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Teaching Spelling to Students With Learning Disabilities: A Comparison of Rule-Based Strategies Versus Traditional Instruction

Abstract: This study compared two instructional methods for teaching spelling to elementary students with learning disabilities (LD). Forty-two elementary students with LD were randomly assigned to one of two instructional groups to teach spelling words: (a) a rule-based strategy group that focused on teaching students spelling rules (based on the *Spelling Mastery Level D* program) and (b) a traditional instruction group that provided an array of spelling activities (i.e., introducing the words in the context of story, defining the meaning of the words, sentence writing, and dictionary skill training) to teach spelling words. Daily instructional sessions lasting 30 minutes were conducted for 4 consecutive weeks. Four different word types (i.e., regular, morphological, spelling rule, and irregular) were introduced as instruction progressed. After receiving instruction in one of the instructional groups, the students were compared on scores from unit tests, a standardized test, a sentence-writing test, a transfer test, and a maintenance test. Overall results indicated that the rule-based strategy group using *Spelling Mastery Level D* was more effective in increasing student-spelling performance, particularly for the regular, morphological, and spelling-rule words. The instructional implications of these findings are discussed.

There is a growing awareness of the need for effective interventions for students with learning disabilities (LD) in the area of spelling (Gordon, Vaughn, & Schumm, 1993; Graham & Stoddard, 1987; McNaughton, Hughes, & Clark, 1994; Mushinski-Fulk & Stormont-Spurgin, 1995; Simonsen & Dixon, 2004). Studies have consistently found that students with LD are less adept at spelling words that conform to phoneme-grapheme correspondences. Further, these students have difficulty learning to spell difficult, multisyllabic words such as words with more than one morphograph than do general education students (Bailet, 1990; Bailet & Lyon, 1985; Boder, 1973; Bruck, 1988; Carlisle, 1987; Carpenter, 1983; Carpenter & Miller, 1982; Fischer, 1985; Horn, O'Donnell, & Leicht, 1988; Whiting & Jarrico, 1980).

One of the reasons students with LD have difficulty in spelling is that they are less effective than students without disabilities in using strategies that allow for the systematic application of spelling rules. Bailet and Lyon (1985) suggested that deficient rule application either alone or in combination with other processing difficulties could cause spelling difficulties. Researchers have provided convincing evidence that students with LD employ ineffective strategies for spelling words (Demaster, Crossland, & Hasselbring, 1986;

McLeod & Greenough, 1980). For example, Gerber and Hall (1987) found that in spite of extensive spelling practice, students with LD appeared not to use spelling strategies. This lack of organization provided students with a limited number of known spelling words.

In a recent study, Darch, Kim, Johnson, and James (2000) demonstrated that students with LD failed to use systematic spelling strategies spontaneously and flexibly in response to the requirements of spelling and writing assignments. In their study, first graders with LD were asked how they attempted to spell unknown words and how they attempted to correct misspelled words. Some comments the students gave were: "I thought hard, I keep on trying"; "I keep thinking about the word. Sometimes I guess if I don't know"; and "I just spelled it and did the best I could." These examples illustrate how students with LD use unsophisticated spelling strategies and tenacity when attempting to spell words. This study suggests that spelling difficulties of students with LD are a result of strategy deficits rather than cognitive deficits.

Students with LD often fail to use effective spelling strategies unless they are explicitly taught to do so (Owens, Fredrick, & Shippen, 2004; Simonsen & Gunter, 2001). For a strategy to be effective, it must be comprised of explicit step-by-step procedures from a highly teacher-directed introduction of a strategy to the point where students can perform complex problem-solving routines with minimal prompting (Darch & Kame'enui, 2004; Marchand-Martella, Slocum, & Martella, 2004). In an earlier study, Robinson and Hess (1981) compared the differential effectiveness of explicit rule-based strategy instruction with low-, average-, and high-performing seventh graders. Results of this study indicated that low- and average-performing students who received instruction that used a rule-based strategy displayed significant spelling achievement gains when compared to controls. However, when the performance of the

high-achieving students was evaluated, less success was found.

Darch and Simpson (1990) extended the Robinson and Hess (1981) study with upper elementary students with LD. Fourth-grade students with LD were randomly assigned to either a group that received instruction involving visual imagery or a group that received rule-based strategy spelling instruction. For example, when students were taught derived or inflected multisyllabic words, the strategy to apply phonemic and morphological principles was employed. With this strategy, students were first provided a rule (e.g., the rule for dropping the final *e* in a word; when a word ends in an *e* and you add a morphograph that begins with a vowel letter, you must drop the *e* [value/valuing]) and then were asked to apply this rule to a carefully sequenced group of practice examples. Finally, students were taught several spelling rules that allowed for systematic application of a spelling strategy to many words. The results indicated that the students taught with a rule-based strategy approach outperformed students who were taught spelling using visual imagery across three probe measures. The range of performance for the strategy group was 70% to 78% words spelled correctly. In comparison, the visual imagery group scored 46% to 50% accuracy across these probes. These differences were considered statistically significant.

