Online Teacher Training: The Early Childhood Technology Integrated Instructional System – Phase 3[1]

Gary Daytner, Linda Robinson, Carol Schneider, and Joyce Johanson

Legislation, research, and practice support access to technology by young children with disabilities. Yet barriers to technology use—lack of training, inadequate funding, failure to acknowledge technology as a relevant issue, or disbelief that technology can positively impact young children with disabilities—often prevail among many disciplines important to early childhood teams (Barnett, 2001; Healy, 1998; Hutinger, Hall, Johanson, Robinson, Stoneburner, & Wisslead, 1994; Pressman, 1999). The purpose of this study is to present the findings from a project utilizing online workshops to assist teachers' use of technology with children with special needs. A total of nine online workshops were made available to in-service and pre-service teachers and evaluated with the use of mixed methods.

Children and Technologies

Technologies serve a variety of *purposes* and *functions* as educational tools for young children, depending upon the versatility of a particular application. In the best of scenarios, technology not only provides a way for children to *do things differently* (i.e., communicate, draw, write), but also enables them to *do different things* (e.g., make and use individualized multimedia software or establish a web site) (Bell, Clark, & Johanson, 1998; Hutinger & Clark, 2000; Hutinger, Clark, & Johanson, 2001; Hutinger, Beard, Bell, Bond, Robinson, Schneider, & Terry, 2001). Children's capabilities range from simple experiences (touching a key or switch)

with immediate consequences to more complex experiences with interactive multimedia activities.

Used appropriately, computers are valuable learning tools for children (Haugland, 2000). Intervening with computers and other technologies, including adaptive peripheral devices or specialized software, produces positive changes in young children (Derer, Polsgrove & Reith, 1996; Hutinger & Johanson, 2000; Hutinger, Johanson, & Stoneburner, 1996; *Promising Practices,* 2000). Moreover, computers may help children learn in new ways (Bransford, Brown, & Cocking, 2000). A single computer can be used by an individual child, two or three children, or a larger group of children, thereby leading to increased positive social interactions (Buckleitner, 1994; Haugland, 2000; Hutinger, 1987, 1998, 1999; Hutinger, Bell, Beard, Bond, Johanson, & Terry, 1998; Hutinger, Betz, Johanson, & Clark, 2003; Hutinger & Clark, 2000; Hutinger, Johanson, & Rippey, 2000).

Using appropriate software can help children develop critical thinking, problem solving, creativity, and mathematical thinking (Clements, 1999a, 1999b; NAEYC, 1996). Software appeals to the wide range of children's abilities and learning styles and can be classified according to five levels of interactivity based on the degree of choice and control the child has over input, software paths, and events (Hutinger & Johanson, 1998; Robinson, 2003a).

Using technology, educators and families can document learning and enhance activities for young children. Digital cameras, video cameras, scanners, and the Internet can be used to collect images for use in tool software. Children can take digital photos or scan photos, drawings, pictures and 3-dimensional objects and transfer them to a computer. Children and adults together can develop individualized software using *BuildAbility, HyperStudio,* or *IntelliPics Studio,*

authoring software that incorporates drawings, videotape, sound, animation, and text (Bell,

Clark, & Johanson, 1998; Hutinger, et al., 2001; Robinson, 2003b).

While educational reforms emphasize computer-based instructional technologies, the

emphasis is on elementary, middle school, and high school rather than on early childhood

programs. However, research and practical experience indicate that young children who have

experiences with technologies can participate more fully in the regular curriculum and are less

likely to be left behind than those without such access (Lewis, 2000; Lewis, Ashton, Haapa,

Kieley, & Fielden, 1998/1999). The Center's experience in research, model development, and

product development demonstrates not only that young children with a wide range of disabilities

can use technology, but also that many of them use it easily and effectively, and retain elements

of software use over time (Hutinger, Bell, Johanson, & McGruder, 2002; Hutinger, Betz,

Johanson, & Clark, 2003; Hutinger & Clark, 2000; Hutinger & Johanson, 2000; Hutinger,

Johanson & Rippey, 2000).

