Special Education, Technology, and Teacher Education

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Abstract Recent trends in special education include the use of technology to provide essential supports so students with disabilities can access, participate in, and demonstrate progress in the general education standards-based curriculum. Research addressing technology's impact on student learning must be demonstrated for continued support of technology in teaching. For students with disabilities, student learning is expanded to include not only academics, but also areas of cultural and linguistic considerations, functional skills, developmental skills, and transitional domains, in particular social domain and career domain. Prevalent themes in the special education technology literature are discussed with implications for research in special education, technology, and teacher education.

Trends in Special Education and Technology

Including ALL Students

Educating all students by today's standards and for tomorrow's living most certainly includes the use of technology. Its relationship to providing essential supports for students with disabilities in areas of self-care, education, employment, recreation/leisure, and community living are readily accepted. Additionally, access to technology can provide meaningful learning experiences to develop problem solving and higher order thinking skills and to function in the world beyond the classroom. The appropriate and successful integration of technology into learning environments has the potential to benefit all students. As states and schools work to implement the requirements of educational reform required by the No Child Left Behind Act (NCLB, 2001), they must ensure that all students are included, in particular students with disabilities. Examples of how technology use contributes to student academics, independence, employment/careers, and productivity have been discussed as "roles of technology for students with disabilities." Specifically, technology assists students to: (a) maximize independence in academic and employment tasks; (b) participate in classroom discussion; (c) gain access to peers, mentors, and role models; (d) self-advocate; (e) gain access to the full range of educational options; (f) participate in experiences not otherwise possible; (g) succeed in work-based learning experiences; (h) secure high levels of independent learning; (i) prepare for transitions to college and careers; (j) work side-by-side with peers; (k) master academic tasks that they cannot accomplish otherwise; (l) enter high-tech career fields; and (m) participate in community and recreational activities (Burgstahler, 2003). The view of technology as playing a "role" for the student with disabilities includes a focus on the teacher's integration of technology into the learning environment and on technology's impact on student outcomes and related benefits. In addition, with the institutionalization of new program standards for special education and the National Council for the Accreditation of Teacher Education (NCATE) (Task Force on Technology and Teacher Education, 1997), teachers are expected to be competent in technology skills and intervention strategies.

Directly related to special education and technology is the signing of the reauthorization of the Assistive Technology Act (AT Act 2004). This act provides assistive technology devices or service to any child or adult with a disability to "minimize deterioration in functioning, to maintain a level of functioning, or to achieve a greater level of functioning in any major life activity." The AT Act ensures that all students have access to technology that supports the activities of life such as learning, leisure/recreation, and work. Under the law, state projects are required to spend 5% of total funding for transition activities (i.e., transition to higher education, vocational school, job, or community living), including student support for those receiving transition services under IDEA. States will be required to provide device reutilization, device demonstration, and device loan programs. Availability of assistive technology devices for trial periods should assist school districts in the selection of appropriate assistive technology devices for their students who may benefit. In addition, provisions are included for a national project to support

state Assistive Technology programs to develop and implement reporting systems (i.e., data collection) to measure the outcomes and benefits of using assistive technology (Bausch, Mittler, Hasselbring, & Cross, 2005).

With the movement to higher standards and accountability under NCLB, the alignment of special education with educational reform requires that special education students be able to access, participate in, and demonstrate academic progress in the general education curriculum. In addition, special education students are required to be assessed within the general education accountability systems. However, the general education curriculum is not designed for students with disabilities; the development and decisions of curriculum adoption and validation have generally not included students with disabilities. It is imperative that the general education curricula be made accessible to all students and include research-based practices that result in achievement for students with disabilities. It is said that such a curriculum is universally designed because it is specifically designed, developed, and validated to meet the diverse needs of students with sensory, motor, cognitive, linguistic, and affective abilities and disabilities (Hitchcock & Stahl, 2003). The universal design for learning (UDL) approach is tied to modern technology. It provides for use of technology by all learners and allows them to select their preferred media. UDL provides for curriculum that is structured in advance and presented in as many different formats as possible. In addition, UDL encourages multiple means of expression in the demonstration of understanding as well as multiple means of engagement. UDL provides the flexibility in the curriculum to meet students' diverse learning characteristics and styles and allow them to be incorporated into the learning process (Corey & Leinenbach, 2004). Assistive technology, universal design and universal design for learning shift the focus and consider the goals for learning, the learning materials, the instructional methods, and the learning assessments. Emergent approaches to improve student learning include (a) technology used as a tool to enhance productivity, engagement and performance; (b) technology used for research, organization, collaboration, and expression; (c) technology used to improve access, participation and progress; (d) technology used for discovery and to act upon accessible content to expose patterns and meaning; and (e) technology used to transform flexible content to preferred media. Resultant benefits include improved access, participation and progress in the general education curriculum (Hitchcock & Stahl, 2003).

