have shown little or no interest in the theoretical literature of the field either before or after conducting their studies. (pp. 2–3)

This view is echoed by Perraton (2000), who declares that "an examination of existing research literature confirms that much of it suffers from an apparently atheoretical approach" (p. 4). He emphasizes that research in open and distance learning needs to be grounded in theory, and that there are often benefits in drawing theory from outside narrow educational confines, and that research will suffer unless this is done. Dillon and Aagaard (1990) supported this stance of borrowing from other fields in their response to Gibson's (1990) argument on the perils of borrowing. While they agree that distance education could use further definition as a field, they also believe that the process is an evolutionary one that proceeds as we try out theories from other disciplines and then either accept them as applicable or discard them as unusable in the context of distance education. They argue that it is only after research indicates that we must discard existing theories that we truly will be able to define distance education as a unique applied field of endeavor. Dillon and Aagaard (1990) point out that the very nature of an applied field such as distance education demands reliance upon an interdisciplinary approach to research. With the rapid spread of online learning into many disciplines, we will increasingly observe an interdisciplinary approach to research in distance education. Model studies, often exploratory, are appearing across disciplines where researchers are examining the interaction of learners with the new online media.

Berge and Mrozowski (2001) in their review of distance education research in four major journals in the United States, Australia, Canada, and the United Kingdom and Dissertation Abstracts International covering the period between 1990 and 1999 observe that pedagogical themes such as design issues, learner characteristics, and strategies for active learning and increased interactivity, dominate the research and appear to be increasing. Research in the areas of equity and accessibility, operational issues, and policy and management issues is less common. In reviewing the research methodologies used in the articles and dissertations, they note that 75 percent used descriptive methods, 12 percent used case studies, 7 percent used correlational methods, and 6 percent used experimental methods. However, they point out several limitations in the methodology used for this review. One of the drawbacks was the categorization of articles and dissertations only by what seemed to be the main research methodology used. This may have resulted in placing publications in inappropriate categories. From their review, Berge and Mrozowski (2001) identify the following gaps in what is being researched:

- Research has tended to emphasize student outcomes for courses rather than for an entire academic program.
- Research does not adequately explain dropout rates.
- Research focuses mostly on the impact of individual technologies rather than on the interaction of multiple technologies.
- Research does not adequately address the effectiveness of digital libraries.

In Perraton's (2000) discussion of issues in research in open and distance learning from a European perspective, he observes that in a review of literature conducted before launching of the International Research Foundation for Open Learning, they found that most research fell under five headings: (1) description, (2) audience studies, (3) cost-effectiveness studies, (4) methodology (methodologies used to teach and support distance students), and (5) social context. He critiques many of these studies for their lack of a theoretical base and for their lack of understanding about the distance education "context." He states that research on the context of open and distance learning, considering its purposes, outcomes, and relevance to major educational problems, has been relatively neglected as contrasted with research on its application. It is findings about the context of distance education that are particularly significant for policy makers.

14.10.3   Current Trends in Distance Education Research

Saba (2000) observes that in the past ten years, a few researchers have conducted rigorous studies that are based on theoretical foundations of the field, or theories of fields closely related to distance education. Among them he cites Fulford and Zhang's (1993), and Sherry, Fulford, and Zhang's (1998) studies on learner perception of interaction, Gunawardena's (1995), and Gunawardena and Zittle's (1997) studies on the implications of social presence theory for community building in computer conferencing, Tsui and Ki's (1996) study on social factors affecting computer mediated communication at the University of Hong Kong, McDonald and Gibson's (1998) study on group development in asynchronous computer conferencing, and Chen

and Willits' (1999) study of interaction in a synchronous video-conferencing environment. Saba (2000) observes that a common theme in these and other distance education research in the past 10 years is the concept of "interaction," which indicates its centrality in conceptualizing the process of teaching and learning. Further, he states that these studies are paradigmatic because their discussion of interaction transcends the idea of distance in its physical sense, and embraces the discussion of teaching and learning in general.

Recent trends in distance education research indicate a preponderance of studies focused on understanding pedagogical issues in the CMC environment. Some of these studies are being conducted outside the field of distance education such as in communication and management and bring an interdisciplinary perspective to the research questions addressed. What is of significance is that new methods are being explored for understanding interaction and the learning process, specifically collaborative learning in CMC using interaction analysis, content analysis, conversational analysis, and discourse analysis; research techniques made possible by the availability of computer transcripts of online discussions. Rourke et al. (2001) in a comprehensive analysis of several studies discuss the potential and the methodological challenges of analyzing computer conference transcripts using quantitative content analysis. (See Chapter by Joan Mazur for a detailed discussion of conversation analysis.)

Another emerging trend is the attempt made by distance education researchers to understand the social and cultural contexts of distance learning. Recent psychological theories are challenging the view that the social and the cognitive can be studied independently, arguing that the social context in which cognitive activity takes place is an integral part of that activity, not just the surrounding connect for it (Resnick, 1991.) These views are exemplified in discussions on the relationship of affect and cognition from a neurobiological perspective in which emotion is seen as an integral attribute of cognition (Adolphs & Damasio 2001; Davidson 2002), socially shared cognition (Resnick, 1991), socioconstructivism, which emphasizes the importance of social processes in individual knowledge building (Vygotsky 1978; Teasley, S., & Roschelle, J.,1993), and sociocultural perspectives which describe learning from a cultural point of view. By stressing the interdependence of social and individual processes in the coconstruction of knowledge, sociocultural approaches view semiotic tools or cultural amplifiers as personal and social resources, and hence, mediating the link between the social and the individual construction of meaning (Vygotsky, 1978).

Lave (1991) extends the interdependence of social and individual processes in the coconstruction of knowledge further by stating that we need to rethink the notion of learning, treating it as an emerging property of whole persons' legitimate peripheral participation in communities of practice. Such a view sees mind, culture, history, and the social world as interrelated processes that constitute each other, and intentionally blurs social scientists' divisions among component parts of persons, their activities, and the world. As the Internet spreads rapidly to many parts of the world we will increasingly see learners from diverse social and cultural contexts in online courses. Therefore,

understanding the sociocultural context of learning will be an important challenge for future research.

