Instructional Technology and Personnel Preparation

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Advancements in instructional technology offer an array of unprecedented opportunities and challenges for persons engaged in personnel development. This article first defines instructional technology, identifies current issues in higher education, and then identifies specific instructional designs, strategies, and media applications for persons involved in early childhood special education personnel preparation.

The application of instructional technology for early childhood special education (ECSE) personnel preparation has major implications for instructional design and delivery, teaching and learning, faculty development, and organizational leadership. In this article, we use the term "personnel preparation" in the broadest possible sense as defined by Winton, McCollum, and Catlett (1997): "strategies (e.g., mentoring, consultation, self-study, guided decision making) and processes (e.g., personnel standards, licensure, certification, competencies, monitoring) that create a community of learners with the capacity to grow and develop in the face of ongoing changes in the field" (xv). Persons involved include those in teaching (e.g., faculty, inservice and technical assistance providers, staff developers, trainers) and learning (e.g., persons participating in inservice training, staff development, continuing education) settings. The critical components of ECSE personnel preparation exist in professional organization documents (e.g., Association of Teacher Educators, Division for Early Childhood, and the National Association for the Education of Young Children, 1994) and publications (e.g., Odom & McLean, 1996; Winton et al., 1997).

The purposes of this article are to (a) define instructional technology and provide examples for ECSE in general, (b) identify the major issues within the context of higher education and discuss implications for ECSE, and (c) provide examples and resources for the practical application of instructional technology to ECSE personnel preparation.

DEFINITION OF INSTRUCTIONAL TECHNOLOGY

The Association for Educational Communications and Technology (AECT) officially adopted and approved the following definition of instructional technology: "Instructional (educational) technology is the theory and practice of design, utilization, management and evaluation of processes and resources for learning" (Seels & Richey, 1994, p. 1). Interestingly, the words "technology" or "technological" are never used in this definition. To understand the components of this definition, each of the four domains is described briefly below with ECSE examples as illustrations.

Design

Teachers have used objects, tools, and books to promote learning for centuries; however, the formal study of instructional technology and why objects, tools, and books are useful in education is relatively recent. During World
War II, instructional design became important because of the critical need to train both a large military force and women in manufacturing tasks to support the military. At present, the proliferation of online courses has raised new questions about design. Instructional design is the process of specifying conditions for learning and involves four areas: instructional systems design, message design, instructional strategies design, and learner characteristics analysis (Seels & Richey, 1994).

**Instructional Systems Design.** Instructional systems design is the overall structuring of the design process, which includes defining what is to be learned, specifying the process through which it will be learned, documenting the process of authoring and producing the instructional materials, implementing the use of the materials (usually in prototype form) in context, evaluating the effectiveness of the materials formatively, and evaluating the efficacy of the materials (Seels & Richey, 1994). In ECSE personnel preparation programs, a team of inter-disciplinary faculty, family members, community agency representatives, and school leaders could examine the preservice training program along these dimensions.

**Message Design.** Message design involves planning for the most effective form of the messages in the instructional system between teachers or materials and the learner by focusing on details such as the layout of visual materials, sequences of messages, and the most effective medium to convey the messages (live teacher, computer screen, video, film, etc.; Seels & Richey, 1994). Frequently, preservice and inservice ECSE trainers make these decisions for courses or workshops; however, these decisions are often based on informed practice rather than research. For example, an instructor might ask, "Will the concepts of recommended practices for family-centered assessment be conveyed most effectively to learners by a live instructor, a virtual instructor via videoconference, a videotaped instructor, or a Web instructor moderating a threaded discussion on the Internet?"

**Instructional Strategies Design.** Instructional strategies design includes the specifications for selecting and sequencing events and activities (throughout a lesson, course, or program) that are generally based on particular theories of teaching and learning, analysis of the instructional context and resources available, and analysis of the type of learning desired as an outcome (Seels & Richey, 1994). For example, events and activities designed for teaching young children with disabilities are different at the beginning of an ECSE program (e.g., first semester of professional courses) than at the end (last semester before graduation).

**Learner Characteristics Analysis.** Learner characteristics analysis provides information about the learners who are the target users of the instructional system, which bears on their ability to learn the material specified in the goals and objectives, including previous success in similar learning environments, motivation, vocabulary, and familiarity with types of instruction and learning styles (Seels & Richey, 1994). For example, ECSE students who have a college degree, are working full time in a classroom, and have children of their own and family responsibilities bring different characteristics to the instructional setting than recent high school graduates who are attending college for the first time and live in a dormitory.

In summary, design is a substantial domain of instructional technology, and scholars in that field recommend that instructors give attention to the process of specifying conditions for learning before examining media use (Newby, Stepich, Lehman, & Russell, 2000).

