Sight Word Recognition Among Young Children At-Risk: Picture-Supported vs. Word-Only

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Abstract: A quasi-experimental design was used to investigate the impact of Picture Communication Symbols (PCS) on sight word recognition by young children identified as 'at risk' for academic and social-behavior difficulties. Ten pre-primer and 10 primer Dolch words were presented to 23 students in the intervention group and 8 students in the control group during interactive games. Assessments occurred at four points and results indicated that children in the control group learned sight words faster under similar conditions of activities and time. These findings are consistent with previous literature and offer further insight into the learning of sight words by this population. Interactive games proved effective with children; they learned quickly over a relatively short time exposure. In the last assessment (word and picture) the intervention group performed better than the control group, indicating that pictures assisted young children to identify and learn new words in a relatively short period of time.

Key Words: Early intervention, Emergent literacy, Assistive technology, Picture communication symbols, Sight word recognition

A number of emergent literacy skills have been deemed to be of importance for future reading development (Clay, 1975; National Reading Panel, 2000; Teale & Sulzby, 1986). These include phonemic awareness, alphabetic principle, fluency, concepts about print, vocabulary development, and comprehension (. Collectively, these skills provide the foundation for the development of reading which is fundamental for independence in our society (International Reading Association [IRA] & National Association for the Education of Young Children [NAEYC], 1996).

According to Karchmer, Mallette, and Leu (2003) traditional understanding of emergent literacy skill development and effective strategies for teaching these skills must continually be examined from a comprehensive perspective (Kamil, Intrator, & Kim, 2000; Lankshear & Knobel, 2003; Neuman & Dickinson, 2001). Such a perspective must, of necessity, consider that young children are exposed to and use an array of technologies in their daily lives (Loveless & Dore, 2002; McGee & Richgels, 2006; Stephen & Plowman, 2003), and that their experiences with technologies transform the very nature of literacy (Anderson, Grant, & Speck, 2008; Jonassen, Howland, Moore, & Marra, 2003; Turbill & Murray, 2006). More specifically, the multimodal demands of interacting with technologies, even at an early age, require education professionals to rethink how emergent literacy skills are developed (Jewitt, 2006; Turbill & Murray).

A comprehensive perspective that embraces the idea that young children are already learning about the world around them and developing understandings of the importance of print must also give credence to the evidence supporting the use of particular technologies used by teachers with young children (Campbell, Milbourne, Dugan, &

Wilcox, 2006; Dunst, Trivette, & Cutspec, 2002; Justice & Pullen, 2003; Lankshear & Knobel, 2003; Odom et al., 2005; Parette, Peterson-Karlan, Wojcik, & Bardi, 2007). That is, the question must be asked, "Does the technology tool have an impact on children's acquisition of targeted emergent literacy skills that are important for later reading success?"

Admittedly, technology applications for typical, 'at-risk' young children, and those with disabilities, have drawn increasing attention from professionals world-wide (Casey, 2000; Jewitt, 2006; Loveless & Dore, 2002; Mistrett, 2004; Mistrett, Lane, & Ruffino, 2005; Siraj-Blatchford, 2004). Such applications hold great potential to facilitate the development of an array of developmental skills, particularly in the area of emergent literacy (Anderson et al., 2008; Bowes & Wepner, 2004; Casey, 2000; Hutinger, Bell, Daytner, & Johanson, 2006; Karchmer et al., 2003; Siraj-Blatchford & Whitebread, 2003). Specific technology applications have been developed, marketed, and routinely used in preschool settings both in the U.S. and abroad for supporting emergent literacy skill development (e.g., Boardmaker™ with Speaking Dynamically Pro®; Judge, 2006; Karemaker, Pitchford, & O'Malley, 2008; Parette, Watts, & Stoner, 2005-2007), though little is known about the effectiveness of such tools to mediate children's emergent literacy learning. Typically, these tools require multimodal involvement of the learner (i.e., images, color, and other elements are often presented in tandem with text; Jewitt, 2006), and education professionals currently have limited understanding of how the learning of emergent literacy skills (e.g., word recognition) is affected by the current presence and use of technologies in young children's daily lives.

