SHERIE H. OWENS, LAURA D. FREDRICK, and MARGARET E. SHIPPEN, Georgia State University

Training a Paraprofessional to Implement Spelling Mastery *and Examining Its Effectiveness for Students With Learning Disabilities*

Abstract: The purpose of this study was to train a paraprofessional to implement the Direct Instruction (DI) *Spelling Mastery* (Dixon, Engelmann, & Bauer, 1990a, 1990b) program and to investigate the effectiveness of the instruction delivered by the paraprofessional for students with learning disabilities. We investigated (a) the extent to which the paraprofessional could be trained effectively and efficiently to implement *Spelling Mastery*, (b) the effectiveness of the program for students with learning disabilities when instruction is delivered by a paraprofessional, and (c) the extent to which the students with learning disabilities maintained and generalized spelling skills. Results indicate that the paraprofessional was trained efficiently and effectively. The students learned and maintained spelling skills that they generalized to unpracticed words.

In order to ensure sufficient training in instructional delivery, Darch, Gersten, and Taylor (1987) suggested that when designing training programs for staff personnel, one should consider the specific requirements of the classroom so that training is functional and efficient. In addition, one should target teaching behaviors that are clearly defined, easily learned, easily implemented in the classroom situation, and unquestionably related to classroom performance (Darch et al., 1987). This same model of teacher training should be accessible to paraprofessionals. According to Giangreco, Edelman, Broer, and Doyle (2001), appropriate training of paraprofessionals should not be optional but should be required of school districts as mandated in the Individuals With Disabilities Education Act (IDEA 1997).

Characteristics of effective staff training programs include (a) performance-based training, (b) efficiency of training, (c) effectiveness of training, and (d) buy-in from the staff (Reid, Parsons, & Green, 1996). Characteristics of effective instruction include (a) explicit teacher direction, (b) learning strategies based on rules, and (c) sequential introduction of skills (Engelmann & Carnine, 1991). By training paraprofessionals through research-validated steps and training them in research-validated practices, paraprofessionals can provide more effective academic instruction.

Students With Learning Disabilities and Spelling Deficits

The ability to spell correctly is critical for success in educational activities (Bos & Vaughn, 1997; Mercer & Mercer, 1998). Limited spelling skills can influence a student's capac-

ity to express ideas in writing (Graham, 1999) and may hinder a student's writing fluency, proficiency, and self-confidence (Graham & Voth, 1990). Spelling errors may distract a reader from the intended message (Jennings, 1997). Deno, Marston, and Mirkin (1982) demonstrated that as students' proficiency in spelling increases, so does the number of words they write.

Research has demonstrated that students with learning disabilities (LD) often have trouble with spelling (Demaster, Crossland, & Hasslebring, 1986; Deshler, Ferrell, & Kass, 1978; Friend & Bursuck, 1996; Gerber, 1986; Gerber & Hall, 1989; Gerber & Lydiatt, 1984; Graham, Harris, MacArthur, & Schwartz, 1991; Graham & Voth, 1990). They experience difficulty in both the detection and the correction of spelling errors (Deshler et al., 1978). Students with LD typically misspell two to four times more words than their peers without disabilities (Deno et al., 1982). When the spelling skills of students with LD were compared to students without disabilities, Gerber (1984) and Invernizzi and Worthy (1989) demonstrated that although progress is delayed, students with LD advance through the same developmental stages of spelling as their peers without disabilities. These findings suggest that by providing effective instruction, students with LD can build spelling skills and become more proficient spellers. Demaster et al. (1986) posited that while the majority of students with LD experience problems in spelling, researchers and practitioners continue to find spelling one of the most difficult skills to remediate. Providing effective instructional strategies in spelling for students with LD is clearly an area for continued investigation.

Direct Instruction Spelling

Direct Instruction (DI) is designed to help students learn by providing extensive practice through a highly structured format, allowing students to learn more in less time (Adams & Engelmann, 1996; Carnine, Silbert, &

Kame'enui, 1997; Engelmann, 1999). *Spelling Mastery* (Dixon, Engelmann, & Bauer, 1990a, 1990b) is a DI program designed to improve spelling skills by explicitly instructing students in the use of curriculum-based strategies. The specific skills taught in *Spelling Mastery* are designed to increase students' ability to match symbols to sounds (alphabetic principle), to recognize bases and affixes (morphographs), and to identify and memorize the spelling of irregular words (whole-word). Components of *Spelling Mastery* include placement tests to determine the most appropriate level for each student and explicit step-by-step teaching procedures in the form of scripted lessons. Lessons are designed to ensure student mastery by providing frequent practice, immediate feedback and reinforcement, and gradual fading from teacher support so that students become self-reliant in strategy use.

While the literature provides a significant amount of research to support the use of DI (for a complete description of DI and supporting research, see Adams & Engelmann, 1996), little research has been conducted to determine the effectiveness of the *Spelling Mastery* program. Lum and Morton (1984) compared second-grade students receiving *Spelling Mastery* ($n = 16$) to second-grade students receiving a more traditional spelling program ($n = 20$). Students instructed with *Spelling Mastery* outperformed those who were taught using a more traditional strategy. Those students instructed with *Spelling Mastery* demonstrated gains in spelling on the Test of Written Spelling-3 (TWS-3; Larsen & Hammill, 1986), suggesting that students taught to use explicit rule-based strategies were able to generalize these skills to unpracticed words.

Darch and Simpson (1990) compared visual imagery to *Spelling Mastery* in teaching students with learning disabilities ($n = 28$). The mean grade level for the participants in this study was 3.7. Participants were randomly assigned to either the visual imagery or the

Spelling Mastery group. The intervention lasted for 6 weeks. Students in the visual imagery group were trained to use a visual imagery mnemonic device when attempting to spell new words. The visual imagery strategy consisted of four steps. After the target word was displayed on an overhead, the students were told to (a) imagine the word in your mind, (b) imagine the word on a large screen, (c) imagine each letter pasted on that large screen, and (d) imagine yourself nailing each letter of the word to that screen. On the TWS-3 students instructed with *Spelling Mastery* significantly outperformed students trained to use visual imagery. The authors concluded that students with LD benefit from learning explicit rule-based spelling strategies and are able to generalize these skills to unknown words.

