Word boxes help children with learning disabilities identify and spell words

Word boxes are innovative approaches to word recognition and spelling instruction. The study reported on here examines the use of word boxes with students who have learning disabilities.

Instructional approaches that incorporate the interrelationships of phonemic awareness, phonological recoding, and orthographic processing have been proven to be useful for helping young children develop basic word identification and spelling skills (Foorman, Jenkins, & Francis, 1993; Vandervelden & Siegal, 1995). Phonemic awareness involves operating on sounds in words. Phonological recoding refers to recoding letters back into their sound constituents. Orthographic processing involves recognizing visual patterns in words and recalling letter sequences.

Word boxes, Clay’s (1993) extension of Elkonin’s (1963) sound boxes, are designed to help children attend to phonological and orthographic features of words. Word boxes are used not only to help children become aware of sounds in spoken language, but also to help children match sounds to print when identifying and spelling words. Word boxes have been used with first-grade children as part of the comprehensive Reading Recovery program. According to Clay, word boxes are used particularly with children who have difficulty hearing the order of sounds in words. Clay also indicated that word boxes can be useful for helping children attend to orthographic features as they write letters of a word in their proper sequence.

A word box is a drawn rectangle that is divided into sections corresponding to sounds heard in words. A pictorial representation of a word is sometimes placed above the drawn rectangle. Counters are placed below the divided sections of the rectangle. As the child articulates each sound in a word slowly she or he simultaneously places the counters in their respective sections of the box. For instance, a child is provided with a word box that is divided into three sections. Above the box is a picture of a cup. As the child articulates the /c/ sound, s/he places the counter in the first divided section of the box. The child places the counter in the next divided section of the box as s/he articulates the /u/ sound and places the counter in the last divided section as the /p/ sound is articulated. Magnetic letters soon replace the counters, and the child is instructed to place magnetic letters into a word box (see Figure 1). Next, the child spells a word by writing the letters in the respective divided sections of a box as she or he hears each sound.

Clay’s word boxes employ a scaffolding approach for developing phonemic awareness, word identification, and spelling skills. The
teacher models the task, shares the task with a child, and gradually guides a child toward completing the task independently with feedback. Carnine, Silbert, and Kameenui (1991) suggested that scaffolds do not exclusively refer to the modeling and corrective feedback provided by a more knowledgeable person, but may be embedded within the task itself. In the case of word boxes, the divided box itself serves as a scaffold in addition to the modeling and feedback provided by the teacher. A supportive structure is created by dividing the box into sections to help children segment each sound heard in words and to help them sequence letter patterns.

Word boxes are considered a plausible approach for developing phonemic awareness, word identification, and spelling (Clay, 1993; Griffith & Olson, 1992; Yopp, 1995) but have not been studied to examine quantifiable changes in children’s performance over time. Sound boxes, however, have been combined with other phonemic awareness tasks as part of a comprehensive phonemic awareness training program in empirical investigations (e.g., Ball & Blachman, 1991).

Sound boxes and word boxes have not been studied with second-grade and upper primary-grade children with learning disabilities. Furthermore, word boxes have not been studied to examine simultaneous trends in word identification and spelling performance. Many upper primary-grade children with learning disabilities have difficulty identifying and spelling very basic words, which makes reading and writing connected text cumbersome and/or cognitively demanding (Stanovich, 1994) and, therefore, not enjoyable. Many of these children need systematic instruction applied over time so that they will have sufficient strategies to engage in the process of attacking words. If children are given ample opportunities to engage in the process of decoding unfamiliar words, they are more likely to identify words with ease when they encounter them again (Adams & Henry, 1997).

As a former special education and remedial reading teacher, I decided to examine whether word boxes instruction would be effective for improving word identification and spelling performance of children with learning disabilities. Special education teachers, remedial reading teachers, and general education teachers may find the systematic implementation procedures and ongoing performance monitoring procedures applicable for working with upper primary-grade students who have very basic reading and spelling difficulties.