Assistive technology equalizes learning opportunities for children with mild to severe

disabilities. However, technology training for early childhood staff and families is essential if the

goal of participation in the regular curriculum is to be met. If teachers and families are without

appropriate knowledge and skills to integrate technology into early childhood curricular

experiences, children's potential will remain untapped.

Training

Lack of training remains a major issue. Angeles and colleagues (2000) found that only

half of teachers with technology in their classrooms use it for instructional purposes. In order to

apply and impact children's learning, teachers report that they must be trained in the use of

different technologies and strategies to integrate those technologies into the curriculum (Berard,

2004; Judge, 2001; Maeers, Browne, & Cooper, 2000; Sianjina, 2000; Vannatta, 2000). Teachers cite lack of time and lack of information about where to obtain training as primary reasons for failing to use technology to its full extent (Judge, 2001).

The success of integrating technology into classrooms is limited by teachers' comfort levels and knowledge of technology. The more training teachers have, the more benefits they see in using technology with their students (Rother, 2003). When teachers are uncomfortable with technology and its use, the impact on the curriculum will not be effective (Merbler, Hadadian, & Ulman, 1999; Schlosser, McGhie-Richmon, & Blackstien-Adler, 2000).

For many reasons, early childhood teachers have been slow to incorporate developmentally appropriate software, hardware, and adaptive devices into curriculum for young children. One major reason is that training to use technology with children is limited. The need is great to include technology across the educational community and make dramatic and timely changes so that *all* children can keep pace with technological and societal changes. However, without well-trained teachers and staff, the need cannot be met. Results of EC-TIIS 2 indicate that those who complete the workshops increase knowledge and skills related to specific technology applications in the regular early childhood curriculum and demonstrate increased positive attitudes toward technology use with young children.

Feasibility and Importance of Web-based Instruction for Adult Learners

Web-based instruction uses an approach to learning that is appealing to busy people and meets the needs of 21st century learners by allowing them any-time access to learning materials. Online courses are convenient because learners are not constrained by geographic location or confined to a set hour for participation (Butler, 2003; Mariani, 2001). Researchers found no significant differences between web-based courses and traditional courses at the university level

(Coppola & Thomas, 2000; Faux & Black-Hugh, 2000; Kubala, 1998; Phipps & Merisotis, 1999; Ryan, 2000; Schulman & Sims, 1999; Shoech, 2000; Teh, 1999; Wade, 1999). Draves (2000) reports that more interaction occurs both between the teacher and students and among students with online learning. The increased interaction may be due to students feeling more at ease to ask questions and participate in discussions when in front of a computer screen than when in a classroom. Students in some web-based learning environments achieve at higher rates than do their peers in traditional classroom settings (Thirunarayanan & Perez-Prado, 2002).

According to Butler (2003), other advantages include flexibility, availability, time savings, and no interruption to job. Web technology enhances adult learning with its potential to increase flexibility, provide access to expertise, facilitate discussion among learners who cannot meet face-to-face, reduce feelings of isolation often experienced by nontraditional learners, increase learner autonomy, and support and promote collaborative and constructivist learning (Burge, 1994; Cahoon, 1998; Eastmond, 1998; Field, 1997; Horton, 2000).

A constructivist approach to learning assumes that knowledge acquisition and exchange is a *learning process*. Learners "construct" models of the environment, then integrate and interpret new experiences and information based on their pre-existing knowledge, beliefs, and personal experiences (Abbott & Ryan, 1999; Anderson, 1996; Bransford, Brown, & Cocking, 2000; Hutchinson, 1995; Kamii & Ewing, 1996; Oliver, 2000; von Glaserfeld, 1995; Wilson & Lowry, 2000). The metaphors of building and shaping suggested by the constructivist model provide a framework for viewing effective staff and family development and a rationale supporting the flexibility and activities built into EC-TIIS web site.