In both of the above studies, teachers were responsible for implementing the interventions. Yet with the increasing demands placed on teachers, especially those who teach students with greater academic needs, teachers may be reluctant or unable to add another educational program to their busy schedule. One alternative approach to instructional support is to train paraprofessionals to implement the *Spelling Mastery* program.

One of the most underutilized, yet potentially valuable assets in the educational system is the paraprofessional (Anderson, 1987; Fredrick, Keel, & Neel, 2002; Johnson, Lasater, & Fitzgerald, 1997; Pigford & Hale, 1996). Often, paraprofessionals have been utilized to perform clerical tasks such as creating bulletin boards, grading papers, or producing photocopies of worksheets. However, more recently, French (1998) found that paraprofessionals are serving increased instructional roles. Anderson (1987), French and Lock (2002), and Wadsworth and Knight (1996) suggest that with effective training and proper guidance from the classroom teacher, paraprofessionals can assume increased instructional responsibilities and provide additional instructional time for students.

Researchers have called for increased investigation of the instructional effectiveness of paraprofessionals (Jones & Bender, 1993). In one study, researchers successfully trained paraprofessionals to implement Direct Instruction reading programs (Keel, Fredrick, Hughes, & Owens, 1999). Results from Keel et al. indicate that while receiving instruction from these trained paraprofessionals, students who were considered at risk for school failure made significant gains in reading. In the current study, paraprofessionals were trained to implement a Direct Instruction spelling program, *Spelling Mastery*.

The purpose of the present study was twofold. The first purpose was to determine if we could effectively and efficiently train a paraprofessional to implement *Spelling Mastery*. The second purpose was to examine the effectiveness of *Spelling Mastery* for students with LD when implemented by a paraprofessional. This study was designed to address the following research questions: (a) Can a paraprofessional be trained effectively and efficiently to accurately implement *Spelling Mastery*? (b) Is *Spelling Mastery*, when implemented by a paraprofessional, an effective program for teaching spelling skills to students with LD? (c) Will students with LD maintain the skills learned from *Spelling Mastery*? (d) Will students with LD generalize the spelling skills learned from *Spelling Mastery* to unpracticed words?

Method

Setting

This study was conducted in a public elementary school located outside a large metropolitan area in the Southeast. The school's population was 35% African American and 65% Caucasian American compared to the district's population of 25% African American and 75% Caucasian American. Thirty-eight percent of the students in the school were eligible for free or reduced lunch compared to 28% of the students in the school district.

All instruction and testing for this study was conducted in a special education resource room that was typical in size and arrangement to the other classrooms in the school. The resource room included two tables for small group instruction and individual student desks for independent work. Eleven students were served in the resource room during the study. During language arts, students either remained in their assigned seats to do independent seatwork, went to the teacher's table for Direct Instruction reading lessons, or went to the paraprofessional's table for language remediation as deemed necessary by the teacher or the paraprofessional. During the study, the paraprofessional conducted *Spelling Mastery* lessons at the table where formerly she conducted individualized language arts remediation.

Participants

Paraprofessional. The first author presented the idea for the research to the learning disabilities coordinator at the district level and asked if the research might be conducted in the school where the first author was a volunteer tutor. The school district already required Direct Instruction for reading, but they were not yet implementing *Spelling Mastery*, and they were interested to learn whether it would be effective for their students. The learning disabilities coordinator presented the research idea to the principal who shared it with the six special education teachers in her school. Two special education teachers were interested. The principal offered the paraprofessionals working with the interested special education teachers the opportunity to learn *Spelling Mastery* and to participate in the research. One paraprofessional volunteered, and she became the paraprofessional participant for this research.

The paraprofessional was an African-American female who had 16 years of experience in the school district and 6 years of experience at the study site. She had a high school diploma and had completed at least one staff development course every year since joining the district. Her most recent courses included child care, child development, and American Sign Language. She stated that she had no training or experience in implementing *Spelling Mastery* or any other Direct Instruction programs. She was exposed to Direct Instruction only through the daily *Reading Mastery* lessons taught by the special education teacher in their resource room. The paraprofessional had never substituted for the teacher or tried to teach *Reading Mastery*.

Prior to this study, the teacher used traditional spelling activities which included writing weekly spelling words 10 times each, writing a sentence using each word, using spelling words to complete cloze procedure sentences, completing a practice spelling test, correctly writing each misspelled word five times, and taking a final spelling test each Friday. Students worked on these assignments independently during class, and what they did not finish in school they took home for homework. Students' spelling averages for the first three weeks of school ranged from 0% to 25% correct. Given the difficulties the students were having mastering their spelling words with this approach, the special education teacher was pleased that her paraprofessional volunteered to implement the *Spelling Mastery* program and participate in this research.

Students. The special education teacher requested the study be conducted with her morning class of 11 students. To participate in the study students needed to be able to name and write the majority of the letters in the alphabet, and they needed to place at the *Spelling Mastery* level where most of the students in their class placed. The 9 students who met the criteria of naming and writing the majority of the letters completed the placement test provided in the *Spelling Mastery Teacher's Guide* (Dixon et al., 1990a, 1990b). Six students placed in Level A, and 3 students placed in Level B of *Spelling Mastery*.

The 6 students who placed in Level A served as participants for this study. They completed a curriculum-based measure to assess their knowledge of the sound–symbol correspondences taught in Level A of *Spelling Mastery*. Performance on the curriculum-based measure was used along with teacher input to form three pairs of students. Derek, Keisha, Nicole, and Bobby correctly wrote between 50% and 55% of the letter sequences while Jim and Kyle correctly wrote 20% and 0%, respectively. The teacher reported that Derek and Keisha demonstrated the highest academic skills in the classroom. Therefore, we paired Derek with Keisha to form Pair 1, Nicole with Bobby to form Pair 2, and Kyle with Jim to form Pair 3.

All student participants were diagnosed by the school district as having LD and were receiving services in a special education resource setting for 10 to 15 hr per week. They ranged in age from 7 years 10 months to 9 years 8 months with intelligence quotients ranging from 85 to 108. All participants were in third grade except Derek who was in second grade. Demographic information is provided in Table 1.