Implementation of the word boxes study

Participants. I was particularly interested in implementing the word boxes approach with a sample of students with learning disabilities who pose a challenge for their special education teacher because they are so limited in their word identification and spelling skills. Through conversations with their special education teacher and examination of current standardized test results, six urban elementary students who were identified as having a specific learning disability in basic reading skills and receiving resource room instruction for part of each day were selected to participate in this study. All names are pseudonyms. The students were mainstreamed in general education classes for certain subjects. Criteria for diagnosis of a specific learning disability followed state and federal guidelines, including a significant discrepancy between IQ and achievement.
Three second-grade males (Nate, Al, and Harold), two third-grade males (Mark and Sam), and one fourth-grade male (Mick) whose ages ranged from 7 years 9 months to 10 years 2 months (mean = 9 years 8 months) were chosen for the study. Regardless of their diagnostic label, these students essentially demonstrated significant delays in acquiring fundamentals of early literacy skills such as phonological analysis. Current test results revealed that all students performed significantly below average in letter-word identification and pseudoword naming as measured by the Woodcock-Johnson Tests of Achievement–Revised (1990). Spelling test scores derived from the Kaufman Test of Educational Achievement (1983) also reflected significant below average performance. Results from the Test of Phonological Awareness (1994) indicated that the students had not mastered the ability to detect similarities and differences among phonemes in words.

During reading activities in their classrooms, the students were observed to have particular difficulties with segmenting and blending sounds in words.

The students’ basic word identification and spelling skills were so limited that they demonstrated difficulty with single-syllable words, with consonant-vowel-consonant (CVC) patterns, and consonant blend-vowel-consonant patterns (CCVC). During reading activities in their classrooms, the subjects were observed to have particular difficulties with segmenting and blending sounds in words (phonological analysis) as well as recognizing visual cues and recalling letter sequences in words (orthographic processing).

Literacy instruction in the students’ resource room consisted of small-group storybook reading, drill and practice activities involving reading words from a list of sight words, and writing weekly spelling words 10 times each. Other activities included phonics workbook exercises and daily journal writing. Very little if any systematic instruction was observed, especially in facilitating phonological and orthographic processing of words.

Materials. Word identification and spelling quizzes consisted of a list of 10 words that were typed in 24-point font size on white paper. A magnetic board and colored markers were used to draw the divided boxes. Tokens were used as counters; magnetic letters and colored markers were also provided.

Procedures. In order to determine whether the word boxes instructional approach was effective for improving word identification and spelling performance, I decided to observe quantifiable changes in student performance over time using a multiple baseline design across subjects. A multiple baseline design across subjects is a single-subject research design that permits the instruction to be implemented in a staggered fashion across individual subjects so that changes in performance during instruction sessions are directly comparable to noninstruction (i.e., baseline) conditions. According to McCormick (1995), multiple baseline designs allow one to view ongoing as well as quantifiable changes in performance during the instructional process rather than only at the completion of treatment conditions, as is the case with pretest-posttest designs.

In this study, multiple baseline designs were essentially applied to two groups consisting of three participants in each group. One group consisted of three second-grade students with learning disabilities, and the other group consisted of two third-grade students and one fourth-grade student with learning disabilities.

Baseline. Before the word boxes instructional approach was implemented, word identification and spelling measures were used to obtain students’ baseline levels on identifying and spelling words with CVC and CCVC patterns. Word identification and spelling measures consisted of a list of 10 words. Prior to the development of specific quizzes used for each session, 200 words were placed on cards. The cards were shuffled and mixed up, and every 20th word in the stack was chosen to be placed on 10-item probes. This was done separately for word identification and spelling measures so that word identification and spelling quizzes were not completely identical during any one session. All 200 words were
similar in type and difficulty level (i.e., a combination of CVC and CCVC patterns). All words contained three to four sounds.

**Word boxes instruction sessions.** Word boxes instruction consisted of 20-minute daily lessons over approximately 21 sessions. I worked with each student individually to provide ample guidance and feedback. I drew divided boxes that represented sounds heard in a word on a magnetic board. Learning all words with word boxes involved the combined use of counters, magnetic letters, and writing utensils. I initially placed counters underneath the divided box and later replaced the counters with magnetic letters. I demonstrated the task, placing the counters and later magnetic letters into the respective divided sections of the word box as I slowly articulated each sound in a word.