Description of the EC-TIIS Website

EC-TIIS website (www.wiu.edu/ectiis/) contains nine workshops, resources related to assistive technology and early childhood, and information about the Project. Workshop topics include Adaptations; Computer Environment; Curriculum Integration; Emergent Literacy; Expressive Arts; Family Participation; Math, Science and Social Studies; Software Evaluation; and Technology Assessment. See Figure 1 for workshop descriptions and the Appendix for sample workshop pages. Content is based on the Center's curricula and training materials and includes written text, photos of children engaged in technology activities with some using adaptive devices, and PDF (portable document format) files with further information, curriculum ideas, activities, resources, and related articles.

The EC-TIIS website was designed to be an information-intensive, attractive, comprehensive website with an intuitive user interface and navigation system. The site uses high contrast graphics for easy viewing. Through the use of externally imported style sheets, variable width pages, and minimalist design, the average total page weight is kept low, approximately 25k, which means the content of the site is fast loading even on slower dial-up systems. EC-TIIS website opens with a colorful splash page containing a collage of photographs of young children using technology. An introductory statement and link to the Center website are under the graphic. The right side bar menu contains links to About Us, Contact Info, FAQ (Frequently Asked Questions), Glossary, Login, Products, Register, Resources, and Sample Workshops. Each workshop contains a navigation bar at the top for easy access to other parts of the website. To view workshops, participants must first register, using the online Registration Form. The form provides EC-TIIS staff with user information such as name, address, e-mail, how the user found the site, the research group to which the user belongs, and what workshops are of interest to the user. After completing the Registration Form, the user is required to complete a

Technology Survey and either the Classroom or Family survey, depending on which group the user identified on the Registration form.

Users are required to complete a Pre-Assessment before entering a specific workshop. After completing the registration process, participants can then view workshops at any time by logging into the site with their User Name and Password. A Progress Page listing the workshops and the user's completion of pre and post assessments is created for each participant. Users are asked to complete an online Workshop Evaluation upon exiting the website.

EC-TIIS Workshop Descriptions

Adaptations

The Adaptations Workshop has information and resources on a variety of adaptive input methods as well as portable communication devices and customized activities for young children.

Computer Environment

The Computer Environment Workshop includes strategies for designing and adapting the physical environment, a checklist of considerations for setting up the computer center, and ideas for managing computer time.

Curriculum Integration

The Curriculum Integration Workshop contains ideas for integrating technology into the early childhood curriculum, activity planning information, and a wide variety of classroom examples.

Emergent Literacy

The Emergent Literacy Workshop focuses on curriculum applications, adaptations, and assessment techniques for using technology to support emergent literacy development in young children.

Expressive Arts

The Expressive Arts Workshop highlights techniques for incorporating technology into expressive arts for young children, including environmental design considerations, curriculum activities, and adaptations.

Family Participation

The Family Participation Workshop contains information on levels of family participation, workshop strategies, and resources to assist families in using technology with their young children.

Math, Science, and Social Studies

The Math, Science, and Social Studies workshop emphasizes strategies for designing computer activities, off-computer materials, and adaptations to engage young children in the learning process and help them meet early learning standards.

Software Evaluation

The Software Evaluation Workshop provides guidelines for selecting developmentally appropriate software, classifying and evaluating children's software, and suggests software for supporting classroom themes and children's learning preferences.

Technology Assessment

The Technology Assessment Workshop contains procedures for using a team process to assess a young child's technology needs and techniques for making equipment, software, and activity recommendations.

Results

Results of EC-TIIS 3 demonstrate attainment of the study's research goals and the effectiveness of the workshops on the use of technology with young children with

disabilities. Research results confirm Phase 2 findings. Data results from the surveys and workshop pre and post assessments indicate that EC-TIIS online workshops were effective in increasing knowledge, attitude, and skill in using technologies in the early childhood environment. An analysis of the nine sets of pre and post assessments showed statistical significance for a majority of the items. Comments from participants indicate new knowledge gained in areas related to technology and curriculum integration, and specific gains in emergent literacy and expressive arts knowledge.

