

Theoretical Foundations

Distance Education Research and Continuing Professional Education: Reframing Questions for the Emerging Information Infrastructure

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Abstract: *This article reviews the evolution of the theoretical influences upon the study of distance education and explores the influence of the emerging telecommunications technologies upon questions important to the continuing professional education of health professionals. The article offers multiple frameworks for posing research questions designed to help us understand professional learning in the new telecommunications environment.*

Key Words: Adult education, continuing medical education (CME), continuing professional education, distance education, learning, technology, telecommunications

The application of distance education in the continuing education of health professionals offers the potential to significantly reduce the boundaries between learning opportunities and the learning needs of professionals. However, as distance education becomes increasingly driven by developments in telecommunications technologies, the danger exists that the demands of technology will overshadow the needs of the learners. This position, foreshadowed by McLuhan¹ and revisited again by critics such as Postman^{2,3} and Esslin,⁴ is one in which technology is seen both as a powerful resource and a pervasive influence upon society. Often, the true impact of telecommunications upon our ways of seeing and doing goes unforeseen and unnoticed.

In an era characterized by the proliferation of telecommunications technologies, it is important that continuing professional educators understand how these technologies influence learning and

the learning environment. Distance education can serve as a vital resource in the practice of continuing professional education, particularly in an environment driven by an abundance of information and a scarcity of funds. However, unless distance education as a field of study begins to address questions of importance to continuing professional education, its role will remain largely irrelevant. This article explores the evolution of the theoretical influences upon the field of distance education and, in doing so, attempts to bridge the gap between the questions asked by the field of distance education and the answers needed by continuing professional educators.

Defining Distance Education

It is important to begin with a definition of distance education. Definitions in the literature abound but most are conceived in the idea of linking learners to the resources of the educational institution.⁵⁻⁷ These definitions of distance education represent a view that is too narrow, because they neglect the necessary linkage of educational institutions to learning resources and, perhaps most important for

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the field of continuing professional education, ignore the role of distance education in fostering self-directed learning. Is it distance education if classrooms at multiple universities are connected to promote interinstitutional collaborative learning? Is it distance education if a physician queries Medline for the latest information about an unusual condition or uses the Internet to query a specialist on line about a problem of practice? Using the traditional definitions, the answer to both questions would be no. The college classroom, the seminar room, the home, office, or patient bedside are places of limits that become limitless when connected to an information infrastructure. Current definitions of distance education ignore the fact that the integration of telecommunications technologies into the learning environment is blurring the boundaries between "self-directed" and "institutional-directed" learning. In order to grasp the full potential of distance education, it is important that continuing professional educators understand how distance education can serve formal and informal learning.

Thus, I define distance education as the linking of learners and learning resources separated by time and/or distance. I will also describe the use of telecommunications in distance education as the application of electromagnetic energy to distance education. The influence of the energy source is significant for two reasons. First, electromagnetic energy surrounds us completely; it is ubiquitous. Second, electromagnetic energy travels at the speed of light; it is instantaneous. Thus, the potential of applying telecommunications technologies to education is ubiquitous, instantaneous access to learning resources. Thus, this definition more accurately reflects the current professional environment in which the problems of practice and the problems of learning are inseparable.

Theoretical Influences on the Study of Distance Education

We currently lack the data to support the argument that technology shapes our view of learning,

although many critics of technology take that position. I will argue, however, that a relationship exists between our use of technology and our views of learning. This relationship becomes apparent when we explore the theoretical influences upon the field of distance education. The striking feature of much of the research in distance education is the absence of theory-driven research. On the one hand, this is to be expected from a field in its infancy. However, the conceptual void represents a danger to further developments in the field. Rather than being the driving force behind the increasingly powerful and pervasive technologies, our views of distance education may instead be driven by the demands of these technologies. What is lacking in the evolution of the field of distance education is a clear conceptual focus. This, I will argue, stems not from an absence of theory but from theory confusion caused by the rapidly changing technological environment.

The evolution of thinking about distance education can be classified into four phases of thinking about distance education. Each phase is characterized by a different frame of thinking about learners and learning compatible with the characteristics of the dominant technology of the time. Each phase of technological development, moving from accessibility of correspondence study to the era of the visually rich mass media to the interactivity of the microcomputer brings a new set of questions that represent new ways of viewing learners and learning. I propose that we are on the brink of a new phase of technological development: network communications. On the one hand, the phase of network communication provides a new lens from which to frame familiar questions. However, it is also a phase that offers new capabilities and, as a result, brings questions that we have yet to frame.