**Media Utilization**

Media utilization includes the selection of the communications medium and the delivery system. The acts of choosing a recent journal article in a course packet or using a videotape in class that illustrates recommended practices in a local preschool classroom are examples of making choices about communications media. The delivery system may be that the article resides at the university library reserve desk or is available digitally. The videotape delivery system may consist of the instructor showing it in class or making it available on the course Web site through streaming video.

Obviously, media and delivery systems have changed over time. For example, during the correspondence education days the medium was print, and the delivery system was the postal service. Today, the media may include print, video, and audio, and the delivery systems may consist of the Internet, telephone lines, or satellite links. Often instructors use media and delivery systems with little thought as to how they fit into the instructional system experienced by their students (Belland, 2000). Alternatively, when an instructor selects the media and delivery system based on the criteria that emerge from an instructional design process, a substantially increased probability is that the technological product will help students achieve their learning objectives in a much more efficient and effective manner (Belland, 2000; Newby et al., 2000; Ragan, 1999).

Utilization involves the adoption of innovations. For example, when an instructor is examining resource lists to select instructional materials that will fit the instructional design, he or she is likely to be prepared to use whatever medium is required for the deployment of the most effective materials (Belland, 2000). As new techno-
logical products and processes become available to educational professionals, they need to be in a position to evaluate them and provide students access to the best of the new (Belland, 2000; Newby et al., 2000; Ragan, 1999). In summary, utilization is critically linked to the practice of design.

**Management**

The third area of the definition of instructional technology involves management. Instructional technologists have major responsibilities for a number of management tasks, including (a) the acquisition, maintenance, and replacement of equipment, (b) the coordination of project management involving teams of professionals working together to design an instructional system, (c) the delivery of services and supports that encourage instructors and students to use technology, and (d) the management of the information (Belland, 2000). Which of these instructional technology tasks will be the primary responsibility of the instructor or of other staff depends on the educational institution, its organization, policies and procedures, and funding. For example, an ECSE instructor who uses electronic mail (e-mail) for communicating with students will need to determine how students will have access to computer equipment, how they will get e-mail accounts, how they will learn to use e-mail, and who can provide help. In most cases, the ECSE instructor relies on other technology support staff to assist in these tasks. Good management (e.g., a coordinated team approach) provides students with timely and effective e-mail support.

**Evaluation**

Instructional technologists use evaluation methodologies common to all evaluation (Belland, 2000). Evaluation of instructional design usually involves the development of criterion-referenced measures as opposed to norm-referenced ones because design projects have clearly articulated outcomes, which can become the criteria for measurement. Instructional technologists are interested in providing timely and accurate information to those involved in an educational technology design effort. Formative evaluation yields substantial improvements in the quality of the finished product, and summative evaluation yields important information as to whether the instructional system functions well on its own, independent of its original designers.

Although evaluation is the last component of the definition of instructional technology, it currently receives much attention in higher education. Lively discussion is under way as to what constitutes high quality instructional interaction (Applebone, 1999; Guskin, 1994a, 1994b; Ragan, 1999), specifically in the area of distance education. The following section provides a review of the issues in this area.

**DISTANCE EDUCATION VERSUS TRADITIONAL INSTRUCTION**

**Historical Context**

Interestingly, distance education has a long history; it is more than 100 years old (Moore & Kearsley, 1996; Mushni, 1980). Correspondence study is considered the first generation of distance education courses in academia, with the first programs established in the late 1800s (Moore & Kearsley, 1996; Verduin & Clark, 1991); in addition, instructional audio (originating at the University of Wisconsin in 1919) and instructional television (originating at the University of Iowa in the 1930s) brought new media to higher education (Chamberlain, 1980; Verduin & Clark, 1991). Although the first commercial computer conferencing system was developed in 1971 and the first personal computer bulletin board system was created in 1978, it was not until the early 1980s that computer conferencing systems were first used for course activity and delivery (Harasim, Hilz, Teles, & Turoff, 1998).

Presently, distance education through multimedia technology and the Internet is the newest solution for delivering instruction to learners who are unable to travel to campus or simply prefer the convenience of online courses (Dede, 1996). In the last 2 years the public and private sectors have invested billions of dollars in distance education, and according to the U.S. Department of Education, “Distance education programs grew 72% from 1995 to 1998 in institutions of higher education alone” (Saba, 2000, p.1).

The current controversy stems from the delivery of distance education courses and whether they are superior or inferior to traditional, face-to-face, classroom courses (Phipps & Merisotis, 1999; Russell, 2000). Underlying this question is the emergence of the global marketplace in which the communication and entertainment industries are driving the development of high-performance computing and communications media (Dede, 1996). The results are universal access by the general public to courses online, which influences the local market for the traditional delivery of instruction. Thus, political and economic factors call for the examination of the quality of instruction.