Studies have indicated that contemporary classroom instruction usually does not account for the wide range of spelling achievement apparent in general and special education students (Graham & Voth, 1990; Morris, Blanton, Blanton, & Perney, 1995). Usually spelling is taught as a whole-class activity, making little or no attempt to individualize spelling instruction according to students' skills. Students are typically instructed to study the words on their own during the week, to write the words from memory several times, and to generate their own sentences containing the words (Morris, Blanton, Blanton, Nowacek, &

Perney, 1995). Vallecorsa, Zigmond, and Henderson (1985) suggested that special educators should improve their knowledge of validated methods for teaching spelling based on a research foundation.

As Berninger et al. (1998) suggested, the poor spelling skills of students with LD may be a function of underlying difficulties using appropriate spelling strategies. It seems that students may need to be taught specific spelling strategies. Future research should address the most effective use of spelling strategies and procedures for teaching spelling to students with LD.

The purpose of the present study was to evaluate the effectiveness of using rule-based strategies when teaching spelling to students with LD. To accomplish this, students with LD were randomly assigned to one of two instructional groups. One instructional method focused on teaching specific strategies through explicit rule-based instruction, while the other method was based on the instructional procedures derived from the traditional spelling basal programs currently used in many elementary classrooms. Since there are varied conceptual approaches used for the evaluation of spelling for students with LD (Moats, 1994), five criteria were employed to assess spelling performance: (a) short-term unit tests; (b) a standardized spelling test; (c) a generalization sentence-writing test; (d) a transfer test to similar, but untaught, spelling words; and (e) a maintenance test.

Method

Participants

Participants ($N = 42$) were elementary-aged students receiving specialized programs for students with LD in eastern Alabama. Students were classified as LD by the school district's special education review committee in accordance with state and federal guidelines. These guidelines include a one standard deviation discrepancy between tested intelligence and achievement for students with the exclusionary criteria to ensure that the learning difficulty was not due to other conditions (e.g., visual, hearing, or motor disabilities; mental retardation; emotional conflict; or environmental, cultural, or economical disadvantage).

Students who returned consent forms, signed by both the student and parent, were randomly assigned to instructional groups. From the original pool of 44 students, 1 student moved and 1 student had a high number of absences (four or more) and was not included in the final sample. This resulted in a total of 42 participants for this study, 21 for each instructional group.

All 42 students were between the ages of 8 and 12 years (mean chronological age = 9.8 years) and in the second through fourth grades (2nd = 6, 3rd = 24, and 4th = 12). Thirty-two of the students were boys and 10 were girls. Skill levels of the students were determined by test scores found in their special education files. Full-scale intelligence quotients from the *Wechsler Intelligence Scale for Children-III* (WISC-III) or the *Wechsler Preschool and Primary Scale of Intelligence-Revised* (WPPSI-R) were obtained. The range of IQs for the sample was 80 to 116 (mean Full Scale IQ = 87.27, $SD = 15$). In addition, students were administered the spelling subtest of the *Wide Range Achievement Test* (Jastak & Wilkinson, 1996). This test was administered to all students approximately 1 week before beginning the experimental intervention. Relative to grade placement, the spelling achievement of the total sample of students was low (mean grade level = 1.6).

Setting

Instruction took place in each student's special education classroom. Sessions lasted approximately 30 minutes and met daily for 20 consecutive school days (i.e., 4 weeks). To control for possible school effects, each school

had students randomly assigned to instructional groups. There were eight instructional groups, four specific groups for each instructional method, across the three participating schools. Spelling instruction was scheduled with the students' teachers at times they considered most convenient.

Materials and Selection of Spelling Words

Materials. The lessons for the rule-based strategy instruction were taken from the *Spelling Mastery Level D* program (Dixon & Engelmann, 1990), a Direct Instruction program published by SRA. This program was selected because it employed systematic rule-based strategies for teaching spelling words according to word types. The lessons in this program were scripted so the experimental teachers followed the program just as they were written by the authors. In each lesson, students were taught strategies or rules for certain spelling skills.

Phonetically regular words were included for Week 1. Two letter combinations (i.e., *ea* and *oa*) were taught within the context of 24 phonetically regular words. Week 2 words contained those words formed by adding a prefix or a suffix (morphographs). For example, adding the prefix *un* to the base word *happy* formed the word *unhappy*. Two morphographs (i.e., *un* and *less*) were taught in the context of 24 words.

Week 3 words drew upon spelling rules to derive the spelling patterns for the word segments. Spelling changes were made when word parts were combined. For example, the word *hopping* was formed by doubling the final *p* in the word *hop* and adding –*ing* (i.e., *hop* + *ing* = *hopping*) by applying the rule for doubling final consonants. Two spelling rules (i.e., the rule for doubling final consonants and the rule for dropping a final *e*) were presented in the context of 24 spelling-rule words. Week 4 words were composed of irregular words. This category contained 24 words having common letters or letter combinations not representing their respective, most common sounds (e.g., *people, several, nineteen*).

The comparison instructional group involved traditional instruction based on a composite from two basal spelling series (*HBJ Spelling:* Carlson & Madden, 1988; *Laidlaw Spelling:* Roser, 1987). This approach was selected because many elementary schools use basal spelling programs. According to the teacher's editions of these programs, the lessons were designed to improve spelling skills by teaching students to think by themselves. The programs focus on patterns and generalizations in spelling words and were designed to mesh with language skills in listening, reading, and writing (Carlson & Madden). The lessons in the traditional approach were scripted so the teachers followed the program just as they were written by the authors.

