

Chapter 6

Learning in a networked world: New roles and responsibilities

Terry D. Anderson and D. Randy Garrison

Developments in communications technology are having a profound effect on both distance education and higher education in general. Technologies such as computer-mediated communication and learning networks are making collaborative and personalized learning experiences, at a distance, a reality. These same technologies and the growing pressure to provide quality learning experiences on-campus are also transforming higher education, particularly with regard to the dominance of the lecture.

Oblinger and Maruyama (1996) report that in higher education a “majority of institutions construe teaching almost entirely in terms of lecturing” (p. 2). Interestingly, this practice of focusing on the transmission of information shares similar characteristics to traditional distance education. Although the medium of transmission is different, both teaching and learning models are largely based upon one-way transmission of information with little chance for sustained interaction. In distance education the dominant model has attempted to maximize access through the mass production of self-instructional course materials (Garrison, 1997; 1995). In campus-based higher education, the lecture is also used to transmit information as efficiently as possible. However, developments in commu-

communications technologies are causing those in higher education to rethink teaching and learning. Communications technology that supports sustained interaction is having a significant impact in higher education — both on-campus and at a distance.

This chapter will explore the new roles and responsibilities for higher education teachers and learners in a communications technology environment. The discussion will first focus on the broad issues of communication, control, and collaboration. Then the full range of educational interactions will be identified and described in the context of learning networks.

Communication, Control, and Collaboration

To understand the new roles and responsibilities of teachers and learners, we must begin with a discussion of the nature of educational communication where personal meaning and continuous learning (learning how to learn) are intended outcomes. While it may seem obvious “that education depends upon acts of communication” (Salomon, 1981), not all communication fully qualifies as being educational. Educational communication in its best sense should be reciprocal (i.e., two-way), consensual (i.e., voluntary), and collaborative (i.e., shared control). Too often educational transactions are dominated by the one-way transmission of information without considering the process of constructing meaningful and worthwhile knowledge. Educational communication must facilitate the construction and negotiation of meaning, which is dependent upon critical discourse and knowledge confirmation. Educational communication must be explanatory and not just confirmatory. That is, it explains why a conception makes sense or not, as opposed to simply stating that it is right or wrong.

Communication for educational purposes should have an interactive component. This inherently shifts the balance of control. This balance of control is being shifted in higher education, as learners and society in general demand that learning be meaningful and relevant to changing needs, and in distance education, as a result of learning networks. The access and independence (where and when) characteristic of the industrial model of distance education provided little control and support with regard to what was to be learned and how it was to be assimilated. This excessive focus of distance education on independence as an ideal was

questioned and the concept of control proposed (Garrison, 1989; 1995; Garrison and Baynton, 1987).

The control model attempted to reflect the complexity of the educational transaction. The control dynamics were placed in the context of a dynamic interaction among teacher, learner, and content, facilitated by unconstrained two-way communication. More specifically, control was seen as a subset of these macro-level components and consisted of three dimensions — independence, support, and proficiency (see Figure 1). In essence, “control” means having choices and making decisions as well as having the necessary contextual support and capability to successfully achieve the intended learning outcome. “Independence” reflects the freedom to choose and pursue desired learning goals. While independence may well be desirable, it may also be a mirage that results in more insidious forms of dependence. Independence may result in isolation and not produce worthwhile and expected learning outcomes. “Support” balances independence and reflects the range of human and non-human resources that can facilitate meaningful and worthwhile learning. “Proficiency” reflects the ability to construct meaning and the disposition needed to initiate and persist in a learning endeavor. The integrating process is the quality of the communication and collaboration