Symbol Usage in Emergent Literacy Classroom Practices

Graphic symbols such as those in Boardmaker™ (Mayer-Johnson, 2006) are frequently used in early childhood education settings in tandem with strategies for teaching emergent literacy skills (Antonius & Zeijdel, 2007; Giovanetti, 2006; Spencer, 2002). Work conducted in the field regarding the use of symbols has focused primarily on an analysis of symbol learnability and complexity (Fuller & Lloyd, 1987; Soto, Cassidy, & Madanat, 1996). Essentially, a symbol is something "that stands for or represents something else" (Vanderheiden & Yoder, 1986, p. 15). The *something else* is the symbol's 'referent.' Early work examining symbols and their referents has suggested a continuum of symbols that range from *transparent* (i.e., easily guessed in the absence of a referent) to *translucent* (i.e., the referent's meaning may or may not be obvious but the relationship can be perceived once the meaning is provided) to *opaque* (i.e., no relationship is evident even when the symbol's meaning is known; Fuller & Lloyd; Lloyd, Fuller, & Arvidson, 1997; Soto et al.; Schlosser, 1997a, b). Picture Communication Symbols (PCS) found in Boardmaker™ (Antonius & Zeijdel, 2007; de Graft-Hanson, 2006; Judge, 2006) have been found to be easily learned when transparent or translucent relationships between symbol and referent exist (Fuller & Lloyd; Mizuko, 1987; Soto et al.). These symbols are a set of color and black and white drawings developed by Mayer-Johnson, LLC for use in augmentative and alternative communication (AAC) systems (Mayer-Johnson, 2008).

Sight Word Reading and Technology Applications

Of particular importance in developing early reading foundation skills is the development of 'sight word' reading competencies. Reading sight words is necessary for young children's independence, safety, and more mature

reading experiences as they grow older and progress in the public school curriculum (Carnine, Silbert, Kame'enui, & Tarver, 2004; Ehri, 2005; National Reading Panel, 2000; Rivera, Koorland, & Fueyo, 2002). Browder and D'Huyvetters (1988) defined sight word reading as a discrete, observable response that is controlled by a printed stimulus. Sight words are lists of words that (a) are recognized without mediation or phonetic analysis (Browder & Lalli, 1991); (b) can be read from memory; and (c) include not only high-frequency words but any words that can be "read from memory" (Ehri, p. 169).

Early work by Samuels (1967) suggested that in teaching sight words to beginning readers, less efficient learning occurs when a new word to be learned is accompanied by related pictures. Samuels argued that this could be detrimental to learning new words since the child would depend on the extra cues to anticipate an unknown word. Thus, as Hill (1995) noted, appropriate responses to the graphic features of the word might not be acquired, or 'blocked' (Didden, Prinsen, & Sigafoos, 2000; Fossett & Mirenda, 2006) and incorrect responses may occur, particularly if the child depends on the 'extra cues' to anticipate the unknown word.

Singer, Samuels, and Spiroff (1973) compared three procedures for introducing new words, including words (a) in isolation; (b) in sentences (context); and (c) with pictures. Typically comparing two groups--one in which a picture appeared with each word and one without pictures--the investigators found that context and picture cues slowed acquisition of new word acquisition. When pictures accompanied the words, students required longer to reach criterion and made more errors than when pictures were not present. Later reports confirmed these findings (Center for Literacy and Disability Studies, n.d.; Fossett & Mirenda, 2006; Saunders & Solman, 1984; Singh & Solman, 1990).