Participants were receiving special education services for basic reading skills (Derek, Bobby, Nicole, Jim, Kyle), reading comprehension (Keisha, Bobby, Nicole, Jim), written expression (Derek, Bobby, Jim, Kyle), mathematics calculation (Keisha, Nicole, Kyle), and mathematics reasoning (Keisha, Nicole). In addition, Bobby was receiving services for speech and language and for visual impairment. Kyle suffered a traumatic brain injury in an automobile accident 9 months before the study. He was subsequently diagnosed with cerebral palsy and attention deficit hyperactivity disorder that was regulated with medication that he took before coming to school each day. No

Table 1
Student Demographic Data

Student	Gender	Age	Ethnicity	SES	IQ	Specific academic achievement	Years in special education placement	Hours of service per week
Derek	M	7-10	A		94	104[a]	1.11	15
Keisha	F	9-2	C		100	84[a]	2.8	10
Bobby	M	8-9	C		90	72[a]	0.6	10
Nicole	F	9-2	A	F	93	88[a]	6.2	10
Jim	M	9-8	A	F	85	65[b]	0.7	15
Kyle	M	8-7	C	F	108	42[a]	2.3	15

Note. A = African American; C = Caucasian American; F = Free or Reduced Lunch.

[a] Woodcock–Johnson Psychoeducational Battery—Revised—Tests of Achievement, Standard Battery and Supplemental Battery—Subtest: Dictation (Woodcock & Johnson, 1989).

[b] The Diagnostic Achievement Battery—Second Edition (DAB—2)—Subtest: Written Composition (Newcomer, 1990).

other participants were taking medication during the study.

Treatments

This study included two treatments. The first treatment was the training of the paraprofessional in the implementation of the *Spelling Mastery* program. This treatment was evaluated to determine if the training procedures were effective and efficient for training a paraprofessional to implement the *Spelling Mastery* program. The second treatment was instruction in the *Spelling Mastery* Level A program. The *Spelling Mastery* treatment was evaluated to determine its effectiveness in teaching spelling skills to students with LD.

Paraprofessional training. The first author trained the paraprofessional to use the *Spelling Mastery* program in two 1-hr sessions on consecutive days during the paraprofessional's free period. Training included instruction and practice on accurately pronouncing isolated sounds and presenting all 14 types of exercises (pronunciation, spelling sounds, writing sounds, etc.) found in Level A of *Spelling Mastery*. During the first training session, the first author pronounced each target sound and after each sound, asked the paraprofessional to pronounce the sound. If the paraprofessional pronounced a sound incorrectly, the author immediately recorded the error, modeled the correct pronunciation, and asked the paraprofessional to repeat the correct pronunciation. Throughout the remainder of this 1st training hour, the first author periodically returned to any sounds the paraprofessional initially mispronounced and asked her to try the sounds again. This continued throughout the 1st training hour until the paraprofessional correctly pronounced each sound at least three consecutive times.

In addition to introducing and practicing the sounds during the first training session, the first author modeled the entire first lesson in Level A. Modeling included the first author

delivering the script, signaling for student responses, and performing error-correction procedures. After modeling this lesson, the first author answered all of the paraprofessional's questions. Next, the paraprofessional practiced each type of exercise in Level A of the *Spelling Mastery* program. The first author responded as a student, sometimes correctly and sometimes incorrectly, in no predetermined manner so that the paraprofessional could practice the correction procedures. In addition, the first author provided feedback about how well the paraprofessional was following the script, as this is critical for implementing the program correctly. At the end of this first 1-hr training session, the paraprofessional asked to take the materials home to review the exercises and to prepare any questions she might want the first author to address during the second training session. She later indicated that she briefly reviewed the exercises for approximately 15 min before the second training session.

The second session was similar to the first session with the addition of a second paraprofessional. The principal requested that a second paraprofessional attend the second training session, as the principal was interested in expanding the use of *Spelling Mastery* into other classes. The second paraprofessional served as a student during the second training session, which allowed the first author to concentrate on observing and providing immediate feedback to the paraprofessional participating in this study. During the second training session, the participant paraprofessional practiced all letter sounds and each type of exercise found in Level A of *Spelling Mastery* while the second paraprofessional responded, sometimes correctly and sometimes incorrectly. If the participant paraprofessional made an error while presenting an exercise, the first author immediately corrected the error and asked the paraprofessional to practice the exercise until she correctly demonstrated each type of exercise three consecutive times.

Following this initial training the first author met with the paraprofessional for approximately 15 min on each of three occasions to review critical aspects of implementing *Spelling Mastery*. During one observation the first author noticed that the paraprofessional was not consistently requiring mastery before moving to a new skill. The first author met with the paraprofessional to emphasize the importance of requiring mastery before continuing. On two occasions when the percentage of correct statements made by the paraprofessional fell below 85% during procedural fidelity, the first author met with the paraprofessional immediately following the observations and emphasized the importance of following the script exactly as written.

Spelling Mastery Program, Level A. Level A of *Spelling Mastery* includes a teacher presentation book with scripted lessons that the paraprofessional followed and a student workbook for each participant. The specific skills taught include phonemic spelling based on sound–letter correspondences and the spelling of irregular words. In Level A, 13 sight words are explicitly taught, and 31 sound–symbol correspondences are introduced. Twenty-seven of the sound–symbol correspondences are explicitly taught and 4 are not (see Table 2).

Measures

Two sets of measures were used to evaluate the two treatments in this study—measures of the efficiency and effectiveness of the paraprofessional training, and measures of the effectiveness of Level A of the *Spelling Mastery* program for students with LD.

Evaluating training of the paraprofessional. We evaluated both the efficiency and the effectiveness of the training provided to the paraprofessional. The efficiency of the training was assessed by the amount of time it took to complete the training. The effectiveness of the training was assessed by examining procedural fidelity, or the extent to which the paraprofes-

sional implemented *Spelling Mastery* as it was designed to be implemented. Two critical aspects of *Spelling Mastery* instruction were assessed: error correction procedures and following the script. They were assessed simultaneously during 10-min sessions conducted across 20% of the intervention sessions. A student error was recorded if either member of the pair responded incorrectly or failed to respond. If the paraprofessional immediately corrected the error, an error correction was recorded. For the correction to be considered immediate, it had to be the first thing the paraprofessional said after an error occurred. For it to be counted as a correction, the paraprofessional needed to model the correct response, say the correct response with the students, and have the students repeat the correct response without her help. The number of corrected errors was divided by the total number of errors to determine procedural fidelity for error corrections.