Qualitative data from teachers points to the effects of their EC-TIIS participation on the use of technology in their classroom. They indicated changes made to their classroom as a result of knowledge gained in EC-TIIS Workshops. Changes mentioned most often included making materials and equipment more accessible to children, designing the computer environment more appropriately, and integrating specific strategies at the computer, such as the use of a sign-up sheet. Most teachers indicated the website served as a good resource for themselves as well as others in the field.

Early childhood staff observed many benefits for children resulting from their participation in EC-TIIS. Children have more time on the computer and more choices in the writing center. The reported changes made by educators to their centers, and specifically, the computer center, indicated that materials became more accessible to children both on and off computer. Participants who used the information from the workshops to make changes in their classroom and curriculum reported increased access to technology and integrated activities for children in the classroom. Some noted positive changes in children's progress.

Faculty who incorporated EC-TIIS workshops into course content found the information to be beneficial to students, especially as it concerned addressing the needs of children with

disabilities. Students indicated the online format was enjoyable, reported many gains in knowledge related to workshop content, and noted their participation would be beneficial to their current or future teaching position. The effectiveness of the workshops for college students points to the fact that different types of educators benefitted from EC-TIIS.

Overall participants indicated the workshop design was of high quality and the content was current and addressed developmentally appropriate practices in early childhood. Educators, faculty, students, and families commented on the usefulness of the workshops as a vehicle for training on early childhood and assistive technology topics.

Lessons in Online Training Learned

EC-TIIS 3 staff learned many lessons related to the development of a sophisticated online data collection system and the implementation of research in an online environment. First, the development and testing of the online system is a time consuming endeavor. EC-TIIS 3 research and data retrieval depended on the operation and maintenance of the complicated data collection system. The resulting system used in EC-TIIS 3 provides a model which can be used by others conducting online training.

Second, to insure that a complete set of workshop pre-assessments were completed, staff programmed the online surveys and assessments so that participants were required to complete all questions before entering any workshops. Before this programming change, many incomplete surveys and few pre-assessments were received. After the change, the user must answer all questions before he/she can access the workshops. This change resulted in complete sets of data for the surveys and pre-assessments.

Third, EC-TIIS staff learned from Phase 2 that an incentive was needed to get educators to complete assessments and provide other data. In Phase 3, EC-TIIS offered four types of

professional development credit: Certificate of Completion, Continuing Education Units (CEUs), Continuing Professional Development Units (CPDUs), and graduate course credit. As part of the credit requirements, participants needed to complete the workshop post assessment and *Exit Survey*. This provided both quantitative and qualitative data to support claims of effectiveness. Staff also learned that the use of a discussion board must also be connected to an incentive. Although many EC-TIIS participants had access to the discussion board, only those receiving course credit used this type of technology.

Fourth, EC-TIIS staff learned that one problem in collecting data online is the difficulty in tracking website participants. Each time a follow-up survey was distributed via e-mail to participants, at least 15% of messages were returned indicating invalid e-mail addresses. Also, getting follow-up data, especially child data from participants was difficult. When ECTIIS staff sent a request for child data to 350 educators, no response was received. The only examples of child data came from the two graduate students using the online workshops for IDT 573 credit. They included descriptions of child products in their course assignments.

Advice for Educators Interested in EC-TIIS

EC-TIIS online workshops are available to teachers, families, support personnel, faculty, and students through the website. Anyone interested in the project is welcome to register on the EC-TIIS website and review workshop content. Center staff continue to disseminate information about the workshops and encourage educators and families to take advantage of this early childhood resource. Faculty can incorporate the workshops into course content and use EC-TIIS Performance Indicators as part of class assignments. College students can use the workshops as a resource for early childhood and special education courses.