In the following section we discuss some of the major trends we have observed in distance education research during the past 10 years and point out avenues for future research. Research has focused on the distance learner, and pedagogical and design issues associated with learning and satisfaction such as interaction, the social dynamic, and social presence. It is also evident that research is beginning to examine the sociocultural context of distance learning and address factors that influence interaction, group dynamics and community building in the online environment. Research has begun to address the complexity of distance education through systems modeling techniques and there is a recent trend toward rethinking and redesigning experimental and quasi-experimental comparative studies to yield more useful results.

14.10.3.1 The Distance Learner.
Perhaps one of the earliest theory based research studies on the distance learner was the study conducted by Baynton (1992) to test the theoretical model developed by Garrison and Baynton (1987), and refined by Garrison (1989), to explain the learner's sense of "control" in an educational transaction. The model proposed that control of the learning process results from the combination of three essential dimensions: a learner's independence (the opportunity to make choices), a learner's proficiency or competence (ability, skill, and motivation), and support (both human and nonhuman resources). Baynton's factor analysis (1992) confirms the significance of these three factors and suggests other factors which may affect the concept of control and which should be examined to accurately portray the complex interaction between teacher and learner in the distance learning setting.

A comprehensive collection of research and thinking on distance learners in higher education was published in a book edited by Chere Campbell Gibson in 1998. Research addressed by the chapter authors included improving learning outcomes, academic self-concept, gender and culture, roles and responsibilities in learning in a networked world, learner support, and understanding the distance learner in context. Based on her dissertation research, Olgren (1998) discusses three factors that have a major impact on learning: (1) cognitive learning strategies for processing information, (2) metacognitive activities for planning and self-regulation, and (3) the learner's goals and motivations. Research suggests that academic self-concept plays an important role in persistence in distance education and that this aspect of general self-concept is a dynamic and situational attribute of the distance learner, and one that is amenable to intervention (Gibson 1998). Sanchez and Gunawardena (1998) in their development of a profile of learning style preferences for the Hispanic adult learner in their study population based on nine instruments, show learner preferences for motivational maintenance level, task engagement level, and cognitive processing level. Burge (1998) discusses gender-related differences in distance education. Recent research and issues related to the distance learner are discussed by Gibson (2003) and Dillon and Greene (2003).

A review of research related to learner characteristics and CMC variables published in refereed distance education

journals revealed the emergence of studies analyzing learner experiences with computer conferencing: learner perspectives (Burge, 1994; Eastmond, 1994); critical thinking (Bullen, 1998); group dynamics (McDonald & Gibson, 1998); equity of access (Ross, Crane, & Robertson 1995); computer self-efficacy (Lim, 2001), and practice-based reflection (Naidu, 1997). Of these, three studies (Bullen, 1998; Burge, 1994; Eastmond, 1994) investigated the relationship between learner characteristics and the unique aspects of the online environment. Burge (1994) explored the salient features of the CMC environment and the effects of these features on learning from the learners' perspective. Bullen (1998) noted that the factors most frequently identified by students as either facilitating or inhibiting their participation and critical thinking in online discussions were those related to the attributes of computer conferencing technology, described by Harasim (1990) as time-independence, text-based communication, computer-mediated communication, and many-to-many communication.

Employing grounded theory, and the constant comparative model for qualitative research (Glaser & Strauss, 1967), Eastmond (1994) examined adult students' experience of learning in an online course. Then, using data from various dimensions of the study, Eastmond (1994) developed the Adult Distance Study Through Computer Conferencing (ADSCC) model as a framework from which to understand the dynamics of successful learning by computer conferencing. Surrounding the model is the context within which the computer conference is held and the larger institutional and societal milieu that influences the distance learning experience. Within this context there are three major aspects which sequentially influence the student's study experience:

1. Readiness—the personal and environmental factors that prepare the student for study in this instructional situation
2. Online features—the unique elements that make up the computer conferencing environment
3. Learning approaches—the general and specific learning strategies a student uses to make the conference an effective learning experience.

Eastmond notes that the educational institution can positively impact readiness, online features, and learning approaches. The individual also can improve each dimension iteratively as the person uses new knowledge about learning approaches or online features to enhance readiness or elements of the online environment. Gunawardena and Duphorne (2000) tested the ADSCC model which Eastmond developed using grounded theory principles by employing a quantitative approach to data analysis.

The purpose of the Gunawardena and Duphorne (2000) study was to determine if the three variables in the Eastmond (1994) ADSCC model, learner readiness, online features, and CMC-related learning approaches, are (i) related to learner satisfaction, (ii) intercorrelated, and (iii) able to predict learner satisfaction with an academic computer conference. The study was based on the inter-university "GlobalEd" computer conference that provided a forum for graduate students in distance education to share and discuss research, and experience

distance education by using CMC. All three variables showed a positive relationship to learner satisfaction. The strongest positive correlation was found between online features and learner satisfaction. The variable, online features, was also the best predictor of learner satisfaction. This has implications for designing computer conferences where attention must be paid to orienting adult learners to the unique elements that make up the computer conferencing environment. This includes the design of both the technical aspects and the social environment of an academic computer conference.

14.10.3.2 Interaction and Learning. The issue of "interaction" has been an area of much debate in the practice of distance education. Often debated questions are: What type and level of interaction is essential for effective learning? Does interaction facilitate learning and transfer? How does synchronous (real-time) and asynchronous (time-delayed) interaction contribute to learning? Is interaction more important for certain types of learners? Should patterns of interaction change over time when designing a distance education course? Is it worth the cost? Computer-mediated communication (CMC) has led to the emergence of networked learning communities, or "cybercommunities" bound by areas of interest, transcending time and space (Jones, 1995, 1997). It is the ability to facilitate communities of inquiry to engage in higher order thinking in many disciplines that is one of the most important contributions of this medium for online learning. Many of the studies on interaction have tried to examine the "interaction" that occurs in such collaborative learning environments using methods such as content analysis and interaction analysis of computer transcripts.

