

Examination of Critical Issues for Development and Implementation of Online Instruction

*Scott D. Johnson
Nilda Palma-Rivas
Chanidprapa Suriya
Steve Downey*

University of Illinois at Urbana-Champaign

This descriptive and exploratory study examined several critical issues affecting the development and implementation of online instructional programs. The intent of the study was to (a) help online program instructors, administrators, instructional designers, and technology developers understand the unique challenges and opportunities presented by online instruction; and (b) expand the base of knowledge regarding this new form of instructional delivery. The study has direct implications for online program development in HRD.

Keywords: Distance Learning, Online Instruction, Instructional Design

A primary goal of university level Human Resource Development (HRD) programs is to prepare professionals for leadership roles in HRD. HRD units in corporate America are responsible for employee training and professional development, with billions of dollars spent each year on education and training services. The importance of HRD has heightened in recent years due to technological advances in the workplace, concerns about the quality of education possessed by entry level employees, and the change toward more participatory organization structures and management practices. Efficient and effective training and development of the workforce is critical for helping corporations of all sizes adapt to change and remain competitive. Consequently, demand is high for well-trained HRD professionals who can effectively manage a wide variety of HRD roles and functions.

As the importance of private sector training continues to grow, a parallel growth in the need for professional development opportunities is evident. While most university HRD programs offer master and doctoral degrees in HRD through on-campus programs and traditional off-campus delivery means (e.g., distance education using television or audiographic systems), there is an increasing need to reach prospective students who are unable to commute to campus or participate in traditional remote offerings. To better serve the large numbers of working HRD professionals who desire professional development and advanced degrees, graduate programs are starting to create Internet-based courses that reach the widely distributed off-campus audiences not being served through traditional delivery methods.

Numerous issues must be addressed when developing and implementing online instructional programs. Some of these issues include factors that directly affect learner performance such as the knowledge and skills one brings to the instructional environment and the technologies used to deliver and support the instruction (Rothwell & Kazanas, 1998). Other issues of equal importance are the need to develop faculty skills in instructional design and technology use (Threlkeld & Brzoska, 1994; Willis, 1994), providing instructional technology training for the students who enroll in online programs (Willis, 1993), and establishing a technical support system to address the needs of both the instructors and the students (Willis, 1993, 1994).

Problem Statement

Although online instruction is gaining prominence in the delivery of advanced HRD degrees, little theoretical or empirical research has examined the critical issues affecting the development and implementation of online HRD graduate programs. To address this need, a descriptive and exploratory study of an online HRD Master degree program at a large Midwestern university was conducted in 1998. The purpose of this study was to (a) help online program instructors, administrators, instructional designers, and technology developers understand the unique challenges and opportunities presented by online instruction; and (b) expand the body of knowledge regarding this new form of instructional delivery.

Research Questions

The following questions guided this examination of critical issues for online instructional development and implementation:

1. What technologies are used for online instruction?
2. What technical knowledge and skills are needed by students, instructors, and program developers to successfully participate in online programs?
3. What training is needed by students and instructors before and during their participation in online programs?
4. What are the technical support needs and requirements of online programs?

Review of Literature

Rapid developments in information technology have made possible a new method of distance education called *online instruction*. Online instruction can be defined as an innovative type of instruction that is delivered to remote audiences over the Internet (Khan, 1997). The Internet provides an opportunity to develop new learning experiences that were not possible previously (Alexander, 1995). One of the advantages of online instruction is that information/content can be delivered to any computer that has access to the Internet, anywhere and at any time. Harasim (1989) argues that online education is more than a new delivery mode. It is a learning domain that enables learners to engage in learning interactions more easily, more often, and perhaps more effectively, but also results in qualitatively new and different forms of educational interactions (p. 62). Even though online instruction is being rapidly adopted by many educational institutions and businesses to deliver instruction (ASTD, 1997), little is known about the critical issues that affect the development and implementation of online graduate programs. From the program developers perspective, a new understanding of these issues is critical for the development and implementation of quality online instruction.