Such findings are interesting, however, when we recognize that most young children are immersed in interactions with technology every day that present multimodal learning opportunities (e.g., large screen televisions and programming that is language-based; computer programs available in home settings; play with electronic toys and games; Bowman & Beyer, 1994; Jewitt, 2006; Loveless & Dore, 2002). This is sometimes true with Boardmaker™ when learning activities are designed for presentation on computer screens or projected onto large screens using LCD projectors (Blum, Watts, & Parette, 2008; Parette, Blum, Boeckmann, & Watts, in press; Parette, Hourcade, Boeckmann, & Blum, in press). Thus, another perspective to understand how children learn sight words is that learning is enhanced when pictures, such as those provided using Boardmaker™, are paired with words to be learned (Goodman, 1965). Using this reasoning, Denberg (1976-1977) commented,

> pictures are introduced, not to supplant print but to provide one additional source of information from which the beginner can sample as he reads. Increasing the amount of available information through the medium of pictures is shown to have a strong facilitative effect on word identification in context and a smaller, though significant, facilitative effect on word learning. (p. 176)

Limited support for this position has been reported in the professional literature (Elman, 1973; Montare, Elman, & Cohen, 1978).

Hill (1995) recommends that Samuel's (1967) theory appears to be preferable as a model for teaching non-readers of normal ability new words. In comparing typical children to those

with Down syndrome and learning disabilities, sight vocabulary was observed to be learned most efficiently by all participants when the target word was presented in isolation (Hill). Similar findings have been reported in studies conducted with children with disabilities to teach sight words (Burns, 2007; Conley, Derby, Roberts-Gwinn, Weber, & McLaughlin, 2004; Didden, de Graaff, Nelemans, & Vooren, 2006; Fossett & Mirenda, 2006).

Dolch sight words in the preschool classroom. For young children identified as being 'at-risk,' teaching sight word recognition may require explicit skill instruction on the part of education professionals (Ehri, 2005; Lee & Vail, 2005; Stahl, McKena, & Pagnucco, 1994). Boardmaker™ can be used to develop materials used for the teaching of sight words. The National Reading Panel (2000) has recommended that vocabulary "be taught both directly and indirectly" and that "dependence on a single vocabulary instruction method will not result in optimal learning" (p. 14). Even more importantly, the National Reading Panel observed that there was a paucity of research regarding effective instructional methods for vocabulary instruction and subsequent measurement of vocabulary growth.

The most frequently used list to teach sight words is the Dolch List (Dolch, 1936; Rivera et al., 2002). The original Dolch list contained 220 words and if one can read all of those words, one can read at a third grade level (Dolch, 1948). These vocabulary words continue to be prevalent in curricula materials used in early childhood education settings nationally (Rivera et al.; Squidoo, LLC, 2008), and are often paired with pictures when teaching young children, both with and without disabilities. However, there is a recurring finding of a lack of consistent positive effects of images on learning (Answers.com, 2007), which is influenced markedly by the kind of image that is used. A review of studies examining type of image usage (i.e., decorative or conceptually relevant) reported that 'decorative illustrations' were found to lead to the smallest improvements and sometimes negative effects in learning (Levin, Anglin, & Carney, 1987). Such 'decorative' illustrations are found in frequently used technology applications such as Boardmaker™ with Speaking Dynamically Pro® (Duffie & McGinn, 2005) which may be used to teach sight words.

Since classrooms across the country often use technologies such as Boardmaker™ with Speaking Dynamically Pro® to develop classroom instructional materials and teach emergent literacy skills (Antonius & Zeijdel, 2007; Judge, 2006), it begs the following research questions:

1. What is the impact of use of PCS found in Boardmaker™ on sight word recognition by young children 'at risk'?
2. Will providing the written word and a PCS of a sight word compared to providing only the written word increase children identifications of a set of sight words?