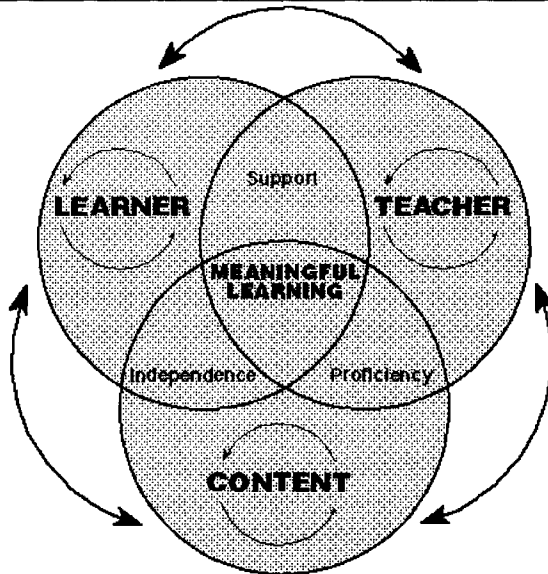


Figure 1: Transactional Relationships in Higher Education
(Adopted from Garrison, 1989)

as well as the balance of control among facilitator, learners, and curriculum.

The quality of the learning outcome is found at the center (intersection) of the overlapping macro- (teacher, learner, and content) and micro- (independence, support, and proficiency) level educational relationships reflected in Figure 1. If the three control dimensions are in dynamic balance, the resulting learning outcome will be personally meaningful as well as socially worthwhile. That is, the very purpose of attending to and balancing independence, support, and proficiency dimensions (i.e., control) is to facilitate meaningful and worthwhile learning outcomes. More specifically, by “meaningful” we mean that learners have assumed responsibility to make sense of the content through assimilating or accommodating new ideas and concepts into their existing knowledge structure. Worthwhile knowledge is that knowledge which has been consensually confirmed and which has redeeming social values.

In the educational context, meaningful and worthwhile learning goes beyond simply accessing information and control. Increasingly the issue is the quality of the learning experience — the ability to critically judge information and construct knowledge and action. The independence and isolation characteristic of the industrial era of distance education is being challenged by the collaborative approaches to learning made possible by learning networks. Moreover, educational theory is shifting to a collaborative constructivist conception of learning. This orientation recognizes that shared control is the prerequisite for a learner to assume responsibility to construct meaning. Responsibility “suggests an obligation for purposeful unconstrained participation of the individual in creating meaning ... through the critical analysis and integration of new ideas/values” (Garrison, 1993, p. 36). Responsibility is a key issue in a collaborative constructivist perspective of teaching and learning.

The constructivist perspective rejects the view that knowledge can be transmitted in whole from the teacher to the learner. Constructivist learning scenarios are complex and collaborative. They focus on individual responsibility to construct meaning as well as authentic reciprocal communication for the purposes of confirming understanding and generating worthwhile knowledge. Until recent times, collaborative constructivist approaches to learning at a distance were limited by the technology (audio/video teleconferencing), cost, and convenience. However, with the developments in integrating telecommunications and computer technologies, the resulting learning networks make it possible to offer collaborative

learning experiences at a distance in a cost-effective manner. Sustained networked communication has become affordable to institutions of higher education and make it possible to offer a broad range of programs to learners without geographical boundary.

Types of Interaction

The previous model of transactional relationships (see Figure 1) suggests six possible types of interaction. At the intersection of the three macro-components exist the first set of interactions: learner-teacher, learner-content, and teacher-content. Within each of the macro-components exists another set of interactions: learner-learner, teacher-teacher, and content-content. It is interesting to note that Moore (1989) had previously identified three of the six interactions that emerged from the transactional relationships: learner-teacher, learner-content, and learner-learner. However, we believe that all types of interactions have importance in understanding the teaching-learning transaction. In the context of communications technologies, particularly learning networks, we discuss each of the six interactions. The issues of support, independence, and proficiency (i.e., control issues) guide the discussion within each type of interaction.

