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## Abstract

This paper outlines the use of the *Writing with Symbols 2000* software to facilitate emergent literacy development. The program's use of pictures incorporated with text has great potential to help young children with and without disabilities acquire fundamental literacy concepts about print, phonemic awareness, alphabetic principle, vocabulary development, and comprehension. The flexibility and features of the software allow early childhood professionals to create a variety of early literacy tools for the classroom, including worksheets, storybooks, and interactive activities.

The educational contributions of technology in supporting emergent literacy development for young children who are at-risk or who have disabilities has been well-documented over the years (Anderson, Grant, & Speck, 2008; Bowes & Wepner, 2004; Hutinger, Bell, Daytner, & Johanson, 2005; Karchmer, Mallette, & Leu, 2003; Mistrett, Lane, & Ruffino, 2005; Siraj-Blatchford & Whitebread, 2003). As the number of technology applications being marketed to educators increases exponentially (Kurzweil, 2008), it becomes difficult to keep up with technology applications in classroom settings (Mistrett et al.; Parette & Stoner, in press). As a result, schools likely underutilize the wide array of technology tools currently available on the market designed to support literacy acquisition and other important developmental skills.

The Individuals with Disabilities Education Improvement Act of 2004 (IDEIA) requires early childhood education professionals to consider assistive technology (AT) in developing programs for young children with disabilities [20 U. S. C. § 1401(1)-(2)]. In so doing, educators might consider potential student needs in five critical emergent literacy skill areas: alphabetic principle, phonemic awareness, oral reading fluency, vocabulary, and comprehension (National Reading Panel, 2000; NICHD Early Child Care Research Network, 2005). Specific student needs for compensatory supports can then be matched to AT to support and enhance the development of these five skill areas (Mistrett et al., 2005; Parette & Stoner, in press). Young children who are at-risk or who have disabilities often fall behind their nondisabled peers in their development of emergent literacy skills. AT can help to compensate for these delays, facilitating greater subsequent educational success.

Many software programs currently used in early childhood settings nationwide, such as *Clicker V* (Crick Software, 2007), *Boardmaker™ with Speaking Dynamically™ Pro* (Mayer-Johnson, 2003), and *Writing with Symbols 2000* (Widget Software Ltd., n.d), have been reported as enhancing emergent literacy in young children with and without disabilities. The research base to date supporting the use of such software is still incomplete (Campbell, Milbourne, Dugan, & Wilcox, 2006; Edyburn & Smith, 2004; Parette, Peterson-Karlan, & Wojcik, 2005; Rust & Smith, 2006; SEAT Center, National Center for Technology Innovation, and University of Kansas, 2005; Vukelich, 2004). However, the potential educational contributions of technology are such that early childhood education professionals should actively seek to be implement such applications.

### ***Picture-Supported Software and Literacy Learning***

Graphically-based software programs incorporating picture-supported text can help emergent readers develop a positive literate self-image, and acquire important concepts about print. Using picture-supported text in conjunction with picture-supported writing can help emergent readers successfully engage in literacy activities long before they are able to read and spell individual words or even recognize letters (Abbot & Lucey, 2005; Fossett & Mirenda, 2006; Hill, 1995; Sheehy, 2002).

Abbot and Lucey (2005) conducted qualitative research in the United Kingdom to gather data regarding 'symbol literacy' in special schools. Participants in this survey identified benefits of symbol usage for those pupils who struggled with traditional literacy. The researchers reported that, "Respondents...wrote about the benefits for emotional and personal development that followed symbol use, and the improvement in access to literacy that this provided" (p. 200).

For most children, learning to recognize simple words in print is a task that is accomplished relatively easily (Sheehy, 2002). However, for children with atypical development or other learning issues, skills in traditional word recognition may be difficult to acquire even with intensive instructional support. In contrast, many young children learn to recognize and name logographic symbols (letters, symbols, or signs used to represent entire words) with ease, given that (a) many of these icons are highly transparent (understandable without specific training), and (b) understanding logographic symbols does not require decoding into sub-units or phonemes. The ease with which picture symbols are learned has led to symbols becoming an integral and successful component of many effective early reading skills programs.

Sheehy (2002) investigated the efficacy of picture symbol use in teaching word recognition skills. This work concluded that these symbols can be effective in enabling students in acquiring word recognition and associated early literacy competencies. Specifically, it was noted that:

Educational research into classroom practice shows that some children have learned to recognize words using symbols as teaching cues and current educational advice still recommends the use of symbols to teach word recognition. (p. 48)

Fossett and Mirenda (2006) investigated use of picture-to-text matching instruction to teach sight word recognition to learners with developmental disabilities. The researchers found that use of pictures with text was beneficial when accompanied by appropriate instructional techniques.

### ***Writing with Symbols 2000 and Emergent Literacy Development***

Despite the early stage of the evolution of the evidence base regarding symbol-based software programs and emergent literacy outcomes, it seems reasonable to conclude that technology holds great promise in eliciting emergent literacy in young children (Anderson et al., 2008). The next logical question is to determine the specific potential contribution(s) of a particular technology on children's emergent literacy learning (Anderson et al.; Karchmer et al., 2003; Siraj-Blatchford, 2004).