Method

Participants

Children participating in the study were from a Midwestern city, were aged 4-5 years, and attended seven different preschool classrooms for children 'at risk.' Children were identified as being at risk based on a three-pronged process including administrations of (a) the Developmental Indicators for Assessment for Learning-3 (DIAL-3; Mardell-Czudnowski & Goldenberg, 1998); (b) the Preschool Phonological Screening section of the Hodson Assessment of Phonological Patterns-3 (HAPP-3; Hodson, 2004); and (c) a

Table 1
Participant Assessment Data

Group	Gender			
	n Male	*n* Female	ROWPVT *Avg* Standard Score	EOWPVT *Avg* Standard Score
Control	4	4	98	94
Intervention	19	7	96	90

screening checklist that is a composite of common risk factors (i.e., exposure to drugs or alcohol during pregnancy, premature birth, violence in the home, frequent hospitalizations, low income family, and other factors). Children identified as being at risk performed at least one standard deviation below the norm in two domains of the DIAL-3, or satisfied any two of the following criteria: (a) score of one standard deviation below the norm in a domain on the DIAL-3; (b) exhibit at least four risk factors on the screening checklist; or (c) perform one standard deviation below the norm on the Preschool Phonological Screening of the HAPP-3. All students were participating in the Making A Difference Using Assistive Technology (MDAT) project, a three-year grant funded by the Illinois Children's Healthcare Foundation (Parette, Watts, & Stoner, 2005-2007). This project provided AT toolkits (Edyburn, 2000) to 10 classrooms to help develop children's emergent literacy skills, though project activities did not specifically focus on teaching the children sight words. The toolkit contained a (a) Dell™ personal computer and keyboard, (b) microphone, (c) scanner, (d) digital camera, and (e) ceiling-mounted projection system with Bluetooth keyboard and wireless mouse. Software included in the AT toolkit included Office 2003 (Microsoft®, 2003); Intellitools® Classroom Suite (Cambium Learning Technologies, 2006); Boardmaker™ with Speaking Dynamically Pro® (Mayer-Johnson, 2006); Writing with Symbols 2000 (Widget Software ltd., 2007); and Clicker® 5 (Crick Software, 2007).

As part of the larger MDAT project, all participants had completed the Expressive One Word Picture Vocabulary Test (EOWPVT; Academic Therapy Publiscations, 2000a), and the Receptive One Word Picture Vocabulary Test (ROWPVT; Academic Therapy Publications, 2000b). Participants' demographic information and assessment data are provided in Table 1. Children were randomly assigned to either a control (n = 8) or intervention (n = 23) group. EOWPVT and ROWPVT assessments indicated that control and intervention groups had similar expressive and receptive vocabulary ability at the beginning of the study.

Setting and Materials

All assessments and training sessions were conducted in a quiet place outside of the classroom. Since the participants ranged in age from 4 to 5 years, 10 pre-primer and 10 primer Dolch words were selected to be presented to the participants during each session. See Table 2 for the complete list of the 20 words.

Two sets of stimuli cards were developed for presentation to the participants. One set consisted of the printed Dolch word, in 12-point font, on a 2 x 2 in laminated card. The other set consisted of the printed Dolch word, in 12-point font, with a corresponding picture created from Boardmaker™. Pictures were chosen from the picture communication (PCS) symbols generated by Boardmaker™ based on 'concreteness' of the symbol. The control group played games that used only the

Table 2
Percentage of Correctly Read Words Across Assessments

	Intervention			Control				
Word	% Baseline	% Mid	% Post-Word	% Post-Picture	% Baseline	% Mid	% Post-Word	% Post-Picture
A	30.4	68.4	65	70	37.5	87.5	87.5	87.5
He	0	0	0	56.5	12.5	25	25	42.9
His	0	5.2	0	30.4	0	25	0	0
I	39.1	42.1	60	65.2	12.5	100	87.5	100
In	0	5.2	0	43.5	25	12.5	25	57.1
On	0	0	10	43.5	0	12.5	12.5	14.3
Said	4.3	10.5	5	47.8	0	0	25	28.6
She	0	0	20	65.2	12.5	12.5	12.5	85.7
They	0	0	0	69.6	0	0	0	14.3
You	0	5.2	15	73.9	0	25	25	42.9
To	0	0	5	52.5	12.5	12.5	37.5	28.6
And	4.3	5.2	0	35	12.5	12.5	12.5	28.6
But	4.3	5.2	35	91.3	0	0	25	57.1
For	0	0	5	78.3	12.5	12.5	12.5	42.9
Had	0	0	0	43.5	0	0	0	71.4
It	4.3	0	0	35	0	0	0	14.3
Of	4.3	0	5	21.7	0	12.5	0	14.3
That	0	0	0	17.4	0	0	12.5	14.3
The	0	5.2	0	8.7	0	0	0	0
Was	4.3	5.2	5	21.7	0	12.5	12.5	14.3
Total	5	8.2	11.5	48.5	6.9	16.9	20.6	37.8