Learner-teacher interaction

Learner-teacher communication goes to the heart of education — both face-to-face and at a distance. Moore and Kearsley (1996) include interaction in their definition of distance education, which begins, “The transaction which we call distance education is the interplay between people who are teachers and learners” (p. 200). The physical distance separating learners and teachers in distance education contexts necessitates that this communication be mediated. Nearly every communication medium has been adapted, with varying degrees of success, to support this learner-teacher interaction. This challenge has led to the development of techniques and approaches designed to facilitate the learning interaction by minimizing any deleterious effects of the media and maximizing the potential for productive learning interactions. For example, Hardy and Olcott (1995) suggest learning activities such as advanced questions, paced group learning, and immediate reinforcement of learner input are particularly appropriate to audio teleconferenced interactions. Collins and Berge (1998) maintain a “Moderator’s Home Page” (<http://cac.psu.edu/~mauri/moderators.html>) which contains links to re-

sources aimed at helping both teachers and learners adapt to learning in computer-conferenced environments.

A key element in this dyad is support. Interaction between learner and teacher is essential to assess current understanding, design appropriate approaches (e.g., depth, pacing), stimulate critical reflection, and diagnose misconceptions. These elements of support are required whether educational communication is mediated technologically or occurs in a conventional face-to-face environment. While support elements are often neglected in campus-based higher education, they are usually absent in traditional distance education approaches. Support in campus- or distance-based higher education is dependent upon sustained two-way communication. Communications technology can support learning in campus-based or distance education.

Supporting learner-teacher interactions through technology requires access and opportunities to become proficient with the appropriate technology in use. The problems of providing access to, and support for, telecommunications has led many institutions and teachers to provide “optional” or “enrichment activities” for those learners who wish to use the technology. This approach, though laudable in its attempt to provide options for learners, is rarely successful, as learners sense the undervalued nature of the optional activity. In response, they often do not take the time and energy to create the necessary community of inquiry (Anderson, 1994). Opportunities to improve proficiencies in learning are lost.

Learner-learner interaction

Distance educators have traditionally defined interaction and support in terms of tutor, teacher, or institutional assistance provided to the individual learner. When one considers distance education contexts enriched by telecommunications tools used to support multiple forms of learner-learner and learner-teacher interactions, the concept of support, proficiency, and independence must be expanded to include learners supporting each other.

There is a growing literature base supporting the use of peer interaction in formal face-to-face educational settings. Damon (1984) noted that “intellectual accomplishments flourish best under conditions of highly motivated discovery, the free exchange of ideas and the reciprocal feedback between mutually respected individuals” (p. 340). Lipman (1991) emphasized the crucial importance of community in education and intellectual development. We argue that this learning community realized

through learner-learner interaction need not, nor should it, be absent from the distance education experience.

The development and growth of stable and sustaining virtual communities based upon network technologies (Turkel, 1995) supports the notion that communities can develop and thrive without physical proximity. These communities are different from their face-to-face and place-bound communities, but we cannot deny that they are meeting diverse social and intellectual needs of widely distributed individuals. Distance educators are now exploring and evaluating the potential benefits of learning communities that exist only through the mediation of telecommunications technologies. By isolating and measuring variables for quantitative analysis and engaging in rigorous qualitative investigation, researchers are gaining an understanding of the important learner-learner interaction in mediated contexts.

Audio and video teleconferencing have been shown to be capable of supporting learning communities. Anderson and Garrison (1995) identified how different learning activities and instructional design components of university courses delivered via audio teleconferencing impact the creation of these learning communities. Latchem (1995) reviews literature on video conferencing, identifying successful applications, and notes the capacity of the medium to support cultural exchange and social relationships amongst learners.

Perhaps the most exciting learning communities are being developed using computer-mediated communications systems. Harasim et al. (1995) note the characteristics of this medium to support collaborative learning (an important component of the learning community). These characteristics are the capacity for active learning, interaction (both quantity and intensity), access to group knowledge and support, democratic learning environment, convenience, and motivation to complete tasks. Collaborative experiences can be “synchronous,” in which case all participants are logged onto networked computers at the same time, or “asynchronous,” in which case messages or other content are left by participants in common areas for retrieval or contribution by participants when they next log-on to the network. The capacity to support interaction in an asynchronous format provides an opportunity for reflection and deliberation not found in any synchronous learning environment — including face-to-face classrooms. Learner-learner interaction on computer networks is being used to support and develop many kinds of “virtual” communities (religious, sports, professional, hobby, etc.), be-

sides those related directly to higher education. For example, Trudy and Peter Johnson-Lenz have been supporting a “Virtual Learning Community” since 1988, in which computer-conferencing systems are used to create and sustain therapeutic relationships amongst participants (Johnson-Lenz and Johnson-Lenz, 1991).