One increasingly common software application used to support emergent literacy is *Writing with Symbols 2000 (WWS 2000)* (Widget Software, n.d.; Judge, 2006). *WWS 2000* is essentially a word and symbol processing program containing four primary components: (a) the *Talking Symbol Processor*, (b) the *Talking Word Processor*, (c) *Grids for Printing*, and (d) *Grids for Writing*.

The *Talking Symbol Processor* function automatically illustrates words as they are typed, with an option to customize pictures for a particular word. The program comes with over 3,800 Picture Communication Symbols™ (each in black and white and in color), and over 4,000 black and white Rebus symbols. These symbols can be further supplemented with imported photos or graphics.

In the *Talking Word Processor*, the program uses synthetic speech to pronounce letters, words, or sentences as they are typed. The child can also choose to have his/her created writing spoken after sentences are constructed.

The *Grids for Printing* component allows the early childhood education professional to produce a wide array of teaching and communication materials including time tables, worksheets, communication books, and games. Options to make a new grid, open a saved grid, or open a template grid are also available.

The *Grids for Writing* component allows children to write using symbols or text within a grid cell. A grid cell can have letters, single words, pictures, or complete phrases within it. A set of grids can be linked to give access to large relevant vocabularies for individual child or group use. *WWS 2000* also allows users to choose (a) the line and background color; (b) the type of symbols (c) switch scanning; and (d) speech feedback (Widgit Software Ltd., n.d.).

These features have clear potential to support the development of emergent literacy skills in children. For example, Stoner, Meadan, and Parette (2008) found that the incorporation of *WWS 2000* into an emergent literacy program helped young children who were at-risk to identify and learn new words in a relatively short period of time, and also enhanced their oral speech production (i.e., mean length of utterance). There are five specific fundamental emergent literacy elements to which *WWS 2000* might especially contribute, including concepts about print, phonemic awareness, alphabetic principle, vocabulary development, and comprehension.

### ***Concepts about Print***

*WWS 2000* holds great potential to facilitate acquisition of fundamental concepts about print, including understanding about how texts are configured and function, and how a reader best approaches them (Justice & Pullen, 2003; McGee & Richgels, 2008). The ability of *WWS 2000* to create illustrated language experience stories may be especially significant (Gately, 2004). The early childhood education professional can create a picture and text story based on areas of interest exhibited by the child. Alternatively, children may create their own personal stories. Young learners may be more motivated to write and share these stories because of the relevance to their lives. In the process students also acquire such basic print concepts as directionality of print, story titles, and the relationship of pictures and words.

The education professional can create story book materials for each child using *WWS 2000*'s *Talking Symbol Processor*, allowing the child to then share his or her story using the symbols as prompts (see Figure 1).

<Insert Figure 1 about here>

Using the *Grids for Printing*, teachers might also create and print out miniature books. After preparing an appropriately structured grid and writing simple sentences, each can be printed and stapled to create personal books for each child (see Figures 2 and 3).

<Insert Figures 2 & 3 about here>

### ***Phonemic Awareness***

Phonemic awareness refers to phonological awareness, or the reader's conscious attention to the phonemes (meaningful sounds) of spoken language (Abbot, Walton, & Greenwood, 2002; McGee & Richgels, 2008; Otto, 2008). A number of *WWS 2000* features support development of phonemic awareness. Using the "Add Sound to Graphic" function, the education professional can add a sound file to its corresponding visual representation to complement visual presentation of symbols. (see Figure 4).

<Insert Figure 4 about here>

*Grids for Printing* allows the education professional to create worksheets that provide opportunities to practice distinguishing sounds. For example, a learner might cut out the pictures prepared on a grid and printed, and place them in the correct category of its beginning sound on another printed grid (see Figure 5).

<Insert Figure 5 about here>

*Grids for Writing* can be used to provide children with additional opportunities for experiences in linking spoken language to written language (Abbott, Walton, & Greenwood, 2002). If the education professional has access to a computer, projection unit, and screen in the classroom, effective interactive group language and literacy activities may be created. For example, a question with associated symbols may be presented to the children, followed by phonemic awareness questions presented either to individuals or to the entire class (see Figure 6).

<Insert Figure 6 about here>

### ***Alphabetic Principle***

Alphabetic principle refers to the use of letters to represent speech sounds that combine to make words (McGee & Richgels, 2008; Stahl & Yaden, Jr., 2004). Mastery of alphabetic principle is a prerequisite to fluent, skilled reading ability (Justice & Pullen, 2003). When the education professional is teaching alphabetic principle, the *Talking Symbol Processor* can be used to identify the letters of individual sounds. In this way students learn that the letters combine to form a word. The corresponding symbols help the child to understand the individuality of each letter and then the word that it forms.