One important area of online development and implementation neglected by research is the degree of technical knowledge, skills, resources, and support needed by students, instructors, and program developers. Even though technology is becoming very popular, the use of computers for instructional purposes is still not widespread and the lack of knowledge and skills in relation to hardware and software issues can create much frustration (Hill, 1997). The lack of knowledge and skills for online participation and development leads to the need for training. In this respect, the training of students and instructors has received some attention from researchers. Instructors must be trained, not only to use the technologies, but also to apply the technologies to their instruction (Franklin, Yoakam, & Warren, 1996). Also, because technologies must be updated to capitalize on new capabilities, skills must also be systematically updated to maintain the user's ability to employ the evolving technologies. Franklin, Yoakan, and Warren (1996) conclude that instructor development and training contributes more to an online system's success than any other factor. Beyond the instructors, the program developers and technical support staff also need to be well trained because the quality of an online program depends greatly on the expertise of the development team.

Methodology

This descriptive and exploratory study examined critical issues affecting the development and implementation of an online HRD masters degree program offered by a large Midwestern university. Started in June, 1998, the online program consists of a series of eight courses in human resource development and is being taught to a geographically dispersed cohort. The online graduate program was designed for individuals currently working in, or aspiring to, positions in human resource development.

Program Participants

A total of 23 individuals, mainly HRD professionals from corporations in the Chicago area, comprised the student body for this online cohort program. Though most students were from the Chicago area, one resided in Connecticut and a second was based in Georgia. Most students had considerable work experience in human resource development, with an average of over 4 years HRD-related employment. The participants had strong educational backgrounds with some of them pursuing their second masters degree. Demographically, the students were a very diverse group (i.e., 17 females/6 males; 5 minority students; age range from 25 to 50).

Data Collection and Analysis

A multi-method approach was used to identify issues affecting the development and implementation of online instruction. Data were gathered in this study using a wide range of methods including in-depth interviews, surveys,

observations, and document analysis. Specific data sources included personal notes from participants, minutes and notes from project team meetings, and electronic data records (e.g., e-mail messages, WebBoard archives, IRC Chat logs, and synchronous activity logs).

Technology resource analysis. An examination of the technology resources required by online students featured analysis of hardware, software, and support systems necessary for participation in the program. The analysis of this area included a comprehensive “environmental scanning,” a canvassing of comparative software reviews conducted by independent organizations, an inspection of computer system requirements for the software chosen for the online program, and testing of various hardware configurations to assess respective performance levels.

Technical knowledge and skill requirements. One goal of this study was to determine the technical knowledge and skills needed by instructors, program developers, and students who are involved with online instructional programs. To identify the technical knowledge and skills required by online instructors and program developers, two different methods were used: “environmental scanning” and in-depth open-ended interviews with key informants. Online programs identified through the environmental scanning were analyzed from a variety of perspectives, including the type of technology and communication tools used, instructional design approaches, synchronous and asynchronous activities, and course web design and navigation interfaces. Data regarding the knowledge and skills needed by instructors and program developers were supplemented with data obtained from open-ended interviews conducted with program participants, instructors, and developers.

Two methods were used to determine students’ needs: observations and open-ended interviews. Three beta testers were observed while they navigated the course web site, completed exercises, and participated in synchronous and asynchronous activities. A checklist guided the observation process. This observation instrument was developed based on an in-depth analysis of the class web site and a list of tasks and procedures students would follow to participate in the online class. Once the beta testers finished reviewing the online course, they were interviewed to assess various aspects of their experience. Data from the observations and open-ended interviews revealed the knowledge and skills needed to successfully perform in the online program.

Training needs analysis. Structured surveys and document analysis were used to identify the training needs of students. The structured survey was used as a diagnostic tool that was completed by students prior to the start of the online class. Data from the structured survey of student training needs were analyzed using common statistical analysis. Documents collected during the program delivery were analyzed using a document analysis form. The researchers coded the related documents by relevant topic and different training needs. Observations and open-ended interviews were used to identify the training needs of the instructors. Specifically, the “participant as observer” approach was used (Creswell, 1994). Data revealing the training needs of instructors prior to and during the online delivery were obtained from observation notes kept by the researchers.

Technical support analysis. Strongly related to the analysis of technology resources is the technical support provided by the program. The difference in these variables, however, lies in the depth of analysis being conducted. During this phase of the study, the focus was on the forms of support services provided by the online program, how they were used by the stakeholders (e.g., toll free phone support, chat spaces, e-mail, Instant Messenger, personal visits, etc.), and the nature of the problems encountered (e.g., types of problems and their solutions). These data were in the form of descriptive narratives, frequency counts, recurring theme/category depictions, and frequency of occurrence mapping.