Effective and meaningful learning communications between/among learners requires consideration of all three control dimensions (support, proficiency, and independence). First, instructional support must be provided such that meaningful learning activities are integrated with the educational goals. Instructional approaches and support must be congruent with the desired educational goal if learners are to achieve deep/meaningful learning outcomes. When communication is mediated, technological training and sustained support are imperative. Second, learning how to use the tools of communication needed to support learner-learner interaction is an issue of proficiency. Being competent users of various synchronous and asynchronous communications technologies requires considerable proficiency. Best practice dictates that higher education institutions provide opportunities for learners to gain these proficiencies — preferably in a stress-free, nongraded learning context. Finally, learner proficiency and support with regard to both content and communication skills are crucial in determining the independence associated with educational experiences at a distance. Independent learning requires considerable learning proficiency but should not be seen as an ideal. Collaborative learning experiences should not be sacrificed in the name of individual choice and freedom. Learner-learner interaction and collaborative learning enhance the quality of learning and need to be included in distance education experiences whenever practical. That is, collaborative learning activities should be included in course work and must not be seen as “optional add on” activities, but should be directly related to expected learning outcomes of the course.

The final sphere of interaction amongst participants of the educational enterprise concerns teacher-teacher interaction.

Teacher-teacher interaction

A third communication dyad looks at teacher-teacher interaction and the effects of communications technologies upon this interaction. Most professional teacher-teacher interaction takes place in a context of professional development, that is, teachers communicating with each other in order to enhance their teaching competencies. Interaction is critical to professional development (Cervero, 1990), as practitioners need to de-

velop their learning in the applied context in which it is practiced. This professional development communication has often been confined to infrequent gatherings at face-to-face conferences or scheduled professional development seminars.

New communication tools are expanding the opportunities for teacher-teacher interaction and moving exclusive dependence upon face-to-face interaction to a distributed community which interacts “anytime/anyplace.” One example of this is the e-mail distribution lists which teachers use to inform both their teaching practice and their subject matter expertise. *The Directory of Electronic Journals, Newsletters and Academic Discussion Lists*, 6th Edition, published by the Association of Research Libraries compiles listings of over 3,000 academic and professional discussion lists and 1,688 electronic journals, newsletters, and newsletter-digests. The growth of the directory indicates the explosive growth of teacher-teacher communication using this media. The 1996 edition describes an increase of 257% in journals and a 26% increase in the number of discussion lists since the 1995 edition.

Teacher-to-teacher interaction is also enhanced by the professional gatherings and conventions of teaching, learning, and academic organizations. The increasing costs and demands of time are giving rise to new forms of professional interaction known as virtual conferences (Anderson, 1996). Virtual conferences use a variety of media to support presentations and interactions among professionals in widely distributed locations. Early virtual conferences followed the presentation and discussion format common to face-to-face conferences, with dialogue being supported via e-mail (Anderson and Mason, 1993). More recently, virtual conferences have used video conferencing, virtual reality, and World Wide Web (WWW) tools to support a variety of activities, including debates, role plays, and panel discussions. Virtual conferences can be hosted at a fraction of what it would cost participants and organizers for a face-to-face conference. However, it is doubtful that the full social benefit of a relaxed face-to-face dialogue will ever be realized in a mediated context.

The issues of support, proficiency, and independence for teacher-teacher interaction are similar to those for learner-learner interaction. We next discuss the three forms of interaction, including the content dimension.

Learner-content interaction

The development of exciting new tools, which allow humans to “interact” directly with learning resources, forms the next two types of interaction leading to meaningful learning. Juler (1990) argued that “the text is the

basis of all forms of education and that interactions that learners have with their texts are just as important as the interactions they have with real people” (p. 28). We disagree with the notion that interaction with content/resources carries the same potential qualitative impact as interaction with people, but we do not deny that it serves an essential function and that learning does take place through such interaction. The question is the nature and quality of such learning outcomes.