To determine adherence to the script during these observation sessions, the first author recorded all deviations (additions, omissions, or alterations) from the script, no matter how minor the deviations were. Adherence to the script was calculated by dividing the number of words delivered as scripted, by the total number of words in the script and multiplying by 100.

Evaluating the Spelling Mastery program. There were two measures of the effectiveness of the *Spelling Mastery* program. One measure of the effectiveness of *Spelling Mastery* was a curriculum-based measure. Curriculum-based measures are directly derived from the instructional program (Salend, 2001) and provide useful information about the types of errors students make in relation to the skills being taught (Banerji & Dailey, 1994; Pike & Salend, 1995). They are particularly useful for monitoring the impact of an intervention (Isaacson, 1999).

The curriculum-based measure was adminis- tered as a series of probes throughout the study. The sound–symbol correspondences and sight words taught in Level A of *Spelling Mastery* were used to develop 18 probes: 3 baseline, 12 intervention, 1 final, and 2 main- tenance. Each probe consisted of 12 spelling words that included all the sound–symbol cor- respondences introduced in Level A of *Spelling Mastery*. Each probe included 29–31 sound–symbol correspondences and 56–64 let- ter sequences. With the exception of the

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Table 2
Skills Introduced in Spelling Mastery *Level A*

Sounds introduced and explicitly taught

/t/	spelled **t**	/p/	spelled **p**	/h/	spelled **h**
/m/	spelled **m**	/ĕ/	as in "m**e**t"	/ss/	as in "s**a**t"
/d/	spelled **d**	/nn/	spelled **n**	/ă/	as in "h**a**t"
/shsh/	spelled **s-h**	/ĭ/	as in "s**i**t"	/rr/	spelled **r**
/ŏ/	as in "m**o**p"	/thth/	spelled **t-h**	/ll/	spelled l
/ff/	spelled **f**	/ll/	as in "spe**ll**"	/g/	as in "**g**ot"
/z̄z̄/	as in "boy**s**"	/ō/	as in "g**o**"	/all/	spelled **a-l-l**
/ar/	spelled **a-r**	/b/	spelled **b**	/ŭ/	as in "c**u**p"
/vv/	as in "lo**v**e"	/ing/	spelled **i-n-g**	/k/	as in "**c**ake"

Sight words introduced and explicitly taught

what	are	to
do	many	friends
you	come	they
read	of	the
book		

Sounds introduced but not explicitly taught

| /w/ | spelled **w** | /k/ | spelled **k** | /ī/ | as in the word "h**i**ve" |
| /ā/ | as in "p**a**ve" | | | | |

maintenance probes, each probe contained two sight words. Each of the maintenance probes included three sight words to provide additional opportunity to demonstrate maintenance of sight words.

Probes included both taught and untaught sound–symbol correspondences and sight words. If the *Spelling Mastery* program was effective, we anticipated that students' performance on the probes would improve as students completed more lessons. The paraprofessional conducted the probes for each pair of students upon completion of every fifth lesson (i.e., 5, 10, 15…60). When a pair of students completed a lesson that was to be followed by a probe, the probe was administered immediately following the lesson unless there was not enough time in the session. In that case, the probe was administered at the beginning of the next session. To conduct the probe the paraprofessional (a) pronounced the word, (b) asked "what word," (c) read a sentence containing the word, and (d) repeated the word. Students wrote only the words, not the sentences. Each word was scored as being spelled correctly or incorrectly.

To provide a more sensitive measure of student progress, we also scored correct letter sequences for each word students wrote (Keel, 1993). If students are learning sound–symbol correspondences, it is likely these will appear as correct letter sequences even in words students cannot yet spell correctly. A correct letter sequence in a word is (a) the correct first letter, (b) the correct last letter, or (c) any two correct letters in a row. The first correct letter is considered a correct sequence because the student starts the word correctly. Similarly, the correct last letter of a word is counted as a correct sequence because the student writes it correctly and stops after that letter. Except for the first and last letters, the student must write two letters correctly in sequence to count as a correct letter sequence. If the student writes a correct letter but the letter that precedes or follows it is incorrect then the

sequence is counted as incorrect. For example, in the word swim, if the student spells it s-w-e-m, scoring is as follows: s counts as a correct sequence, s-w counts as a correct sequence (two letters written correctly in sequence), w-e counts as an incorrect sequence because the e is incorrect, e-m counts as an incorrect sequence because the e is incorrect—one incorrect letter counts as an error for both the letter that precedes it and the letter that follows it. Finally, m is counted as a correct sequence because the letter is the correct final letter and the student stopped after writing it. Spelling swim as s-w-e-m results in three out of five correct sequences. Each word has one more letter sequence than the number of letters in the word.

In addition to the probes administered after every five lessons, overall progress and generalization of spelling skills were measured with Forms A and B of the Test of Written Spelling-4 (TWS-4; Larsen, Hammill, & Moats, 1999), administered as pre- and posttests, respectively. Both forms contained 50 words and were administered individually to each student. Overall improvement on the TWS-4 would indicate a generalization of spelling skills from *Spelling Mastery*, as the TWS-4 assesses a participant's ability to spell words that do and do not follow the ordinary rules of spelling and that were not practiced in *Spelling Mastery*. As with the probes, words on TWS-4 were scored two ways: as spelled correctly or incorrectly, and based on correct letter sequences.

Experimental Design

A multiple probe design (Alberto & Troutman, 2003) across participants was used to assess the functional relationship between the *Spelling Mastery* treatment and the outcome measures. The six participants progressed through the design in pairs. Each pair was taught as a pair by the paraprofessional such that if one member of the pair was absent, the other member of the pair did not receive

instruction in *Spelling Mastery* that day. The performance data from each pair dictated when the next pair began treatment. After baseline, Pair 1 (Derek and Keisha) began treatment while the others remained in baseline. Data from both Derek and Keisha had to show an ascending trend with treatment before the second pair (Bobby and Nicole) began treatment, and data from the second pair had to show an ascending trend before the third pair (Jim and Kyle) began treatment. An ascending trend was defined as three consecutive data points increasing during intervention (Barlow & Hersen, 1984). Pairs waiting in baseline received intermittent probes (Alberto & Troutman, 2003). In addition, a pretest–posttest design was used to identify any overall improvement on the TWS-4.