Henri (1992) makes a significant contribution to understanding the relationship between interaction and learning by proposing an analytical framework for assessing the learning process through the facilitation of interaction in a collaborative computer conferencing environment. She proposes a system of content analysis which involves breaking messages down into units of meaning and classifying these units according to their content. The model consists of five dimensions of the learning process: participation, interaction, social, cognitive and the metacognitive. This framework has informed studies of collaborative learning (Hara, Bonk, & Angeli, 2000; McDonald & Gibson, 1998; Newman, Webb, & Cochrane, 1995). Garrison (2000) has noted that Henri's real contribution is that it is a collaborative view of teaching and learning that provides a potential structure for coding CMC messages to study the nature and quality of the discourse.

Utilizing Henri's (1992) model as a starting point, Gunawardena, Lowe, and Anderson (1997) began to address questions related to the process and type of learning that occurred in an online professional development conference conducted as a debate across international time lines They used interaction analysis (Jordan & Henderson, 1995) of the computer transcript as their method. They were interested in examining the relationship of interaction to learning evident in the following two questions:

1. Was knowledge constructed within the group by means of the exchanges among participants? And

2. Did individual participants change their understanding or create new personal constructions of knowledge as a result of interactions within the group?

In using Henri's (1992) model as a framework of analysis to address these two questions, Gunawardena et al. (1997) found that Henri's definition of the concept of interaction was unsuited for the interactions that occur in a computer conferencing environment. They, therefore, proceeded to define interaction within the CMC environment and develop a framework of interaction analysis that would be more appropriate for analyzing the debate transcript. Gunawardena et al. (1997) believed that the metaphor of a patchwork quilt better describes the process of shared construction of knowledge that occurs in a constructivist learning environment. The process by which the contributions are fitted together is interaction, broadly understood, and the pattern that emerges at the end, when the entire gestalt of accumulated interaction is viewed, is the newly-created knowledge or meaning. They defined interaction as the essential process of putting together the pieces in the cocreation of knowledge.

Based on this new definition of interaction, the debate was analyzed for the (1) type of cognitive activity performed by participants (questioning, clarifying, negotiating, synthesizing, etc.), (2) types of arguments advanced throughout the debate, (3) resources brought in by participants for use in exploring their differences and negotiating new meanings, and (4) evidence of changes in understanding or the creation of new personal constructions of knowledge as a result of interactions within the group.

Their development of an interaction analysis model (Gunawardena et al., 1997) is based on social constructivist theory to examine the negotiation of meaning that occurred in the online conference. They described the model in phases, as they saw the group move from sharing and comparing of information (Phase I), through cognitive dissonance (Phase II), to negotiation of meaning (Phase III), the testing and modification of the proposed coconstruction (Phase IV), and to the application of the newly constructed meaning (Phase V). In applying the model to the analysis of the debate they note that the debate format influenced the process of coconstruction by sometimes supporting and sometimes hindering the efforts made by participants to reach a synthesis.

The efficacy of the Gunawardena et al. (1997) interaction analysis model was tested in other studies. Kanuka and Anderson (1998) analyzed a professional development forum with this model and found that the majority of learning occurred at the lower phases of the interaction analysis model (Phase I and II). The model was applied to a study at the Monterrey Technology Institute's Virtual University in Mexico by Lopez-Islas and his research team (2001). An interesting observation they made is that the phases of cognitive dissonance, and the testing and modification of the proposed coconstruction were almost absent in the conferences as the Latin culture does not favor the open expression of disagreements, and therefore, there is no need to extensively test and modify group proposals. Jeong (2001) applied the Gunawardena et al. (1997) model and developed a model of 12 critical thinking event categories, while Reschke (2001) applied the model and developed the Degree of Synthesis Model.

Another interaction analysis model that has been developed for understanding learning in computer-mediated environments is Garrison, Anderson, and Archer's (2001) model that describes the nature and quality of critical discourse in a computer conference. Utilizing content analysis techniques, they suggest that cognitive presence (i.e., critical, practical inquiry) can be created and supported in a computer conference environment with appropriate teaching and social presence. Cognitive presence is defined as the extent to which learners are able to construct and validate meaning through sustained reflection and discourse in a critical community of inquiry. Cognitive presence reflects higher-order knowledge acquisition and application and is associated with critical thinking. Garrison et al. (2001) note that this practical inquiry model is consistent with the one developed by Gunawardena et al. (1997).

These interaction analysis models, an emerging area of research in distance education, present a means to evaluate the process of learning through the analysis of computer discussions. However, there are issues that need to be addressed in relation to interaction analysis or content analysis methods. Issues related to validity and reliability of the findings were addressed by Rourke et al. (2001). The need to triangulate findings with other data gathering methods such as interviews, surveys and journals is evident. As Hara et al. (2000) point out each computer conference will have its own unique attributes and researchers may have to design electronic discussion group analysis criteria on a case by case basis. For instance, a problem solving activity online will require different types of skills from a debate, or using the medium for sharing of information. While detailed analyses of computer transcripts fall within the realm of research and are very time consuming, a practitioner with relevant skills should be able to analyze small segments of computer discussions (for example, a two-week discussion) to determine the process of learning.

14.10.3.3 Social Dynamic.
With the growing interest in facilitating collaborative learning in the online environment, distance education research is beginning to address the social dynamic that underlies learning and satisfaction. Recent studies have tried to examine the relationship of cognitive and social processes (Cecez-Kecmanovic & Webb, 2000; Kanuka & Anderson, 1998; Kumpulainen & Mutanen, 2000; Nolla, 2001; Wegerif, 1998). Kanuka and Anderson (1998) in their study showed that social discord served as a catalyst to the knowledge construction process observed. Kumpulainen and Mutanen (2000) introduce an analytical framework of peer group interaction that can be modified to apply to different studies of peer group interaction and learning. On the one hand, it can be used to highlight the dynamics between social and individual learning, and on the other hand to investigate how cognitive and social aspects of learning interrelate and interact in synergistic ways. Based on the results of their study, Vrasidas and McIsaac (1999) reconceptualize interaction as a theoretical construct and emphasize the importance of socially constructed meanings from the participants' perspectives.