Assistive technology includes the use of software and is a required consideration for special education students. Determining and evaluating software use and developmental appropriateness for the classroom is daunting especially in light of the standards-based curricula states have adopted. Many teacher preparation programs do not include a component of software evaluation and its use with special education students for managing information and determining student needs. To be a technologically competent special educator, teachers have the skills to select developmentally appropriate software, to understand and delineate the related benefits of the software, and to align software skills with curriculum. Teachers must understand how software may provide opportunities for the student with disabilities to control environments, to stimulate imagination, to interact with others, and to use open-ended exploration to facilitate development of higher order skills (Weber & Forgan, 2002; Forgan, Schoon, Singler, & Weber, 1999; Weber & Schoon, 2001).

Considering what we already know about teacher technology use, and in spite of the fact that technology-using teachers see the impact on students, published studies support what we suspect, that teachers are not using technology (Roblyer, 2004). Yet, the integration of technology and quality teaching are said to be inseparable. Content knowledge and pedagogical knowledge, as indicators of quality teaching, become readily evident within the process of technology integration that includes definition, planning, strategies, student management, and assessment (Pierson, 2001). However, technological knowledge must be modeled and emphasized in teacher education programs in order to ensure its understanding and its appropriate, successful application by the teacher in the K-12 classroom (Ludlow, 2001; Martin, 2004; Martin & Crawford, 2004; Martin & Crawford, 2005). Special educators are more likely to use technology competently if it has been embedded in coursework and field experiences (Ludlow, 2001; Martin, 2004). Based on indications reflecting a need for better training of teachers, the following issues related to technology use and special education teacher education programs have been identified: (a) university faculty factors such as a lack of modeling of technology in courses; (b) lack of technology implementation in activities and coursework; (c) a lack of expertise to develop complex technology mediated instruction; and (d) lack of technology integration in special education field experiences (Ludlow 2001). Technology integration is a tool that is known to contribute to the educational success of students with and without disabilities (Crawford & Martin, 2001; Seevers, Crawford, & Martin, 2001; Roblyer, 2004). To meet the education needs of students with disabilities and to ensure their access, participation, progress, and assessment within the

general education curriculum, teacher technological competence should be viewed as a critical teacher skill for addressing and meeting student's educational needs.

Dominant Themes in Special Education-Technology Literature

Reviews of the literature support the use and benefits of technology in special education (Blackhurst & Edyburn, 2000; Edyburn, 2000; 2001; 2002; 2003; 2004; Jeffs, Morrison, Messenheimer, 2003; Okolo, Bahr, & Reith, 1993; Woodward & Reith, 1997). Edyburn provides an annual literature synthesis of the journals in special education technology, special education, and educational technology. Edyburn's comprehensive reviews of the literature related to special education and technology and the resultant synthesis form the basis for prevalent trends found from 2000 through 2003. In addition, literature related to technology use by students with intellectual disabilities is discussed in related to functional domain areas (Wehmeyer, Smith, Palmer, & Davies, 2004).

