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2006 Year in Review: What Have We Learned Lately?

Dave L. Edyburn, Ph.D.
University of Wisconsin-Milwaukee

In contrast to fields like psychology and reading, the field of special education technology is a relatively young discipline. As a result, we lack the sophisticated research analysis tools that define the knowledge base in more established fields.

For the past eight years I have conducted an annual review of the special education technology literature. This work involves scanning the contents of 31 journals and capturing each article that I think is relevant to the work of special education technology professionals. After reading, analyzing, and indexing each article, I prepare an analysis of this one-year profile of the knowledge base. The purpose of this work is to answer the question, "What have we learned lately?"

The value of having this dataset at my fingertips has been personally rewarding and an investment in my professional productivity. While I have published the results of my first five reviews for 1999-2003 in *The Journal of Special Education Technology,* it has been difficult to keep this annual project on a time schedule that synchronizes with the journal's publication schedule. As a result, data analyzing the literature in 2004, 2005, and 2006 has not been published. The length of the article also has become an issue since recent reviews routinely involve more than 225 articles. As a result of these challenges, I have decided that is necessary to begin exploring other formats to disseminate the results of the annual review.

Exploring New Formats

One of the first options I explored was the creation of a simple bibliography highlighting the top 10 articles in a given year. This format offers a way for me to easily highlight and disseminate some amazing finds in the professional literature and allows interested readers to learn about new developments sooner than would be possible through the publication of the annual review article. The obvious drawback to this approach is that it is not comprehensive and results in a hit-or-miss approach to matching readers with appropriate articles.

Another analysis and dissemination format I have been exploring involves the creation of thematic analyses. For example, in an article in-press with *The Journal of Special*

Education Technology, I provided a thematic analysis of the 2006 special education technology research literature that focused on research methods. This work briefly examines 31 articles and highlights the contribution of each article to the knowledge base relative to research methods for investigating special education technology.

Similar to the format of thematic analysis articles, I have prepared a conference paper that provides a medium length treatment of a subset of the annual literature. As I will detail below, this paper will provide readers a thematic analysis of the special education technology literature from 2006. The purpose is to provide a thematic analysis of the literature and provide at least a brief reference to each of the 85 articles that I captured from the knowledge base. The primary advantage of this approach is that the information can be disseminated at major conferences, without length constraints.

Finally, I have been involved in creating specialized citation software to manage the data set that has accumulated through the many years I have been conducting my annual synthesis of the literature. During this session, I will briefly demonstrate the key features of Cite Minder. While I have maintained a database for many years, the value of this tool is that interested readers can have access to the entire data set and manipulate the information in ways that are not possible with print products.

I have created a special web page (http://www.uwm.edu/~edyburn/what.html) to assist researchers and practitioners interested in monitoring the progress of my work relative to my annual reviews of the literature. Visitors will find additional information on the top 10 lists, thematic analysis articles, thematic analysis conference papers, and links to information about the Cite Minder software.

Method

Search Procedures

The methodology known as the comprehensive one-year research synthesis approach (Edyburn, 2000) was utilized to for the review of the literature to define the body of knowledge that was published in 2006. In this conference paper, I report on the literature from 2006 contained in a subsection of the knowledge base that represents the core knowledge base of special education technology contained in four journals (*Assistive Technology*, *Closing the Gap*, *Journal of Special Education Technology*, and *Special Education Technology Practice*).

Selection Procedures

The author reviewed each journal issue by browsing the table of contents to identify article titles potentially of interest to researchers and practitioners in the field of special education technology. As necessary, individual articles were scanned to ascertain their relevance. Announcements, editorials, and product reviews were not counted nor were articles that focused primarily on medical or rehabilitation applications of technology. Relevance. An article was judged to be relevant if it expressly mentioned technology (assistive, instructional, or educational) and individuals with disabilities in contexts

associated with schooling or learning. This could include articles addressing student or teacher use of technology in special education, assistive technology, instructional technology, how-to articles, resources guides, policy or legal issues. Articles were also considered relevant if, despite not explicitly addressing individuals with disabilities, they served to inform the design, acquisition, implementation, or evaluation of educational technologies, media, materials, or methods. Again, announcements, editorials, and product reviews were not counted nor were articles that focused primarily on medical or rehabilitation applications of technology. Obviously, there is an element of judgment in this decision-making. However, given the function of the synthesis to serve as an early-alert system, an effort was made to err on the side of including all articles of potential interest to professionals working in the discipline.