Nolla (2001) in her dissertation research used content analysis techniques to investigate the social nature of online learning and its relationship to cognitive learning, and found that: (1) Equilibrium can exist between socioemotional-affective

areas such as encouraging, supporting, and praising, and task areas; (2) in a positive, encouraging environment, participants are willing to give opinions more than they are requested to; (3) moderators had a prevalent role in maintaining the social environment of the conferences, thus, facilitating information exchange and providing the shared space essential for collaborative group work; and that (4) social interaction is linked to academic discussions and therefore, to separate them for analysis is artificial. She concludes that instructors should consider providing the opportunities and the environment for the identified social interaction categories to occur within a flexible course framework and that future research should focus on the impact different moderating styles have on student participation.

Wegerif (1998) used ethnographic research methods to investigate an online course offered by the British Open University and concluded that collaborative learning was central to feelings of success or failure on the course and that social factors were critical to collaborative learning. Those who felt that they had gained most from the course moved from feeling like outsiders to feeling like insiders. Those who dropped out or felt that they had failed to learn as much as they might were those who felt that they had remained outsiders unable to cross the threshold to insider status. The findings of the study point to several factors which can move students from being outsiders to becoming insiders, including features of the course design, the role of moderators, the interaction styles of course participants and features of the technological medium used. McDonald and Gibson's (1998) study of interpersonal dynamics and group development in computer conferencing found that there is a definite pattern to interpersonal issues in group development. Their results indicate that people meeting, discussing, and collaborating as a group via computer conferencing have similar interpersonal issues, at comparable stages and proportions, as reported in the literature for face-to-face groups. Carabajal, La Pointe and Gunawardena (2003) in their analysis of research on group development in online learning communities point out that there is empirical evidence that online groups can form, interact, and accomplish tasks through the online technology, yet the addition of a technological dimension distinguishes the online groups from the face-to-face groups in several ways. For example, online groups take longer to complete their tasks than face-to-face groups. However, there are many things that we still do not know about CMC's impact on group structure, process and development. Ravitz (1997) notes that the assessment of social interactions that occur online must use ethnographic approaches such as discourse analysis of messages that tell more about the interactions that occurred. He focuses attention on the importance of assessing questions such as "How did the interactions change the participants?" and proposes one methodology described as the Interactive Project Vita.

14.10.3.4 Social Presence.
Social presence (defined in the theory section of this chapter) is one factor that relates to the social dynamic of mediated communication, as well as to other factors such as interaction, motivation, group cohesion, social equality, and in general to the socioemotional climate of a learning experience. The importance of studying CMC from a social psychological perspective has been emphasized by

international communication research (Jones, 1995; Spears & Lea, 1992; Walther, 1992). Lombard and Ditton (1997) in an extensive review of literature on the concept of presence in telecommunications environments identify six interrelated but distinct conceptualizations of presence, and equates "presence as social richness" with social presence.

A detailed discussion of the literature on social presence is found in Gunawardena (1995). A common theme in the conclusions of social presence studies conducted in traditional face-to-face classrooms is that teacher "immediacy" is a good predictor of student affective learning across varied course content (Christophel, 1990; Gorham, 1988; Kearney, Plax, & Wendt-Wasco 1985). In CMC research, social presence theory has been used to account for interpersonal effects. CMC with its lack of nonverbal communication cues is said to be extremely low in social presence in comparison to face-to-face communication. However, field research in CMC often reports more positive relational behavior and has indicated the development of "online communities" and warm friendships (Baym 1995; Walther 1992).

Walther (1992) notes that a significant number of research studies that have explored the effects of CMC have failed to account for the different social processes, settings, and purposes within CMC use as well. Research has reported that experienced computer users rated e-mail and computer conferencing "as rich" or "richer" than television, telephone and face-to-face conversations. Therefore, he notes that the conclusion that CMC is less socioemotional or personal than face-to-face communication is based on incomplete measurement of the latter form. Walther's (1992) "social information-processing perspective" (P. 67) considers how relational communication changes from initial impersonal levels to more developed forms in CMC. This perspective recognizes that extended interactions should provide sufficient information exchange to enable communicators to develop interpersonal knowledge and stable relations.

The relationship of social presence to learner satisfaction and learner perception of learning have been studied by distance education researchers using a variety of research designs. Hackman and Walker (1990), studying learners in an interactive television class, found that cues given to students such as encouraging gestures, smiles and praise were factors that enhanced both students' satisfaction and their perceptions of learning. Utilizing two stepwise regression models, Gunawardena and Zittle (1997) have shown that social presence is a strong predictor of learner satisfaction in an academic computer conference. This finding, supports the conclusions of Hackman and Walker's (1990) study, and the view that the relational or social aspect of CMC is an important element that contributes to the overall satisfaction of task-oriented or academic computer conferences (Baym 1995; Walther 1992).

An additional finding in the Gunawardena and Zittle (1997) study was that participants who felt a higher sense of social presence within the conference, enhanced their socio-emotional experience by using emoticons (icons that express emotion, such as ☺, ;-), ☹), to express missing nonverbal cues in written form. At low levels of social presence the use of emoticons had no effect on satisfaction, while at higher levels of social presence, there was an improvement on satisfaction as emoticon use

increased. This raises the question of individual differences along personality or social-psychological lines, and begs the need for future research to investigate individual differences (other than learning styles) as mediating factors in developing the social environment for online learning. These findings have implications for designing online learning where equal attention must be paid to designing techniques that enhance social presence and the social environment. Instructors who are used to relying on nonverbal cues to provide feedback and who have a lesser-developed ability to project their personality will need to learn to adapt to the CMC medium by developing skills that create a sense of social presence.

Rourke et al. (1999) examine the relationship of social presence and interaction in an online community of inquiry. They define social presence as the ability of learners to project themselves socially and affectively into a community of inquiry. They present a template for assessing social presence in computer conferencing through content analysis of conferencing transcripts and conclude with a discussion of the implications and benefits of assessing social presence for instructors, conference moderators, and researchers.

In other research, Jelfs and Whitelock (2000) explored the notion of presence in virtual reality environments and found that audio feedback and ease of navigation engendered a sense of presence. Tu and McIsaac (2002) examined dimensions of social presence and privacy. The dimensions that emerged as important elements in establishing a sense of community among online learners were social context, online communication and interactivity. The privacy factor was important in maintaining a comfort level for students working online.