Annual consistencies in findings are evident for the cumulative years 2000-2003. More issues of practice in special education technology are published than research efficacy. Although when research approaches and related topics are collapsed, numbers are about equal. Edyburn suggests this may be a function of annual publication cycles for the journals. Additionally, more articles are published that have application across disabilities than are disability specific reflecting a current trend toward classroom interventions and strategies with a wider application. Articles related to PreK-grade 8 are more often published than for a specific age/grade level. Most published articles with a technology-curriculum basis focus on reading, writing, and math. Science areas, social studies, and social skills/social interaction, play, as well as functional, career/vocational skills, are minimally addressed by the published special education and technology literature. Although technology integration was one of the highest occurring topics, the synthesis did not include a breakdown as to learner-centered or instructor centered integration of technology or whether technology integration was at the teacher education program level or the K-12 classroom level. Software evaluation was also minimally represented as was alternative assessment and study tools. The reviews serve to provide a way for researchers to identify gaps in the literature and to have a comprehensive resource that synthesizes content in special education and technology journals.

Dominant themes in the 2000 literature review include augmentative/alternative communication (AAC), accessibility, assistive technology, implementation issues, Internet applications and web resources, preservice teacher education and technology integration (Edyburn, 2001). An overabundance of articles on technology in post-secondary education suggests the use of convenience samples. During 2001, Edyburn (2002) found dominant themes of accessibility, assistive technology, implementation issues, Internet use and Web resources, technology integration, and universal design. The 2001 literature also included new developments in assessment accommodations (Destefano, Shriner, & Lloyd, 2001; Fuchs & Fuchs, 2001; Johnson, Kimball, Brown, & Anderson, 2001; Ysseldyke, Thurlow, Bielinski, House, Moody, & Haigh, 2001) and ethics (Burnam & Kapai, 2001). Of note was an increase in efforts focused on measurement, instrument development and validation with the potential to help measure concepts such as effectiveness and technology integration (Beck, Thompson, Clay, Hutchins, Vogt, Romaniak & Sokolowski, 2001; Duggan, Hess, Morgan, Kim, Wilson, 2001; Lumpe & Chambers, 2001). In his 2001 synthesis, Edyburn highlighted two theoretical works. The first article offers important technology applications for individuals with disabilities involving touch interfaces (Bussell, 2001) and the second article addresses the role of sound in multimedia learning environments (Bishop & Cates, 2001). In 2002, dominant themes included alternative and augmentative communication (AAC), assistive technology, instructional design, instructional strategies, multimedia, preservice teacher education, staff development and technology integration. There were new developments in assessment accommodations technology that may assist the field in measuring key constructs concerning the effectiveness and impact of special education (Helwig, Anderson, & Tindal, 2002; Helwig, Rozek-Tedesco & Tindal, 2002; Johns, Crowley, Guetzloe, 2002; Meloy, Deville, & Frisbie, 2002; Thurlow, 2002). Of note were articles that addressed hand-held computing (10 articles) and professional decision-making (5 articles). Of concern was the limited number of publications in understanding issues of equity, culture and language differences (Edyburn, 2003). During 2003, Edyburn (2004) found there was a 229% increase in the number of articles related to reading and technology versus 2002. Overall, dominant themes remained fairly consistent with previous years: assistive technology, implementation issues, instructional design, instructional strategies, outcomes of technology, professional development, reading and technology, and technology integration.