**Research Findings**

Studies of distance education in comparison to traditional classroom instruction have found no statistically significant difference in the effectiveness of the two approaches (Machtmes & Asher, 2000; Phipps & Meri-
sotis, 1999; Russell, 2000; Smith & Dillon, 1999). In one review, over 400 studies on assessing the quality of distance education were examined (Russell, 2000). The results showed that regardless of delivery mechanisms (whether simple print or sophisticated computer-based or interactive video-based), the effectiveness of instruction was about the same; however, the overall quality of the 400 studies is questionable and thereby renders many of the findings inconclusive. Numerous gaps in the research require more investigation and information such as the fact that the research (a) emphasizes student outcomes for individual courses rather than for a total academic program, (b) does not adequately explain why the dropout rates of distance learners are higher, (c) does not address the quality of digital libraries, and (d) does not take into account the differences in how students learn (Russell, 2000). These results support findings from a report commissioned by the American Federation of Teachers and the National Education Association that reviewed 40 studies on distance education (Phipps & Merisotis, 1999).

Responses From Institutions of Higher Education

Recent publications from Pennsylvania State University (Ragan, 1999) and the University of Illinois (University of Illinois, 1999) found faculty groups in agreement that “good teaching is good teaching.” In other words, the guiding principles and practices related to effective teaching and learning environments apply to traditional resident instruction as well as to distance education models. The report from the University of Illinois found that moving learning environments from concrete buildings into cyberspace can be effective, if done correctly (University of Illinois, 1999). The guidelines developed at Pennsylvania State University reiterate that regardless of where or when it is delivered, the focus on learning goals and objectives is fundamental for the instructional design, development, delivery, and evaluation of the educational event (Ragan, 1999).

At the national level, the Institute for Higher Education Policy (IHEP) recently released a list of quality benchmarks for distance learning in higher education (Institute for Higher Education Policy, 2000). The list of 24 quality measures is the centerpiece of “Quality On the Line: Benchmarks for Success in Internet-Based Distance Education,” a report of a study commissioned by the National Education Association and Blackboard, Inc. To formulate the benchmarks, IHEP identified firsthand, practical strategies being used by six U.S. colleges considered to be leaders in online distance education (all provide Internet-based degree programs). The benchmarks are to assist policymakers, faculty, students, and others in making reasonable and informed judgments with regard to the quality of Internet-based distance education (IHEP, 2000). Many benchmarks are common sense, but the study validates their importance. The following section offers some practical ideas on how to apply information on instructional technology to ECSE personnel preparation.

APPLICATION OF INSTRUCTIONAL TECHNOLOGY

Suggestions for Instructional Design and Use

In the definition of instructional technology, design and utilization were two domains. Figure 1 illustrates one way for instructors to examine their instructional strategies, the media, and delivery systems to support student learning. This survey was designed for faculty in teaching their courses; however, inservice and staff development providers can also use it to examine their own training events. Figure 1 includes definitions for the instructional strategies, many of which are well-known and described in the ECSE literature (cf. Winton et al., 1997; McWilliam, 2000). Further description is needed regarding the types of instructional media.

Online Materials. The first media category in Figure 1 is online materials, which could include Web sites of the major organizations, research centers, and government agencies that are important to the topical areas. The Division for Early Childhood/Council for Exceptional Children Web site maintains a comprehensive listing of links for the field (www.dec-sped.org). In addition, Web-based course development tools (e.g., WebCT, Lotus Learning Space, Blackboard CourseInfo) and other resources for Web-based instruction and conferencing (e.g., WebBoard) assist instructors in organizing their instructional materials and Internet links. A recent article in the online journal Early Childhood Research & Practice [http://ecrpuiuuc.edu/] contains lists of and links to Internet resources for tools and ECSE programs using distance education strategies (Hains, Conceição-Runlee, Caro, & Marchel, 1999).

Electronic Reserve. Electronic reserve provides a medium for libraries to use to store documents in electronic files that students can access via the Internet. It allows students to remotely access items faculty have placed on reserve for their classes. With this digital library system, students may view, print, or download course material such as lecture notes, exams, journal articles, and book chapters. Because copyright laws apply, restrictions specify who has access and how long documents are available (e.g., 1 semester). University librari-
Please reflect on your course and identify the various media that you used for each of the instructional strategies by marking an "x" in the appropriate box.