Results and Discussion

The results of this study are summarized in four sections that address critical issues for the development and implementation of online instructional programs. The issues deemed most critical include the technology resources used in online programs, the knowledge and skills needed to participate in online programs, training issues that need to be addressed by program developers, and the type of technical support that should be provided. Collectively, the following information can guide the development and implementation of online instructional programs.

Technology Resources Used in Online Programs

Appropriate technologies must be selected in order to achieve full and effective participation by online students and instructors. Based on a combination of (a) environmental scanning, (b) canvassing of software reviews, and (c) hardware requirement inspections and configuration tests, the following analysis identifies key technologies that support online program development and utilization.

A comprehensive analysis of online programs implemented by universities located in the United States and abroad was conducted. An analysis of over 150 online instructional programs and courses was carried out to identify common practices for course design and technology utilization. Based on this review, several conclusions can be made:

1. Email and web-based technologies form the core of most online courses.
2. Few online programs currently utilize audio and video conferencing technologies.
3. Few online programs use proprietary technologies in the delivery of their courses.
4. Most sites use technologies that conform to open industry standards (i.e., W3C standards).
5. On the minority of sites that utilized them, a blend of multimedia technologies were employed, such as streamed video clips and a modicum of animation and applets.

Once the basic technologies were identified from the environmental scanning, an analysis of independent software was conducted to determine the best software for utilizing these technologies. Based on that analysis, it was possible to conclude that the most applicable software for future online programs are:

- Eudora Pro 4.0 (e-mail)
- RealPlayer 5.0 (multimedia)
- Netscape 3.x or Internet Explorer 4.x (web browser)
- AOL Instant Messenger 2.0(paging/messaging)
- Winsock FTP LE 95 (file transfer)
- Microsoft Office 97 (production)
- Acrobat Reader 3.0 (document sharing)

To further identify technology resources appropriate for online programs, technology reviews in online and paper-based industry publications were examined. Several trends from these reviews were apparent:

1. With little surprise, industry standard software, such as Microsoft Office and Netscape's Communicator, are viewed as the best, or near the best, in their respective categories.
2. Cross-platform availability, reliability, cost, ease of use, and customizability are central factors common to most technology review/selections.
3. Compliance with advanced industry standards, accessibility support, and advanced features are occasional factors in the reviews.

Hardware configuration requirements. To ensure that students use computer systems capable of supporting the technologies selected for use with online programs, all technologies listed above were reviewed for hardware specification requirements. These requirements were developed based on tests using multiple hardware configurations to measure performance levels and to develop final recommendations and requirements. The minimum and recommended specifications for a Windows-based system are shown in Table 1.

Table 1
Minimum and Recommended Systems for Participation in Online Programs

Minimum Configuration	Recommended Configuration
<ul style="list-style-type: none"> • 486process running at 100 MHz • 16MB RAM • 200MB available disk storage* • 14.4 modem • 16-bit sound system • 4x CD-ROM 	<ul style="list-style-type: none"> • Pentium 166 MHz Processor (or faster) • 32MB RAM • 200MB available disk storage* • 28.8 modem • 32-bit sound system • 12x CD-ROM

Note. * Storage space estimates the amount of space required to store all of the applications (Microsoft Office, etc.) and the work/data files generated by the students during the course of the program.

Technical Knowledge and Skills Needed to Participate in Online Instruction

Building on the technologies identified for online instruction, key informants, instructors, and program developers were interviewed to determine the knowledge and skills required to use the selected technologies to support their role as instructor, program developer, or learner. Also, three beta testers were observed and interviewed. Results are presented below in two parts: (a) the knowledge and skills required to develop and conduct online instruction and (b) the knowledge and skills required to participate in online programs.

Knowledge and skills required by developers and instructors. The development of online instruction requires that both the instructors and the program developers know basic operation of word processing and presentation software, multiple web browsers, and HTML editors. In addition, program developers need advanced knowledge and skills for creating multimedia files, to transfer files from development machines to servers and, for some online programs, the ability to design database systems using software such as ColdFusion or Microsoft Access. For synchronous activities, developers and instructors also need to be able to broadcast and archive live audio and use text chat to interact with students. Additional skills include the management of e-mail and threaded discussion group software as

well as chat functions. Possessing the knowledge and skills needed to implement these functions are very important for program development, management, monitoring, and troubleshooting. Table 2 provides a summary of the specific knowledge and skills required by instructors and program developers, by phase and by application.