Selection of spelling words. Ninety-six spelling words were taught across 20 consecutive instructional days, 24 spelling words per week, six per instructional day. The number of spelling words was determined by assessing the number of spelling words presented in typical commercial spelling programs. The same spelling words were taught to both instructional groups. To increase the external validity of the study, the spelling words were selected on the basis of different word types and level of difficulty (fourth grade) from the commercial spelling programs (*Spelling Mastery Level D*) and basal spelling programs (*HBJ Spelling*; *Laidlaw Spelling*). Table 1 shows the specific words taught to both groups.

Dependent Variables and Measures

Students were taught in groups ranging in size from 3 to 6 students. On the 4th, 8th, 12th, and 16th days of instruction, students were tested on the words they had been taught during the previous spelling lessons.

There were five types of dependent variables in this study including students' performance on:

(a) unit tests covering a selected set of words presented in the lessons, (b) a standardized spelling test, (c) a generalization test in a writing activity, (d) a transfer test of spelling skills to untrained words, and (e) a maintenance test that measured spelling skills over time.

Spelling errors consisted of any misspelling in which letters of the words were substituted, omitted, sequenced incorrectly, or written illegibly. Capitalization and the method of writing letters (cursive or printing) were not considered in scoring. The percentage of correct words on each test was measured. The percentage correct was calculated by dividing the number of correct words by the total number of words and multiplying by 100. Raw scores were used in the analysis of the *Test of Written Spelling-3 (TWS-3)* data.

Table 1
Instructional Words Used During Spelling Instruction

Week	Day	Instructional Words	Word Type
Week 1	Day 1	lead, feast, heal, treat, speak, leave	Regular
	Day 2	sneak, wheat, freak, heat, beast, peanut	
	Day 3	toast, float, oatmeal, soup, load, coat	
	Day 4	boat, road, coast, roast, oak, throat	
Week 2	Day 5	unsafe, unfair, unkind, uneven, unclear, unlock	Morphographic
	Day 6	unhappy, unable, unsure, unlucky, unclean, unreal	
	Day 7	careless, restless, lifeless, pointless, speechless, endless	
	Day 8	toothless, groundless, sleepless, nameless, useless, helpless	
Week 3	Day 9	guiding, tracing, valuing, solving, quoting, smoking	Spelling-rule
	Day 10	skating, grading, driving, sliding, closing, sloping	
	Day 11	batting, humming, hopping, begging, tagging, skipping	
	Day 12	running, stopping, hitting, robbing, tapping, winning	
Week 4	Day 13	thought, was, through, he, nineteen, the	Irregular
	Day 14	athletes, exercised, all, morning, those, people	
	Day 15	often, draw, pictures, eight, children, school	
	Day 16	author, wrote, several, different, stories, together	

Unit tests. At the end of every four lessons (i.e., 4th, 8th, 12th, and 16th days) a 24-item test consisting of all the words from the unit was administered to students in both instructional groups. The purpose of this measure was to evaluate the students' skill in spelling words presented in each unit of instruction. All students were given a numbered paper and instructed to write the words as they were dictated by the teacher. Whenever necessary, the rate of presenting the words was slowed to allow students time to spell a test word. Students were not assisted if they had difficulty with a word.

Standardized test. The *Test of Written Spelling-III* (*TWS-3*; Larsen & Hammill, 1994) was administered the day following the last day of instruction. The *TWS-3* assesses spelling performance on both phonetically regular (i.e., predictable) and phonetically irregular (i.e., unpredictable) words. Therefore, it was possible to determine if there existed an interaction between word type (regular vs. irregular) and method of spelling instruction.

Generalization test. The purpose of the sentence-writing test was to evaluate the students' skill in exhibiting generalization of learned spelling skills to a writing situation. On the day following the last day of instruction, the students were asked to write sentences that included spelling words previously taught; that is, a randomly selected subset of words from the curriculum was dictated to the participants who were then asked to write a sentence using each word. This test required students to write sentences using selected words from each of the four word types.

Transfer test. On the last day of instruction, students were assessed on their skill in exhibiting generalization of their spelling skills to untaught words. These words were composed from similar patterns but the specific words were not taught during the instructional unit. This test was a 24-item test representing the four word types, with six items from each word type.

Maintenance test. After completion of the entire instructional program, students in both groups had a comprehensive posttest consisting of words the students were taught. One week following the last day of instruction, the teachers returned to the school and tested 24 words randomly selected in previous lessons, with six words from each word type.

Experimental Design

This study employed the posttest-only, equivalent-groups design to evaluate the relative effects of two highly dissimilar instructional methods. To increase external validity, the two instructional methods and corresponding lessons (i.e., rule-based strategy and traditional instruction method) were developed using existing commercial spelling programs as models. All students in both instructional groups were taught the same spelling words. To increase the internal validity of the present study, lessons were scripted to allow teachers to implement each instructional method properly.