Correspondence Study and the Humanistic Roots of Distance Education

The field of distance education itself emerges from the idea of access and the origins of distance

education lie in the practice of correspondence study. Correspondence study evolved from the early extension education movement. An extension of early twentieth-century populism, the purpose of correspondence study was to "extend" education to all people.⁸

Correspondence study is sometimes characterized as "education by mail," in which messages are communicated in print and distributed through the mail.⁹ The dominant technology used by correspondence study is print, a technology that is a highly accessible, inexpensive, and, therefore, very "democratic" form of communication. Because correspondence study offers "one-to-one" patterns of communication, it was conceived as a highly individualized form of distance education.⁵

Thus, the roots of distance education were formed by democratic, humanistic ideals of the early adult education movement, and the dominant technology of the time, correspondence study, was a natural extension of those ideals. The technology of print was consistent with the ideals of adult learning that were so influenced by the humanism of Carl Rogers and Abraham Maslow, who portray learners as autonomous, independent, and self-motivated.⁵ The questions of this period focused upon learners and the concepts of participation and persistence dominated the early literature in distance education. Thus, questions driving the research and theory of the early distance education movement were questions related to access and were questions compatible with the technology of the era. This line of inquiry still represents a thread of research for educators interested in distance education. Typical questions seek to discover who participates in distance education and to examine the relationships between psychological and institutional variables and participation and persistence.

Mass Media and the Study of Human Cognition

As the means of communication shifted from the medium of print to the mass media of radio and

television, so did a shift occur in our ways of thinking about distance education. The focus on correspondence study shifted to a focus on educational television and the resulting "one-to-many" patterns of communication offered by broadcast and satellite technologies. Television and radio could bring education to many people at once, whether at home or at work, eliminating the barriers of time and distance that separated learners from other forms of institutionalized education. The humanistic ideals of adult education that had earlier influenced the field of distance education gave way to the ideas of cognition and industrialization.⁵

The mass media brought a new resource to bear upon learning at a distance, characterized here as bandwidth. In technical terms, bandwidth represents the range of continuous frequencies offered by a transmission. Thus, increases in bandwidth increase the richness of the information. Low bandwidth technologies such as print and voice rely primarily upon symbols and words for communication, while high bandwidth technologies such as television rely on the transmission of images for communication. Thus, the concreteness of pictures, motion, and sound replace the abstraction of words dominated by the print-based media. Information is useless without meaning and as bandwidth increases so does the richness of communication and the potential to enhance meaning and interpretation. Likewise, bandwidth enables the presentation of highly realistic images that may be necessary for certain learning tasks, such as psychomotor skills.

As the dominant medium of education at a distance shifted from print to television so did the focus of the research questions, which shifted from the autonomous, independent learner to the content specialist and instructional designer. In contrast to correspondence study, the mass media model of distance education is characterized by one-to-many communication patterns in which prerequisite knowledge dominates interest. The design of instruction was now driven by the demands of the task to be taught rather than the needs of learners. Thus, the influence of the mass

media brought a shift in thinking about education at a distance, as the questions posed by the theories of humanism and adult learning gave way to questions posed by cognitive psychology. The questions that were now important to educators were questions about teaching and instruction rather than learners and learning. The empirical research was dominated by "comparative studies," research that examined the comparative learning benefit of alternative delivery systems. Comparative studies represent a body of literature that has justified the practice of distance education but largely failed to answer questions about the fundamental nature of distance education.

The Personal Computer and Theories of Communication

In the late 1970s, the first personal computer was manufactured. Until that time, computer technology was largely unavailable to the home or classroom. Fifteen years later, the home computer market has become one of the fastest growing industries in the industrialized world. It was in this period that we saw the emergence of distance education as a field of study. The 1980s brought new journals, professional conferences, and credit and non-credit programs devoted to the study of distance education. As the field emerged, we saw little connection between the theoretical work in the field with its ties to adult learning^{5-7,9} and the actual empirical research in the field with its links to cognitive psychology.¹⁰⁻¹¹ This gap between theory and research has been exacerbated by the dramatic changes in the technological environment.

The computer, originally designed as an information-processing device, found a growing influence as a communications device. Among the telecommunications technologies, computer communications are unique. In contrast to the "one-to-many" communications patterns of the mass media, the computer offers "one-to-one patterns" of communications similar to correspondence study. Like correspondence study, the computer offers the potential for a highly individualized

learning experience. However, unlike correspondence, computer communications offer a very immediate and interactive form of communication; communication via computer travels at the speed of light, rather than at the speed of the postal service. Computer communication offers both synchronous (real time) and asynchronous (delayed) interaction — thus, time and place independence — and can provide the benefit of both group-paced and individualized paced learning.