Table 2
Technology Knowledge and Skills Required by Program Developers and Instructors

Software Function	Software Applications	Specific Knowledge and Skill Requirements	
		Program Developers	Instructors
Document Creation	Word Processing	Create and format documents using tables and borders. Convert documents to HTML file	Create and format documents using tables and borders. Convert documents to HTML file
	Presentation Software	Create instructor presentations, use templates, add clip art, print, and record narrations. Create presentations for use on the Internet	Create instructor presentations, use templates, add clip art, print, and record narrations. Create presentations for use on the Internet
WWW Access	Web Browser	View and navigate WWW, use search tools and bookmarks, use plug-in to play multimedia files, and download programs from Internet.	View and navigate WWW, use search tools and bookmarks, use plug-in to play multimedia files, and download programs from Internet.
Communication & Collaboration	E-mail	Create, forward, and reply to messages and send attachments. Sort incoming mail and create mailing lists	Create, forward, and reply to messages and send attachments. Sort incoming mail and create mailing lists
	WebBoard	Post, delete, and attach files to a message and participate in chat sessions	Post, delete, and attach files to a message and participate in chat sessions
	RealEncoder	Broadcast live audio and archive audio files	Broadcast live audio and archive audio files
Web Page Development	HTML editors	Create and edit Web pages. Use templates, forms, images, multimedia files, and advanced HTML tags	N/A
	Database	Write and test scripts to create and maintain online grade books	Provide grades and feedback and download students' assignments
	File Transfer	Upload and download files to the course server	N/A
Multimedia Development	PhotoShop	Create and edit images	N/A
	Digital Video	Create and edit streaming video	N/A
	Scanning	Scan texts and images	N/A

Knowledge and skills required to participate in online programs. Data from observations and open-ended interviews conducted with the three beta testers revealed that to fully participate in an online instructional program, including both synchronous and asynchronous sessions, students should have basic skills in using web browsers, threaded discussion groups, and e-mail applications. Table 3 presents a summary of the specific knowledge and skills needed to effectively participate in online delivery.

Table 3
Technology Knowledge and Skills Required by Program Participants

Software Function	Software Applications	Specific Knowledge and Skill Requirements for Participants
Web Access	Web Browser	View and navigate WWW, use search tools and bookmark, use plug-in to play multimedia files, and download programs from Internet
Document Creation	Word Processing	Create, format documents using table and border functions
Communication and Document Exchange	E-mail	Create, forward , and reply messages, and send attachment Sort incoming mail and create mailing list
	WebBoard	Post, delete, and attach files to a message and participate in chat rooms
	Various Software	Install, use, upgrade, troubleshoot software
	Database	Submit assignments and access instructor feedback and grades

Training Needs of Online Students and Instructors

The following description of training needs of students and instructors was derived from data collected through use of a structured survey, interviews, and electronic data archives. In addition, numerous experiences were gained through the development and implementation of an online degree program in HRD over the past year. The following section identifies the training needed by both the students and the instructors of online programs.

Training needed by students. An analysis of the online students' technology resources and capabilities was conducted to determine if the students in the program had adequate computer resources and the skills needed to participate in online instruction. Based on this analysis, technology training was clearly the type of training most needed by the majority of the students. For example, most of the students did not have the skills necessary to download software from the Internet or use a Web Browser to conduct searches or install plug-ins to play multimedia files. Specifically, training was needed in advanced uses of web browsers and use of communication tools such as e-mail and WebBoard. In addition to providing training on the use of the new technologies for online instruction, the students needed to be trained to install software and troubleshoot problems when they occurred.

The necessary technology training was provided in several forms. First, an orientation session was designed and implemented during the first class session. Computer applications and tools used for the online instruction were presented and explained in order to familiarize the students with the technology. Second, before the beginning of the course, the students were required to complete an orientation assignment located on the course web site. The assignment included tasks that helped the students gain the necessary skills needed to participate in the online class, such as sending e-mail attachments, posting messages in WebBoard, and listening to audio files. The third form of technology training involved hands-on practice with the specific technologies to be used by the students. Step-by-step explanations were integrated into the instruction early in the course and students were encouraged to practice using the new technology.

Technology training was perceived as a way to avoid frustration, wasted time, and potential dropouts. Technology training was also perceived as a critical event to be accomplished before presenting actual course content. Training is critical because the online students want to be confident in using technology before they engage in the learning the content. The students perceive technology training as a way to be better prepared to learn the content.