written words and the intervention groups used the same games; however, in addition to the written word a corresponding picture created from Boardmaker™ was included. Two games--*Bingo* and *Shake, Drop, and Roll*--were played during the training sessions. Sessions lasting 15 min were conducted twice a week with each group.

Experimental Design

A quasi-experimental, non-equivalent control group pretest-posttest design was used (Campbell & Stanley, 1966). Dependent measures were correct oral reading of the targeted Dolch words. Four assessments were conducted during the study for both intervention and control groups. In each assessment children were asked, individually, to read the 20 sight words. Each word was typed on a separate 2 x 2 in laminated card. The assessments were administered at (a) baseline; (b) mid intervention (i.e., two wks after beginning the study); (c) post assessment using the written word only with both groups (i.e., four wks after the beginning of the study); and (d) post assessment using the written word and the corresponding picture (i.e., four wks after the beginning of the study) with both groups. All assessments were audio-taped.

Procedure

Each control and intervention group was further divided into smaller groups of two or three children. Six graduate student clinicians from the Department of Communication Sciences and Disorders were trained in the procedures and conducted all assessment and intervention sessions twice a week. Supervision was provided by a certified speech and language pathologist who is also a faculty member in the Department of Special Education. Intervention sessions consisted of playing either *Bingo* or *Shake, Roll, and Find* with the 20 targeted Dolch reading words. All reading words were used during each session.

Before each game, the clinician would read each card to the students and have each student repeat the word. The games played during each training session were the same for the entire week and then alternated the following weeks. *Bingo* was played by providing each small group with a *Bingo* card that had either the word paired with picture printed (intervention groups) or only the printed word (control groups). The clinician conducting the training session shook the cards in a large plastic jar, allowed each student to select one, and asked the student to read it. If the child could not read the word the clinician said the word and asked the child to repeat. The procedure continued until all 20 Dolch words were read.

Shake, Drop, and Roll was played by providing each small group with a game card that consisted of one row of six spaces with corresponding die pictures and one row with blank spaces. The clinician randomly laid the reading cards face down (with pictures for the intervention groups and without pictures for the control groups) and the student rolled the die. The clinician would then turn over the corresponding reading word and ask the student to read the word. If the child could not read the word the clinician said the word and asked the child to repeat. Before the next student's turn the card would be replaced with another. This procedure continued until all 20 words had been read.

Fidelity and Reliability

To ensure fidelity of treatment graduate students were trained on all procedures prior to the beginning of the study. In addition, graduate students checked each step of the protocol (i.e., procedural checklist) as it was completed for integrity of procedures per session; 100% of procedure steps were completed. In addition, 50% of all sessions across groups and graduate student clinicians were randomly chosen for fidelity of treatment checks. A faculty member from the Department of Special Education completed the procedural checklist and checked for agreements. Procedural fidelity across groups and clinicians was 97%.

Social Validation

All students were interviewed at the end of the study. Students in the control group were asked : (a) Did you like the games that we played? (b) What did you like about them? (c) Which one did you like the most? and (d) Do you think the games helped you to learn the words on the cards? All but one student in the control group responded positively when asked if he or she liked the games and an equal number of students identified *Bingo* and *Shake, Drop, and Roll* as their favorites. When asked if the games helped them learn the words on the cards, all students responded 'yes.'