**DEFINITION OF TERMS:**
- **Active Experimentation:** Students conduct surveys, perform tests or experiments, site visits, or other "hands-on" activities.
- **Case Study:** Students work through authentic or fictitious narratives of problems or situations, which require a variety of thinking skills to resolve.
- **Class Handouts:** Reading materials developed by the instructor to be distributed to students.
- **Collaborative Learning:** Students work together in groups to teach each other new material and produce group documents or projects. May include group and individual assessment.
- **Colloquy:** A technique in which experts interact with the audience.
- **Debates:** Students are asked to take sides on an issue and argue for them. May include arguing against one's own point of view.
- **Field Experience:** Students are asked to visit sites and observe or participate.
- **Guest Lecture:** Guests make presentations.
- **Interrupted Lecture:** Instructors regularly interrupt lecture to pose problems, encourage questions, ask for feedback; may involve student-to-student interaction.
- **Interviews:** Interrogators ask resource people for information.
- **Lecture/mini lecture:** Instructors make presentations. Mini-lectures are short presentations.
- **Papers or Written Projects:** Written assignments on some aspect of the course.
- **Peer Teaching:** Students present information or lead discussion in class. May also involve peer critiquing.
- **Question and Answer:** Students or instructors ask questions; answers may be individual/group, written/verbal.
- **Quizzes:** Instructors pose questions to students that require individual/group, written/verbal responses for evaluation purposes.
- **Role-playing, Performance:** Students act out issues, positions, or literature, in order to demonstrate understanding of important concepts; also includes mock interview or clinical practice.
- **Simulations:** Students work through "What if?" scenarios to practice formulating hypotheses and examining outcomes.
- **Small Group Discussion:** Students work together in groups of three to five for a variety of purposes.

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**FIGURE 1.** Instructional media survey instrument.
ans are excellent resources for assisting in setting up this process and providing support (e.g., scanning documents). This medium allows ECSE instructors to make available many public domain materials (e.g., child find brochures, family interview questions, sample Individual Family Service Plans, transition timelines, local screening tools, etc.) that students can review and use.

Electronic Mail. E-mail includes messages, usually text, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses (e.g., mailing list). Like postal mail, electronic mail exchanges are made at the convenience of the user and the sender; unlike telephone calls, they are not real-time communications but can be sent or read at any time.

Listservs/Reflectors. Listserv or reflector groups enable electronic mail users to extend the notion of community to those who are geographically dispersed but share a common interest. Typically, those with e-mail capability can “join” or “subscribe” to Internet discussion groups, which enables them to send a single message to all those who have subscribed to the discussion group. The frequency of messages varies greatly depending on the activity of the members. The messages arrive daily (or less frequently) in subscribers’ e-mail mailboxes as single messages or as a daily “digest” of all messages posted to the list that day. Listserv software is one of the most commonly used programs to support online discussion groups. For example, the Division for Early Childhood maintains a governmental relations listserv that provides information on federal policy and legislative activities.

Online Forums. Online forums offer topical discussion strands that allow users to post topics as well as submit responses or comments to various existing topical strand discussions on a Web site. Topics and responses may or may not be distributed to a restricted list of subscribers. ECSE instructors may choose, for example, to close the discussion exclusively to class participants or a subgroup of students. In other situations, the discussions are open for reading and responding by any visitor. For instance, the National Early Childhood Technical Assistance System hosted national experts via satellite, then had the presenters available in online discussion forums during the month after the presentations for follow-up questions and discussion.

Electronic Presentations. A variety of types of electronic presentations exist. A familiar example is software designed to assist and enhance lecture presentations (e.g., PowerPoint). Web casts and other real-time electronic presentations offer new opportunities for educators and students to be virtually present at events far removed from their local communities. For example, in August 1999 the National Child Care Information Center (NCCIC) presented a live Web cast of keynote speeches by Frank Fuentes, Olivia Golden, and Pat Montoya of the U.S. Department of Health and Human Services (DHHS) at the ACB Child Care Bureau’s State Administrator’s Meeting in Washington, DC (these keynote addresses remain archived on the NCCIC Web site at http://nccic.org/sam99/webcast.html for archival viewing by Web users). In addition to offering real-time participation opportunities, the archives of such events can be a rich resource for those engaged in personnel preparation.

Face-to-Face. Face-to-face instruction takes place in those settings in which instructor(s) and learners are located in the same physical environment at the same time. Traditional campus classrooms and agency or school district workshops are common examples.

Independent Learning. Independent learning courses may be credit courses designed as alternatives to traditional face-to-face classroom instruction. They offer maximum scheduling flexibility for students interested in independent study or who cannot make an uninterrupted 16-week classroom commitment. In an independent learning course, textbooks and workbooks may be supplemented with video and/or audiotaped instruction or computer communications (see http://www.dlt.asu.edu/dlt_info/correspond.html). Independent learning makes university credit courses accessible to all. Often the instructor and student design activities that the student conducts independent of the instructor. On campus, students may formally enroll in an independent study with a professor. Within traditional course offerings, the amount of face-to-face interaction and independent learning varies from situations where professors assign independent learning activities such as interviews or observations that take place outside of the college classroom to weekend college courses that meet monthly with independent study assignments completed in between face-to-face meetings. Similarly, inservice follow-up strategies, such as the development of action plans that identify next steps or the identification of mentors, extend the instructional event beyond the workshop or group event that occurred.