Procedures

Teacher training. Teacher training across two levels of spelling instruction (i.e., rule-based strategy, traditional instruction) was included in this study. The teachers were three graduate students who were enrolled in a masters program in LD from a mid-sized southeastern university. They were trained in both instructional methods. Each teacher met individually three times for approximately 1 hr each time with the researchers providing training to implement the respective spelling instructional methods. During the training sessions, discussion regarding the rationale for each procedure, researchers' demonstration of the technique, and the provision of scripted lessons were provided. Training was structured through the use of lesson scripts (beyond the programs) developed by the first author. Using these lesson scripts the first author determined whether teachers satisfactorily implemented the lessons as designed. Through role-playing, the teachers practiced the instructional procedures and also

were critiqued by the first author. Prior to implementation, teachers were required to demonstrate criterion levels of performance during role-playing situations. To control for teacher effects, each teacher taught both instructional methods. To control for order effects, the sequence of teaching the two instructional methods was determined by random assignment.

Rule-based strategy instruction. The general instructional procedures across all word types were organized around three activities. First, the teacher introduced the spelling rule. The students were asked to tell the spelling rule and the teacher gave the spelling words. For example, when the students were taught morphological words, the students were asked to identify each unit in the words, and they learned the meaning and spelling of the presented morphograph. Then the students practiced spelling various morphographs in a group-response format (i.e., choral responding) and took turns individually. Two important rules of morphographs were emphasized: all morphographs have meaning, and most morphographs are spelled the same way regardless of the word in which they appear (5-7 min).

Next, the students were taught to apply a spelling rule to other words under the teacher-directed practice (10-12 min). Finally, the students practiced a spelling rule by completing their worksheets independently. During each session, the teacher circulated from student to student to give corrections, feedback, and praise (5-7 min). The teacher corrected all errors, providing an explicit model of the correct spelling, and then had the students spell the word chorally. Once the students were firm with their responses, individual students were asked to spell the words.

Traditional instruction. Lessons were organized around three instructional activities. First, the teacher pretested the spelling words by dictating them. Then the students corrected the pretest under the teacher's guidance. In a lec-ture-discussion format, the students were guided to determine what common parts the spelling words had and discussed the meaning of each word (5-7 min).

Next, following the presentation of words, the students worked independently on a spelling worksheet by writing the words one or two times in the form of a definition, a sentence completion task, a crossword puzzle, a matching exercise, or a vocabulary exercise. The students were told to work at their own pace, and the teacher was available if they required assistance. During the period the teacher circulated around the room (10-12 min).

Finally, after completing the independent spelling worksheet, the students completed follow-up activities including dictionary and handwriting skill training activities (5-7 min).

Instructional Fidelity

To ensure the instructional fidelity, teachers were observed twice a week by a trained observer. The observer was a doctoral student in special education. The observer evaluated whether the teachers were (a) adhering to instructional time, (b) following the scripted instructional formats for all groups, (c) teaching the correct word list for each phase of the study, and (d) using error correction strategies. There was 98% adherence determined by observational forms.

Results

The data were first examined to determine whether there were statistically significant differences between two instructional groups on participant-selection variables with separate one-way analysis of variance (ANOVA). Data analyses consisted of analyses of variance on each dependent variable (i.e., IQ, age, and spelling achievement).

Because the four different spelling word types taught during the intervention could not be

equated in terms of word difficulty, the analysis used to assess treatment effects was separate one-way ANOVA. One-way analyses of variance were completed on: (a) four 24-item unit tests, (b) a 16-item sentence-writing test, and (c) a 24-item maintenance test. Since the transfer test and the *TWS-3* sampled different spelling words than those the students were taught, each was analyzed separately with an ANOVA. An alpha level of .05 was used to determine statistical significance.

Equivalence of Groups

Means and standard deviations of the participant selection and description variables are reported in Table 2. The one-way analyses of variance revealed there were no statistically significant differences between the groups in age ($F[1,40] = -3.08, p > .05$), IQ ($F[1,40] = -.07, p > .05$), and spelling achievement based on *WRAT-3* spelling ($F[1,40] = -.05, p > .05$).

Unit Tests

Table 3 provides the means, standard deviations, and percentage of correct answers for students in each instructional group across the four unit tests. As can be seen in Table 4, the rule-based strategy group outperformed the traditional instruction group when compared on total unit test scores for each of the four unit tests. Overall, the rule-based strategy group performed with 68.4% accuracy, while the tradi-

tional instruction group performed with 45.2% accuracy ($F[1,40] = 13.44, p < .05$).

Because each unit test included different word types, it was possible to determine if an interaction existed between instructional method and word type. On Unit Test 1 (i.e., phonetically regular words) the students taught with the rule-based strategy considerably outperformed students taught with the traditional instruction method, scoring 86.5% correct vs. 62.1% correct, respectively ($F[1,40] = 10.46, p < .01$). On Unit Tests 2 (i.e., words with morphographs) and 3 (i.e., spelling-rule words) the students in the rule-based strategy group scored 78.8% and 64.9%, again outperforming the traditional instruction group that performed at 47.0% and 38.5%, respectively. In both comparisons, the differences were statistically significant ($p < .05$). However, on Unit Test 4 (i.e., irregular words) the difference between the rule-based strategy and traditional instruction groups was not statistically significant ($F[1,40] = 2.38, p = .13$).

