Title: Research and resources on the use of technology in inteventions for students with disabilities

Date: March 2009

Question: What are some evidence-based practices with technology interventions for assisting young children (3–8 years) with emerging or established learning disabilities?

Response:

As a tool for access to the general curriculum and to demonstrate mastery of content learned, technology is very powerful for students with learning disabilities, physical impairments, speech impairments, emotional disturbances, autism spectrum disorder (ASD), speech impairments, and all of the other categories that qualify students to receive special education services. It is also important to consider the motivational and engagement benefits to infuse technology into the instructional process for all students.

Often, "technology" is thought of as computer-oriented when it can in fact range from 'no tech' (differently shaped writing implements, wide lines paper, large graphed paper, book holders), to 'low tech' (raised lines, large print text, page fluffers to turn pages, graphic organizers, pencil grips, magnetic letters, alternative keyboards, touch screens, spell checkers/grammar checkers), to 'high tech' (ACC devices, switches, speech to text, text to speech).

Several references, along with author-provided abstracts/excerpts and links (where available), as well as resources, are provided below. For further information please feel free to contact Sharen Bertrando (sbertra@wested.org). She has a great deal of expertise in the integration of technology for all students in education, especially students with disabilities.

Publications

Carlson, B. and Samels, K. (1997). *Kids included through technology are enriched: A guidebook for teachers of young children.* Minneapolis, MN: PACER Center, Inc. Retrieved March 10, 2009 from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/15/0e/0b.pdf.

This guidebook is designed to provide information on technology to teachers and service providers who work with children with special needs. It may also be helpful for parents and caregivers of young children. Topics include: (1) the definition of assistive technology; (2) the philosophy of using technology with young children and a rationale that demonstrates benefits for youngsters who have special needs; (3) how technology supports early learning, particularly self-expression, communication, social interactions, and education; (4) assessing

for helpful technology; (5) identifying the tools of assistive technology; (6) team tasks in assessment; (7) choosing computer technology for the classroom, including selecting appropriate software and peripheral devices; (8) introducing other devices such as a trackball, mouse keys, touch screen, drawing tablets, and electronic pointing devices; (9) keyboard modifications and alternative keyboards; (10) switch technology; (11) augmentative and alternative communication; (12) effective practices for teaching children to communicate; (13) integrating technology into the early childhood classroom, including how to design lessons with technology; (14) how to use technology for teachers' administrative tasks; (15) assistive technology in a cultural context; (16) assistive technology in the Individualized Education Program or the Individualized Family Service Plan; and (17) funding issues. Appendices include teacher resources, an explanation of legal issues, and a list of resource organizations.

Gale, D. (2006). *The effect of computer-delivered phonological awareness training on the early literacy skills of students identified as at-risk for reading failure.* Retrieved March 10, 2009 from http://purl.fcla.edu/usf/dc/et/SFE0001531

Abstract: The current study examined the effects of two computer-delivered phonological awareness training programs (Earobics Step 1 and Lexia Early Reading) on the early literacy skills of kindergarten and first grade students at risk for reading failure. The study utilized a multi-group pretest–treatment–posttest design. Student participants, who were identified for the study through a schoolwide screening, were randomly assigned to one of three groups (i.e., Earobics, Lexia Early Reading, or control), and their progress was monitored throughout a five-week intervention period. Results using an analysis of covariance (ANCOVA) to examine differences in adjusted mean post-test scores indicated that the Earobics program produced better outcomes than the Lexia and control groups as measured by the Dynamic Indicators of Basic Early Literacy Skills. Results of a hierarchical linear modeling (HLM) analysis examining initial status and rates of growth also indicated greater rates of change among the Earobics group when compared with the Lexia and control groups. The Earobics program was shown to be an effective intervention for improving early literacy skills for students at risk for reading failure. Implications of the study for working with early elementary students who show deficits in phonological awareness are discussed.

Judge, S. (2006). Constructing an assistive technology toolkit for young children: Views from the field. *Journal of Special Education Technology*, *21*(4), 17–24.

