

## Teaching Spelling and Composition Alone and Together: Implications for the Simple View of Writing

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Third graders with low compositional fluency ( $N = 96$ ) were randomly assigned to 4 time-equated treatments in an instructional experiment (24 lessons over 4 months): spelling (alphabetic principle plus its alternations), composing (reflective discussion plus teacher scaffolding), combined spelling (alphabetic principle) plus composing (teacher scaffolding), and treated control (writing practice, no instruction). All treatments increased compositional fluency. Spelling and combined spelling plus composing were most effective for word-specific spelling (taught words). Teaching alternations improved phonological decoding and transferred to spelling in composing. Composing and combined spelling plus composing were most effective for persuasive essay writing. Only combined spelling plus composing increased both spelling and composing. Results are related to the simple view of writing that integrates diverse theoretical traditions and instructional practices.

Although considerable research has focused on teaching writing to general-education and special-education students, little research has specifically focused on supplementary writing instruction for children who are at risk for meeting state standards in writing. These children are likely to include both general-education and special-education students. The purpose of this instructional experiment was, therefore, to evaluate the relative effectiveness of alternative instructional approaches for improving the writing of at-risk writers through supplementary writing instruction.

We studied at-risk writers in third grade for two reasons. First, third grade is a transition time in writing development. Often students' writing problems are not apparent in first and second grade when teachers and parents are more concerned about reading, and writing problems do not surface until third grade when the writing requirements of the curriculum increase. Second, many schools are taking a proactive stance on writing standards. Instead of waiting until children fail to meet the writing standards, teachers are identifying children who are at risk in writing and providing

instructional assistance to increase the likelihood that students will meet standards. Because the state in which this study was conducted administers the first assessment of writing standards in spring of fourth grade, many of these prevention programs are implemented in third grade.

We identified children at risk in compositional fluency because amount written under timed conditions is one of the early indicators of writing disability in the primary grades and is correlated with quality of written expression (Berninger et al., 1992). Transcription (handwriting and spelling) skills uniquely predict compositional fluency throughout the elementary grades (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997). Training handwriting transfers to improved compositional fluency (Berninger et al., 1997; Graham, Harris, & Fink, 2000; Jones & Christensen, 1999). Training spelling transfers to improved compositional fluency (Berninger et al., 1998; Graham, Harris, & Chromzempa, in press).

### Conceptual Framework

The first treatment trained a transcription skill—spelling. Written expression problems may stem from an inability to spell words needed to express one's ideas. Increasing spelling skill may improve written expression because children's spelling becomes recognizable by others, leading to increased motivation to communicate using written language. Increasing spelling may also raise ratings of compositional quality by adults who often equate writing ability with both spelling and quality of text produced.

The second treatment trained composing alone. Written-expression problems may stem from difficulties with the planning, text generating, reviewing, and revising processes of writing (Hayes & Flower, 1980). Explicit tutor modeling and scaffolding of each of these processes can improve written expression by increasing metacognitive and procedural knowledge of these processes (e.g., Englert et al., 1988; Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Harris & Graham, 1996, 1999).

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The third treatment trained one instructional component from each of the first and second treatments. At-risk third-grade writers may benefit from teaching low-level transcription and high-level text generation close in time (e.g., Berninger, Abbott, Whitaker, Sylvester, & Nolen, 1995). However, to equate time across conditions so that results are not attributable just to more instruction and practice, we combined just one instructional component from the first treatment and one instructional component from the second treatment. Teaching methods are typically multidimensional involving more than one instructional component. Thus, we compared whether combining two specific instructional components was more effective than either of the single instructional components alone when instructional time is kept constant.

The fourth treatment was a treated (contact) control in which students practiced keyboarding (transcription) and composing (text generation) but received no explicit instruction in either spelling or composing. Including this control allowed us to evaluate whether practice alone is sufficient for improving a skill or whether explicit, teacher-provided instruction is necessary for a specific writing skill.

### Theoretical Perspective on Spelling in the American English Alphabetic Writing System

English is an alphabetic writing system in which phonemes correspond to functional spelling units (usually one or two letters); the same phoneme can correspond to a small set of alternative one- or two-letter functional spelling units referred to as *alternations* (Venezky, 1970, 1995, 1999). Thus, spelling is a phonological-to-orthographic translation. For example, the /long a/ phoneme can be spelled with a single letter *a* in a closed syllable (e.g., cat), a single letter *a* in an open syllable (e.g., apron); the vowel team *ea* (e.g., great), the vowel team *ai* (e.g., aim), the combination of the letter *a* and a final silent *e* (e.g., game), the two-letter combination *ey* (e.g., they), or the multiletter unit *igh* (e.g., eight). The example given is for one of the phonemes with the most alternations. Fortunately, most phonemes do not have as many alternations for associated spelling units. Unfortunately, children may receive phonics instruction for reading that teaches only (a) letter-phoneme correspondences for single letters and (b) a letter-by-letter strategy for sounding out words. This instructional practice for transforming written words into spoken words may confuse children who try to apply phonics in the reverse direction to transform spoken words into their written form when spelling. For example, this kind of phonics will not apply to spelling words in which a phoneme is represented by a two-letter spelling unit (e.g., vowel teams or *r*-controlled vowels) rather than a one-letter spelling unit. Consider the words *boat* (b oa t) and *chalk* (ch al k), which cannot be spelled solely on a letter-by-letter basis: The first word contains three phonemes represented by two one-letter and one two-letter spelling units, and the second word contains three phonemes represented by one one-letter unit and two two-letter units.