Suggestions for Guiding Impact Studies in Special Education and Technology

NCLB looks for scientific evidence that an approach works better than another choice in a given situation. To address this requirement, recommendations for special education and technology impact studies suggest the following process: Start with a clear statement of need for a new teaching method; offer a hypothesis (based on previous empirical studies) to explain why the technology approach is the best choice; carry out research to determine that the method works as hypothesized and confirm the conditions under which it works best (Roblyer, 2004). Four kinds of impact research to support this process include: "establishing relative advantage; improving implementation methods, monitoring impact on societal goals, and reporting on common uses in order to shape directions" (Roblyer, 2003, p. 31). Four areas of technology benefits that have not been thoroughly researched and are applicable to special education and technology have been delineated. The first, "research to establish relative advantage," includes preventing inert knowledge (i.e., skills learned but never used) and increasing cultural awareness and acceptance (e.g., internet projects to encourage appreciation of other cultures and improve attitudes about other ways of life). Second, "research to improve implementation methods" might include word processing and online chats and conferences. Thirdly, "research to monitor impact on important societal goals" addresses information literacy and visual literacy skills as part of high quality education for all students, yet not all summaries of essential skills include them. Are students acquiring the skills, to what degree? Do students have access to the benefits of technology? Lastly, "studies to monitor and report on common uses and shape directions" addresses how technologies are being used in practice and what impact they have on school life (Roblyer, 2004). Of import is is the value of a commitment to a line of research, following guidelines for reporting that include clear, detailed information of the study allowing for replication by others to build on the work, and writing coherent descriptions of methods, findings, and conclusions (Roblyer, 2004). Further suggestions, as well as guidelines for using an action research model, are included in an overview of experimental designs that also could be implemented in special education action research projects to determine technology effectiveness in secondary and postsecondary settings (Aaron & Bartlett, 2003).

Many published reports are descriptions of what is often referred to as "promising practices." Although these publications do not necessarily meet the criteria for empirical studies, they can form the impetus for the development and implementation of a study based on the "promising practice" described. An example of a promising practice for students with disabilities in the area of science, an area that is not very evident in the special education and technology research, is the use of a software program to support science learning. For example, one program that may be beneficial is called EcoBeaker 2 (Meir, 1999). Evaluation of software by a non-manufacturer or developer and the integration of the software into a learning setting for students with disabilities could contribute to its possible impact on problem solving skills, higher order thinking skills and learning science principles. McGee and Howard (1999) reported on a collaborative effort of teachers and researchers to determine through classroom implementations the effects of software that addressed science content and inquiry skills. After implementations, data were analyzed and classroom activities revised to strengthen the desired use and impact of the software. In a description of a fifth grade unit on exploring the solar system, the authors, both classroom teachers, report that the at-risk students were able to complete HyperStudio projects as well as their peers (Lyon & Barry, 1999). Further investigation into collateral skills, such as communication skills, initiative, task commitment, and ability to work with others, may lend support for the hypothesis that cooperative Hypermedia activities assist at-risk students in making connections to the real-world. Butler and Wiebe (2003) describe a project for student teachers whereby they had to develop a technology-based science lesson that combined curriculum knowledge and pedagogical skills to incorporate computer graphics with animation technology within the science lesson and then teach the lesson to secondary students. One notable result was the impact on the use of technology by cooperating teachers. In an article consistent with universal design for learning, students are provided with multi-sensory approaches to learning with media and technology tools. EasyBook allows teachers to design instruction to meet individual needs of students with disabilities. In particular, students with disabilities found the use of the graphic-based approach to writing helpful for organizing thoughts using their own words. Two studies addressing technology impact include research demonstrating a correlation between school library media centers, instructional technology and student achievement when using a strong media program (Morris & Milan, 2004) and the integration of integrated electronic editing tools into a second grade classroom with an impact on student editing choices (Fletcher, 2001; Daniels, 2003).

Implications for Research

While this discussion does not imply an inclusive review of the area of special education and technology. It is already obvious that areas for future or further research are evident. In the area of special education teacher

education, the impact of technology use during student teaching on classroom learning (and on cooperating teachers) could be looked at and the impact of technology use in special education field experiences could be investigated further. Impact in these areas could include any change in recommendations for assistive technology made by cooperating special education teachers at IEP meetings; sharing technology information and expertise with colleagues; and keeping informed of technology that impacts students and instructional approaches (Anderson & Petch-Hogan, 2001). An evaluation of lesson plans and the integration of technology at both the teacher-centered and learner-centered levels with assessment results for lesson plan objectives could indicate not only technology integration but also impact on learning. Analysis of software use for teaching, teacher's methods of evaluating software, how it's used and the resultant impact on student learning is an area that could be related to development of higher-order thinking skills, problem-solving, communication, and social skills. All of which have not been thoroughly researched in relation to the impact of technology and special education or at-risk students. In addition, modeling of technology use at both the instructor-centered and learner-centered levels by university faculty may be related to appropriate and successful technology integration in the classroom. Follow-ups on first year special educators and their integration of technology into the classroom at the instructor-centered, as well as learner-centered levels, may assist in determining faculty impact on teacher use of technology. In addition, an analysis of university course projects, activities, and assignments to determine levels of technology integration could reflect faculty modeling of technology use at both the learner and instructor-centered levels as well as determine if standards are being met and technology impact is being assessed.