The relationship between social presence and interactivity need to be examined more fully in future research. Examining these two concepts, Rafaeli (1988, 1990) observes that social presence is a subjective measure of the presence of others as Short et al. (1976) defined it, while "interactivity" is the actual quality of a communication sequence or context. Interactivity is a quality (potential) that may be realized by some, or remain and unfulfilled option. When it is realized, and when participants notice it, there is "social presence." There is a need for future research to examine the relationship between social presence and interaction to further understand how each affects the other. Research on social presence and CMC has indicated that despite the low social bandwidth of the medium, users of computer networks are able to project their identities whether "real" or "pseudo," feel the presence of others online, and create communities with commonly agreed on conventions and norms that bind them together to explore issues of common interest.

14.10.3.5 Cultural Context. Reflecting the globalization and internationalization of distance education and the importance of cultural factors that influence the teaching learning process in distance education, two recognized journals in the field devoted special issues to addressing cultural factors that influence the use of technology (The *British Journal of Educational Technology,* Volume 30, number 3, published in 1999), and cultural considerations in online learning (*Distance Education,* Volume 22, number 1, published in 2001). With the rapid expansion of international online course delivery, some

of the questions that have emerged as discussed by Mason and Gunawardena (2001) include:

- What does it mean to design course content for a multicultural student context?
- What kind of environment and tutor/instructor support most encourages nonnative students to participate actively in online discussions?
- What are the organizational issues involved in supporting a global student intake?

One factor related to online learning that has sometimes been a barrier is the issue of language, even language differences within the same country. Non-native students, using a second language to communicate, find the asynchronous interactions of online courses easier to understand than the faster pace of verbal interaction in face-to-face classes. However, the jargon, in-jokes, culture-specific references and acronyms of typical online native speaker communication can become a barrier (Mason & Gunawardena, 2001.) There are clear disadvantages of working in another language in online courses, when students have to contribute toward collaborative assignments or participate in discussion forums with those for whom English is the first language (Bates, 2001). Global universities are faced with the choice between continuing to expect all students to adjust to traditional English-Western academic values and uses of language, or changing their processes to accommodate others (Pincas, 2001).

McLoughlin (2001) who has been actively researching cross-cultural issues in the online learning environment offers a theoretically grounded framework that links culturally inclusive learning with authentic curriculum and assessment design using the principle of constructive alignment. She points out that a goal of culturally inclusive online learning is to ensure that pedagogy and curriculum are flexible, adaptable and relevant to students from a diverse range of cultural and language backgrounds. Pincas (2001) alerts us to literature, findings and research that impact on the cultural, linguistic and pedagogical issues of global online learning.

Researching cross-cultural issues pose many challenges. We see the emergence of research studies beginning to address cultural issues based on established theoretical frameworks or by progressing to develop grounded theory frameworks. Goodfellow, Lea, Gonzalez, and Mason (2001) investigate some of the ways that cultural and linguistic differences manifest themselves in global online learning environments. They present outcomes of a qualitative study of student talk from a global Masters Program taught largely online, and identify the areas of "cultural otherness," "perceptions of globality," "linguistic difference," and "academic convention," as focal constructs around which student experiences could be recounted.

Two teams of researchers from the University of New Mexico in the United States and Universidad Virtual del Tec de Monterrey in Mexico (Gunawardena, Nolla, Wilson, López-Islas, Ramírez-Angel, & Megchun-Alpízar, 2001) examine differences in perception of online group process and development between participants in the two countries. Their mixed method

design using survey and focus group data, based on Hofstede's (1980) and Hall's (1976, 1984) theoretical frameworks for determining cultural differences, identified several factors that could be described as cultural factors that influence online group process and development. Survey data indicated significant differences in perception for the Norming and Performing stages of group development, with the Mexican group showing greater agreement with collectivist group values. The groups also differed in their perception of collectivism, low power distance, femininity, and high context communication. Country differences rather than age and gender differences, accounted for the differences observed. For the Mexican participants the medium of CMC equalized status differences, while USA participants were concerned that the lack of non-verbal cues led to misunderstanding. Both groups felt that the amount of time it takes to make group decisions in asynchronous CMC, and the lack of commitment to a fair share of the group work, were problems. Focus group participants in Mexico and the United States identified several factors that influence online group process and development:

1. Language, or forms of language used
2. Power distance in communication between teachers and students
3. Gender differences
4. Collectivist versus individualist tendencies
5. Perception of "conflict" and how to manage it
6. Social presence
7. The time frame in which the group functions
8. The varying level of technological skills.

Focus group data indicated both similarities and differences in perception of these factors between the two groups.

In a subsequent exploratory study, which extended the Gunawardena et al. (2001) study, the researchers examined the negotiation of "face" in an online learning environment (Gunawardena, Walsh, Reddinger, Gregory, Lake, & Davies, 2002). Utilizing a qualitative research design, the study addressed the question: How do individuals of different cultures negotiate "face" in a non face-to-face learning environment? Results of interviews conducted with sixteen participants representing six cultural groups indicated that cultural differences do exist in presentation and negotiation of "face" in the online environment. In evaluating responses to the three scenarios presented in this study, they found that regardless of cultural heritage, the majority of participants expressed the importance of establishing positive face in an online course environment. They wanted to project a positive, knowledgeable image with association to dominating facework behavior. With regard to conflict behavior, responses were mixed and indicated cultural as well as individual differences.

These research studies expose the problem inherent in categorizing comparison groups in cross-cultural studies, since groups that are defined as nationally or culturally different can differ in many other background characteristics. Therefore, it is usually difficult to determine if differences observed are related to culture or other factors. Other problems in cross-cultural research relate to translation of instruments and construct equivalence. Future researchers need to conceptualize identity issues in cross-cultural studies to go beyond simplistic stereotyping, and use qualitative methods to understand how people define themselves.

The other types of studies that address cultural issues in distance education, examine design issues for the online environment based on reviews of literature or on experience designing for diverse audiences. Incorporating cultural differences and individual preferences in online course design, means that instructors and designers must understand the cultural contexts of the learners, be willing to be flexible, and provide choices in activities and methods to achieve the goals of the course. Based on a review of literature and research studies on cultural factors influencing the online environment, Gunawardena, Wilson, and Nolla (2003) developed a framework, AMOEBA (Adaptive, Meaningful, Organic, Environmental-Based Architecture) for online course design that helps to visualize these options in a flexible, open-ended learning environment that can be molded to the needs identified. In this framework, an instructor becomes a facilitator and a colearner with the students by involving them in curricular decisions and providing choices in language, format, activities, methods, and channels for communication.