Procedures

Baseline procedures. During baseline, participants did not receive any spelling instruction in the resource room or in their general education classroom. Probes were conducted once for Pair 1, twice for Pair 2, and three times for Pair 3. Responses on probes were scored as percentage of words spelled correctly and percentage of correct letter sequences.

Intervention procedures. Participant Pairs 1, 2, and 3 were instructed with Level A of *Spelling Mastery* (Dixon et al., 1990a) for approximately 12, 9, and 4 weeks, respectively. Each pair of students received instruction for 20 min a day every school day that both members of the pair were present. Not all pairs received the same number of probes, as probes were conducted after a pair completed a set of five lessons, and not all pairs completed the same number of lessons. Pair 1 completed the final probe the next school day after completing the *Spelling Mastery* Level A program. Pairs 2 and 3 completed the final probe the last day of the study as determined by the school district. All students received the same final probe that assessed all sound–symbol correspondences introduced in the program.

Maintenance procedures. Two weeks and 5 weeks after the intervention was withdrawn, all three pairs were assessed using two new probes of the same format used during baseline and treatment. Students did not participate in any formal spelling instruction between the final probe and the two maintenance probes.

Reliability

For the first baseline probe for one student, the first author and a graduate student worked together discussing and scoring correct letter sequences and correct words item by item to train the graduate student as a second observer. Students completed a total of 74 probes throughout the study. The first author made copies of 23 (31%) of these probes before she scored them. The second observer independently scored these 23 probes. Agreements and disagreements were marked for each correct letter sequence and for each word, and interobserver reliability (IOR) was calculated separately for each measure. Agreements were divided by agreements plus disagreements and multiplied by 100. For correct letter sequences the IOR averaged 91% with a range of 83% to 100%, and for correct words the IOR averaged 99% with a range of 92% to 100%.

Social Validity Measures

Social validity is important for establishing acceptability and usefulness of the assessment and treatment procedures (Kazdin, 1982; Wolf, 1978). To measure social validity, the students, paraprofessional, and teacher each completed a different survey. A 5-point Likert-type scale, ranging from *strongly agree* to *strongly disagree* with a middle range of *undecided*, was used for each survey. The teacher's social validity survey included seven items that asked if *Spelling Mastery* (*SM*) was better than the traditional way she was teaching spelling, if it was worth the time invested, if she was pleased with the progress students were making, if she would continue to use *SM*, if she would use it with other students, if the paraprofessional would

continue to use *SM*, and if she would allocate additional instructional responsibilities to the paraprofessional. The social validity survey for the paraprofessional included six items that asked about the difficulty in learning to use *SM*, the difficulty in teaching spelling with *SM*, if *SM* was worth the time invested, if she was pleased with the progress students were making with *SM*, if she would like to use *SM* with other students she works with, and if she would like to continue using *SM*. The students' social validity survey had three items that asked if learning spelling with *SM* was better than learning spelling the old way, if they would like to continue using *SM*, and if it was difficult to learn spelling words using *SM*. The first author informed students that their responses were confidential. After explaining the options, which were color coded to assist students in finding their desired responses, the first author read the items aloud and the students circled their responses. The teacher, paraprofessional, and the students were invited to provide additional comments about the program.

Results

This study was designed to address four research questions.

1. Can a paraprofessional be trained effectively and efficiently to accurately implement *Spelling Mastery*?

2. Is *Spelling Mastery*, when implemented by a paraprofessional, an effective program for teaching spelling skills to students with LD?

3. Will students with LD maintain the skills learned from *Spelling Mastery*?

4. Will students with LD generalize these spelling skills?

To determine if a paraprofessional can be trained effectively to accurately implement *Spelling Mastery*, we examined procedural fidelity data, and to determine if this training was efficient, we examined the time required to train the paraprofessional. Two critical components of effective implementation of *Spelling Mastery* include immediate corrective feedback and following the script. Both components were included in the measures of procedural fidelity. The paraprofessional provided immediate corrective feedback an average of 97% of the time with a range of 86% to 100%. The paraprofessional's following of the script ranged from 72% to 100% with an average of 97%. The total training time included 2 hr of initial training and 45 min for three 15-min follow up meetings.

To examine the extent to which *Spelling Mastery* is an effective program for students with LD when it is implemented by a paraprofessional, we examined probe data (Table 3 and Figures 1 and 2). Table 3 presents students' mean performances for correct letter sequences and correct words across baseline, intervention, and maintenance. Improvement in the average percentage of correct letter sequences from baseline to intervention was 29.77% and 20.15% for Derek and Keisha, respectively. For Bobby and Nicole the improvement from baseline to intervention was 20.63% and 24.25%, respectively. Jim's and Kyle's improvement from baseline to intervention was 32.87% and 9.60%, respectively. Except for Kyle, similar improvements in percentage of words spelled correctly are seen across all students with improvements ranging from 19.79 percentage points for Bobby to 35.25 percentage points for Keisha. Individual data on Figures 1 and 2 show little or no change in percentage of correct letter sequences or correct words during baseline and fairly steady improvement across intervention except for Kyle who never spelled any words correctly.

To answer our third research question and determine if students maintained the skills taught in *Spelling Mastery*, we examined maintenance data which are available for everyone except Kyle who moved before maintenance data were collected. Maintenance probes were conducted 2 and 5 weeks after *Spelling Mastery* instruction ended. For both percentage of correct letter sequences (Figure 1) and percentage of correct words (Figure 2) most students showed a slight decrease in their performance on the first maintenance probe compared to the last intervention probe and the final probe before maintenance. However, maintenance probes at 5 weeks showed that all students,

except Nicole, were performing as well as they were towards the end of the intervention. Except for Nicole's percentage of correct words during maintenance, all students averaged a higher percentage correct for letter sequences and for words during maintenance than during the intervention (see Table 3).