In order for meaningful interactions to occur between learner and content, the learner must actively engage the content materials. Turoff, Hiltz, and Balasubramanian (1994) describe the goals of learner-content interaction as:

- Forming degrees of agreement or disagreement with the material
- Seeking or reaching an understanding of the material
- Relating it to what one already knows (or doesn't know)
- Realizing confusions and lack of understandings that need further pursuit

They suggest the development of tools to assist learners in making explicit and public their attempts at achieving these goals. They refer to their set of tools as collaborative hypertext environments in which learners can annotate materials, create their own private and shared hypermedia links within the learning materials, and have the capacity to directly and indirectly author new items for inclusion in the database of learning resources. Thus, the record of learner-learner and learner-teacher interaction becomes the content with which succeeding learners interact.

We are just beginning to see the development of robotic support characters on the networks. Turkle (1995) documents the strange but supportive interactions between humans and software programs known as “bots” or “agents.” These programs are given limited communications capacity by their creators and are designed to explain, guide, entertain, or answer queries from humans with whom they come into contact in a cyberspace environment. Educators will soon be programming bots to provide tutoring, ask questions, stimulate, and otherwise engage learners in learning conversations. Further development of intelligent tutorials, simulations, and agent-directed tutorials promises to support huge increases in both the quantity and quality of learning resources available to learners. We are just beginning to see how we can incorporate these resources into

higher education programs and support learners in their effective use of these resources.

There is little doubt that the immense, eclectic, and often stimulating content available on the Internet can lead to learners and teachers spending large amounts of time exploring and learning using this medium. Like any pastime, hobby or profession, Internet use can become so time-consuming as to impact negatively other aspects of daily life. This term has been labeled “Internet addiction.” A recent search using one of the Internet search engines returned 1800 sites in which the term “Internet addiction” was discussed. There are self-diagnostic instruments and even self-help groups (ironically these groups convene on the Internet) designed to help users achieve appropriate use of Internet tools. Joseph Woo maintains an interesting site (<http://home.hkstar.com/~joe-woo/hazard.html>) which provides numerous links to the physical, psychological, and legal “dangers” of excessive Internet usage.

Distance education learners are perhaps best positioned to take advantage of new “virtual” learning resources in that they are generally more receptive to technologically mediated study and activities where face-to-face learning may not be a preferred or even a realistic possibility. The development and testing of effective virtual learning resources for distance learners could provide a competitive advantage for learner and institutions that are committed to distance education services.

It is clear from the rapid development of learning tools for use in both face-to-face and distance contexts that we are at the threshold of a renaissance of tools to support learner-content interaction. However, the increasing size of potential learning resources brought about by the growth of the Internet creates an environment that is incredibly stimulating at the same time as it can be intimidating and even addictive to learners. The key issue in this type of interaction is learner proficiency and intellectual development. Learners must have the maturity and ability to go beyond surfing the Internet and simply acquiring fragmented bits of information. Learner-content interactions on the Internet raise the question of authenticity. Research on authentic learning projects and activities (Brown et al., 1989) has shown the effectiveness of assigning learners authentic learning activities and tasks. The question is how authentic can learning experiences be, which do not consider the learner’s ability to make sense of overwhelming amounts of information.

The issues raised in learner-content interaction are shared in the next dyad, teacher-content interaction.

Teacher-content interaction

Interaction between teacher and content is often subsumed as a normal component of the research or professional development function required of most teachers in formal, higher education systems. In distance education this interaction reflects the structure and flexibility of the course materials (Moore, 1989). Garrison and Shale (in Garrison, 1989) have made the argument that, in conventional higher education, transmission of content and communication generally use the same medium (e.g., lecture and questions). In traditional distance education, however, the teacher/designer prepares the lessons in a prepackaged format and closing the “communication loop is an activity separate from the transmission of information and frequently is supported by a medium different from that used to distribute the content” (p. 19). More recently, this model of distance education has been brought into question with the use of teleconferencing technologies, particularly computer conferencing, which has unified the transmission of content and communication comparable to conventional higher education.