Abstract: Assistive technology is guaranteed by law to be included when appropriate on individualized education plans (IEPs) for young children with disabilities. Yet, the full potential of technology remains unfulfilled due to insufficient knowledge of options available, limited professional development, and a dearth of evidence on its effectiveness for particular daily routines and activities. This article describes a proactive strategy for meeting the needs of young children with disabilities through an assistive technology toolkit approach. Surveys were completed by 38 early childhood special education professionals to assess what assistive technology tools are most useful for working with young children with disabilities. Results indicated that communication and low-technology devices were considered most useful. Discussion focuses on the effectiveness of an assistive technology toolkit that supports the learning, language, and motor development of young children with disabilities.

Macaruso, P., Hook, P. E., & McCabe, R. (2006). The efficacy of computer-based supplementary phonics programs for advancing reading skills in at-risk elementary students. *Journal of Research in Reading, 29*(2), 162–172. Retrieved March 10, 2009 from

http://www.iste.org/Content/NavigationMenu/Research/NECC_Research_Paper_Archives/NECC_2006/McCabe_Robert_NECC06.pdf
Abstract: In this study we examined the benefits of computer programs designed to supplement regular reading instruction in an urban public school system. The programs provide systematic exercises for mastering word attack strategies. Our findings indicate that first graders who participated in the programs made significant reading gains over the school year. Their post-test scores were slightly (but not significantly) greater than the post-test scores of control children who received regular reading instruction without the programs. When analyses were restricted to low-performing children eligible for Title I services, significantly higher post-test scores were obtained by the treatment group compared to the control group. At post-test, Title I children in the treatment group performed at levels similar to non-Title I students.

Robinson, L., Schneider, C., Daytner, G., Johanson, J., & Hutinger, P. (2009). *Early Childhood Technology Integrated Instructional System (EC-TIIS). Phase 3: Final report.* Macomb, IL: Western Illinois University, Center for Best Practices in Early Childhood. Retrieved March 10, 2009 from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/43/cd/9e.pdf
Abstract: The Early Childhood Technology Integrated Instructional System 3 (EC-TIIS 3), housed in the Center for Best Practices in Early Childhood (the Center) within the College of Education and Human Services at Western Illinois University (WIU), was funded in 2004 by the U.S. Department of Education's Office of Special Education Programs (OSEP) as a three-year Steppingstones of Technology Innovation Phase 3 Project. EC-TIIS 3 was designed to confirm the positive results of EC-TIIS 2 and to test the effects of web-based training on a diverse audience in large, complex settings, ultimately providing a website that is easy for educators and families to use and that contains information leading to improved technology services for young children. The EC-TIIS site is a unique teaching/learning website that combines training content from the Center's tested and effective early childhood technology-related projects, into a series of nine workshops designed to provide technology knowledge and skills. The major goals of EC-TIIS 3 were four-fold: (1) to test the effects of EC-TIIS' online training on a diverse audience in large, complex settings, ultimately providing a teaching/learning community website easy for families and educators to access and use; (2) to improve access to functional use of technologies in developmentally appropriate curriculum targeting young children with disabilities and their families; (3) to determine the effects of strategies to increase the quantity and quality of web-based training and data collection; and (4) to further refine EC-TIIS usability, to advance the availability, quality, and use of technology in addressing the practical problem of improving online education. Study 3, which included university and community college faculty and students, was designed to explore, confirm, extend, and compare findings related to use of the workshops as a supplement to university and community college courses and as a stand-alone graduate course. 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.