Chen, Mashhadi, Ang, and Harkrider (1999) propose that social and cultural understanding need to be explicit and up front, before participants are able to build the on-line networks of trust upon which effective communication and learning is based. Feenberg (1993) argues that most online groups need a familiar framework adapted to their culture and tasks, otherwise "they are repelled by what might be called contextual deprivation." (p. 194). Social rules and conventions of communication are vital to understanding the norms according to which we carry out conversations and judge others. For instance, cultural variations in the use of silence might well lie behind some lack of participation in online discussions.

Discussing cultural issues in the design of Web-based course-support sites, Collis (1999) notes that cultures differ on willingness to accommodate new technologies, acceptance of trial-and-error in terms of computer use, differences in expectations for technical support, preferences for precision versus browsing, preferences for internal versus system/instructor control, and differences for tolerance of communication overlaps and interruptions. Chen et al. (1999), drawing from Stoney and Wild's 1998 study, point out that in designing culturally appropriate Web-based instruction,

... the interface designer must be aware how different cultures will respond to issues of the layout of the graphical interface, images, symbols, colour and sound, inferring that culture itself cannot be objectified unproblematically as just another factor to be programmed into a learning course. (p. 220)

Such apparently simple issues of layout and format become increasing complex as the plurality of learners increase. Malbran and Villar (2001) discuss how to incorporate cultural relevance into a Web-based course design by showing how they adapted a university level course on cognitive processing to the local context in Argentina using familiar images and metaphors.

Another area of research that is increasingly gaining prominence is studies examining gender differences in online communication. One of the early studies examining gender differences and learner support in distance education was conducted by Kirkup and von Prummer (1990). Results of Blum's (1999) study examining gender differences in asynchronous learning employing content analysis of student messages, suggests there are differences between male and female distance education students, which contribute toward inequitable gender differences. These differences are both similar and different from the traditional learning environment. Herring (2000) provides a detailed review of literature while addressing gender differences in CMC, and also examines issues related to gender and ethics in CMC (Herring, 1996). Burge (1998) argues that gender-related differences in how adults learn "require sustained attention, knowing that 'distance' raises psychological barriers to programs and course completions as well as geographical and fiscal barriers" (p. 40).

These studies indicate a growing awareness of issues related to culture and gender in distance education. As the Internet spreads, researching these issues in the online environment will become increasingly important. Current research on the relationship between the social and the cognitive processes of learning will provide impetus for examining culture and gender issues further. While designing sound and rigorous studies to examine cultural factors is a challenging task, it is a challenge that must be taken up if we are to clearly understand the sociocultural context of online learning. Future research using qualitative and ethnographic methodology may provide useful answers to many of the questions in this area.

14.10.3.6   Distance Education as a Complex System.   Distance education is a complex system consisting of many subsystems that interact with each other over time. Moore and Kearsley (1996) believe that a systems approach is helpful to an understanding of distance education as a field of study and is essential to its successful practice. They note that a distance education system consists of all the component processes such as learning, teaching, communication, learner support, design, management, and several other factors that form subsystems and interact to make the whole system work. Further, there are other factors such as social, political, economic, and global issues that influence distance education. Therefore, the ability to visualize interactions and see patterns becomes increasingly important in order to gain a better understanding of how distance education works within different contexts. Recently, research has begun to emerge that examines distance education from a systems perspective, and promises to be a direction that future research will adopt.

Saba (1999) argues that a systems approach is necessary to describe distance education and define a set of principles and rules for its effective use, as well as a set of criteria to determine its effectiveness. This holistic view of the process reveals the behavior of each individual learner. Saba (2000) advocates using methods related to systems dynamics as well as hierarchy and complexity theories to provide a more comprehensive understanding of the field. Saba and Shearer (1994) demonstrated how to understand the concept of transactional distance through

their research using systems modeling techniques. Transactional distance is seen as representative of the interaction of many variables affecting and being affected by each other over time. The data points representing several variables that interact over time are numerous. What is of interest, however, is not each data point, but the pattern that emerges from observing each individual learner (Saba, 1999).

14.10.3.7   Rethinking Comparative Studies.   While comparative studies have been widely criticized for problems related to research design and lack of theoretical and practical value to the field, Smith and Dillon (1999) note the renewed interest in comparative studies that examine the effectiveness of online learning. This interest has been fueled by the U.S. Department of Education's Strategic Plan for 2002–2007 <http://www.ed.gov/pubs/stratplan2002–07/index.html> which calls to transform education into an evidence-based field. This plan encourages the use of scientifically based methods (often described as randomized trials with control groups) to evaluate federally funded distance education programs.

Smith and Dillon (1999) argue that the problem with comparative studies is not in the "comparison," but in the media/method confound. They believe that comparison studies designed with clearly defined constructs of both media and delivery systems can serve to advance our understanding of the phenomenon of distance education. They propose a framework based on media attribute theory that can be used to categorize both media and delivery systems based on research related to learning and motivation. Their framework is based on identifying and defining categories of attributes embedded within each delivery system and the media used by the delivery system that may support learning in different ways. Their categories or attributes include (1) realism/bandwidth, (2) feedback/interactivity, and (3) branching/interface. They note: "It is important that comparative studies explain more than just which technologies were used; they must also explain why and how the media and delivery systems were used to support learning and motivation" (p. 6). As Saba (2000) notes, Smith and Dillon have shown that a new set of categories and clearly defined constructs of both media and delivery systems could improve comparative studies and cure the "no significant difference" phenomenon.

Lockee, Burton, and Cross (1999) advocate longitudinal studies as a more beneficial approach to conducting future research in distance education. They argue that the collection of data over time can provide a more accurate perspective, whether through qualitative case studies or more quantitative time-series analyses which might demonstrate patterns in certain variables.