To determine if students generalized the spelling skills they learned with *Spelling Mastery*, Forms A and B of the TWS-4 were administered as a pre- and a posttest, respectively. Standardized measures of performance on the pretest could not be accurately determined, as the students scored lower than the

Table 3
Mean Percent Correct on Curriculum-Based Probes

| Student		Baseline	Intervention	Improvement	Maintenance	Final lesson
Derek	*CLS	52.00	81.77	29.77	91.00	60
	**CW	41.67	66.67	25.00	79.17	
Keisha	CLS	55.00	75.15	20.15	80.50	60
	CW	16.67	51.92	35.25	58.34	
Bobby	CLS	52.50	73.13	20.63	77.50	36
	CW	25.00	44.97	19.79	54.17	
Nicole	CLS	51.00	75.25	24.25	80.50	36
	CW	25.00	57.29	22.29	54.17	
Jim	CLS	25.33	58.20	32.87	63.00	22
	CW	0.00	24.98	24.98	37.45	
Kyle	CLS	3.00	12.60	9.60	N/A	22
	CW	0.00	0.00	0.00	N/A	

Note. *CLS = Correct Letter Sequences; **CW = Correct Words.
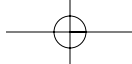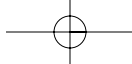
Figure 1

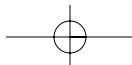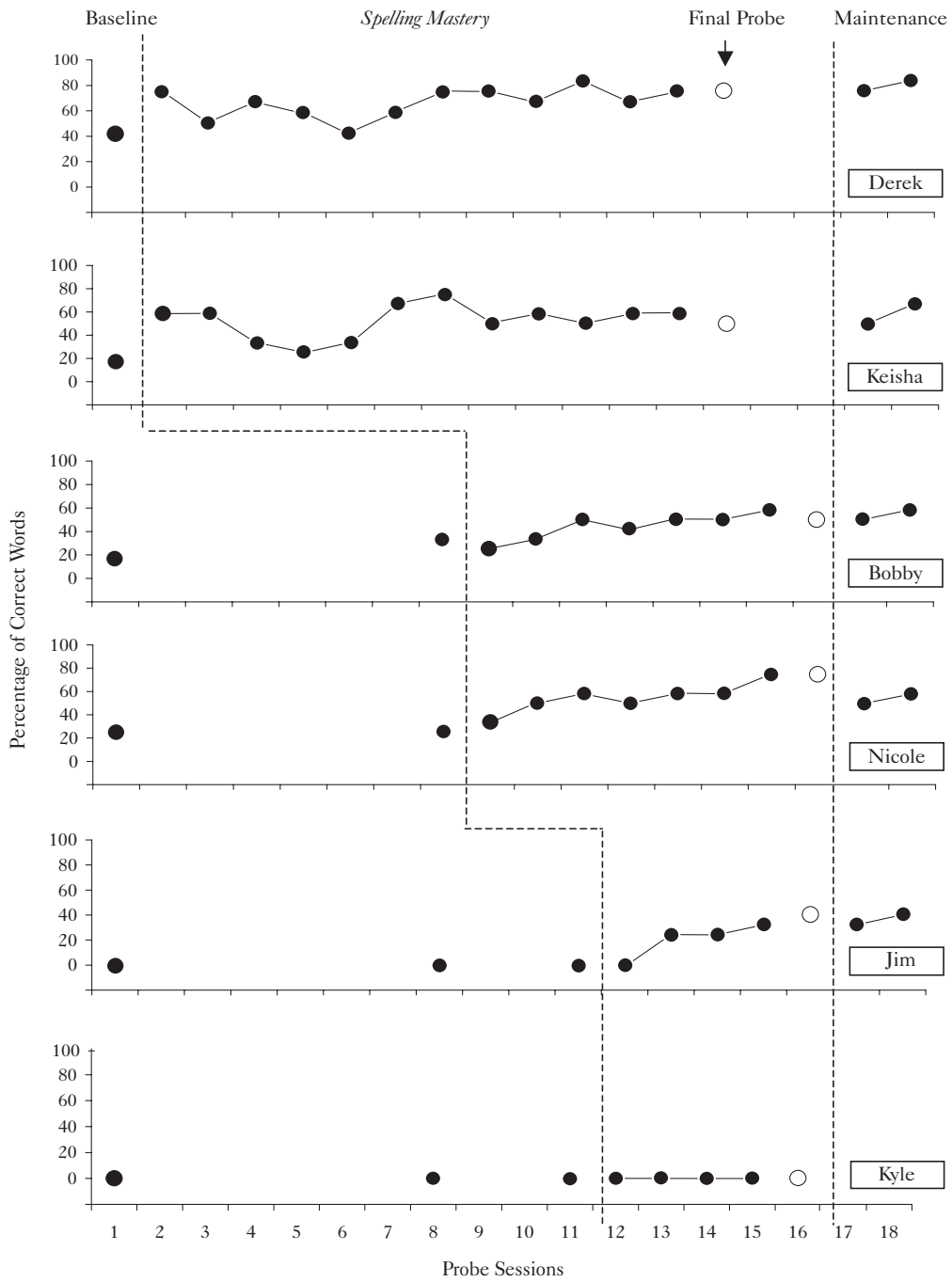*Correct letter sequences on probes across conditions.*
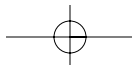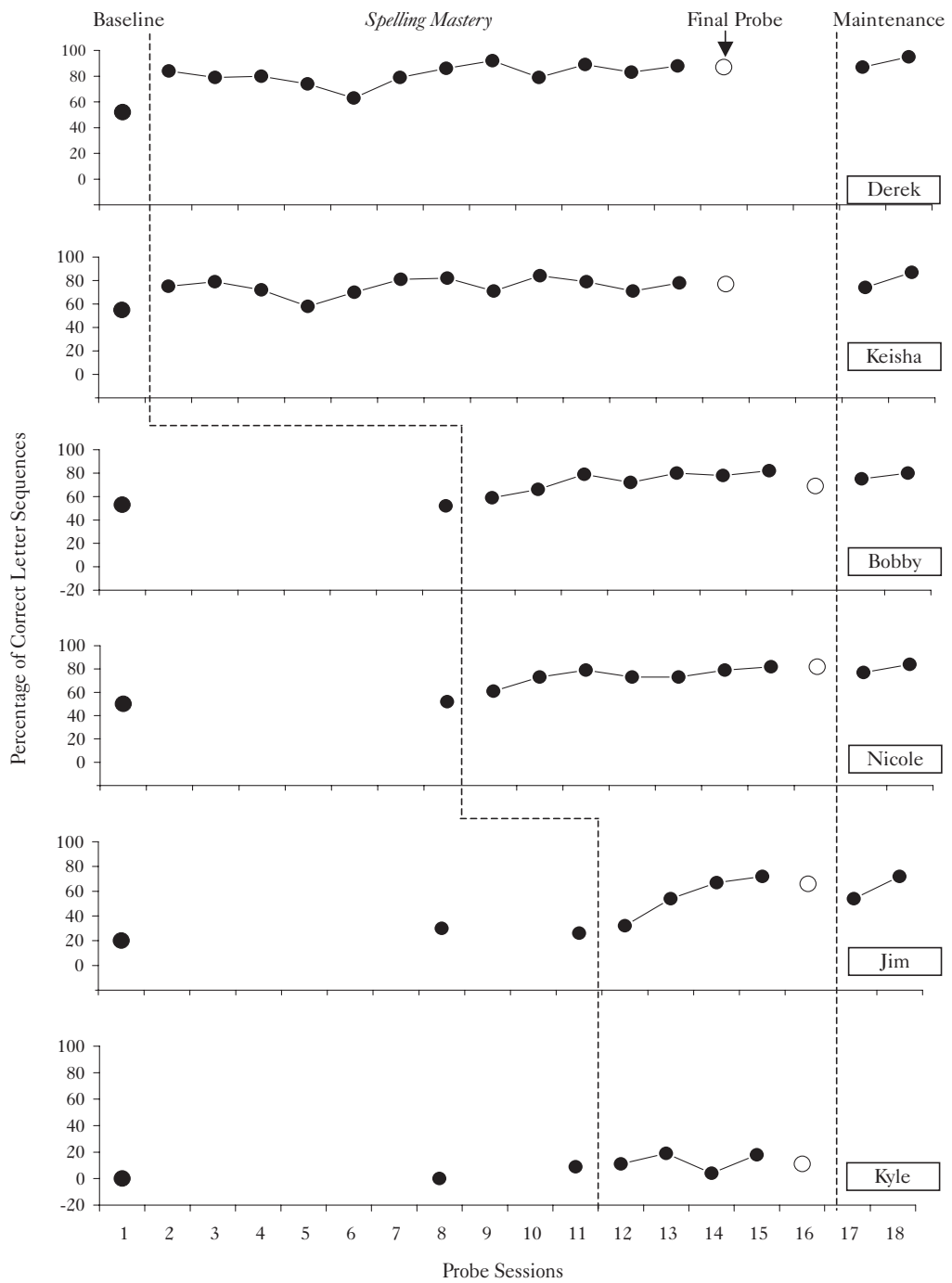
Figure 2
Correct words on probes across conditions.