Frequently, instructors select a variety of strategies and media that fit the goals, objectives, context, and content of the instructional event(s). For example, Smith, Martin, and Lloyd (1998) described several strategies and media that they used to integrate the Internet in their preservice teacher training program. They developed case studies, which were accessible to students via a specially designed course Web site. Each case was supplemented with video and audio clips, photographs and graphic images, links to other related Web sites, and a discussion forum such as listservs, news groups, and e-mail.
Likewise, a faculty member designing a course online with no face-to-face interactions will have different considerations for strategies and media than a colleague who teaches on campus and has opportunities for group interactions with students. Similarly, an inservice provider who is designing statewide training with the goal of planning systematically for the integration of content in the workplace will choose different types of activities and media, including ones that maximize follow-up strategies (Wolfe, 1998; Wolfe & Snyder, 1997).

**Suggestions for Getting Started**

Arguably, one of the greatest challenges for those engaged in preparing personnel, providing technical assistance, or offering inservice education is that of becoming an information provider in the new electronic environment. Faculty engaged in personnel preparation in colleges and universities often begin by creating their own faculty home page on a university server, often with assistance from a knowledgeable colleague, staff member, or student. By using a team approach, however, more substantive integration of technology into coursework can begin. Those engaged in ECSE personnel preparation inside and outside of the university community have assumed the role of content experts, working with instructional design experts and other partners to learn about the uses of instructional technology (Hains et al., 1999; Rowland, Rule, & Decker, 1996; Rule & Stowitschek, 1991). Many universities offer extended opportunities for faculty development by releasing faculty from teaching a semester-long course and providing technical support and development opportunities.

**Case Examples**

In most ECSE teacher training programs, preservice students participate in a variety of activities designed to provide them with opportunities to gain experience in working with children and families. These include practicum and student teaching experiences in which students can practice skills they have acquired in class and at the same time learn from their supervisors and cooperating teachers. In many courses, instructors design their curricula to include activities such as inviting community members to class to serve as panelists to discuss special topics (e.g., family members speaking about their experiences in the special education system), showing videotapes of young children engaged in a variety of activities, reading and discussing actual case studies, and observing children and teachers in the classroom. With the increased accessibility of the Internet, instructors now have additional resources they can use to connect their students to the real world.

The number of Web sites on the Internet increases daily and includes sites related to almost every topic of interest. Many nonprofit groups, agencies, and organizations have developed their own Web sites to disseminate information and resources to their membership or target audience. Although some instructors may not have the luxury of time, expertise, and resources to develop their own course-related Web site, most faculty are already able to supplement class activities with information that can be accessed from existing Web sites. Using guidelines on evaluating Web sites, instructors can select Web sites that will meet the needs of their students. Appendix A provides examples of selected Web sites for use in ECSE instruction based on our knowledge and use of these sites.

Although many students come to college with increasingly sophisticated computer skills, the "digital divide" still exists in higher education. A simple exercise to help beginning students learn to access information from the Internet is to create a list of bookmarks and assign a "treasure hunt" for various pieces of information contained in those Web sites. Because the instructor selects the Web sites and identifies key information for searching, this introductory experience ensures success and reduces anxiety for first-time learners. This activity can be completed in a computer lab, in teams outside of class, or individually. To accommodate the range of students' skills, pairing novices with experts in teams can add peer support to the learning experience.

Another assignment is to search and evaluate several Web sites dealing with specific topics. For example, students may be assigned to identify Web sites that provide information to families on their child's specific disability. Part of this assignment is not only to identify Web sites but also to evaluate those Web sites to determine their potential usefulness, appropriateness, validity, and appeal to their target audience. Bakken and Aloia (1998), Peters-Walters (1998), and Small (1997) offer some guidelines on what to look for in Web sites. With the increase of Web sites on the Internet, it is important that students learn to be discriminating in the sources they use to gather information. Appendix B provides prototype guidelines for students and faculty when designing and evaluating Web sites. These guidelines have not been field tested. The guidelines could be adapted into a checklist depending on the needs of the target audience. For example, an open-ended format, which allows for comments, could be used with expert Web users while a rating scale could be used to guide novice users.

Creativity in using the Internet and the information provided in Web sites is also critical in facilitating a connection between students and the real world. Instructors can take advantage of the information provided in an existing Web site or in the way some Web sites are designed to develop activities for their preservice students. For ex-
ample, a University of Kansas Web site, "Circle of Inclusion" (http://www.circleofinclusion.org/) offers information on the topic of inclusion for early childhood service providers and families. This Web site includes a preschool inclusion manual, which instructors can use as a supplemental reading assignment for their class. Additionally, this Web site has a section of interviews with service providers and family members who are currently playing an active role in inclusive settings. Web users are encouraged to select a role (e.g., administrator, teacher, parent, and support personnel such as a family service coordinator and school psychologist) and read each person's response to a series of questions dealing with his or her role in inclusive programs. A link to the community programs with which each individual is connected offers a context for each person's response. Instructors can extend the use of this case study approach by adapting the interview questions to their local situation and using them to interview members of their own community. In addition, they can facilitate a discussion among students on aspects of inclusion as seen through the eyes of the different stakeholders.