With the increasing pace of knowledge generation within most disciplines and the impact of technological change on means and methods of communicating and accessing information, teachers have the means to interact with the learning content in many novel ways. For example, many teachers are creating WWW “home pages” as a learning resource, information repository, and promotional device for their courses. The creation of these pages provides an opportunity for the teacher to link his or her learners with the many learning resources available on the WWW. Teachers soon realize that, since their learners are being exposed to new resources and different viewpoints, knowledge is no longer containable within the teacher’s classroom or the course learning package. Teachers are being exposed to the learning resources of other teachers and other institutions. This both stimulates and threatens teachers, as they realize that consumer choice and satisfaction will require them to match the variety and quality of content resources provided by competitive suppliers. The opportunity for teachers to interact with the learning content provided by other teachers is increasing dramatically as a result of the WWW. Prior to the WWW, teachers rarely or never were exposed to the means and methods by which other teachers constructed their learning content. This exposure will lead to improvements in teaching as it stimulates reflection and communication. Based upon this shared experience, teachers will be able to access and adopt the teaching content created by other teachers.

The support needed to help teachers access and organize instructional content through the WWW is very important. Teaching in a global, information-rich environment is a very different experience than lecturing in a closed classroom. Obviously new technical skills are required, but these are often the easiest to acquire. More difficult is the task of helping teachers to embrace continuous change that will mark the relationship between teachers and content for the foreseeable future. Teachers will have to cope with a world where knowledge development is continuous and where subject matter expertise is only one component of the skill set necessary to create sophisticated and effective learning content for use by learners. We do, however, see opportunities and significant progress in the development of authoring tools that assist teachers in interacting with and creating learning content. Such products as WEBCT (<http://homebrew.cs.ubc.ca/webct/>) and the Virtual University (<http://virtual-u.cs.sfu.ca/>) provide easy-to-use templates and tools that assist teachers in creating and modifying content and managing the learning environment.

Content-content interaction

Content interacting with content pushes our discussion somewhat into the realm of science fiction. Nonetheless, we are seeing early examples of programs written to retrieve information, operate other programs, make decisions, and monitor resources on the networks. These programs are known as intelligent agents (see <http://www.fdc.co.uk/agent.html>). For example, such an agent could be designed by an agriculture economics teacher teaching a lesson on futures marketing. The agent would regularly update the lesson examples by retrieving information from on-line future quotations and could alert the teacher or learners if any unusual activity is taking place. The lesson, thus, becomes “ever green” and gains in credibility as it displays real information from today’s marketplace.

Internet search engines are other examples where intelligent agents are continuously scouring the networks and sending the results of their discoveries back to central data bases. In the not too distant future, teachers will utilize learning resources that continuously improve themselves through their interaction, not only with learners, but also with other intelligent agents.

We leave the exploration and definition of independence, proficiency, and support in the interaction of non-human learning resources to the computer scientists charged with creating and rearing these aviators!

Conclusion

Learning in a networked world presents many new roles and responsibilities for both the teacher and the learner. As well, it will radically change the construction and delivery of the course content. The issue of control will be radically challenged in higher education. The balance of control in an educational transaction mediated by technology will have to be negotiated based on the various types of interaction and will focus on issues of support, proficiency, and independence. Higher education is being transformed by new developments and applications of learning technologies both on and off campus. We believe that the use of interaction between and among learners, teachers, and content promises to increase opportunities for, and experience of, deep and meaningful learning.

However, we do not think that use of this interactive capacity within the old paradigms of learning will realize this potentiality. As Brown and Duguid (1996) state: "Without more thought to learners and their practical needs, we fear that not only will these [communication] technologies be underexploited, but they may well reinforce the current limitations of our higher education system" (p. 19). Therefore, we must reconceptualize the teaching-learning transaction in higher education if we are to fully realize the potential interactive capabilities of communication technologies and achieve higher-quality learning outcomes.