Another type of research that is gaining increasing prominence with funded Web-based projects, is developmental research which provides opportunities to study processes while implementing the distance education programs. Not unlike the process of formative evaluation, developmental research enables the testing of prototypes by methods such as interface evaluation studies. In complex Web-based learning environments, developmental research can provide timely feedback for the improvement of the learning design to facilitate learning.

This discussion on research in distance education has shown the development of research from early media comparison studies that yielded "no significant differences" which were clearly conducted to justify distance education as a worthwhile endeavor, to research that is focusing on critical pedagogical, design, and sociocultural context issues based on theoretical constructs in the field and related fields such as communication. The newer studies have focused on the distance learner, issues associated with the teaching learning process such as interaction, transactional distance, and control, and the sociocultural context of learning including factors such as social presence, group dynamics, community building, culture, and gender. It is evident from recent research studies that these lines of questioning would continue in future research. Research has also begun to address the complexity of distance education systems through a systems perspective, and it is likely that this would be an avenue for future research with the development of system modeling computer programs such as STELLA and Star Logo that are capable of modeling entire systems. An area of research that has received scant attention in the literature so far is related to policy, management, organization and administration of distance education. Future research will need to address these issues as distance education moves on to become an international and global movement.

14.11   INTERNATIONAL ISSUES

The United States is a relative newcomer to the distance education scene. The British Open University led the way in the early 1970s and was soon providing leadership to developing countries, each with a unique need to educate, train, and provide job opportunities for growing populations.

Drawing upon the well-known model of the British Open University, countries such as Pakistan, India, and China have combined modern methods of teaching with emerging technologies in order to provide low-cost instruction for basic literacy and job training. Turkey has recently joined those nations involved in large-scale distance learning efforts. Sir John Daniel, UNESCO's Assistant Director-General for Education, and former Vice-Chancellor of the British Open University, has called these largest distance learning institutions mega-universities, those having more than 100,000 students enrolled in learning at a distance (Daniel, 1996). One example of a rapidly growing mega-university is Anadolu University in Turkey. Now 20 years old, Anadolu's distance education program currently enrolls over 600,000 students and is one of the three largest distance education program in the world (Demiray, 1998; Demiray & McIsaac, 1993; McIsaac, Askar & Akkoyunla, 2000; McIsaac, 2002). These mega-universities are huge enterprises that require organization, resources and effective delivery systems. Traditionally these media delivery systems have relied heavily on print, supported by film, video, and most recently computers. However mega-universities are now looking toward other information and communication technologies.

Distance learning delivery systems, particularly those that rely on ICTs (information and communication technologies) have benefited from the economic growth of the telecommunications industry. As early as 1990, telecommunication equipment and services accounted for $350 billion and employed 2.8 million workers. The communication industry in OECD countries has continued as an extremely profitable and competitive business with public telecommunication operators developing new ISDN and satellite services. The increased development of mobile communications is being matched with increased deregulation and privatization of networks, increasing competition and lowering costs.

In many countries, although the existing communication infrastructure is old and may be dysfunctional, newer technologies have been used to provide for the flow of information to the majority of the population through distance education delivery systems (McIsaac, 1992). Today, the newer cellular radio technologies, which can handle a greater number of users than previous fixed link networks, are providing leapfrog technologies. Such mobile technologies can be put in place with less cost than wired networks and, in addition, occupy a very small spectrum of the radio frequencies.

According to an NUA Internet Survey in August 2002, more than 553 million people worldwide have Internet access. That is ten percent of the world's population, with the percentage of use growing rapidly (*http://www.nua.ie/survey/index.cgi*). Other relevant facts illustrate the current growth of Internet access, and, in some countries, broadband use.

Africa—has between 1.5 and 2.5 million Internet users in the 49 sub-Saharan African countries

Asia—will have more Internet users than either Europe or North America by the end of 2002. South Korea has the highest broadband penetration in the world, 60 percent, and more DSL lines than any other country.

Australia/New Zealand—number of broadband connections doubled from July 2001 to March 2002 to 251,000

Europe—UK lags behind rest of Europe with only 9 percent using broadband. Germany 39 percent broadband, Sweden has 33 percent.

Middle East—the highest use led by United Arab Emirates, Kuwait, and Israel.

North America—25 percent in Canada have broadband, 12 percent in the USA

Latin America—most have narrowband Internet access. Use expected to increase from 25 million in 2002 to 65 million by 2007.

What does this rapid increase in the use of ICTs mean for international distance education? Although the future of new technological developments promises increased accessibility to information at low cost, this access is not without its own pitfalls. Economic power remains largely within the hands of developed countries. From an economic point of view, some disadvantages include the selection of a costly technological solution when a simpler and existing technology might suffice. Technology used over long physical distances with primitive and unreliable electricity and telephone services is not the most appropriate solution.

The most important consideration for the majority of developing countries is economic independence. It is in many of

the economically developing countries that the largest distance learning projects are undertaken. A top educational priority for many such countries is to improve the cost effectiveness of education and to provide training and jobs for the general population. Researchers across the globe have called for the establishment of national priorities for research in areas such as distance education (Jegede, 1993). One particularly important collection of research articles on Open and Distance Learning (ODL) provides valuable information from 20 countries about the status of open and distance education in Asia and the Pacific Rim. Organized by the Centre for Research in Distance and Adult Learning (CRIDAL) at the Open University of Hong Kong, these articles provide comprehensive information on distance learning and much needed empirical data from which to examine the future prospects of ODL development in the region (Jegede & Shive, 2001)

Two additional groups that are leading international developments in distance education are the Commonwealth of Learning (COL), and UNESCO. COL is an intergovernmental organization made up of leaders of more than 50 commonwealth governments including Australia, Britain, Canada, India, New Zealand, and Nigeria. Created in 1989 to encourage the development and sharing of knowledge and resources in distance learning, the COL is the only intergovernmental organization solely concerned with the promotion and development of distance education and open learning.