Analysis Procedures

To address the research question concerning what was learned in 2006, the results of the search were assembled into a master bibliography and then sorted alphabetically by author's last name. Content analysis procedures were used to code of each article according to its type (development, essay, policy, practice, research, theory, etc.). One descriptor was used to describe its disability focus, if a specific disability was addressed in the article. If appropriate, one descriptor was assigned for grade/age level, and one descriptor for curriculum area. Finally, one-to-three topic descriptors were assigned to describe the focus of the work.

Highlights of the 2006 Special Education Technology Literature

In the sections that follow, I provide a thematic analysis of the 2006 literature contained in four core special education technology journals (n=85) and highlight what I believe are important contributions regarding each of the recent additions to the knowledge base. Some articles may be discussed in more than one section.

AAC

In an interesting article, Politano and Peterson (2006) describe 40 ways to utilize AAC in fun and practical ways. In perhaps one of the most innovative articles of the year, Murphy (2006a) describes how AAC can be used to engage students in a theater curriculum by programming their lines into the device.

Rush and Helling (2006) provide practical advice and resources on building and using an AAC evaluation toolkit to assess the abilities and needs of AAC candidates. Murphy (2006b) addresses the five Ws (why, when, what, where, and who) of AAC use by adults.

Dudek, Beck, & Thompson (2006) studied whether peer attitudes of children in grades 3-5 were affected by the type of AAC device a child used. Specifically, the research sough to determine and whether the screen was dynamic or static. No significant results were found by the type of device. Children viewed a videotape of an AAC user. Significant differences were found by gender and were consistent with previous

research results that indicate that females are more positive toward those who use AAC then are males. This research has important implications for social acceptability of AAC (e.g., do not focus on devices but on efficiency and effectiveness of communication).

Accessibility Research

An example of design research involves the design of accessible microscopes (Duerstock, 2006). This article offers an interesting model for improving access to the curriculum and careers for individuals with disabilities. Attention has also been devoted to the accessibility of handheld computers (Cox & Fahey, 2006). Wells and Barron (2006) found that 91% of the K-12 schools they studied had at least one accessibility error related to Section 504 and 84% of the web sites had at least one Priority 1 error. Burgstahler (2006a) has described a series of indicators that can be used to measure the accessibility of a distance education program for individuals with disabilities.

Assistive Technology Consideration

The literature provides several interesting examples of advances in the knowledge base concerning frameworks that move assistive technology consideration practices beyond the historical trail and error efforts. Koch (2006) created a taxonomy of the demands of scanning with a switch and linked it with software to provide a means of assessing user knowledge, skills, and performance. Banton and Press (2006) profiled a variety of portable word processors to highlight features that may focus or deter adoption for individuals with certain kinds of needs. Moore, Duff, and Keefe (2006) highlight the need to involve the student in the IEP and AT consideration process. Corrigan (2006) provides a rare parent voice as she summarizes tools that worked for her son to minimize the impact of dysgraphia. Edyburn (2006a) advances a definition of the term "cognitive prosthesis" and argues that such tools are essential assistive technologies for individuals with mild disabilities where the impairment involves cognition rather than physical or sensory impairments.

Wiazowski (2006) sought to clarify several forms of assistive technology for individuals with visual impairments and emphasized the importance of assistive technology as part of an expanded core curriculum. This concept has important implications for other disability groups that must rely on their assistive technology across the life span and thus deserve an extensive and high-quality training period to immerse themselves in mastery their devices.

Development of New Assistive Technologies

The design of accessible microscopes provides an interesting case study concerning the research and development process of creating new assistive technologies (Duerstock, 2006). Wing (2006e) describes the process one company used to bring a new software product to market and gives insight the the collaborative and interdisciplinary nature of product development.