Silver-Pacuilla, H. (2006). *Moving toward solutions: Assistive & learning technology for all students.* Washington, DC: The National Center for Technology Innovation. Retrieved

March 10, 2009 from
http://www.nationaltechcenter.org/documents/MovingTowardSolutions.pdf
Excerpt: Assistive and learning technology offers great promise for these students. The tremendous advances in technology in the past decade have led to the development of speech synthesis and recognition technology, interactive software, and miniaturization and portability that help these students achieve and thrive. The promise and potential for the field has never been greater. The question remains: What will it take for assistive and learning technology to be considered a critical component of education to help more students learn, achieve, and reach their potential? The National Center for Technology Innovation (NCTI), an initiative funded by the U.S. Department of Education's Office of Special Education Programs to foster technology innovation and collaboration, posed this critical question in a series of forums conducted from the fall of 2004 to the spring of 2005…This report provides a prismatic look at the dynamic field of education and business professionals focused on technologies to meet special learning needs. It highlights the individual perspectives of stakeholder groups and provides a unique synthesis. Through its work, NCTI seeks to improve understanding of opportunities within reach, promote collaboration, and encourage the development of technologies and implementation approaches that will create higher expectations for students with special needs and enable them to succeed.

Resources

The Access Center
http://www.k8accesscenter.org/index.php/category/technology-applications/
http://www.k8accesscenter.org/index.php/category/computer-assisted-instruction/
The Access Center resources focus on core content areas—language arts, math, and science—as well as on instructional and learning strategies to provide students with disabilities access to rigorous academic content. We have a series of professional development modules and information briefs on such topics as teaching and learning strategies, media and materials, supports and accommodations, universal design for learning, differentiated instruction, and collaborative teaching. (Note: The links above lead to resources in Technology Applications and Computer-Assisted Instruction. The information briefs often provide examples and are supported by research.)

All Kinds of Minds
http://www.allkindsofminds.org/PTK/resources.aspx
All Kinds of Minds is a not-for-profit organization that translates the latest research from neuroscience and other disciplines on how children learn—and vary in their learning— into a powerful framework that educators can use in the classroom. Our professional development courses offer not only breakthrough ideas but practical solutions for educators to unlock the potential of all children who learn differently. The website provides a free monthly newsletter, articles by Dr. Mel Levine and others, case studies, discussion groups, a LearningBase of strategies, and much more. (Note: This link is to the Toolkit, providing resources to help parents, educators, and clinicians understand why a child is struggling in school and how to help each child become a more successful learner.)

The Alliance for Technology Access
http://www.ataccess.org/
The mission of the ATA is to increase the use of technology by children and adults with disabilities and functional limitations. ATA encourages and facilitates the empowerment of people with disabilities to participate fully in their communities. Through public education, information and referral, capacity building in community organizations, and advocacy/policy efforts, the ATA enables millions of people to live, learn, work, define their futures, and achieve their dreams.

Bookshare.org
http://www.bookshare.org/
Bookshare is an initiative of Benentech, a nonprofit organization that combines the power of the human mind with a deep passion for social improvement. It addresses the needs of underserved communities with innovative technology solutions. Benentech's first project, Bookshare, focuses on the challenge of access to reading materials for people with print disabilities.

CAST
http://www.cast.org/index.html (or contact Research Scientist Peggy Coyne, Ed.D.)
CAST is a nonprofit research and development organization that works to expand learning opportunities for all individuals, especially those with disabilities, through Universal Design for Learning. Founded in 1984 as the Center for Applied Special Technology, CAST has earned international recognition for its innovative contributions to educational products, classroom practices, and policies. Its staff includes specialists in education research and policy, neuropsychology, clinical/school psychology, technology, engineering, curriculum development, K–12 professional development, and more. Note: A list of current research projects can be found at http://www.cast.org/research/projects/index.html. Two relevant projects include:

1. Literacy by Design (Beginning Readers with Cognitive Disabilities)
   http://www.cast.org/research/projects/lbd.html
   CAST, in partnership with the University of Maine's Center for Community Inclusion and Disability Studies, conducted a three-year, classroom-based study, Literacy By Design (LBD), to examine the effectiveness of a technology-based approach to literacy instruction that applies Universal Design for Learning principles and research-based reading instruction to young students with significant cognitive disabilities (SCD).
2. Read with Me eBooks http://www.cast.org/research/projects/Read_with_Me_eBooks.html
   Educators and parents know that it is very important to talk to young children when they read to them. The Read with Me eBooks instructional approach guides teachers and parents in how to "talk" to children when they read storybooks to them. CAST is creating a universally designed, research-based emergent literacy curriculum for use with young children with disabilities, dual language learners, and other at-risk children. The digital storybook curriculum, with companion print books, provides strategies and support for early literacy in the areas of phonics, phonemic awareness, vocabulary, book awareness, and reading comprehension. The digital storybooks include animated embedded coaches that provide models for teachers and parents in how to use the literacy strategies and suggest extension activities that support emerging literacy skills within the context of storybook reading.)

CITEd
http://www.cited.org/index.aspx and http://www.cited.org/index.aspx?page_id=13
The Center for Implementing Technology in Education (CITEd) identifies evidence-based practices for integrating instructional technology to support the achievement of all students. CITEd's Research Center offers evidence-based, promising, and emerging practices based on the latest research. Explore how technology can be used to enhance instruction with an emphasis on students with special needs. Browse research and its implications for your classroom, school, and district.

The Council for Exceptional Children (CEC)
http://www.cec.sped.org//AM/Template.cfm?Section=Home
The Council for Exceptional Children (CEC) is the largest international professional organization dedicated to improving the educational success of individuals with disabilities and/or gifts and talents. CEC advocates for appropriate governmental policies, sets professional standards, provides professional development, advocates for individuals with exceptionalities, and helps professionals obtain conditions and resources necessary for effective professional practice. (Note: See evidence-based practices at http://www.cec.sped.org/AM/Template.cfm?Section=Evidence_based_Practice&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=24&ContentID=4710.)

Clearinghouse for Specialized Media and Translations (CSMT)
http://www.cde.ca.gov/re/pn/sm/
The California Department of Education (CDE) Clearinghouse for Specialized Media and Translations (CSMT) produces accessible versions of textbooks, workbooks and literature books adopted by the State Board of Education. Products and services are provided pursuant to California law, No Child Left Behind (NCLB), the Individuals with Disabilities Education Act (IDEA), the Americans with Disabilities Act (ADA), and Sections 504 and 508 of the Rehabilitation Act of 1973. Production and dissemination of materials including Braille, large print, recordings, and American Sign Language Video-books are funded by California's Instructional Materials Fund (IMF). CSMT also assists in providing devices such as monoculars to view the curricula. Funds to purchase specialized books, materials, and equipment are provided by the IMF for qualified students with hearing or vision impairments, severe orthopedic impairments, or other print disabilities.

The Family Center on Technology and Disability
http://www.fctd.info/
The Family Center on Technology and Disability (FCTD) is a resource designed to support organizations and programs that work with families of children and youth with disabilities. We offer a range of information and services on the subject of assistive and instructional technologies. Our website is full of assistive/instructional technology resources of interest to families of children with disabilities. The website offers access to monthly newsletters, online discussions moderated by nationally recognized experts, a database of FCTD members which is comprised of more than 3,000 disability organizations, a resource review database with hundreds of reviews of AT resources, and more. (Note: 916 assistive and instructional technology resources have been identified, reviewed, and annotated. See http://www.fctd.info/resources.)

iPhone and iPod touch Apps for Special Education http://www.scribd.com/doc/24470331/iPhone-and-iPod-touch-Apps-for-Special-Education
This is a list of iPhone and iPod touch applications for education and special education. Each app in the list includes a one-sentence description by the author. The app descriptions were based on App Store descriptions and personal trials. (Note: iPhone has free apps for access such as Dragon (speech to text); bump (file sharing), and FogWindow (white board).)

The Iris Center
http://www.iris.peabody.vanderbilt.edu/
http://www.iris.peabody.vanderbilt.edu/resources.html
The IRIS Center is a national center that aims to provide high-quality resources for college and university faculty and professional development providers about students with disabilities. IRIS seeks to obtain this goal by providing free, online, interactive training enhancements that translate research about the education of students with disabilities into practice. Visit the IRIS Center for Training Enhancements for free online interactive resources that translate research about the education of students with disabilities into practice. Our materials cover a wide variety of evidence-based topics, including behavior, RTI, learning strategies, and progress monitoring. (Note: there is a section on behavior management. They are soon publishing a whole site on assistive technology supports.)