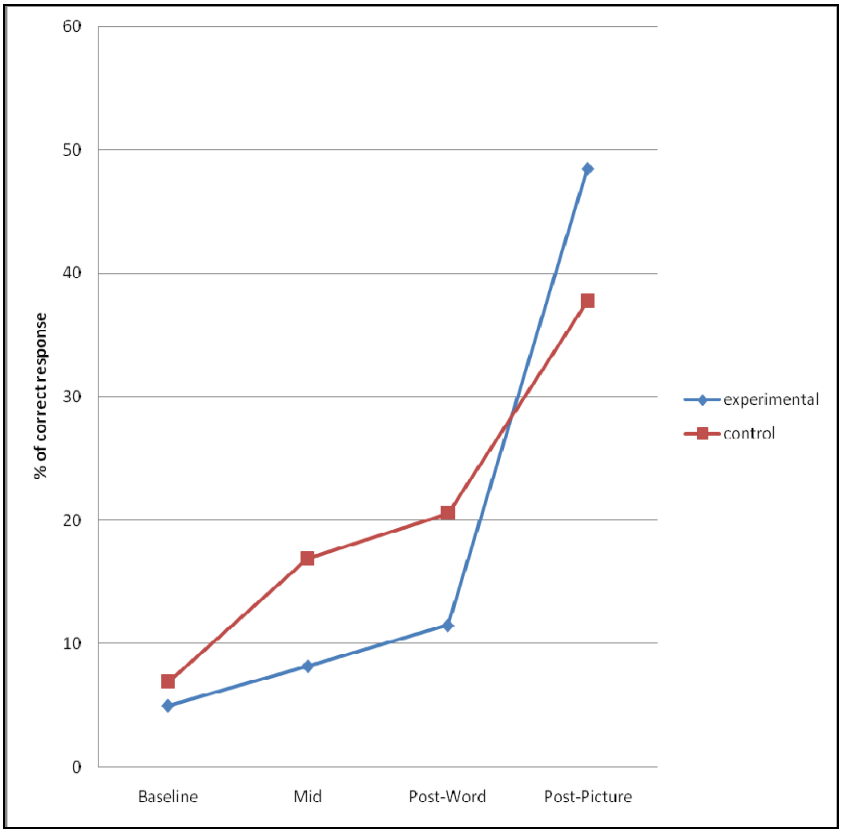

Figure 1. Percentage of correct words across treatment conditions.

Students in the intervention group were asked: (a) Did you like the games that we played? (b) What did you like about them? (c) Which one did you like the most? (d) Do you think the games helped you to learn the words on the cards? (e) Did you like having pictures with the words? and (f) Did the pictures help you learn the words? Why?

Twenty-two students in the intervention group reported liking the games and three stated they did not. *Shake, Drop, and Roll* appeared to be the favorite game of the intervention group, due primarily to the engagement of children in the task of rolling a die. All but 2 students thought the games helped them learn the words and all but 1 student reported liking the pictures with the words. When asked if the pictures helped them learn the words all but one student said 'yes.' One student comment, "because the pictures made me smarter," illustrated the student perspective that pictures assisted with reading the words. Regardless of the condition (intervention or control), the children were engaged in playing games with the clinicians and appeared to enjoy their interactions.

Responses to questions about social validity were audio-taped and hand written by the clinicians who were working with each group of students; the audio-taped responses were transcribed by a graduate student not involved in the acquisition of the data and compared to the hand-written transcripts of the clinicians. Reliability was 100%.