Assistive Technology Outcome Measurement

Koester (2006) describes the development of a data-based model of the factors that influence the performance of speech recognition users and help predict which users will be successful. An impressive study analyzes multiple conceptual models for assessing the communication rate of AAC users by using automated data logging files (Smith, Higginbotham, Lesher, Moulton, & Mathy, 2006). An exploratory study of word prediction in conjunction with onscreen keyboards found that onscreen keyboards may improve typing speed (Anson, Moist, Przywara, Wells, Saylor, & Maxime, 2006). Silverman and Smith (2006) studied the technical adequacy of a modification to the School Function Assessment known as the SFA-AT could enhance decision-making about assistive technology use. Edyburn (2006e) challenges readers to consider how to measure the outcomes of assistive technology when the tasks involve learning. Susi and Laskarzewski (2006) describe a new software tool that was designed to help assistive technology teams gather data about the critical factors influencing a student's ability to perform and make meaningful progress.

Mirenda, Turoldo, and McAvoy (2006) measured the output of 24 students when handwriting, using a word processor, and a predictive word processor as they prepared three writing samples in 10 minutes. No significant differences were found in the number of words generated in each of the three conditions. However, word processing and the predictive word processor resulted in higher percentages of legible words, correctly spelled words, and correct word sequences.

Lance, McPhillips, Mulhern, and Wylie (2006) studied 93 secondary students with reading disabilities to understand the impact of specialized assistive technology tools (Read & Write Gold, speech synthesis, spellchecker, homophone tool, and dictionary) compared to performance to students using a standard software package (Microsoft Word) and a control group. The results indicated improvement for the assistive technology group on reading comprehension, homophone error detection, spelling error detection, and word meanings. The Microsoft Word group showed improvement on spelling error detection, and word meanings but performed worse on homophone error detection. The control group showed no significant improvements on any of the measures.

Two studies examined the use of assistive technology by young children and parent perspectives. Wilcox, Dugan, and Guimond (2006) conducted telephone interviews with 924 parents of children that had received assistive technology to assess their use of assistive technology at home. The findings contradict the common myth that parents underutilize assistive technology. The findings also suggest that the parents' experience was such that they did not experience recommended best practices. This study is a rare examination of assistive technology services and holds implications for all levels of education. Hamm, Mistrett, and Ruffino (2006) studied parent satisfaction with play outcomes of their children birth to age three with a variety of toys and assistive technologies. Parents tended to select low-tech and off-the-shelf toys. No differences in satisfaction were found based on the type of toy.

Funding Assistive Technology

National survey research by Carlson and Ehrlich (2006) revealed that the most common source of funding for assistive technology is personal/family funds. Wilcox, Dugan, and Guimond (2006) also found that families identify, use, and pay for the assistive technology of their preschool children.

Assistive Technology Integration

Several examples of technology integration strategies, as they could be applied to assistive technology, have been noted (Antonious & Zeijdel, 2006; Bassett, 2006; Connor & Snell, 2006; Cox, & Fahey, 2006). Nicholson (2006) describes the important of seating and positioning considerations for the classroom. Edyburn (2006f) explores the issue of creating a toolkit of products that support learner productivity with common learning tasks. Judge (2006) describes her efforts to validate an assistive technology toolkit that could be useful to young children.

Assistive Technology and Mild Disabilities

Despite the high incidence of some disabilities, little information is available about assistive technology for students with mild disabilities. Herlihy (2006) describes some provocative applications of mainstream technologies and how these tools have hidden supports that can facilitate learning and performance of individuals with mild disabilities. Edyburn (2006c, 2006e) challenges readers to consider how to measure the outcomes of assistive technology when the tasks involve learning. Edyburn (2006g) provide an overview of assistive technology for students with mild disabilities focusing on issues of consideration, implementation, and outcome measurement.