After a few demonstrations, I shared the task by having the student place counters in the divided box while I slowly articulated sounds heard in a word. The student was then asked to slowly articulate sounds in a word while I placed counters in the divided box. The student eventually performed the entire task independently with my feedback. First the student practiced placing the counters. This was followed by placing magnetic letters in the divided word box as words were orally presented and later by writing the letters in the divided word box as he heard each sound in a word.

The word boxes instructional approach was implemented for the first participant in each group once baseline stability was achieved. In order to maintain experimental control, the other students remained in baseline until the first participant demonstrated progress on both word identification and spelling performance quizzes. Once the first participant in each group made progress or reached mastery level, the word boxes approach was implemented with the second student, leaving the third student in baseline until the second student demonstrated progress on daily probes. All subjects were eventually provided with daily instructional lessons with word boxes.

During instructional sessions, 10-item word identification and spelling measures, similar to baseline quizzes, were administered daily after 20 minutes of instruction with the word boxes. The criterion level for successful performance on word identification and spelling probes was set at a minimum score of 90 percent accuracy (9 out of 10 correct responses). The procedures for selecting words for both word identification and spelling measures were the same as those applied during baseline sessions. This permitted me to make direct comparisons between the two conditions.

**Maintenance.** One month after instruction ended, all subjects were administered 10-item word identification and spelling probes once a week over 10 weeks to determine if students maintained their enhanced performance levels. The weekly measures consisted of words that were similar in type and difficulty level to those that were administered during baseline and instruction conditions.

**Transfer.** Following the establishment of maintenance levels, students were asked to read short stories that contained the types of words that the participants were taught during instructional sessions. Each student was given one story per week over a 3-week period. Students were also asked to write sentences that were orally dictated once a week over 3 weeks. Each story and dictated sentence task contained a combination of 10 words with either CVC or CCVC patterns. Short stories and dictated sentences tasks were used to evaluate whether the students were able to transfer reading and spelling words to some other context independent of the one that was provided during instruction condition.

**Results and discussion**

Students’ performance scores were calculated for baseline, instruction, maintenance, and transfer phases. All percentages given have been rounded to the nearest whole percentage and are presented in Table 1. Results of each probe for all students are presented online graphs. Figure 2 shows second-grade students’ performance on word identification and spelling probes during baseline, instruction, maintenance, and transfer phases. Figure 3 shows two third-grade students’ and one fourth-grade student’s performance.

As can be seen from Figures 2 and 3, the word boxes approach was effective for improving and maintaining all students’ word identification and spelling skills. All students were able to identify and spell words in another context 1 month after instruction with the word boxes ended.
Table 2 presents the number of trials or sessions it took each student to reach a specified criterion score of nine correct responses on word identification and spelling during the instruction condition. For the six students studied, the number of trials or sessions ranged from three to seven with a mean of five trials to reach 9 out of 10 correct responses on word identification. In spelling, trials ranged from four to nine with a mean of approximately six trials to reach the minimum of 9 out of 10 correct.

Informal observations of students during all conditions were noted. Students appeared to have very limited if any strategies for decoding and spelling words while they were working on assessments during baseline conditions. A similar pattern that emerged with all students was their difficulty grasping the sequence by which sounds were presented in words. This difficulty with positioning phonemes was even more evident when students were spelling words. Students would often end a word with a letter representing the initial consonant sound in a word and/or leave out the letter representing the middle or vowel sound altogether. This lack of vowel knowledge is characteristic of disabled readers who have not acquired the alphabetic system fully (Ehri & McCormick, 1998).
Figure 2
Word identification and spelling performance across three second-grade subjects

Sessions

Nate

Al

Harold

0 5 10 15 20 25 30 35 40 45 50 55 60

0 5 10 15 20 25 30 35 40 45 50 55 60

0 5 10 15 20 25 30 35 40 45 50 55 60

Baseline Intervention Maintenance Transfer

10-item probes

○ = Spelling
△ = Word identification

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Figure 3
Word identification and spelling performance across three third- and fourth-grade subjects

Mark

Sam

Mick

○ = Spelling
△ = Word identification

0 5 10 15 20 25 30 35 40 45 50

0 5 10 15 20 25 30 35 40 45 50

0 5 10 15 20 25 30 35 40 45 50
Many times the other letters that students wrote did not correspond to the sounds they heard in words.