Standardized Test

Students' performance on the *TWS-3* provided instructional effects on different word types (predictable vs. unpredictable). As can be noted in Table 4, although the scores for both groups in predictable words were low (rule-based strategy = 10.62 correct, traditional

Table 2

Comparison Between Two Instructional Groups at the Onset of Study

Criteria	Rule-based		Traditional Instruction		F(1, 40)	P value
	M	SD	M	SD		
Age	120.33	10.56	114.86	9.65	-3.08	> .05
IQ (Full-Scale)	86.81	9.82	87.73	10.71	-0.07	> .05
Spelling	1.62	0.67	1.57	0.68	-0.05	> .05

instruction = 7.33 correct), the rule-based group outperformed the traditional instruction group on the predictable words subtest ($F[1,40] = 4.55$, $p < .05$). However, the total score between the two groups did not differ statistically ($F[1,40] = 2.31$, $p > .05$). Similarly, no statistically significant difference was found on the unpredictable words subtest ($F[1,40] = 2.06$, $p > .05$), where the mean score of the rule-based strategy group was 7.76, and the traditional instruction group averaged 7.00.

Sentence-Writing Test

Table 5 presents the descriptive statistics for each group on the sentence-writing test. Both groups performed poorly on the sentence-writing test. As can be seen in Table 5, the students in the rule-based strategy group

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Table 3
Means, Standard Deviations, Percentages Correct, and F Values of the Unit Tests Across Two Instructional Groups

		Rule-based Strategy[a]	Traditional Instruction[a]	F(1,40)
Total[b]	M	65.65	43.38	13.44[d]
	SD	12.37	24.96	(p = .007)
	%	68.4	45.2	
Unit Test 1[c]	M	20.76	14.90	10.46[d]
	SD	3.97	7.29	(p = .0024)
	%	86.5	62.1	
Unit Test 2[c]	M	18.90	11.29	10.90[d]
	SD	5.43	9.07	(p = .0020)
	%	78.8	47.0	
Unit Test 3[c]	M	15.57	9.24	15.36[d]
	SD	4.72	5.71	(p = .0003)
	%	64.9	38.5	
Unit Test 4[c]	M	10.0	7.90	2.38
	SD	3.83	4.91	(p = .1310)
	%	41.7	32.9	

a Each group had 21 participants.

b Possible total score for the unit test total was 96.

c Possible total score for each unit test was 24 (Unit Test 1 = regular words, Unit Test 2 = morphological words, Unit Test 3 = spelling-rule words, Unit Test 4 = irregular words).

d Indicates that the difference was statistically significant at p < .05.

performed at 40.9% correct while students in the traditional instruction group performed at 30.6% accuracy. There was not a statistically significant difference between the two instructional groups on the total score of the sentence-writing test ($F[1,40] = 2.78$, $p > .05$). However, the rule-based strategy group outperformed the traditional instruction group in words that reflected spelling rules to a statistically significant degree (rule-based strategy = 57.1% correct, traditional instruction = 36.5% correct; $F[1,40] = 10.38$, $p < .05$).

Transfer Test

Analysis of variance procedures found no statistically significant difference between the two groups on the total score of the transfer test ($F[1,40] = 2.54$, $p > .05$). In fact, both groups performed similarly on the transfer test. As can be seen in Table 6, the rule-based strategy and traditional instruction groups performed at 40.9% and 30.6% correct, respectively. However, further analysis found

significant differences between the two groups when compared only on their skill in spelling regular words (rule-based strategy = 50.0% correct, traditional instruction = 28.6% correct; $F[1,40] = 8.24$, $p < .05$).

On spelling-rule words, students taught with the rule-based strategy method outperformed students in the traditional instruction group (rule-based strategy = 53.2% correct, traditional instruction = 36.5%), however this difference was not statistically significant ($F[1,40] = 4.02$, $p = .05$).

Maintenance Test

There were no significant differences between the two instructional groups on the total score of the maintenance test ($F[1,40] = 3.14$, $p > .05$). Both groups performed similarly on the maintenance test. As can be seen in Table 7, the rule-based strategy and traditional instruction groups performed at 47.0% and 33.3%, respectively. However, further analyses found significant differences favoring the rule-based

Table 4

Means, Standard Deviations, and F Values of the TWS-3 Across Two Instructional Groups

		Rule-based Strategy[a]	Traditional Instruction[a]	$F(1,40)$
Total[b]	*M*	18.38	14.33	2.31
	SD	7.24	9.82	($p = .14$)
Predictable[c]	*M*	10.62	7.33	4.55[d]
	SD	4.52	5.42	($p = .04$)
Unpredictable[c]	*M*	7.76	7.00	2.06
	SD	3.08	4.74	($p = .16$)

a Each group had 21 participants.

b Possible total score for the *TWS-3* was 100.

c Possible total score for each word type was 50.

d Indicates that the difference was statistically significant at $p < .05$.

strategy group on its performance on rule-based words (rule-based strategy 57.1%, traditional instruction 31.7%; $F[1,40] = 9.12$, $p < .05$). Finally, there were no significant differences between the two instructional groups on the other word types, even though the rule-based strategy group obtained higher percentages correct on each of the word type items on the maintenance test. The highest performance on the maintenance test was made by the rule-based strategy group on phonetically regular words (60.3%), followed by spelling-rule words (57.1%), morphographic words (54.8%), and irregular words (15.9%).