Results

The number and percentage of correct responses (reading Dolch words) in each of the four assessments (baseline, mid intervention, post intervention, and post

intervention with pictures) for each of the 20 Dolch words is presented in Table 2. Figure 1 presents the

percentage of correct answers across all Dolch words. During baseline, children in the control group on average correctly read 6.9% of the words and children in the intervention group correctly read 5% of the words. In the mid intervention assessment the control group read 16.9% and the intervention group read 8.2% of the words. In the first post assessment (only written words) the control group read 20.6% and the intervention group read 11.5% of the words. In the final assessment (written word and its corresponding picture) the control group read 37.8% and intervention group read 48.5% of the words. Overall, the control group participants learned faster and read more words in assessment 3 (post with only words). During assessment 4 (words + picture) the intervention group read more words correctly.

Outcomes and Benefits

The finding that children in the control group learned selected Dolch sight words faster under similar conditions of activities and time is consistent with previous literature investigating the influence of pictures when learning sight words (Center for Literacy and Disability Studies, n.d.; Fossett & Mirenda, 2006; Saunders & Solman, 1984; Singer, Samuels, & Spiroff, 1973; Singh & Solman, 1990). However, despite these findings, some research supports the practice of pairing sight word learning with pictures (Arlin, Scott, & Webster, 1978; Elman, 1973). When working with students who have disabilities, in particular, pictures do appear to support sight word learning when used in conjunction with specific instructional strategies (Browder & Lalli, 1991). It may be that this recognition underpins ongoing classroom practices nationwide that reflect the use of pictures in teaching sight words (cf. abcteach, 2001-2008; About, Inc., 2007; Squidoo, LLC, 2008). To some extent it may also be that the gap between evidence-based research and practice remains quite wide, and findings in the field continue to be ignored or poorly disseminated to practitioners (Peterson-Karlan & Parette, 2007).

However, this study offers further insight into the learning of sight words with a specific population, i.e., young children identified as being 'at risk.' In this study, all children did learn during interactive games and reported enjoyment with participation. The interactive games used with these children who are at risk for academic and social-behavior difficulties proved effective for learning sight words and students in the current study learned quickly over a relatively short exposure time (i.e., four wks).

Additionally, in the last assessment (word and picture) the intervention group performed better than the control group. This appears to indicate that the pictures did help the young children to identify and learn new words in a relatively short period of time; however, the results suggest that practicing sight words with a picture and word might be best beneficial when testing occurs with a picture and word. Interestingly, all the children but one in the intervention group reported that pictures helped them learn the sight words. It is possible that the children became dependent on the pictures and therefore identified more words correctly in the fourth assessment (i.e., word and picture) compared to the third assessment (i.e., word only). However, the intervention period was very short. In addition to the short period of intervention, the limitations of this study include the relatively small number of participants, the unbalanced number of participants in the control and intervention groups, and the absence of a fading phase for the pictures. Future outcomes research should be conducted to determine if a fading phase

for the picture component would facilitate learning. Alternatively, the question should be asked by early childhood education professionals, "Do we really want to fade the pictures at this point with this group of children?" It may be that the next step is to teach these words in the context of a sentence and only at a later point fade the pictures. More research in this area is needed.

In discussing the implications of research involving students with disabilities, Browder and Lalli (1991) observed that education professionals should "consider simplicity, as well as effectiveness" (p. 226). Some early childhood teachers are 'early adopters,' i.e., they will embrace the use of technology early in their careers and utilize these important learning support tools routinely in their classrooms (Parette & Stoner, 2008). Other teachers will be 'later adopters,' i.e., they will use technology less willingly, if at all (Parette & Stoner). Since studies have shown that sight word learning occurs *both* with and without the use of pictures, and in light of the widespread development of technology applications marketed to early childhood professionals and used in classrooms nationwide, it remains important for early childhood professionals to continually examine outcomes of their classroom practices on the development of emergent literacy skills among children.

Also, as Flynn (1994) has observed, changes in general intelligence have occurred over time, suggesting "the continuing capacity of the human brain to respond to increasing novelty and complexity in the environment" (Siraj-Blatchford & Whitebread, 2004, p. 18). Given that children in today's society are exposed to and use technology in very different ways than in generations past, it is especially critical that we continue to question whether past knowledge about child learning continues to hold true in the technology-rich world in which they live.

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