Studies that focus on the impact of technology on learning are readily evident in the special education literature. Due to the varying characteristics, supports, and individual educational programs of students with disabilities, group studies may not always be appropriate for this population. Studies that use a single subject design to determine technology effects include studies impacting self-help skills (Norman & Collins, 2001); impacting task fluency during a home-based intervention (Lasater & Brady, 1995); impacting independence on vocational and independent living tasks (Riffel, Wehmeyer, Turnbull, Lattimore, Davies, Stock, & Fisher, 2005); and impacting student performance on written and oral quizzes in content area information (Blankenship, Ayres, & Langone (2005). The impact of technology may also be determined by examining the "role" of technology for the student with disabilities (Burgstahler, 2003). This view includes a focus on the teacher's integration of technology into the learning environment and on technology's impact on student outcomes and related benefits. It is important for studies with demonstrated effects to be replicated to build a foundation of research support for the impact of technology on student learning, i.e., meeting general education curriculum standards and IEP objectives for students with disabilities.

Areas of further or future research in special education and technology can be found in the current reviews of empirical literature (Langone, Clees, Rieber, & Matzko, 2005; Mechling, 2005), in a consolidation of published literature in an area related to special education and technology with implications for research (Liaupsin, 2002) and in a literature review related to technology use, functional domain areas and students with intellectual disabilities (Wehmeyer, Smith, Palmer, & Davies, 2004). Wehmeyer, et al determine that although there is only limited information about the use of technology by students with intellectual disabilities, there is sufficient evidence that these students could benefit from technology across multiple domains. More research is also needed to examine the impact of universal design features on technology use by students with intellectual disabilities as well as other disability areas. In an investigation of assistive technology articles (1963-2003) that included studies that indicating that assistive technology had an impact on learning, the failure of many studies to find significant correlation between selection and matching of assistive technology and students with disabilities was noted. In addition, topics of assistive technology not found or thoroughly researched in the literature are identified (Size, Murphy, Smith, Yu, & Murphy, 2004).

Suggested Areas of Research

Recently, the Council for Exceptional Children (CEC), in a response to the Institute for Education Sciences (IES) (August 16, 2005), suggested research area recommendations related to those receiving special education services, i.e., birth to young adult. The over-arching priority to address in research is to improve academic achievement for all children and to expand academic achievement to include domains beyond academics such as outcomes related to functional skills, development, and transition. In particular, the social domain (areas of social skills, social relationships, social behaviors, emotional regulation), the career domain (including post-secondary transitioning, post-secondary outcomes), and other critical outcomes for students with disabilities related to responsible

citizenship. Additionally, the involvement of family and cultural/linguistic considerations, as well as race, ethnicity, poverty, limited English proficiency, disability and family circumstance. Each of these areas has a relationship to the use and impact of technology either at the teacher level or the learner level. With funding from AT 2004, assistive technology will be available to students to support learning outcomes, but without continued research to support the impact and benefits of technology use, how long can the funding be expected to continue.