Assistive Technology and Transition

The use of assistive technology continues to capture the interest of professionals concerned about the transitions of students with disabilities, particularly school to work and secondary to post secondary transitions (Bassett, 2006; Burgstahler, 2006b)

Research Methods

A milestone in the development of the field is the ability to conduct research syntheses on the knowledge base. Alper and Raharinirina (2006) prepared a synthesis of the literature and provides numerous insights about the number of quality research studies, purpose, disabilities of the participants, research designs, independent and dependent variables, assistive technology assessment procedures, family involvement, and more.

The emphasis in NCLB on accountability has produced a variety of extant data bases that may be of special interest to researchers. Edyburn (2006b) described how to access extant data sets that contain student achievement data.

The literature reveals incremental progress in strengthening the research methods used to study and measure assistive technology outcomes. An impressive study analyzes multiple conceptual models for assessing the communication rate of AAC users by using automated data logging files (Smith, Higginbotham, Lesher, Moulton, & Mathy, 2006). This issue has been problematic because of excessive pause intervals which significantly skew measurement of actual communication rate performance. Penrod, Bauder, Simmons, Belcher, & Corley, 2006 describe how they conducted an obstacle course to measure the ability of subjects to navigate an environment using a commercially available mobility cane. Edyburn (2006c) describes a procedure known as Time Series Concurrent Differential (TSCD) for measuring the effectiveness of an assistive or instruction technology intervention. Two articles describe the use of online surveys and quizzes (Bouck, 2006; Edyburn, 2006d).

There is a curious trend developing that involves using non-handicapped individuals in research on the efficacy of assistive technology (Anson, Moist, Przywara, Wells, Saylor, & Maxime, 2006; Penrod, Bauder, Simmons, Belcher, & Corley, 2006). I wonder if this issue signifies a problem with relying on convenience samples or whether these studies are part of a larger research agenda to obtain normative data that can be used to compare performance with individuals with disabilities.

Collaborative Research Efforts

The literature reveals an increase in the scale and scope of efforts to gather evidence about the outcomes of assistive technology. Several projects describe state level projects: Arizona, functional curriculum (Cummings, Musselwhite, Van Howe, & Wagner, 2006), and Iowa, the efficacy of text readers (Dimmitt, Hodapp, Judas, Munn, & Rachow, 2006). Chernek (2006) describes a collaborative research project between a software company and a school district to assess the efficacy of a phonics instruction software product on student achievement.

Instructional Design

Historically, technology has been treated as a black box that holds magical power for improving the lives of individuals with disabilities. Fortunately, researchers are beginning to understand the importance of explicitly identifying the instructional design principles that are being designed into technology products. Some interesting developments in this area during the past year include: use of PowerPoint as a prototyping environment for measuring user efficacy of dynamic displays used in augmentative communication systems (Carson & Kennedy, 2006) and profiles of authoring tools such as My Own Bookshelf (Stindt, 2006).

Ely, Emerson, Maggiore, Rothberg, O'Connell, and Hudson (2006) describe a technology they developed and a protocol they created for inserting text descriptions into artificially paused digital video as a means of increasing the content knowledge provided to students with visual impairments. The results indicate some promising results for this technique and provided evidence about the effective placement and use of eDescriptions.

Lancaster, Lancaster, Schumaker, and Deshler (2006) used an interactive CDROM self advocacy curriculum to study the efficacy of a test-taking strategy by students with high incidence disabilities.

Anderson and Lignugaris/Kraft (2006) conducted a study examining the use of video-cases for fostering preservice teacher decision making about problem behaviors. The results indicate positive effects on preservice teachers' analytical skills relative to functional behavioral assessment.

Many articles describe the development of specialized software products (de Graft-Hanson, 2006a 2006b, 2006c, 2006d, 2006e; Nuttall, & de Graft-Hanson, 2006; Wing (2006e) and offer insights about the instructional design features of these new commercial products.

The design of technology-based instructional materials for students with autism has also received attention this year (Giovanetti, 2006; Hoban, 2006; Smith & Smith, 2006). Anderson and Anderson (2006) provide an example of how to develop an inclusive thematic unit using principles of backward design.

Wojcik (2006) describes a variety of screen capture software products and how these tools can be used to support and extend training.