Discussion

This study was designed to compare the relative effectiveness of rule-based strategy spelling instruction and traditional spelling instruction. While results of the present study

Table 5

Means, Standard Deviations, Percentages Correct, and F Values
of the Sentence-Writing Test Across Two Instructional Groups

		Rule-based Strategy[a]	Traditional Instruction[a]	$F(1,40)$
Total[b]	M	7.24	5.14	2.78
	SD	3.51	4.57	$(p = .10)$
	%	40.9	30.6	
Regular[c]	M	2.05	1.71	.44
	SD	1.60	1.68	$(p = .51)$
	%	51.2	42.9	
Morphological[c]	M	2.29	1.43	3.88
	SD	1.38	1.43	$(p = .06)$
	%	57.1	35.7	
Spelling-rule[c]	M	2.29	1.14	10.38[d]
	SD	1.06	1.24	$(p = .00)$
	%	57.1	36.5	
Irregular[c]	M	0.62	0.86	1.11
	SD	0.59	0.85	$(p = .30)$
	%	15.5	21.4	

a Each group had 21 participants.

b Possible total score for the sentence-writing test was 16.

c Possible total score for each word type was 4.

d Indicates that the difference was statistically significant at $p < .05$.

indicate that students with LD taught with a rule-based strategy method outperformed students taught with a traditional instructional method in words of high predictability (i.e., regular, morphological, and spelling-rule words), this study also shows how difficult it is to teach spelling skills to students with LD. For example, on four of the measures (standardized, generalization, transfer, and maintenance tests), students taught rule-based strategies statistically outperformed those students taught with traditional instruction on predictable words. These findings have major implications for the selection and sequencing of spelling words and the amount of practice necessary to ensure maintenance and application of spelling rules to untrained words.

The outcomes on the four unit tests allow a comparison between the instructional groups on a short-term spelling recall measure. The students in the rule-based strategy group

Table 6

Means, Standard Deviations, Percentages Correct, and F Values of the Transfer Test Across Two Instructional Groups

		Rule-based Strategy[a]	Traditional Instruction[a]	$F(1,40)$
Total[b]	*M*	9.81	7.33	2.54[d]
	SD	3.74	6.06	($p = .12$)
	%	40.9	30.6	
Regular[c]	*M*	3.00	1.71	8.24[d]
	SD	1.38	1.52	($p = .00$)
	%	50.0	28.6	
Morphological[c]	*M*	1.81	1.57	0.18
	SD	1.36	1.83	($p = .67$)
	%	30.2	26.2	
Spelling-rule[c]	*M*	3.19	2.19	4.02
	SD	1.36	1.83	($p = .05$)
	%	53.2	36.5	
Irregular[c]	*M*	1.81	1.86	.0016
	SD	0.98	1.77	($p = .91$)
	%	30.2	31.0	

a Each group had 21 participants.

b Possible total score for the transfer test was 24.

c Possible total score for each word type was 6.

d Indicates that the difference was statistically significant at $p < .05$.

scored significantly higher on Unit Tests 1-3. Although their performance on Unit Test 4 (i.e., irregular words) was higher, the difference was not statistically significant. This finding may be due, in part, to the type of spelling practice provided during strategy instruction and the nature of irregular words. The learning activity in the strategy group for the irregular words required that the students work with a sentence composed of irregular words. For example, for the irregular words *eight, children, school,* and *together,* the sentence "Eight children left school together" was used. Students read the sentence first and spelled each word. They then practiced using each word in a sentence. Finally, they practiced spelling each word. This procedure involved less instruction in specific spelling strategies than the instruction for words of high predictability because there were no consistent rules that can be applied to irregular words.

Table 7
Means, Standard Deviations, Percentages Correct, and F Values of the Maintenance Test Across Two Instructional Groups

		Rule-based Strategy[a]	Traditional Instruction[a]	$F(1,40)$
Total	M	11.29	8.00	3.14
	SD	5.16	6.75	($p = .08$)
	%	47.0	33.3	
Regular	M	3.62	2.86	1.26
	SD	2.18	2.22	($p = .27$)
	%	60.3	47.6	
Morphological	M	3.29	2.38	2.06
	SD	2.03	2.06	($p = .16$)
	%	54.8	39.7	
Spelling-rule	M	3.43	1.90	9.12[d]
	SD	1.43	1.81	($p = .00$)
	%	57.1	31.7	
Irregular	M	.90	.84	1.12
	SD	.86	.73	($p = .13$)
	%	15.9	14.1	

a Each group had 21 participants.

b Possible total score for the maintenance test was 24.

c Possible total score for each word type was 6.

d Indicates that the difference was statistically significant at $p < .05$.

This finding carries important implications for the selection of spelling words and their sequence in a spelling program. Ehri and Wilce (1985) indicated that organizing initial spelling instruction with words that were not highly predictable had a negative impact on spelling acquisition. When students with LD were provided irregular words, they approached spelling as a rote task rather than a problem-solving process. Most spelling words fall along a continuum of predictability (Berninger et al., 1998). Given that different degrees of sound-spelling predictability exist among spelling units, the degree of pre-dictability may be an important consideration in organizing spelling material. Because students with LD have often been described as uninvolved and passive during learning (Mercer, 1997) and approach spelling as a rote task, providing initial spelling instruction according to high degrees of sound-spelling predictability may increase their active participation in the spelling process.