References

- Anderson, T. (1994). *Socially shared cognition in distance education: An exploration of learning in an audio teleconference context*. Unpublished doctoral dissertation. University of Calgary.
- Anderson, T. (1996). The Virtual Conference: Extending Professional Education in Cyberspace. *International Journal of Educational Telecommunications*, 2(2/3), 121-135.
- Anderson, T., & Garrison, R. (1995). Transactional Issues in distance education: The impact of design in audioteleconferencing. *American Journal of Distance Education*, 9(2), 27-45.
- Anderson, T., & Mason, R. (1993). The Bangkok Project: New tool for professional development. *American Journal of Distance Education*, 7(2), 5-18.
- Brown, J. Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.

- Brown, J. S., & Duguid, P. (1996). Universities in the digital age. *Change*, July/August, 11-19.
- Cervero, R. (1990). A model of professionals as learners. In R. Cervero & J. Azzaretto (Eds.), *Visions for the future of continuing professional education* (pp. 161-182). Athens, Georgia: University of Georgia.
- Collins, M., & Berge, Z. (1998). Moderator's Home Page. [On-line]. Available: <http://cac.psu.edu/~mauri/moderators.html>
- Damon, W. (1984). Peer interaction: The untapped potential. *Journal of Applied Developmental Psychology*, 5, 331-343.
- Directory of electronic journals, newsletters and academic discussion lists*. 6th Edition. Association of Research Libraries.
- Garrison, D. R. (1989). *Understanding distance education: A framework for the future*. London: Routledge.
- Garrison, D. R. (1993). An analysis of the control construct in self-directed learning. In H. B. Long (Ed.), *Emerging perspectives of self-directed learning*. Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education of the University of Oklahoma.
- Garrison, D. R. (1995). Constructivism and the role of self-instructional course materials: A reply. *Distance Education*, 16(1), 136-140.
- Garrison, D.R. (1997). Computer conferencing: The post-industrial age of distance education. *Open Learning*, 12(2), 3-11.
- Garrison, D. R., & Baynton, M. (1987). Beyond independence in distance education: The concept of control. *The American Journal of Distance Education*, 1(3), 3-15.
- Hardy, D., & Olcott, D. (1995). Audio teleconferencing and the adult Learner: Strategies for effective practice. *American Journal of Distance Education*, 9(1), 44-60.
- Harasim, L., Hiltz, S., Teles, L., & Turoff, M. (1995). *Learning networks*. Cambridge Mass. MIT Press.
- Johnson-Lenz, P., & Johnson-Lenz, T. (1991). Post-mechanistic groupware and primitives: Rhythms, boundaries and containers. *International Journal of Man-Machine Studies*, 34, 395-417.
- Juler, P. A. (1990). Promoting interation; maintaining independence: Swallowing the mixture? *Open Learning*, 5(2), 24-33.

- Latchem, C. (1995). See what I mean? Where compressed digital video conferencing works. In F. Lockwood (Ed.), *Open and distance learning today* (pp. 98-107). London: Routledge.
- Lipman, M. (1991). *Thinking in education*. Cambridge: Cambridge University Press.
- Moore, M. (1989). Three types of interaction. In M. Moore (Ed.), *Readings in the principles of distance education*. American Association for Distance Education. University Park: Pennsylvania State University.
- Moore, M., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, CA: Wadsworth.
- Oblinger, D. G., & Maruyama, M. K. (1996). *Distributed learning* (CAUSE Professional Paper Series, #14). Boulder, CO: CAUSE.
- Salomon, G. (1981). *Communication and education: Social and psychological interactions*. London: Sage.
- Turoff, M., Hiltz, S. R., & Balasubramanian, V. (1994). *The human element in collaborative hypertext/hypermedia*. New Jersey Institute of Technology University Heights, Newark NJ. [On-Line]. Available: <http://eies.njit.edu/~turoff/Papers/cscwhy.htm>
- Turkel, S. (1995). *Life on the screen: Identity in the age of the Internet*. New York: Simon & Shuster.