Okolo, Englert, Bouck, and Heutsche (2006) describe their development work to create a web-based virtual history museum as a means of decreasing the text-based nature of learning history. Twyman and Tindal (2006) created an computer-adapted conceptually-based history text to study the difference between 11-12th grade students with disabilities and their non-handicapped peers in experimental and treatment groups. The findings indicated no differences between the groups for comprehension. However, the experimental group performed statistically better on an extended-response essay.

Reading

As might be expected as a result of the emphasis on reading in No Child Left Behind, the literature reveals an increase of articles on technology applications in reading. (Edyburn, 2006i) describes a series of strategies for making text modifications that increase the access to reading in the content areas.

Jeffs, Behrmann, and Bannan-Ritland (2006) interviewed eight parents and their children to understand their perceptions about assistive technology for fostering their child's literacy learning. While parents and children experienced challenges, parents reported seeing their children engaged and excited about their work. Hutinger, Bell, Daytner, and Johanson (2006) describe their research and development efforts to create an emergent literacy and technology curriculum for early childhood. Their studies collected a variety of qualitative and quantitative data that provides rich insight into the issues of implementing and sustaining innovation and the importance of providing time, technical assistance, and insight about the expected changes that teachers will see

in children.

Effective Instructional Strategies

Boon, Burke, Fore, and Spencer (2006) studied the use of cognitive organizers for helping 10th graders learn social studies content. Students using cognitive organizers significantly outperformed students in the traditional textbook instruction condition on tests of declarative knowledge.

Communities of Practice

In a series of articles, Adam Wing profiles the responses by leaders in the field about how collaboration enhances their work (Wing, 2006a, 2006b, 2006c, 2006d). Profiles of selected organizations are also common in the literature (e.g., ATA, Wing, 2006a, Closing the Gap, Ashton, 2006; NCTI, Gray & Silver-Pacuilla, 2006; WATI, Gierach, 2006). Meyers (2006) offers thoughtful advice in the form of seven recommendations on the time demands associated with purchasing, implementing and integrating assistive technology.

Universal Design

The potential of universal design for learning continues to be recognized by many (Kemp, 2006). Edge-Savage (2006) examined the use of Kurzweil 3000 as a universal design for learning tool. Fleming, Kearns, Dethloff, Lewis, and Dolan (2006) described the development and validation efforts to create an instrument to assess technology skills necessary for participating in online assessments. Ruffino, Mistrett, Tomita, and Hajare (2006) created and validated an instrument for assessing the universal design features of toys. Molenbroek and de Bruin (2006) described the problems with using normative data for individuals with disabilities and highlight the need for new observation and virtual tools for enlarging the data set for designers lest we continue to replicate design errors based on assumptions about human differences and abilities.

Professional Development

Edyburn (2006h) created a calendar of professional development activities for teachers to access and use during the summer featuring 10-20 minute learning opportunities. Skylar (2006) highlighted assistive technology online journals, organizations, and resources. Wissick and Schweder (2006) identified a variety of assistive technology resource centers that provide valuable information and resources.

Emerging Technologies

Podcasting continues to capture the attention of practitioners who have been exploring their potential and creating how-to guides to assist the profession in getting started (Cochran, 2006). Okolo (2006a) provided an excellent introduction to the concept of digital books and resources for locating digital texts for the classroom. Okolo (2006b) summarized the conceptual foundation for using video to enhance teaching and

learning and provides a variety of resources for using video from the web to teach content-area information.

Discussion

The purpose of this conference paper has been to provide interested session participants with an update on the progress I have made in my annual reviews of the literature. I described several recent experiments with new formats to expand the options for disseminating the results. In particular, I sought to provide a thematic analysis of 85 articles from the core literature on special education technology to help researchers and practitioners locate relevant and interesting articles. Indeed, there have been many exciting advances during the past year.

Time is an ongoing issue. How much time do we need to allocate to browsing, retrieving, and reading the periodic literature in order to stay current? Failure to address this question and properly allocate time in our professional lives to utilizing the knowledge base means that we are unlikely to make important advances. However, in this context, we is a misnomer. If the profession does not read the literature or use the information to make changes in professional practice, we have not really learned anything.

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