A further implication relates to the initial spelling level of the student and the importance of beginning initial spelling instruction with highly predictable words. In a previous study, Darch and Simpson (1990) found that strategy instruction significantly increased spelling performance for both regular and irregular words on a standardized test of spelling (i.e., *TWS-3*). Our finding did not replicate this result. While students taught with rule-based strategy instruction performed significantly higher than students in the traditional instruction group learning to spell regular words (rule-based strategy group = 10.6 words correct, traditional instruction group = 7.3 words correct), their performance was only slightly higher for irregular words (rule-based strategy group = 7.8 words correct, traditional instruction group = 7.0 words correct). A possible explanation for this was the initial spelling level of the students in each study. The participants in the study had a mean spelling grade equivalent of 3.7 before instruction, while the participants in this study had a mean spelling grade equivalent of 1.6 before instruction. As suggested previously, the spelling difficulties of beginning spellers may stem from irregular spelling patterns that are relatively difficult to learn. Thus, initial spelling instruction should begin with highly predictable words.

A major purpose of increasing spelling accuracy is not mastery in isolation on a spelling test but accuracy within the written text (Brown, 1988; Stevens & Schuster, 1987; Vaughn, Schumm & Gordon, 1993). Unfortunately, few intervention studies address this. In a review of spelling intervention studies, Mushinski-Fulk and Stormont-Spurgin (1995) reported that only 29% of the studies they reviewed measured spelling retention and only 21% measured generalization. Our study showed training effects on maintenance and application of rules to untrained words in some word types (i.e., regular and spelling-rule words). While the rule-based strategy group outperformed the traditional instruction group on all measures except irregular words on the transfer test, both groups' performance on the retention and transfer tests was poor.

These results are not surprising. The reason for such low performance is that students with LD probably need more extensive practice in order to apply rule-based strategies. Although the instruction for the rule-based strategy group provided practice in the application of the spelling rules, the amount of practice provided was not sufficient for mastery. Thus, when strategies are first introduced to students with LD, teachers need to provide more guided and independent practice so that these students with LD can efficiently apply strategies when working independently.

As is often the case with applied research, this study has limitations. Sample size, which was large enough to obtain significant effects for a relatively powerful treatment for predictable words, may not have been large enough to reveal more modest effects on other word

types. One other limitation was the relatively brief exposure to the instructional approaches (i.e., 4 weeks). This limitation may account for the mixed results reported in this study. Although this study was one of the few that included a maintenance measure, the time period between the end of instruction and the maintenance test was relatively brief (1 week). Children with LD are an obvious population to use in the study of spelling deficiencies, but the literature would benefit from research conducted on other groups (e.g., students with mental retardation, behavior disorders, communication disorders, and typical children). Finally, this study did not incorporate pretest assessments when posttests were conducted.

In summary, the results of this study as well as those of previous studies (Darch et al., 2000; Darch & Simpson, 1990) indicate that students with LD can be taught how to be more strategic in their approach to spelling, which in turn improves their spelling performance. However, teaching students to spell all types of words is a daunting process as evidenced by the mixed results reported in this study. While it seems that students can be efficiently taught to spell predictable words (i.e., phonetically regular words), teaching them unpredictable words will require more intensive instruction over a longer period of time. The results of this study have implications for classroom teachers and researchers who are designing evidence-based spelling curricula.

References

Bailet, L. L. (1990). Spelling rule usage among students with learning disabilities and normally achieving students. *Journal of Learning Disabilities, 23,* 121-128.

Bailet, L. L., & Lyon, F. R. (1985). Deficient linguistic rule application in a learning disabled speller: A case study. *Journal of Learning Disabilities, 18,* 162-164.

Berninger, V., Abbott, R., Rogan, L., Reed, E., Abbott, S., Brooks, A., Vaughan, K., & Graham, S. (1998). Teaching spelling to children with specific learning disabilities: The mind's ear and eye beat the computer or pencil. *Learning Disability Quarterly, 21,* 106-122.

Boder, F. (1973). Developmental dyslexia: A diagnostic approach based on three atypical reading-spelling patterns. *Developmental Medicine and Child Neurology, 15,* 663-687.

Brown, M. (1988). An investigation of a spelling intervention with learning disabled elementary school students. *B. C. Journal of Special Education, 12,* 1-18.

Bruck, M. (1988). The word recognition and spelling of dyslexic children. *Reading Research Quarterly, 23,* 51-69.

Carlisle, J. (1987). The use of morphological knowledge in spelling derived forms by LD and normal students. *Annals of Dyslexia, 37,* 90-108.

Carlson, T., & Madden, R. (1988). *HBJ spelling.* Orlando, FL: Harcourt Brace Javanovich.

Carpenter, D. (1983). Spelling error profiles of able and disabled readers. *Journal of Learning Disabilities, 16,* 102-104.

Carpenter, D., & Miller, L. J. (1982). Spelling ability of reading disabled LD students and able readers. *Learning Disability Quarterly, 5,* 65-70.