Based on a review of the trends in the field, research area suggestions from the Council for Exceptional Children and gaps in publication areas related to special education and technology, research agenda topics for special education should address the impact of technology on academic achievement (in particular, science, social studies), career domain, work domain, leisure/recreation domain, social domain, and responsible citizenship, as well as functional skills, developmental skills (e.g., motor skills), and transition. Of import is the maintenance and generalization of the content area skills as well as the technology skills. Computer use in the classroom and its related impact on language, communication skills, study skills, social skills, and demonstration of responsible citizenship need to be studied. The use of technology with at-risk students connecting to real-world problems, to encourage problem solving, and higher order thinking skills are areas lacking for school aged students with disabilities. Assistive technology and its impact on student learning and everyday life (as well as the family's) continues to be important. However, the success of selection and matching of assistive technology to the student with disabilities needs investigation particularly in relation to equity, race, ethnicity, culture, and family language. Software integration into classrooms and how it meets the content standards and impacts learning for students with disabilities needs study by teachers and researchers, not only developers. Teachers need to know how to select and evaluate software and other assistive technology for students with disabilities as well as how to determine and assess its impact on student learning. Studies must document the what, the how, and the impact of teacher technology use in the classrooms. Issues related to second language learners with learning disabilities, as well as assessment accommodations using technology for students with disabilities is a critical topic in relation to high stakes testing.

SITE is in a prime position to encourage and support the dissemination of technology impact studies in special education. It mission to promote research, scholarship, collaboration, exchange, and support among its membership puts it at the forefront as a resource for information related to technology impact on learning for students with disabilities as well as implications for teacher education at the preservice, inservice, and graduate levels. The SITE annual international conference offers topics that encourage members and other attendees to remain current in special education and technology. At the same time, SITE offers opportunities for collegiality, collaboration, and the sharing of research and scholarship with educators from around the world as well as opportunities to showcase promising practices. Surely, the suggested research topic areas in this article will promote a focus on current trends and gaps in the literature related to special education and technology and foster the design, development, and implementation of promising practices and impact studies supporting the use of technology in teaching.

References

Aaron, S. & Bartlett, J. (2003). Using action research to determine technology effectiveness in secondary and post-secondary settings. *In Proceedings of Society for Information Technology and Teacher Education, 2003(1),* 661-666.

Anderson, C. L. & Petch-Hogan, B. (2001). The impact of technology use in special education field experience on preservice teachers' perceived technology expertise. *Journal of Special Education Technology, 16*(3), 27-44.

The Assistive Technology Act [On-line]. Available http://www.ataporg.org/Senate%20final%20AT%20Act%20sept%2030.pdf

Bausch, M. E., Mittler, J. E., Hasselbring, T. S. & Cross, D. P. (2005). The assistive technology act of 2004: What does it say and what does it mean? *Physical Disabilities: Education and Related Services, 23*, 59-67.

Bishop, M. J. & Cates, W. M. (2001). Theoretical foundation for sound's use in multimedia instruction to enhance learning. *Educational Technology Research and Development, 49*(3), 5-22.

Blackhurst, A. E. & Edyburn, D. L.(2000). A brief history of special education technology. *Special Education Technology and Practice*, *2*(1), 21-35.

Blankenship, T., Ayres, K. M., & Langone, J. (2005). Effects of computer-based cognitive mapping on reading comprehension for students with emotional behavior disorders. *Journal of Special Education Technology, 20*(2), 15-23

Burgstahler, S. (2003). The role of technology in preparing youth with disabilities for postsecondary education and employment. *Journal of Special Education Technology, 18*(4), 7-19.

Burnam, B. & Kapai, Y. B. (2001) Ethics and the computer: Children's development of moral reasoning about computer and Internet use. *Journal of Educational Computing Research, 25*, 111-127.

Bussell, L. (2001). Haptic interfaces; Getting in touch with web-based learning. *Educational Technology, 41*(3), 27-32.

Corey, M. L. & Leinenbach, M. T. (2004). Universal design for learning: Theory and practice. *In Proceedings of Society for Information Technology and Teacher Education, 2004(1),* 4919-4926. Norfolk, VA: AACE.

Crawford, C. M. & Martin, S. S. (2001). The integration of assistive and adaptive technologies into the special education classroom. *In Proceedings of Society for Information Technology and Teacher Education* 2001(1), 2631-2633. Norfolk, VA: AACE.

Council for Exceptional Children (August16, 2005). *Council for Exceptional Children's response to IES proposed research priorities*. [Online]. Available: http://www.cec.sped.org.

Daniels, T. H. (2003). Authentic learning: Writing across the curriculum using EasyBook Deluxe in a special education setting. *In Proceedings* of *Society for Information Technology and Teacher Education International Conference 2003* (1), 3196-3198. Norfolk, VA: AACE.