Highlighting the human dimension of globalization and its impact on education, COL's 3-year plan (2000–2003) focuses on providing new opportunities using communication technologies for transfer of knowledge and development of skills-based industries. COL, believing that education offers the best way to overcome the cycles of poverty, ignorance, and violence, is committed to using open and distance learning with appropriate technologies to deliver education to people in all parts of the world. A recent study carried out by COL and funded by Britain found that the state of virtual education depended on where it was carried out. Surging interest in virtual education is emphasizing technology to deliver traditional educational programs by making them more accessible, flexible, and revenue-generating (Farrell, 2001). Most of the growth, COL found, was in countries with mature economies. Developing countries have not yet succeeded in using these new ICTs to bring mass educational opportunities to their people. However, the report continues by identifying new trends that are likely to have an impact on the evolution of distance education systems in developing countries.

One of COL's recent innovations is the creation of a Knowledge Finder portal using Convera's RetrievalWare as a search and categorization engine (http://www.convera.com). This tool provides online sources in the public domain, filtered to select only educational materials and helps developing nations access quality education inexpensively and effectively by providing resources and information in 45 languages.

The second organization that is a leader in the international arena is the United Nations Educational, Scientific and Cultural Organization (UNESCO). In a recent report prepared by UNESCO and the Academy for Educational Development, scholars addressed the effective use of Information and Communication Technologies (ICTs) for the 21st century (Haddad & Draxler 2002). Emphasizing ways that ICTs can be integrated into the educational programs of various countries, the study examines objectives and strategies using case studies. UNESCO has emphasized that there can be no sustainable development without education, and the organization is charged with using the power of education to being about the holistic and interdisciplinary strategies needed to create a sustainable future for the next generation. The new vision of education needed for a sustainable future involves changes in values, behavior and lifestyles. (http://www.unesco.org)

Cultural issues become important in many aspects of distance education delivery. In programs that are developed outside the native environment where it will be used, there are often conflicts in goals, perspectives and implementation. A danger is that the cultural values of program providers become dominant, desirable, and used as the standard. There have been many examples of programs from North America, Australia, Great Britain, and Europe that were purchased but never used in Africa and Asia because the material was not relevant in those countries. Because the appropriate design of instructional material is a critical element in its effectiveness, the issue of "who designs what and for whom" is central to any discussion of the economic, political, and cultural dangers that face distance educators using information technologies (McIsaac, 1993).

Research on distance education programs face a number of obstacles around the world. The lack of financial resources available for conducting adequate needs assessment in many countries, particularly prior to embarking on a massive distance education plan, is a common problem (McIsaac, 1990). In many cases investing money in research is perceived to be unnecessary and a drain from areas in which the money is needed. Time is an additional problem, since programs are often mandated with very little start-up time. In the interest of expedience, an existing distance learning program from another country may be used and revised but many times this does not adequately answer the needs of the specific population.

One solution to the lack of adequate resources available locally has traditionally been the donation of time and expertise by international organizations to help in developing project goals and objectives. The criticism of this approach is that visiting experts seldom have adequate time to become completely familiar with the economic, social and political factors influencing the success of the project. A second, and more appropriate solution, has been to train local experts to research, design and implement sound distance learning programs based on the needs of the particular economy.

Distance education and its related delivery systems are often called upon to support national educational priorities and the current political system. One goal of education, particularly in developing countries, is to support the political organization of the country and to develop good citizens. Distance education programs that endorse this priority will have greater chance for success. National political philosophies and priorities are found reflected in the diversity of distance education programs around the world. These programs conform to prevailing political, social and economic values. Research, particularly of the applied variety, is essential to avoid the trial and error approach

that costs international distance education projects millions of dollars.

14.12 SUMMARY

Distance education programs will continue to grow both in the United States and abroad. One of the reasons for this growth is related to the ever growing global need for an educated workforce combined with financial constraints of established educational systems. Distance education offers life-long learning potential to working adults and will play a significant part in educating societies around the world. Distance education will become of far greater importance in the United States in the years ahead because it is cost efficient and because it allows for independent learning by working adults. If society is to cope with this growing need for an educated workforce, distance education must continue to make its place in the educational community.

A major development in the changing environment of distance education in the United States is the rise of corporate universities and commercial institutions selling academic programs. Commercial companies are increasingly supporting the online infrastructure of universities, and universities are becoming more corporate. The globalized economy will be an increasing factor in the growth of the alternative education market in the United States, and of major educational development in many countries of the world. The growth of an information society will continue to put pressure on those countries without adequate technology infrastructure, and there will be increasing demands for access to higher education to upgrade skills for employment. Information as a commodity and the distributed nature of new knowledge will offer educators opportunities to explore alternative pedagogies and student centered learning. These developments should be questioned and examined critically through a scholarly lens.

Future research should focus on establishing theoretical frameworks as a basis for research, and should examine the interactions of technology with teaching and learning. Researchers should address issues of achievement, motivation, attrition, and control.

Distance education is no longer viewed as a marginal educational activity. Instead, it is regarded internationally as a viable and cost effective way of providing individualized and interactive instruction. Recent developments in technology are erasing the lines between traditional and distance learners as more students have the opportunity to work with multimedia designed for individual and interactive learning. Print, once the primary method of instructional delivery, is now taking a backseat to modern interactive technologies.

The content of future research should:

- Move beyond media comparison studies and reconceptualize media and instructional design variables in the distance learning environment.
- Examine the characteristics of the distance learner and investigate the collaborative effects of media attributes and cognition
- Explore the relationship between media and the socio-cultural construction of knowledge
- Identify course design elements effective in interactive learning systems
- Contribute to a shared international research database
- Examine the cultural effects of technology and courseware transfer in distance education programs

Research methodologies should:

- Avoid microanalyses
- Progress beyond early descriptive studies
- Generate a substantive research base by conducting longitudinal and collaborative studies
- Identify and develop appropriate conceptual frameworks from related disciplines such as cognitive psychology, social learning theory, critical theory, communication theory and social science theories
- Explore thorough qualitative studies that identify the combination of personal, social and educational elements that create a successful environment for the independent learner
- Combine qualitative and experimental methodologies, where appropriate, to enrich research findings

Technology may be driving the rapid rise in popularity of distance education, but it is the well designed instructional situation which allows the learner to interact with the technology in the construction of knowledge. It is the effective interaction of instructor, student and delivery system that affords distance education its prominence within the educational community. Distance education can offer the opportunity for a research-based, practical, integration of technology, instruction and instructor creating a successful educational environment.

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