Another rich resource for instructors to use in their classes is the Early Childhood Research Institute on Culturally and Linguistically Appropriate Services (CLAS Web site http://clas.uiuc.edu/). This site offers users a dynamic and growing database of practitioner-oriented materials designed to promote effective practices while also being responsive to the cultural and linguistic needs of the many diverse families now served by early childhood special educators. Instructors can assign students to search the CLAS database for materials on specific topics such as transition, child find, child guidance, or second language acquisition. They can ask their students to refine their search for materials by looking for those materials developed in various languages (e.g., brochures in English, Spanish, and Hmong on child find), available in different formats (e.g., child guidance information presented in written, audiotape, or videocassette format), or intended for varying age groups (e.g., information on transition for infants). If they have used the materials reviewed on the Web site, students or faculty can add their own comments to the Web site for others to read.

Individuals from a variety of backgrounds have reviewed many of the materials available in the CLAS Web site database. These reviews offer Web users the perspective of knowledgeable individuals in the field (e.g., teachers, family members, technical assistance providers, support personnel, administrators, and teacher trainers) on the appropriateness and usability of the reviewed materials with a variety of groups. Instructors can use these reviews in many ways in their classes. For example, they can discuss the issues of culture and language raised by reviewers about a particular material (each item is typically reviewed by two or more independent reviewers).

Instructors can also ask their students to write a review about one of the materials and compare their reviews with the ones posted on the Web site. The CLAS Web site offers guidelines for service providers, parents, and administrators to consider when selecting and using early childhood materials. These types of activities allow students to learn about new resources that are particularly relevant to cultural and linguistic concerns, as well as learn how to access information that will be useful later in their work.

**CONCLUSION**

Advances in technology are changing the dynamics of teaching and learning in higher education (Grossman, 1999; Guskin, 1994a, 1994b; Merisotis & Phipps, 1999; Ragan, 1999). Although little empirical evidence exists to guide the field in terms of integrating technology into training (Katz & Rothenberg, 1996), Merisotis and Phipps (1999) note, "The irony is that most of the research on technology ends up addressing an activity that is fundamental to the academy, namely pedagogy—the art of teaching" (p. 17).

**AUTHORS’ NOTES**

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**REFERENCES**


APPENDIX A: SELECTED WEB SITES FOR ECSE INSTRUCTORS

WEB SITES FOR SUPPORTING STUDENT SEARCH ACTIVITIES

CLAS: The Early Childhood Research Institute on Culturally and Linguistically Appropriate Services
http://clas.uiuc.edu/

Disability-Related Sites on the World Wide Web
http://TheArc.org/misc/disnkin.html

Division for Early Childhood/Council for Exceptional Children
http://www.dec-sped.org/eilinks.html

Early Childhood Education On Line
http://www.ume.main.edu/~cofed/eceol/

Early Childhood Resource Center
http://www.rti.org/child/

Educational Resources Information Center (ERIC)
http://www.accesseric.org/

Family Village
http://www.familyvillage.wisc.edu

Medscape Pediatrics
http://pediatrics.medscape.com

National Association for the Education of Young Children
http://www.naeyc.org/

National Center for Early Development & Learning (NCEDL)
http://www.fpg.unc.edu/~ncedl

National Early Childhood Technical Assistance System (NECTAS)
http://www.nectas.unc.edu

National Organization for Rare Disorders, Inc.
http://www.rarediseases.org/

Systems Change in Personnel Preparation (Products: Resource Guide)
http://www.fpg.unc.edu/~scpp/

The Individuals with Disabilities Education Act Amendments of 1997
http://www.ed.gov/offices/OSERS/IDEA/

The National Information Center for Children and Youth with Disabilities
http://www.nichcy.org/

WEB SITES WITH DISCUSSION AREAS/LISTSERVS

Wisconsin Families On-Line (Family Stories)
http://www.waisman.wisc.edu/earlyint/wis-fam/index.htmlx

WEB SITES WITH DISCUSSION AREAS/LISTSERVS

ERIC Clearinghouse on Elementary and Early Childhood Education
http://ericeece.org/

Family Village (coffeeshop)
http://www.familyvillage.wisc.edu/coffee.htm

National Parent Information Network
http://npin.org/

Teaching Exceptional Children, Author Online
http://www.cec.sped.org/bk/tec.htm

ONLINE JOURNALS

Child Welfare Review
http://www.childwelfare.com/kids/news.htm

Contemporary Issues in Early Childhood
http://www.triangle.co.uk/ciee/index.htm

Early Childhood Research & Practice
http://ecrp.uiuc.edu/

Future of Children
http://futureofchildren.org

Teaching Exceptional Children, Special Issue: The World Wide Web & Special Education
http://www.cec.sped.org/bk/tec-jour.htm