Destefano, L., Shriner, J. G., & Lloyd, C. A. (2001). Teacher decision making in participation of students with disabilities in large scale assessment. *Exceptional Children*, 68, 7-22.

Edyburn, D. L. (2004). 2003 in review: A synthesis of special education technology literature. *Journal of Special Education Technology, 19*(4), 57-80.

Edyburn, D. L. (2003). 2002 in review: A synthesis of special education technology literature. *Journal of Special Education Technology, 18*(3), 5-28.

Edyburn, D. L. (2002). 2001 in review: A synthesis of special education technology literature. *Journal of Special Education Technology, 17*(2), 5-24.

Edyburn, D. L. (2001). 2000 in review: A synthesis of special education technology literature. *Journal of Special Education Technology, 16*(2), 5-25.

Edyburn, D. L. (2000). 1999 in review: A synthesis of special education technology literature. *Journal of Special Education Technology, 15*(1), 7-18.

Fuchs, L. S. & Fuchs, D. (2001). Helping teachers formulate sound test accommodation decisions for students with learning disabilities. *Learning Disabilities Research and Practice, 16*, 174-181.

Helwig, R., Anderson, L., & Tindal, G. (2002). Using a concept-grounded, curriculum-based measure in mathematics to predict statewide test scores for middle school students with LD. *The Journal of Special Education, 36*(2), 102-112.

Helwig, R. Rozek-Tedesco, M. A., & Tindal, G. (2002). An oral versus a standard administration of a large-scale mathematics test. *The Journal of Special Education,36*(1), 39-47.

Hitchcock, C. & Stahl, S. (2003). Assistive technology, universal design, universal design for learning: Improved learning opportunities. *Journal of Special Education Technology, 18*(4), 45-52.

Jeffs, T., Morrison, W. F., & Messenheimer, T. (2003). A retrospective analysis of technological advancements in special education. *Computers in the Schools, 20*(1/2), 129-152.

Johns, B. H., Crowley, E. P., & Guetzloe,E. (2002). Planning the IEP for students with emotional and behavioral disorders. *Focus on Exceptional Children, 34*(9), 1-12.

Johnson, E., Kimball, K., Brown, S. O., & Anderson, D. (2001). A statewide review of the use of accommodations in large-scale, high-stakes assessments. *Exceptional Children, 67*, 251-264.

Langone, J., Clees, T. J., Rieber, L., & Matzko, M. (2005). The future of computer-based interactive technology for teaching individuals with moderate to severe disabilities: Issues relating to research and practice. *Journal of Special Education Technology, 18*(10), 5-16.

Lasater, M. W. & Brady, M. P. (1995). Effects of video self-modeling and feedback on task fluency: A home based intervention. *Education and Treatment of Children, 18*, 389-407.

Liaupsin, C. J. (2002). The comprehensive evaluation of professional development software: A critique of methodology. *Journal of Special Education Technology, 18*(1), 29-37.

Ludlow, B. L. (2001). Technology and teacher education in special education: Disaster or deliverance? *Teacher Education and Special Education, 24*(2), 143-163.

Lyon, A. & Barry, K. (1999). Journey through our solar system with Nebraska fifth graders. Presented at the *World Conference on Educational Multimedia, Hypermedia and Telecommunications, 1999*(1), 1698-1698.

Martin, S. S. (2004). A sampling of activities used in special education teacher preparation coursework: Meeting the standards. *In Proceedings* of *Society for Information Technology and Teacher Education International Conference 2004*(1), 4930-4935. Norfolk, VA: AACE.

Martin, S. S. & Crawford, C. M. (2004). Preservice educators and the integration of technology to meet state and national standards. *In Proceedings of Society for Information Technology and Teacher Education International Conference 2004(1),* 4938-4941. Norfolk, VA: AACE.

Martin, S. S. & Crawford, C. M. (2005). Supportive learning environments for students with diverse needs and technology use: Discussion of case studies and implications for teacher training. In *Proceedings of Society for Information Technology and Teacher Education International Conference 2005(1),*3931-3936. Norfolk, VA: AACE.