We now begin to see the influence of communications theories on the study of distance education. Perhaps in response to concerns about the "dehumanizing" effect of high technology, we are beginning to see research that evolves from theories related to the social presence of a medium. Social presence theories argue that there are elements in all communications media that can be used to recover the social presence that distance threatens. The social presence of a communication medium impacts the way in which people interact. Social presence is associated with the level of intimacy and immediacy that communication media offers. Immediate systems are systems that the participant perceives to be responsive. Immediate systems are associated with more interactive telecommunications systems. Intimate systems are identified with the concept of a "shared environment," one that fosters a perceived "closeness" or "bond" with other participants. Intimacy is often associated with the high bandwidth technologies. Kearney et al.,¹³ Christophel,¹⁴ and Hackman and Walker¹⁵ have found relationships between factors associated with social presence and learning outcomes in both distance and traditional settings. Thus, the questions framed from this perspective concern the characteristics of feedback in distance education and the influence of mediated feedback on learning and motivation.

Networked Communications and Multiframe Thinking

The trend toward the deregulation of the telecommunications industry will pave the way for the

merger of video, computer, and voice technologies and the development of increasingly sophisticated switching systems. These influences portend dramatic changes in the way that we communicate. Communications in the future will offer simultaneously the time and place independence of correspondence study, the bandwidth capabilities of the mass media, and the interactivity of computer communications — but with a new twist. It is difficult to characterize the Internet in that it is an amorphous, fluid entity. However, the idea of the Internet as a seamless collection of networks capable of linking all digital information is perhaps the best metaphor for networked communications. The theme in this new era is interconnectivity.

In an environment dominated by interconnectivity, the perspectives offered by the perspectives of humanism and adult learning, cognition, and communication all remain relevant. However, we are beginning to hear calls for new ways of framing questions about learning in the telecommunications era. We must realize that we are learning and working in an environment impacted by multiple forces. We can best describe, explain, and predict the impact of these forces only if our questions are framed from multiple perspectives offered by a range of theories that offer insight into learning at a distance. What is needed in the field of distance education today is not a single theoretical thread from which to frame a broad range of questions but rather multiple frames from which we can pose clearly defined questions.

Questions framed from the lens of humanism. The old questions of persistence and participation take new forms in the age of networks. We must continue to understand the factors that contribute to participation and persistence of professionals in both formal and informal distance learning; we have a significant body of research that describes participation in formal and informal learning.¹⁶ However, as learning becomes increasingly technology dependent, it is important that we understand the factors that support and deter the adoption of technology-based solutions by

professionals and the organizations that support professional learning. Deterrents to the adoption of technology include funding systems, insufficient training, and institutional reward systems that are incompatible with distance education alternatives.¹⁷ Factors that support the adoption of innovations include personal and professional rewards,¹⁸ perceived relative advantage of technology solutions, and compatibility with value systems.¹⁹ One line of inquiry that can contribute to our understanding of the adoption of technology is diffusion of innovation theory. The research in distance education exploring the adoption of technology takes an organizational perspective. In contrast, a similar body of research in the field of continuing professional education approaches change from a social psychological perspective.²⁰ The role of the sociological and psychological variables in the adoption of technology is a line of inquiry that will contribute to both distance education and continuing professional education.

Participation in learning requires the ability to access learning opportunities. A new challenge facing education concerns the accessibility of the telecommunications infrastructure. This challenge will be solved largely by public policy. Education has never been a significant factor in the development of public telecommunications policy and this must change if we are to maintain access to the full range of learning resources provided through our telecommunications systems. The perspective offered by theories of humanism is one in which individual and professional growth depend upon learning; and learning depends upon access. As access to education becomes increasingly dependent upon access to a telecommunications infrastructure, we must delicately define the balance between telecommunications as public utility and telecommunications as private enterprise. The theories of humanism provide distance educators with powerful arguments and continuing professional education can provide a powerful voice as we attempt to help define that balance.

The concept of interface is a relatively new concept in the field of distance education and

emerges from advances in the interconnectivity of networked communications. Interface is the degree to which a technology offers continuous access to interactive educational and informational resources.²¹ Interface represents a user-driven technology that provides information on demand in a seamless technological environment. Thus, interface offers the professional an immediate educational experience, one in which questions are answered as practice demands. Interface will serve as a powerful force for self-directed learning as learners gain greater learner control over content, time, place, pacing, and methods of learning. As telecommunications increases learner options, it will also increase learner confusion. An important role of the educator in the self-directed learning environment is to guide the learner through the learning quest. It is from the perspective of the humanist lens that we can best frame questions that will help us identify the skills and support systems needed to facilitate menu-driven learning.