INTERNET RESOURCES ON EVALUATING WEB SITES

Evaluating Web sites
http://www.selco.lib.mn.us/selco/mla/evaluation.html

Evaluating Web sites: Internet Web site Evaluation Scale
http://cube.ice.net/~edu tech/florida web/evalscale.htm

Evaluating Web sites for Instructional Content
http://bearcat.ubly.k12.mi.us/~mrt/MaculStuff/HTML/Evaluating.htm

Kathy Schrock's Guide for Educators
http://www.beavton.k12.or.us/vince/neto/chaff.htm

Reference Sources—Evaluating Web Resources
http://www.swem.wm.edu/Gateway/evaluation.html

(Appendix A continues)
(Appendix A continued)

The ICHM Library Web site Evaluation Page
http://www.ichm.cc.ct.us/web.html

With so many Web sites out there . . . How do you know which ones are worth your while?
http://eagleone.chimacum.wednet.edu/classpages/evaluation.htm

WEB SITES FOR FACULTY INSTRUCTIONAL SUPPORT

American Association for Higher Education, Teaching, Learning & Technology (TTT) Group
http://www.aahhe.org

Collaborative Course Development in Early Childhood Special Education Through Distance Learning
http://ecrp.uiuc.edu/

National Teaching and Learning Forum Homepage
http://www.ntlf.com/

On-Line Educational Resources: Federal Government Educational Resources on the Internet

INTERNET RESOURCES ON ELECTRONIC ACCESSIBILITY

Center for Applied Special Technology (CAST)
http://www.cast.org

Equal Access to Software and Information (EASI)
http://www.rit.edu/easi/

National Center for Accessible Media (NCAM)
http://www.wgbh.org/ncam

Generating Assistive Technology Systematically (GENASYS)
http://www.genasys.usm.maine.edu

World Wide Web Consortium (WC3) Web Accessibility Initiative (WAI)
http://www.w3.org/WAI/

Note. Bookmarks for Appendix A: Selected Web Sites for ECSE Instructors are available from the first author at http://www.uwm.edu/~annhains/selected.htm

APPENDIX B: PROTOTYPE GUIDELINES FOR DESIGNING AND EVALUATING WEB SITES

I. CONSIDERATIONS FOR WEB SITE USERS

Prior to evaluating the technical features of a Web site, content and reliability of information presented on a Web site are of critical importance to users. Web sites are likely to contain one or more of the following kinds of content:

- Education (learning about something)
- Performance (learning how to do something)
- Facts (Which is which?)
- Concepts/Definitions (What is it?)
- Procedures/Steps (How do you do it?)
- Processes/Stages (How does it work?)
- Principles/Guidelines (What would an expert do?)

When evaluating Web site content, does the Web site:

- Explain its purpose? (e.g., advocacy, information, procedures, etc.)
- Let the user know who owns the site?
- Let the user know what the site owner does? (e.g., describes the organization sponsoring the site, which may include philosophy, mission, values, etc.)
- Provide a statement about gathering information about the user (e.g., cookies) and disclose how that information is used?
- Format content effectively and break the content into screen-sized sections?
- Use navigational transitions (e.g., links, headings, bullet points, hot areas, graphics) versus transitional rhetoric? (e.g., terms such as "consequently," "subsequently," "it follows that," which are based on information that either precedes or follows them)
- Use graphics and features that contribute to conveying its message, rather than detracting or distracting from its message?
- Communicate the message in a tone that is appropriate to the intended audience? (e.g., neutral, critical, respectful, etc.)
- Provide current and timely information? (e.g., includes the date Web site was last updated)

(Appendix B continues)
II. CONSIDERATIONS FOR WEB SITE DEVELOPERS

Appearance (or Layout)

The organization of the Web site allows users to systematically navigate through its visual pathways. The visual structure introduces unity, integrity, readability, and control. Unity means that design elements support a common communication goal. Integrity means that the design is focused on the communication goal. Readability is demonstrated by dividing information into manageable subsets that can be processed separately or in parallel. Control is shown by features that help users predict areas of interest and navigate through composition. Specific criteria are listed below.

* Pages that provide a common look help users to know where they are when navigating through the Web site.
* Text is brief and uses the active voice.
* Length is 60 (64 x 20 pixels) words per line.
* Text uses no less than a 10-point font size with sans-serif fonts for the main text to ensure that the user can read the text; bold and italics are used sparingly.
* Bullets help format lists and organize ideas.
* Format incorporates liberal use of whitespace.
* A logo or graphic kept constantly on the screen in a corner or in a column devoted to navigation is a clue to identifying the Web site.