References

Abbott, J., & Ryan, T. (1999). Constructing knowledge, reconstructing schooling. *Educational Leadership, 57*(3), 66-69.

Anderson, T. (1996). What in the world is constructivism? *Learning, 24*(5), 48-51.

Angeles, J., Iannotti, N., Anderson, J., Lanahan, L., Cronen, S., & Smerdon, B. (2000). *Teachers' tools for the 21st century: A report on teachers' use of technology.* Washington, DC: National Center for Education Statistics.

Barnett, H. (2001). *Successful K-12 technology planning: Ten essential elements.* Syracuse, NY:

ERIC Clearinghouse on Information and Technology.

Bell, C., Clark, L., & Johanson, J. (1998, August/September). HyperStudio, a literacy tool. *Closing the Gap, 17*(3), 6.

Berard. Y. (2004, March 22). *Shorting out. Star-Telegram.com.* Retrieved April 13, 2004, from http://www.dfw.com/mld/dfw/news/local/8247085.htm

Bransford, J. D., Brown, A. L. & Cocking. R. R. (Eds.). (2002). *How people learn. Brain, mind, experience, and school.* Washington, DC: National Academy Press.

Buckleitner, W. (1994). What's hot for the computer using tot. *Technology and Learning, 14*(5), 18-27.

Burge, E. J. (1994). *Electronic highway or weaving loom? Thinking about conferencing technologies for learning.* (ERIC Document Reproduction Service No. ED 377 814)

Butler, D. (2003). Introduction to distance learning: What is it? Why I should be interested? Where may I find courses? How much does it cost? Retrieved April 7, 2004, from http://distancelearn.about.com/libraby/weekly/aa120202b.htm

Cahoon, B. (1998). Teaching and learning Internet skills. In B. Cahoon (Ed*.), Adult learning and the Internet: Vol. 78. New directions for adult and continuing education* (pp. 33-41). San

Francisco: Jossey-Bass.

Clements, D. H. (1999a). The effective use of computers with young children. In J. V. Copley
(Ed.), *Mathematics in the early years.* Reston, VA: National Council for Teachers of
Mathematics.

Clements, D.H. (1999b). Young children and technology. In *Dialogue on Early Childhood
Science, Mathematics, and Technology Education.* Washington, DC: American

Association for the Advancement of Science, Project 2061. Retrieved October 15, 2000, from the
World Wide Web: www.project2061.org/newsinfo/earlychild/experience/clements.htm

Coppola, J., & Thomas, B. (2000). A model for e-classrooms design beyond chalk and talk.
Technological Horizons in Education Journal, 27(6), 31-37.

Derer, K., Polsgrove, L., & Rieth, H. (1996). A survey of assistive technology applications in
schools and recommendations for practice. *Journal of Special Education Technology,
13*(2), 62-80.

Draves, W. A. (2000). *Teaching Online.* River Falls, WI: LERN Books.

Eastmond, D. V. (1998). Adult learners and Internet-based distance education. In B. Cahoon
(Ed*.), Adult learning and the Internet: Vol. 78. New directions for adult and continuing
education* (pp. 5-13). San Francisco: Jossey-Bass.

Faux, T., & Black-Hugh, C. (2000). A comparison of using the internet versus lectures to teach
social work history. *Research on Social Work Practice, 10*(4), 454-467.

Field, J. (1997). Passive or proactive? *Adults Learning, 8,* 160-161.

Haugland, S. W. (2000). *Computers and young children.* ERIC Digest. Retrieved November 7,
2002, from http://www.askeric.org/plweb-cgi/obtain.pl

Healy, J. M. (1998). *Failure to connect: How computers affect our children's minds*. New York:

Simon & Schuster.

Horton, W. (2000). *Designing web-based training: How to teach anyone anything anywhere anytime*. New York: John Wiley & Sons.

Hutchinson, J. (1995, September). A multimethod analysis of knowledge use in social policy: Research use in decisions affecting the welfare of children. *Science Communications*, 90-106.