Training needed by instructors. The instructors and teaching assistants involved with the first two online courses in the program were asked to identify the type of training they needed prior to and during their participation in the online program. Different types of training needs were identified prior to the start of the online program, including (a) orientation training, (b) communication-skills training, and (c) technology usage training. The instructors indicated that if a good orientation training program was offered prior to the start of the online program, training during the courses would not be as necessary unless there are changes or updates in the technologies being used.

An orientation training session for online instructors and teaching assistants was considered an essential element to the success of an online course. The following five essential components of an orientation training program were suggested by the instructors:

1. *General overview of the online program.* The first component of an online orientation training program should provide instructors with a general overview of the program, processes involved in using the online instructional system, and how they are supposed to work with instructional designers, web designers, database developers, and technical support. In short, there should be a clear orientation so the instructor understands the structure of the entire program and can better determine their roles and responsibilities. Another element considered important is the organization's vision of the online program as well as its importance to the organization.
2. *Description of the differences between online and face-to-face instruction.* Regarding the differences between these two types of delivery formats, instructors felt that those who have not experienced teaching online should be provided with an introduction to the differences between online and face-to-face instruction. Specifically, the level of detail needed for online delivery and the importance that details play in this type of instruction need to be emphasized. The instructors felt they should be trained on how to adapt face-to-face strategies to online environments. Also, because of the environment in which instruction is delivered, instructors felt they should be introduced to more innovative teaching strategies. In other words, the orientation-training program should provide them with a set of varied teaching options that can be effectively carried out in online environments.
3. *Differences between synchronous and asynchronous delivery.* Training should help instructors better prepare for synchronous and asynchronous delivery formats. For the synchronous sessions, they should be informed about strategies that promote individualized instruction and encourage active participation. For asynchronous sessions, instructors felt they should be prepared to manage time more effectively, learn how to be instructionally flexible, how to provide timely feedback without getting burnt out, and how to create and manage virtual teams.
4. *Communication skill training.* The online instructors felt that oral and written skills are probably much more important in online instruction than in face-to-face instruction. The lack of personal contact and the inability to see people's gestures puts a major burden on oral and written communication. The instructors felt that some information should be provided on how to effectively address online students and how to provide feedback and constructive criticism without being perceived in a negative way. They felt that good online communication skills are necessary because mistakes are more likely to be noticed by online students than face-to-face students. Finally, they suggested that this type of training should provide them with information on how to develop their skills to better interact with students, both formally and informally.
5. *Technology use training.* The instructors and teaching assistants stated that it is essential to know how to use the technology and be able to diagnose and solve common problems. They felt it was necessary to have technology training to get them to the level of feeling comfortable using the technology to interact with people. The instructors felt that they should be provided with many opportunities to gain "hands on" experience. They felt that the best training is the one that most closely simulates the reality of online instruction. The instructors and teaching assistants recommended that they be provided the opportunity to practice in simulated environments until they attain the level of confidence necessary to perform naturally. One-on-one training was found to be effective in learning to master the new technologies.

Other topics that were mentioned as important for an instructor training program included copyright and fair use issues, institutional intellectual property rights policies, how to foster and assess deep learning, strategies for better preparation and time management, and how to facilitate collaborative learning online.

Technical Support Needed for Online Programs

Technical support is a critical aspect of any online program. Without a mechanism for supporting online instructors and students, frustration is sure to occur. The following listing of technical support for online programs was developed based on an analysis of the types of problems faced by instructors and students as they participated in an online program. This information is organized according to (a) the nature of the technology problems confronted and their resolution, and (b) the forms of technology support offered within the program—both initially and currently.

Nature of technology problems. An analysis of e-mail messages, technical support logs from a toll-free telephone support line, and archives from Instant Messenger communications provided a clear picture of the types of problems encountered by students and instructors, their frequency, and the reporting methods used. During the first online course, 90% ($n = 34$) of the requests for assistance occurred during the first half of the course. E-mail was the most common method used to report problems and request technical assistance (86% of all requests). Approximately 50% of the students used the technical support services, with an average of 3.5 support requests per student. Regarding the type of problems being reported, the most common problem was associated with an organizational firewall at a students' place of work that affected the delivery of audio and video files and prevented access to collaboration tools such as WebBoard and IRC chat. Other frequently reported problems were related to the lack of web browser skills, inaccurate use of e-mail functions such as attachments, and server problems due to external causes such as severe weather conditions in the form of storms and lighting. During the development of the first course, a total of 11 different types of problems were reported. These were problems related to email, browsers,

WebBoard and its chat function, RealPlayer, server malfunctions, technical terminology, acknowledgment of messages and document submissions, and PowerPoint presentations.