LD OnLine
LD OnLine.org
LD OnLine is a leading website on learning disabilities and ADHD, serving more than 200,000 parents, teachers, and other professionals each month. LD OnLine seeks to help children and adults reach their full potential by providing accurate and up-to-date information and advice about learning disabilities and ADHD. The site features hundreds of articles, multimedia, monthly columns by noted experts, first-person essays, children's writing and artwork, a comprehensive resource guide, very active forums, and a Yellow Pages referral directory of professionals, schools, and products. Note: A relevant article can be found in the technology section: "Help for Young Learners: How To Choose AT?" http://www.ldonline.org/article/Help_for_Young_Learners%3A_How_To_Choose_AT%3F. Young children with disabilities need an enriched environment to promote their social and cognitive participation and growth. Technologies, from low to high-tech, can play a role in promoting their participation, but are often underutilized. This Info Brief presents an introduction to the role of assistive technology (AT) for young children with disabilities, highlights a six-step framework representing a collaborative approach for AT decision making for young children, and provides links to new resources for researchers and service teams, including the TAM Technology Fan.

The National Center for Technology Innovation
http://www.nationaltechcenter.org/
The National Center for Technology Innovation (NCTI) advances learning opportunities for individuals with disabilities by fostering technology innovation. Specifically, we help researchers, product developers, manufacturers, and publishers to create and commercialize products of value to students with special needs. To achieve its goals NCTI offers services to: analyze needs, issues, trends, and promising technology innovations; cultivate a collaborative network; promote reliable research-based solutions; and facilitate successful commercialization approaches for the education market. (Note: NCTI develops TechMatrix, a tool for finding educational and assistive technology products for students with special needs, available at http://www.techmatrix.org/index.aspx.

Parents Helping Parents
http://www.php.com
Parents Helping Parents (PHP) is a nonprofit, community-based, parent-directed family resource center. PHP provides lifetime guidance, supports, and services to children with any special need, their families, and the professionals who serve them.

Promising Technology Practices for Struggling Readers (SchoolsMovingUp webinar)
http://www.schoolsmovingup.net/cs/smu/view/e/1785
This interactive event (now archived) was led by Heidi Silver-Pacuilla, Deputy Director of the National Center for Technology and Bridget Dalton, Chief Literacy and Technology Officer at the Center for Applied Special Technology. The webcast focuses on research-based and promising technology-based approaches to improving outcomes for struggling readers. Assistive and learning technologies that support reading and communicating in the content areas are featured, related resources are shared, and practical solutions to common instructional and implementation challenges are demonstrated.

Wisconsin Assistive Technology Initiative
http://www.wati.org/?pageLoad=content/supports/materials/index.php
WATI is a volunteer network of assistive (AT) consultants from across the state who continue the work of providing AT training and support within Wisconsin educational settings. (AT materials for young children can be found at the website above.)

Methods

We conducted a search for research and resources in this area, using federal education websites, education research databases, and a general Internet search on Google. We also contacted colleagues at WestEd, including staff from the Center for Prevention & Early Intervention and the Comprehensive School Assistance Program, who provided some additional resources. There was little research on the success of technology interventions for children with learning disabilities, and colleagues confirmed that the literature is thin. More often, publications or organizations highlight innovations for different populations.

This memorandum is one in a series of quick-turnaround responses to specific questions posed by educators and policymakers in the Western region (Arizona, California, Nevada, Utah), which is served by the Regional Educational Laboratory West (REL West) at WestEd. This memorandum was prepared by REL West under a contract with the U.S. Department of Education's Institute of Education Sciences (IES), Contract ED-06-CO-0014, administered by WestEd. Its content does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.