test was normed for their age group. Therefore, comparisons between pretest and posttest performance were conducted by examining students' percentages of correct letter sequences and correct words on each administration of the TWS-4 (see Table 4). None of the students spelled any words correctly on the pretest, making their improvement equal to their posttest score. All students increased the percentage of correct letter sequences on the posttest. Pretest correct letter sequences scores showed substantial differences among students. However, on the posttest, the students who had completed the most *Spelling Mastery* lessons (Derek and Keisha) scored the highest. Nicole scored almost as well as Derek with fewer *Spelling Mastery* lessons; however, Nicole performed higher on the pretest. Compared to Bobby, Jim had a lower percentage of correct letter sequences on the pretest and 14 fewer *Spelling Mastery* lessons, yet their scores on the posttest were very similar.

Social Validity Results

Both the teacher and the paraprofessional were satisfied with *Spelling Mastery*. They both strongly agreed that using *Spelling Mastery* was

Table 4

Percentage of Correct Letter Sequences and Correct Words on Pre- and Posttest Administrations of the TWS-4

Student		Pretest	Posttest	Improvement	Final lesson
Derek	*CLS	42.30	64.29	21.99	60
	**CW	0.00	46.67	46.67	
Keisha	CLS	38.46	70.00	31.54	60
	CW	0.00	40.00	40.00	
Bobby	CLS	42.31	51.92	9.61	36
	CW	0.00	27.27	27.27	
Nicole	CLS	50.00	61.02	11.02	36
	CW	0.00	50.00	50.00	
Jim	CLS	23.08	52.50	29.42	22
	CW	0.00	22.22	22.22	
Kyle	CLS	0.00	11.48	11.48	22
	CW	0.00	0.00	0.00	

Note. *CLS = Correct Letter Sequences; **CW = Correct Words.

worth the time invested, that they wanted to continue to use the program, that they were pleased with the progress of the students, and that they would like to use the program with other students. The paraprofessional strongly disagreed that the program was difficult to learn or that it was difficult to teach spelling using the program. The teacher agreed that using *Spelling Mastery* was better than using the traditional spelling instruction. She strongly agreed that she would have the paraprofessional continue to use *Spelling Mastery* and that she would allocate additional instructional responsibilities to the paraprofessional.

Five of the six students agreed or strongly agreed that learning spelling using *Spelling Mastery* was better than learning spelling the old way and that they would like to continue using *Spelling Mastery*; one student disagreed. All six students either disagreed or strongly disagreed that it was difficult to learn spelling using *Spelling Mastery*. When asked if there were any additional comments about using *Spelling Mastery*, only one student responded stating, "I like the way it is."

Discussion

There were two major purposes of this study. One was to determine if we could effectively and efficiently train a paraprofessional to implement *Spelling Mastery*. The second purpose was to determine the effectiveness of *Spelling Mastery* for students with LD when implemented by a paraprofessional. Paraprofessional training incorporated the elements of an effective training model suggested by Reid et al. (1996). The key features of the training included (a) training all the sounds introduced in the program; (b) training all types of exercises used in the program; (c) training the correction procedures; and (d) practicing sounds, exercises, and correction procedures until reaching 100% accuracy on three consecutive trials.