Darch, C., & Kame'enui, E. (2004). *Instructional classroom management: A proactive approach to behavior management* (2nd ed.). Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Darch, C., Kim, S., Johnson, S., & James, H. (2000). The strategic spelling skills of students with learning disabilities: The results of two studies. *Journal of Instructional Psychology, 27*(1), 15-26.

Darch, C., & Simpson, R. G. (1990). Effectiveness of visual imagery versus rule-based strategies in teaching spelling to learning disabled students. *Research in Rural Education, 7,* 61-70.

Demaster, V. K., Crossland, C. L., & Hasselbring, T. S. (1986). Consistency of learning disabled students' spelling performance. *Learning Disability Quarterly, 9,* 89-96.

Dixon, R., & Engelmann, S. (1990). *Spelling Mastery Level D.* Chicago: Science Research Associates.

Ehri, L. C., & Wilce, L. S. (1985). Movement into reading: Is the first stage of printed word learning visual or phonetic? *Reading Research Quarterly, 20,* 163-179.

Fischer, F. W. (1985). Spelling proficiency and sensitivity to word structure. *Journal of Memory and Language, 24,* 423-441.

Gerber, M., & Hall, R. (1987). Information processing approaches to studying spelling deficiencies. *Journal of Learning Disabilities, 20,* 34-42.

Gordon, J., Vaughn, S., & Schumm, J. S. (1993). Spelling interventions: A review of literature and implications for instruction for students with learn-

ing disabilities. *Learning Disabilities Practice, 8,* 175-181.

Graham, S., & Stoddard, B. (1987). Teaching spelling to the learning disabled: Implications from research. *The Illinois School Journal, 66*(2), 3-15.

Graham, S., & Voth, V. (1990). Spelling instruction: Making modifications for students with learning disabilities. *Academic Therapy, 25,* 447-457.

Horn, J. L., O'Donnell, J. P., & Leicht, D. J. (1988). Phonetically inaccurate spelling among learning-disabled, head-injured, and nondisabled young adults. *Brain and Language, 33,* 55-64.

Jastak, S., & Wilkinson, G. S. (1996). *Wide Range Achievement Test (Rev. ed.).* Wilmington, DE: Jastak Associates.

Larsen, S. C., & Hammill, D. D. (1994). *Test of written spelling (TWS-3).* Austin, Texas: Pro Ed.

Marchand-Martella, N. E., Slocum, T. A., & Martella, R. C. (2004). *Introduction to Direct Instruction.* Boston: Allyn and Bacon.

McLeod, J., & Greenough, P. (1980). The importance of sequencing as an aspect of short-term memory in good and poor spellers. *Journal of Learning Disabilities, 13,* 27-33.

McNaughton, D., Hughes, C. A., & Clark, K. (1994). Spelling instruction for students with learning disabilities: Implications for research and practice. *Learning Disability Quarterly, 17,* 169-185.

Mercer, C. (1997). *Students with learning disabilities* (5th ed.). Columbus, OH: Merrill.

Moats, L. C. (1994). The missing foundation in teacher education: Knowledge of the structure of spoken and written language. *Annals of Dyslexia, 49,* 81-102.

Morris, D., Blanton, L., Blanton, W., Nowacek, J., & Perney, J. (1995). Teaching low-achieving spellers at their "instructional level." *The Elementary School Journal, 96,* 163-177.

Morris, D., Blanton, L., Blanton, W., & Perney, J. (1995). Spelling instruction and achievement in six

classrooms. *The Elementary School Journal, 96,* 145-162.

Mushinski-Fulk, B. M., & Stormont-Spurgin, M. (1995). Spelling interventions for students with disabilities: A review. *The Journal of Special Education, 28*(4), 488-513.

Owens, S. H., Fredrick, L. D., & Shippen, M. E. (2004). Training a paraprofessional to implement spelling mastery and examining its effectiveness for students with learning disabilities. *Journal of Direct Instruction, 4*(2), 153-172.

Robinson, J. W., & Hess, K. D. (1981). A morphemi-cally based spelling program's effect on spelling skills and spelling performance of seventh grade students. *Journal of Educational Research, 75,* 56-62.

Roser, N. L. (1987). *Laidlaw Spelling* (4th ed.). River Forest, IL: Laidlaw Brothers.

Simonsen, F., & Dixon, R. (2004). Spelling. In N. E. Marchand-Martella, T. A. Slocum, & R. C. Martella (Eds.), *Introduction to Direct Instruction* (pp. 178-205). Boston: Allyn and Bacon.

Simonsen, F., & Gunter, L. (2001). Best practices in spelling instruction: A research summary. *Journal of Direct Instruction, 1*(2), 97-105.

Stevens, K., & Schuster, J. (1987). Effects of a con-stant time delay procedure on the written spelling performance of a learning disabled student. *Learning Disability Quarterly, 10,* 9-16.

Vallecorsa, A. L., Zigmond, N., & Henderson, L. M. (1985). Spelling instruction in special education classrooms: A survey of practices. *Exceptional Children, 52,* 19-24.

Vaughn, S., Schumm, J., & Gordon, J. (1993). Which motoric condition is most effective for teaching spelling to students with and without learning dis-abilities? *Journal of Learning Disabilities, 26,* 191-198.

Whiting, S. A., & Jarrico, S. (1980). Spelling patterns of normal readers. *Journal of Learning Disabilities, 13,* 45-47.