An analysis of technical problems during the second online course revealed similar results. In this case, 92% of the support requests were for assistance during the first half of the course. The number of students requesting assistance increased slightly from the previous course, from 50% of the students in the first course to 61% in the second course. During the second course, access problems due to firewall constraints at a student's work location was a common problem, followed by problems with RealPlayer, and difficulties associated with uploading assignments to the course database. The uploading feature of the database was a new feature in the second course. During the development of the second course, there was a decrease in the types of problems reported. A total of 9 different types of problems were reported. These were problems related to the introduction of a new database for uploading documents to the instructor, server malfunctions, PowerPoint files, access to the web site, and access to the WebBoard and ChatBoard due to changes in IP numbers. Three other problems came from new students joining the cohort. These problems were related to the use of speakers, volume, and printers.

Forms of support offered. Given the types and frequency of technical problems from the first two online courses, as well as the prior expectations of potential obstacles, multiple support features were implemented in an effort to reduce the number of technical problems experienced by the online instructors and students. As a result, a comprehensive support system was created for the online program. Initially, only e-mail support and a toll free telephone line to provide access to online staff during normal business hours was provided. While these forms of support were adequate for most technical problems, there were instances where immediate assistance was required during non-business hours. To that end, additional support features were developed and implemented, including a set of Frequently Asked Questions (FAQ) that contain solutions to various problems, the availability of Instant Messenger for 1-to-1 and small group conferencing, and 24-hour chat-based support provided through a "Help Desk" manned by the university's Web Technology Group. With these five support options in place, virtually all of the technological support needs of the online students and faculty can be met satisfactorily.

Summary

This paper examined a variety of critical issues related to the successful development and implementation of online instructional programs. While many of these issues are taken for granted when planning traditional face-to-face instruction, they must be carefully considered when venturing into the realm of online programs. Programs delivered entirely online cannot simply be modifications of existing courses, rather, they must be viewed as completely new delivery systems that present different and unique problems. Online program developers need to carefully analyze the context and source of problems that arise and design appropriate interfaces, technology solutions, and support mechanisms to resolve the difficulties that will be faced by both the instructors and the students.

References

- ASTD (1997). *Percent of companies using selected delivery systems*. [On-line]. Available: http://www.astd.org/virtual_community/research/bench/96stats/graph13.gif
- Alexander (1995). *Teaching and learning on the World Wide Web* [On-line]. Available: <http://www.scu.edu.au/ausweb95/papers/education2/alexander/>
- Creswell, J. W. (1994). *Research design: Qualitative & quantitative approaches*. Thousand Oaks, CA: SAGE.
- Franklin, N., Yoakam, M., & Warren, R. (1996). *Distance learning: A guide to system planning and implementation*. Bloomington, IN: Indiana University.
- Harasim, L. M. (1989). Online education: A new domain. In R. Mason & A. R. Kaye (Eds.). *Mindwave: Communication, computers, and distance education* (pp. 50-62). New York: Pergamon Press.
- Hill, J. R. (1997). Distance learning environments via World Wide Web. In B. H. Khan (Ed.). *Web-based instruction* (pp. 75-80). Englewood Cliffs, New Jersey: Educational Technology Publications.
- Khan B. H. (1997). Web-based instruction: What is it and why is it? In B. H. Khan (Ed.). *Web-based instruction* (pp. 5-18). Englewood Cliffs, New Jersey: Educational Technology Publications.
- Rothwell, W. J., & Kazanas, H. C. (1998). *Mastering the instructional design process: A systematic approach*. San Francisco, CA: Jossey-Bass.
- Threlkeld, R., & Brzoska, K. (1994). Research in distance education. In B. Willis (Ed.). *Distance education strategies and tools* (pp. 41-66). Englewood Cliffs, New Jersey: Educational Technology Publications.
- Willis, B. (1994). Enhancing faculty effectiveness in distance education. In B. Willis (Ed.). *Distance education strategies and tools* (pp. 277-290). Englewood Cliffs, New Jersey: Educational Technology Publications.
- Willis, B. (1993). *Distance education: A practical guide*. Englewood Cliffs, New Jersey: Educational Technology Publications.