Successfully completing this four-part initial training in two 1-hr sessions with three brief follow-up meetings provides evidence of how efficiently paraprofessional training can be accomplished. The effectiveness of the training program can be noted by the high degree of fidelity with which the paraprofessional delivered the instruction. The paraprofessional provided error correction procedures and delivered the script with an average of 97% accuracy. This degree of accuracy suggests that the training was not only efficient, but also effective.

The effectiveness of *Spelling Mastery* for students with LD when implemented by a paraprofessional was demonstrated by students' performance on the curriculum-based measures. Percentage of correct letter sequences and percentage of correctly spelled words increased for all students except Kyle, and these increases occurred only after students moved from baseline to intervention. While Kyle increased his percentage of correct letter sequences, he never spelled any words correctly. There are two potential reasons for Kyle's limited progress. He acquired a traumatic brain injury in an automobile accident 9 months before the study began and was subsequently diagnosed with cerebral palsy and attention deficit hyperactivity disorder. Additionally, his mother died in the accident.

Spelling skills learned during instruction were maintained 2 and 5 weeks after instruction ended. Results from the first maintenance probe were lower than results from the second maintenance probe. However, the first maintenance probe occurred immediately after a 2-week holiday, and the second occurred 3 weeks later. The improvement over the first maintenance probe suggests students with LD may need continuous routine and structure. The average percentage of correct letter sequences and correct words during maintenance was higher than the average during intervention for all students except Nicole, who had a slightly lower maintenance than

intervention average for percentage of correct words. The averages from intervention are based on all probes during intervention. Low scores are to be expected early in the intervention when students have been introduced to a limited number of the sound–symbol correspondences. When these low probe scores are averaged with probe scores from later in the intervention, the overall intervention score is expected to be lower than the average of the maintenance scores. The maintenance scores, however, provide evidence that students mastered and maintained many spelling skills through *Spelling Mastery*.

 Not all students achieved the same level of mastery on the maintenance probes. All probes were designed to measure all the sound–symbol correspondences introduced in the program. However, only the first pair of students completed all 60 lessons of the program. Pairs *2* and *3* completed 36 (60% of the program) and *22* (37% of the program) lessons, respectively, due to time constraints. In their 36 lessons, Bobby and Nicole were introduced to 78% of the sound–symbol correspondences assessed on the probes and averaged 77.50% and 80.50% correct letter sequences, respectively, during maintenance. Jim was introduced to 56% of the sound–symbol correspondences and averaged 63.00% correct letter sequences during maintenance.

Measures of generalization indicate that students showed marked improvement from pre- to posttesting on the TWS-4. Although standardized gain scores could not be computed due to low pretest scores, when the percentage of correct letter sequences was examined on the pre- and post- TWS-4, all students made gains. Additionally, all students except Kyle increased the percentage of words spelled correctly on the posttest.

Through measures of social validity, both the teacher and paraprofessional indicated that the students benefited from the program. Overall, the students indicated that learning spelling using *Spelling Mastery* was better than learning spelling using the traditional method. With the exception of one student, the students indicated they would like to continue using *Spelling Mastery*. Both the participant paraprofessional and the second paraprofessional, who sat in on the 2nd day of training, continue to use *Spelling Mastery* 2 years after the initial study.

Limitations of the Study

This study is not without limitations. Slightly descending data for Pair 1 indicate a lack of mastery early in the intervention. During the first two weeks, eight observations were conducted, four formal and four informal. At that time no lack of mastery was noted. Irregularity in student performance was noted later in the intervention phase. The first author observed the paraprofessional and determined that she was not consistently requiring mastery of a skill before moving to a new skill. During a follow-up discussion, the paraprofessional stated that at the beginning of the study, the first pair of students seemed to "breeze through the lessons," sometimes completing two lessons per session. The paraprofessional reported that she continued at this pace because she thought she was obligated to complete at least one lesson per session. After a brief discussion concerning the importance of students mastering one skill before moving to the next, the paraprofessional began to slow instruction and proceed only after the students demonstrated mastery. This resulted in an improvement in student performance on probes.

Another limitation of this study was our decision to begin intervention with Kyle even though he showed an increase in percentage of correct letter sequences during the third baseline probe. During Kyle's first two baseline probes he used a few letters repeatedly, spelling the word *small* "nevttketb." He used the same letters to spell the word *read* "nevttketbnvettk." For the third baseline probe,

Kyle was instructed to take his time and to listen carefully to each word with emphasis on all directions. His spellings on this probe were each two letters long and he correctly wrote five of the initial sounds and four of the final sounds. As a result, his last data point in baseline indicates improvement prior to treatment. However, Kyle was still unable to spell any words correctly. Additionally, he was in the final pair to begin treatment, his partner's data were stable, and we were concerned about time constraints.

A final limitation is the lack of additional evidence of generalization. The TWS-4 provides some evidence of generalization; however, additional evidence may have been found in students' writing samples. Unfortunately, the teacher considered an examination of students' writing samples a breach of confidentiality and would not allow such a review. Future research should include a review of informal writing samples to determine if there is an increase in the number of words written, the percentage of words spelled correctly, and the percentage of correct letter sequences.

The resource teacher was using a Direct Instruction reading program to teach reading to the students in this study. The reading program is very similar to *Spelling Mastery*, providing explicit step-by-step teaching procedures in the form of scripted lessons. It is possible that students' familiarity with such an instructional approach facilitated their success with *Spelling Mastery* and that other students who do not have prior experience with DI programs may not learn as quickly.

The results of this study provide further evidence of the effectiveness of *Spelling Mastery* for students with learning disabilities. They support the expanded teaching role of the paraprofessional and provide evidence of an effective and efficient training procedure to prepare the paraprofessional. Preparing paraprofessionals to assume instructional roles and providing explicit procedures to train them

can help bridge the research to practice gap. Future research should continue to investigate the instructional role of the paraprofessional and the effectiveness of that instruction for students with a range of abilities. Paraprofessionals continue to be an untapped resource for improving the academic skills of students with learning disabilities.

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Author Note