Navigational Design

The primary goal of navigational design is to allow users to navigate freely and comfortably through a Web site. Users need to be able to access all the parts of the Web site that are of importance to them; likewise, they need, through simple means, to be able to avoid all the sections that are not personally pertinent. The following criteria pertain to navigation:

* A link to a site map or a diagram of the site map itself is continuously visible on the screen.
* The user encounters clear, common navigational methods and is not presented with an overwhelming list of options. The set of navigational controls is always visible. These controls include "buttons" or "hot areas" to access: back, main, site history, and an itemization of the other essential parts of each individual site. Navigating through the Web site is accomplished with a minimum number of clicks or jumps.
* Controls are accessed easily by the intended audience (i.e., graphic iconic controls may be best for young learners or for those with problems reading text).
* Users can see location information so that they know where they are in relation to where they want to be.

HyperText (Hypermedia) Features

One of the most useful and least employed features of Web sites is the use of hypermedia. The power of hypermedia is that it minimizes the need for users to deal with material already well-known or not needed at the present time.

* Text screens seldom need scrolling to enable users to see the complete text. Links should be used instead.

* Definitions of technical words are linked to the technical word every time it appears in the text.
* Links to other Web sites are used instead of repeating information easily linked to elsewhere if (and only if) a return link is provided so that the user does not lose her or his place in the site navigation.
* Search engines are employed within the site to let the user look up particular details within the content included in the site.

Legibility

There are many qualities and sizes of computer monitors. Web designers often work on very large and very high quality ones. They may also be tempted to use small type or picture sizes that may be unreadable or difficult to view on smaller or less sharp monitors. Here are two criteria for legibility:

* Test text, graphics, and links on a variety of monitors and browsers (including earlier versions of browsers, text-only browsers, and voice browsers) or simulations of them to ensure that their work will be widely usable on screens no larger than 10" diagonally.
* Avoid flickering/flushing screens or items as they can be distracting and may cause seizures in some individuals.

Graphic and Video Elements

Effective sites are ones in which graphics and videos are used to communicate ideas but not when text would do as well for particular users. Graphics file size should be minimized for load speed, while maintaining legibility, and should contain no more than 72 dpi (the standard screen resolution). Although some powerful computers can reproduce millions of colors, designers would be wise to work with thousands of colors (normally 216 colors are used—see http://www.webreference.com/dev/graphics/palette.html) to ensure that images will be clear on users' screens. Web sites employ effective use of graphics and video by attending to a number of elements:

* Graphics load quickly to keep user's attention at the Web site.
* Videoclips are no longer than 2 minutes.
* When large images are necessary, thumbnail versions of them appear on the Web site, and a larger image of the graphic can be viewed only if the site user calls for it by clicking on it.
* Graphics (images and icons) must be effective at delivering information quickly so that there is synergy with the content of the text.
* Web sites containing image maps should provide a text-based navigation option.

Electronic Accessibility

Accessibility guidelines for electronic information will continue to change as technology advances. "Accessibility" is a broad term, which for the purposes of this discussion encompasses persons who (a) may not be able to see, hear, move, or be able to process some types of information easily or at all, (b) have difficulty reading or comprehending text, (c) do not have or cannot use a standard keyboard or mouse, (d) have a text-only screen, small screen, or slow Internet connection, (e) do not speak or understand fluently the language in which the docu-
(Appendix B continued)

ment is written, or (f) have an earlier version of a browser, use different browsers, use voice browsers, or employ a different operating system.

The use of universal design concepts can improve access for all users. The World Wide Web Consortium's (W3C) Web Accessibility Initiative (www.w3.org/wai) seeks to increase usability of the Web for people with disabilities; however, their guidelines can be used to increase accessibility for all types of users, rather than just those with disabilities. See WAI Web Content Accessibility Guidelines (http://www.w3.org/TR/WAI-WEBCONTENT/). Some highlights of the WAI guidelines include the following:

- HTML text is used whenever possible (this allows the user to enlarge the text).
- Web site images include large areas that are made active for pointing and clicking.
- Text equivalents (ALT text, long descriptions, captioning, etc.) are provided for images and animations, and auditory descriptions are available.
- Background and foreground color combinations with sufficient contrast are selected.
- Information is not conveyed solely by color.
- If frames are used, titles are assigned to each frame, which allows the user to identify the contents of the frame.
- Web sites are usable if scripts, applets, and other objects are turned off or cannot be accessed.

- Pop-up windows are not used because of navigational difficulty until browsers allow pop-up windows to be turned off.
- Online videos (a) provide captioning (in several languages) for the benefit of the deaf and other language users, (b) use audio descriptions, and (c) provide transcriptions for narration.
- Vocabulary accommodates the range of reading level of the intended audience and acronyms are defined.
- Pages are created with a consistent style.
- Separate accessible or text-only pages are only used when the primary page cannot be designed to be accessible.

Contact Information

Sites provide an e-mail address for the site manager to report any problems encountered while using the site. The site also contains complete contact information for the group responsible for the content of the site, including street address, phone and fax numbers, and names and e-mail addresses of key contact people.

Evaluation

Sites include an evaluation instrument that all users will be encouraged to fill out. It is short, simple, and focuses on specific elements of the site.