In Figure 7, individual letters were typed with spaces in between such that only a lower case letter appears above a capital letter as it was typed. As each letter is typed, the education professional can, for example, say, "'D' makes what sound? 'Duh,' that's right! What happens when I put 'O' and 'G' with 'Duh'? Let's see." The word 'dog' (with no spaces between letters is then typed, and when the spacebar is depressed after the word has been typed, a picture of a dog appears above the word) (see Figure 7).

<Insert Figure 7 about here>

### ***Vocabulary Development***

Once alphabetic principle is attained, children can begin to recognize whole words and expand their personal literacy vocabularies (Otto, 2008; Stahl & Yaden, Jr., 2004). Vocabulary flashcards with words and pictures can be created using *Grids for Printing* (see Figure 8).

<Insert Figure 8 about here>

The education professional can teach words related to a specific theme (e.g., "Transportation"), or select other words of importance to the students. These words then can be used in sentences to promote further understanding of the individual words. Sentence strips can also be created with *Grids for Printing*, by changing the number of cells, the height, and the width (see Figure 9).

<Insert Figure 9 about here>

### ***Comprehension***

Comprehension refers to a reader's understanding of the meaning of oral and written text (McGee & Richgels, 2008; Otto, 2008). Early comprehension abilities in pre-readers provide the foundation for the development of later reading comprehension of narrative or expository material in school (Stahl & Yaden, Jr., 2004). Shared storybook reading has been found to be a promising intervention activity to teach comprehension (Justice & Kaderavek, 2002; Justice & Pullen, 2003; Stahl & Yaden, Jr., 2004).

Using the *Talking Symbol Processor*, a simple story can be created with corresponding symbols for each word (see Figure 10). Then, using the *Grids for Writing*, the education professional can create an interactive activity to ask simple questions related to the story (see Figure 11).

<Insert Figures 10 & 11 about here>

Table 1 presents additional resources and ideas for teachers to more effectively use *WWS 2000* to enhance emergent literacy instruction in young children.

<Insert Table 1 about here>

### **Discussion**

The research base to date for the use of technology such as *WWS 2000* in early literacy in early childhood/early childhood special education programs is still emerging. But to date this extant evidence base is largely positive (e.g., Campbell et al., 2006; Dugan, Milbourne, Campbell, & Wilcox, 2004; Judge, 2006). Considering the ease with which the features of *WWS 2000* lend themselves to early literacy instruction (Judge, 2006), early childhood educators would be well-advised to develop operational and functional competence with this emergent literacy support tool. As technological competence with the software is achieved and the program integrated into early literacy curricula, education professionals can then systematically examine its impact on emergent literacy development, contributing to the knowledge base to subsequently help guide professional practice.

Recent reports from teachers working with young children with disabilities (Judge, 2006) suggest that *WWS 2000* can be effectively incorporated in classroom settings, with current work providing emerging research support for its use (Meadan, Stoner, & Parette, H. P., 2008; Stoner et al., 2008). Reports to date suggest that these young learners enjoy use of technologies that present learning experiences using multimodal facets (e.g., color, pictures, sound, movement combined with text (e.g., Jewitt, 2008). Similar future research report conclusions are likely to add further support for the use of such technology-enhanced teaching approaches as *WWS 2000* in early childhood classrooms of the 21<sup>st</sup> century.

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Table 1

*Resources for Developing Writing with Symbols Learning Materials to Teach Emergent*

*Literacy Skills*

Site	URL	Description
Widgit Software	<a href="http://www.widgit.com/support/wws/index.htm">http://www.widgit.com/support/wws/index.htm</a>	WWS 2000 website which includes product information, tutorials, and learning materials available for download.
Better Living Through Technology	<a href="http://www.blft.org/software/wws2k/">http://www.blft.org/software/wws2k/</a>	Tutorials on capturing unique pictures and embedding in WWS 2000
Mayer-Johnson	<a href="http://www.mayer-johnson.com/TipsAndTricks.aspx?DirID=Writing%20With%20Symbols">http://www.mayer-johnson.com/TipsAndTricks.aspx?DirID=Writing%20With%20Symbols</a>	Contains four tutorials on getting started with WWS 2000, including a basic overview of features, setting up the basic software environment, linking to other resources/files, and creating a matching worksheet

## Figure Captions

*Figure 1.* Story creation using symbols as prompts in the *Talking Symbol Processor*.

*Figure 2.* Grid creation for miniature personal books in the *Grids for Printing*.

*Figure 3.* Sample miniature personal book pages in the *Grids for Printing*.

*Figure 4.* ‘Add Sound to Graphic’ feature of *WWS 2000*.

*Figure 5.* Grids to print to match initial sounds to words in the *Grids for Printing*.

*Figure 6.* Sample group phonemic awareness question in the *Grids for Writing*.

*Figure 7.* Sample alphabetic principle screen in the *Talking Symbol Processor*.

*Figure 8.* Sample vocabulary development grid for flashcard preparation in the *Grids for Printing*.

*Figure 9.* Sample vocabulary development sentence screen in the *Grids for Printing*.

*Figure 10.* Sample story using the *Talking Symbol Processor*.

*Figure 11.* Sample interactive comprehension activity using the *Grids for Writing*.