Hutinger, P. (1987). Computer-based learning for young children. In J. L. Roopnarine & J. E. Johnson (Eds.), *Approaches to early childhood education* (pp. 213-234). Columbus, OH: Charles E. Merrill.

Hutinger, P. (1998). *The expressive arts project: A final report.* Macomb: Western Illinois University, Macomb Projects. (ERIC Document Reproduction Service No. 415646)

Hutinger, P. (1999). How interactive technology affects emergent literacy. *Children and Families, 18*(3), 82-83.

Hutinger, P., Beard, M., Bell, C., Bond, J., Robinson, L., Schneider, C., & Terry, C. (2001). *eMERGing literacy and technology: Working together.* Macomb: Western Illinois University, Center for Best Practices in Early Childhood Education.

Hutinger, P., Bell, C., Johanson, J., & McGruder, K. (2002). *Final report: LiTECH interactive outreach.* Macomb, IL: Center for Best Practices in Early Childhood, Western Illinois University.

Hutinger, P., Bell, C., Beard, M., Bond, J., Johanson, J., & Terry, C. (1998). *Final report: The early childhood emergent literacy technology research study.* Macomb: Western Illinois University, Macomb Projects.

Hutinger, P., Betz, A., Johanson, J., & Clark, L. (2003). *A final report: Results from the early*

childhood curriculum support predicting, listening, observing, and recording—

Integrating technology (ECCSPLORe-IT) model development project. Macomb, IL:

Center for Best Practices in Early Childhood, Western Illinois University.

Hutinger, P., & Clark, L. (2000). TEChPLACEs: An Internet community for young children,

their teachers, and their families. *Teaching Exceptional Children, 32*(4), 56-63.

Hutinger, P., Clark, L., & Johanson, J. (2001). *Final report: Technology in early childhood*

planning and learning about community environments. Macomb: Western Illinois

University, Center for Best Practices in Early Childhood Education.

Hutinger, P., Hall, S., Johanson, J., Robinson, L., Stoneburner, R., & Wisslead, K. (1994). *State*

of practice: How assistive technologies are used in educational programs of children

with multiple disabilities. A final report for the project: Effective use of technology to

meet educational goals of children with disabilities. Macomb: Western Illinois

University, Macomb Projects. (ERIC Document Reproduction Service No. ED 378-721)

Hutinger, P., & Johanson, J. (1998). Software for young children. In S. Lesar Judge and P. H.

Parette (Eds.), *Assistive technology for young children with disabilities: A guide to*

providing family-centered services. Cambridge, MA: Brookline.

Hutinger, P., & Johanson, J. (2000). Implementing and maintaining an effective early childhood

comprehensive technology system. *Topics in Early Childhood Special Education, 20*(3),

159-173.

Hutinger, P., Johanson, J., & Rippey, R. (2000). *Final report: Benefits of comprehensive*

technology system in an early childhood setting: Results of a three year study. Macomb:

Western Illinois University, Center for Best Practices in Early Childhood Education.

Hutinger, P., Johanson, J., & Stoneburner, R. (1996). Assistive technology applications in

educational programs of children with multiple disabilities: A case study report on the state of the practice. *Journal of Special Education Technology, 13*(1).

Judge, S. L. (Winter 2001). Computer applications in programs for young children with disabilities: Current status and future directions. *Journal of Special Education Technology, 16*(1), 29-40.

Kamii, C., & Ewing, J. (1996). Basing teaching on Piaget's constructivism. *Childhood Education, 72*(5), 260-264.

Kubala, T. (1998). Assessing students needs: Teaching on the internet. *Technological Horizons in Education Journal, 25*(3), 26-35.

Lewis, R. (2000). Musings on technology and learning disabilities on the occasion of the new millennium. *Journal of Special Education Technology, 15*(2), 5-12.