McGee, S. & Howard, B. (1999). Using design experiments as a means of guiding software development. *World Conference on Educational Multimedia, Hypermedia and Telecommunications, 1999*(1), 522-527. [Online]. Available: http://dl.aace.org/4299.

Mechling, L. (2005). The effect of instructor-created video programs to teach students with disabilities: A literature review. *Journal of Special Education Technology, 20*(2), 25-35.

Meir, E. (1999). EcoBeaker 2: Teaching ecology and conservation through computer experiments. Poster session presented at the *World Conference on Educational Multimedia, Hypermedia and Telecommunications, 1999*(1), 1619-1619.

Meloy, L. L., Deville, C., & Frisbie, D. A. (2002). The effects of a read aloud accommodation on test scores of students with and without a learning disability in reading. *Remedial and Special Education*, 23(4), 248-255.

Morris, B. & Milam, P. (2004). Instructional technology improves test scores: Implications from research. *In Proceedings of Society for Information Technology and Teacher Education International Conference 2004(1)* 1289-1294. Norfolk, VA: AACE

Norman, J. M. & Collins, B. C. (2001). Using an instructional package including video technology to teach self-help skills to elementary students with mental disabilities. *Journal of Special Education Technology, 16*(3), 5-18.

Okolo,C. M., Bahr, C. M. & Reith, H. J. (1993). A retrospective view of computer-based instruction. *Journal of Special Education Technology, 12*(1), 1-27.

Pierson, M. A. (2001). Technology integration practices as a function of pedagogical expertise. *Journal of Research on Computing in Education, 33*(4), 413-430.

Riffel, L. A., Wehmeyer, M. L., Turnbull, A. P., Lattimore, J., Davies, D., Stock, & Fisher, S. (2005). Promoting independent performance of transition-related tasks using a Palmtop PC-based self-directed visual and auditory prompting system. *Journal of Special Education Technology, 20*(2), 5-14.

Roblyer, M. D. (2004). If technology is the answer, what's the question? Research to help make the case for why we use technology in teaching. *In Proceedings of Society for Information Technology and Teacher Education* 2004(1), 27-38. Norfolk, VA: AACE

Sze, S., Murphy, J., Smith, M., Yu, S., & Murphy, J. (2004). An investigation of various types of assistive technology (AT) for students with disabilities. *In Proceedings of Society for Information Technology and Teacher Education International Conference 2004*(1), 4459-4964. Norfolk, VA: AACE.

Thurlow, M. L. (2002). Positive educational results for all students: The promise of standards-based reform. *Remedial and Special Education, 23*(4), 195-202.

Weber, R. K. & Forgan, J. W. (2002). Challenging decisions: Software selection and IEP process. *In Proceedings of Society for Information Technology and Teacher Education International Conference 2002*(1), 2276-2280. Norfolk, VA: AACE.

Weber, R. K., Forgan, J. W., Schoon, P. L., & Singler, J. L. (1999). Identifying the technological needs of the special education teacher. *In Proceedings of Society for Information Technology and Teacher Education* 1999(1), 1585-1588. Norfolk, VA: AACE.

Weber, R. K. & Schoon, P. L. (2001). Special educators' technology literacy: Identifying the void. *In Proceedings of Society for Information Technology and Teacher Education International Conference 2001*(1), 2641-2646. Norfolk, VA: AACE.

Wehmeyer, M. L., Smith, S. J., Palmer, S. B., & Davies, D. K. (2004). Technology use by students with intellectual disabilities: An overview. *Journal of Special Education Technology, 19*(4), 7-21.

Woodward, J. & Reith, H. J. (1997). A historical review of technology research in special education. *Review of Educational Research, 67*, 503-536.

Ysseldyke, J., Thurlow, M., Bielinski, J., House, A., Moody, M., & Haigh, J. (2001). The relationship between instructional and assessment accommodations in an inclusive state accountability system. *Journal of Learning Disabilities, 34*, 212-220.