Questions framed from the lens of cognitive psychology. As communication moves from symbols to images, the communication transaction requires less interpretation. Information is useless without meaning and as bandwidth increases so does the richness of communication and the potential to enhance meaning and interpretation. It is bandwidth that allows us to make abstract ideas more concrete. Bandwidth also represents a more intimate and richer learning experience.²² However, bandwidth is expensive and can exponentially increase the cost of communications. In addition, too much information can also create cognitive overload and may actually impede learning. Too often the full potential of bandwidth remains unused, as the spoken word still dominates video-based communication in distance education. Thus, the cost of the higher bandwidth technologies may not be recovered in terms of total learning benefit. Transmitting only the image of a talking head or inserting expensive video footage for a "Hollywood effect" may ultimately impede learning by unnecessarily interfering with the communication or by unnecessarily adding to the cost.

Theories of cognition help us select and design learning resources based upon the requirements of the learning task. From the perspective of continuing professional education, the cognitive approach can help us frame questions that will help us explore the role of bandwidth for learning tasks that benefit from highly realistic images, such as skill learning, problem-based learning, and, ultimately, the transfer of learning. Often, learning a new procedure requires leaving the work site to attend training, requiring some delay between instruction and application. Through distance education, training takes place at the work site and the transfer is immediate. As the time between instruction and transfer declines, performance may indeed improve. Likewise, theories of cognition may be able to help us frame questions that explore interactions between key learner characteristics and capabilities of telecommunications technologies. For instance, learners who have a low expectancy of performance on a certain task may require a more intimate and interactive medium of delivery than learners that have a high expectancy of performance. Learners with high expectations may benefit from a self-study program, whereas learners with low expectations may not.

Theories of human cognition contribute to our understanding of how humans classify and organize information into meaningful knowledge. Postman³ argues that, as information increases, relative knowledge declines due to our inability to encode large amounts of unrelated bits of information. As technology increases our access to information, our ability to translate that information into meaningful knowledge will become increasingly complex. A physician who uses a digital network to access a variety of expert resources may receive considerable information in a timely manner. However, this information may be retrieved as bits of discrete information. Although the information was obtained immediately, the skills required to organize that information into meaningful knowledge may add to the complexity of the learning process. The perspectives offered cognitive psychology and schema

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theory can help us frame questions that will contribute to our ability to manage unrelated bits of information. organize that information into mean-

Adrianson and Hjelmquist²⁵ found that the nature of a problem impacted group cohesion and satisfaction with the problem but not with the quality

which may alter the nature of communication. In turn, the way we derive meaning from our environment may take on new forms. Bandwidth, interface, access, and interaction represent one view of the ways in which technology filters communication. Will the application of telecommunications alter our perceptions of reality? Will the intimacy of bandwidth, the immediacy of interactivity, the discontinuity of interface blur the distinctions between the artificial and real, the self and machine? My students argue that group discussion using computer communications requires a different approach to thinking than traditional group discussions. A speech therapist I once interviewed discovered that, when using television, his patient became more responsive, because, the therapist suggests, the patient believed television is not real and is, therefore, less threatening than face-to-face counseling. These are the questions posed by McLuhan,¹ who argued that our tools as extensions of ourselves cause us to alter our view of self. The meaning of professional is largely defined by the professional culture. If telecommunications alters the tools of communication and the culture is an extension of those tools, what impact will that change have on the meaning of professional? This is a difficult idea to conceptualize but an important question to answer.

The evolution of thinking about distance education began from the perspective offered by the theories of humanism then shifted to theories of cognition and theories of communication. Now, in searching for new explanations for the new capabilities of telecommunications, we are beginning to explore new frameworks offered by psychosocial and sociocultural theories. I have attempted to argue that we have experienced an evolution in our thinking in distance education that has been driven by the technological environment. Through the theories of humanism, we have posed questions about self-directed learning. Through the theories of cognition we have posed questions related to organization of information into meaningful knowledge. Through the theories of communication, we have posed questions

about the role of feedback in learning. Through the psychosocial and sociocultural theories, we are beginning to pose questions about the impact of technology upon interpersonal interaction and meaning. These shifting perspectives are necessary but not sufficient. We must realize that all views have unique contributions to our understanding of learning at a distance. All views offer ways to frame questions that will help answer questions important to the field of continuing professional education. The single lens is too vulnerable to the demands of the technology that it is designed to control. Only when we approach our questions about distance education through a lens of many colors will we begin to exercise some control over the multiple forces that are blurring the boundary between learning and practice.

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