Lewis, R., Ashton, T., Happa, B., Kieley, C., & Fielden, C. (1998/1999). Improving the writing skills of students with learning disabilities. *Learning Disabilities: A Multidisciplinary Journal, 9*, 87-98.

Maeers, M., Browne, N., & Cooper, E. (2000). Pedagogically appropriate integration of informational technology in an elementary preservice teacher education program. *Journal of Technology and Teacher Education, 8*(3), 219-229.

Mariani, M. (2001, Summer). Distance learning in postsecondary education: Learning whenever, wherever. *Occupational Outlook Quarterly, 45*(2), 2-10.

Merbler, J. B., Hadadian, A., & Ulman, J. (1999). Using assistive technology in the inclusive classroom. *Preventing School Failure, 43*(3), 113-117.

National Association for the Education of Young Children. (1996). *Guidelines for preparation of early childhood professionals.* Washington, DC: Author.

Oliver, K. (2000). Methods for developing constructivist learning on the web. *Educational Technology, 40*(6), 5-18.

Phipps, R., & Merisotis, J. (1999, April). *What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education.* Retrieved March 19, 2004 from the Institute for Higher Education Policy Web site: http://www.ihep.com/Pubs/PDF/Difference.pdf/

Pressman, H. (1999, November). *The impact of technology on learning in our schools: Where are we heading?* Paper presented at the meeting of AACTE's Creating the Future of Schools, Colleges, and Departments of Education in the Age of Technology: An Invitational Working Conference, Cupertino, CA.

Promising practices in technology: Supporting access to and progress in the general curriculum. (2000, June). [Technical report]. Washington, DC: U.S. Department of Education, Office of Special Education Programs. Retrieved February 15, 2004, from http://www.air.org/techideas/reports.html

Robinson, L. (2003a). A new way to learn: Guidelines for choosing developmentally appropriate software for young children. *Kansas Child, 2*(4), 12-13.

Robinson, L. (2003b). Technology as a scaffold for emergent literacy: Interactive storybooks for toddlers. *Young Children, 58*(6), 42-48.

Rother, C. (2003, November). Technology's value in education. *T.H.E. Journal,* 35-38.

Ryan, R. (2000). Student Assessment comparison of lecture and online construction equipment and methods classes. *Technological Horizons in Education Journal, 27*(6), 78-86.

Schlosser, R. W., McGhie-Richmon, D., & Blackstien-Adler, S. (2000). Training a school

team to integrate technology meaningfully into the curriculum: Effects on student

participation. *Journal of Special Education Technology, 15*(1), 31-44.

Schulman, A., & Sims, R. (1999). Learning in an online format versus an in-class format: An

experimental study. *Technological Horizons in Education Journal, 26*(11), 54-56.

Shoech, D. (2000). Teaching over the internet: Results of one doctoral course. *Research on

Social Work Practice, 10*(4), 467-487.

Sianjina, R. (2000). Educational technology and the diverse classroom. *Kappa Delta Pi, 37*(1),

26-29.

Teh, G. (1999). Assessing student perception of internet-based online learning environments.

International Journal of Instructional Media, 26(4), 397-409.

Thirunarayanan, M. & Perez-Prade, A. (2002). Comparing web-based and classroom-based

learning: A quantitative study. *Journal of Research on Technology Education, 34*(2),

131-137.

Vannatta, R. (2000). Evaluation to planning: Technology integration in a school of education.

Journal of Technology and Teacher Education, 8(3), 231-246.

von Glasersfeld, E. (1995). A constructivist approach to teaching. In L.P. Steffe, & J. Gale

(Eds.), *Constructivism in education,* (pp. 3-15). Hillsdale, NJ: Lawrence Erlbaum

Associates.

Wade, W. (1999). Assessment in distance learning: What do students know and how do we know

that they know it? *Technological Horizons in Education Journal, 27*(3), 94-108.

Wilson, B., & Lowry, M. (2000, Winter). Constructivist learning on the web. *New Directions for

Adult and Continuing Education, 88,* 79-88.