After several sessions using word boxes, students began to vocalize each letter-sound correspondence in the order in which letters were presented in words before saying the words as a whole. This became evident when students read and spelled words on the assessments as instructional sessions progressed. When words were presented orally during spelling assessment after a 20-minute word boxes lesson, students would orally repeat each sound heard in the words several times before they would spell the entire word. Later, students’ vocalizations became subvocalizations (almost whispers) as they attempted to identify and spell words. Students were able to identify and spell words with more ease and automaticity once they internalized phonological and orthographic structures in words.

The word boxes approach was successful in helping children maintain performance levels in identifying and spelling basic words because the supportive structure of the divided boxes first helps children conceptualize each phoneme as a sound segment and later encourages the blending of sounds to make a whole word. According to Busink (1997), children need to become aware of the phonological structure of words, particularly sound segments and blends, so that they are able to benefit from word recognition and spelling instruction. A recent study of a variety of phonological awareness tasks (e.g., rhyme categorization, alliteration categorization, and phonemic segmentation) found that phonemic segmentation was the best predictor of reading and spelling performance (Nation & Hulme, 1997).

Students with reading difficulties not only demonstrate limited phonological skills but also have difficulty grasping orthographic (letter) knowledge about words (Stanovich & West, 1989). In the current study, word boxes also helped students attend to the orthographic features of words. The use of magnetic letters and writing letters in the boxes helped the students process the visual pattern of letters in words. This was especially evident during performance on word identification and spelling probes as students were able to recognize words using visual cues and recall sequences of letters in words.

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### Table 2

<table>
<thead>
<tr>
<th>Subject</th>
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<th>Spelling</th>
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<tr>
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<td>5</td>
</tr>
<tr>
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<td>3</td>
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</tr>
<tr>
<td>Harold</td>
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</tr>
<tr>
<td>Mark</td>
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</tr>
<tr>
<td>Sam</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Mick</td>
<td>7</td>
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</tr>
</tbody>
</table>

Adaptations for classroom use

Word boxes provide students with opportunities to operate on the phonological structure of words and grasp orthographic features of words. Word boxes may be used in a variety of language and literacy activities in small- and large-group classroom settings. Operating on phonological structures and attending to orthographic features in words within a meaning-based context may be reinforced by incorporating a combination of word boxes and other word study approaches.

For example, word boxes can be used in combination with learning words by analogy. This can be accomplished through the Word Wall technique described in *Phonics They Use: Words for Reading and Writing* (Cunningham, 1995). Students can construct a Word Wall of words that share similar spelling patterns and draw boxes around each letter or letter combinations that represent sounds heard in words.

After students have ample opportunities to work with a teacher, independent practice using word boxes can be done through reading and writing centers in the classroom. Words can be placed on an audiotape with pauses between each word. As students listen to words slowly articulated on the tape, they can place either counters or magnetic letters and write letters (depending on their developmental levels) in a divided box. A variety of boxes that are divided into three or more sections, depending on the number of phonemes presented in words, can be placed at the table next to the audiotape recorder. Correct responses may be given on the audiotape for self-checking after...
ample time is given for the student to make a response.

The use of technology can be incorporated with word boxes instruction especially during independent practice sessions. Word boxes and performance monitoring procedures can be created on a computer program. A word can be orally presented, and the student can click on the appropriate boxes presented on the computer screen when he or she hears each sound in a word. Corrective feedback can be given through some form of cueing system embedded in the program.

Word boxes can be instructional tools that reinforce phonological and orthographic awareness while children read and write connected text. Children can be instructed to draw boxes around a letter or letter combinations representing sound units heard in words during contextual reading and writing activities (i.e., reading storybooks and writing stories and daily journal entries).

Word boxes can be used in conjunction with lessons aimed at developing vocabulary. As children learn word meanings, they can draw boxes around morphemic (meaningful) word units, especially segmenting and grasping spelling patterns of words in and out of context.

References

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