Alternations are often either ignored or misrepresented as evidence of the irregularity of English rather than as evidence of English's variant predictability, depending on the number of alternations for a specific spelling unit or letters not corresponding to a phoneme. For example, a cartoon claiming that English is impossibly irregular because phonics begins with *ph* rather than *f*

reflects lack of understanding that *ph* is an alternation of the /f/ phoneme from the Greek layer of the language (Balmuth, 1992; Henry, 1990). The much maligned *ough* can be taught as a multiletter spelling unit that represents phonemes for /long o/ (e.g., though), /long oo/ (e.g., through), and /aw/ (e.g., cough and ought). Also, alternations operate somewhat differently in each direction, so that alternative spellings for the same phoneme and alternative phonemes for the same spelling do not necessarily coincide (Berninger, 1998a, 1998b). The willingness of children to work hard to learn to spell words may depend on whether they perceive English phoneme-spelling correspondence as generally predictable on the basis of a small set of one- and two-letter alternations (alternative spelling units for the same phoneme) or as hopelessly irregular. For further theoretical discussion of the regularities in how English orthography represents phonology, from the perspective of linguistic science, see Venezky (1970, 1995, 1999). For further discussion of instructional implications of this theory, from the perspective of educational psychology and the classroom teacher, see Berninger (1998a, 1998b).

A long-standing clinical observation is that children make more oral-reading errors on structure words than on content words, but whether children make more spelling errors on structure words than on content words has not received research attention. Because structure words have fewer decodable spelling units than content words, they are often taught as high-frequency words whose spelling must be memorized. We reasoned that explicit instruction in alphabetic principle for those spelling units that are decodable in structure words may help developing writers learn to spell structure words even though they are not as decodable as content words.

### Theoretical Perspective on Simple View of Composing

According to the simple view of writing (Berninger, 2000; Berninger & Graham, 1998), which synthesizes diverse theoretical research traditions (cognitive, developmental, neuropsychological, and educational) in composition research, developing writing can be represented by a triangle in a working-memory environment in which transcription skills and self-regulation executive functions are the vertices of the base that enables the goal of text generation at the top vertex (see Berninger & Amtmann, in press). The translation component in Hayes and Flower's (1980) model of adult skilled writing has two components in developing writing—transcription and text generation (Berninger & Swanson, 1994). Text generation draws on both idea generation and translation of those ideas into language representations in working memory (Berninger et al., 1992). Transcription skills enable the writer to translate those language representations into orthographic symbols using pencil, pen, or keyboard. Deficits in transcription skills or neurodevelopmental processes related to transcription can interfere with development of the text-generation component (Berninger, 1994). The more automatic the low-level transcriptions skills are, the more capacity-limited, working-memory resources are available for high-level composing skills (McCutchen, 1996). Strategies for self-regulation guide the writing process (e.g., Harris & Graham, 1992; Wong, 1997; Zimmerman & Reisenberg, 1997). Strategies for goal setting, making plans to reach goals, monitoring ongoing processes, and reviewing and revising generated text correspond to the planning and reviewing-revising components of the Hayes and Flower cognitive model of adult skilled writing. The

knowledge-telling, self-regulation strategy used by novice writers matures into the knowledge-transforming, self-regulation strategy used by skilled writers (Scardamalia & Bereiter, 1986, 1987; Scardamalia, Bereiter, & Goleman, 1982).

This simple view of writing identifies key instructional components for developing writing ability: transcription and self-regulation working together for the goal of text generation in working memory. Whereas the spelling training in our instructional experiment aimed at developing the transcription component, the composing training aimed at developing the text-generation component using self-regulation strategies organized by levels of language (word, sentence, and text; Berninger, 1994).

The social constructivist view of writing development also influenced the intervention. Composing training always included a scaffolding component in which an expert provided guided assistance in nudging learners along their developmental continuum (zone of proximal development; Vygotsky, 1978). Writing may be conceptualized as a social activity in which writers not only compose for an audience but also coconstruct—through dyadic discussion—goals, plans, content, strategies, and even initial and revised versions of text (e.g., Calfee & Patrick, 1995; Englert et al., 1988, 1991; Wong et al., 1994; Wong, Butler, Ficzer, & Kuperis, 1996; Wong, Wong, Darlington, & Jones, 1991). The composing-only treatment included such a reflective social component as well as the teacher-directed scaffolding. Third graders already have some knowledge of arguments in oral discourse. As early as the preschool years, children can argue with their peers and caregivers (e.g., Eisenberg & Garvey, 1981). Fourth graders have emergent skills in argumentation in oral discourse (Anderson, Chinn, Chang, Waggoner, & Yi, 1997). Fourth graders can learn to write arguments, though not to the same level of competence as sixth graders (Ferreti, MacArthur, & Dowdy, 2000). Having children discuss and argue orally before composing might result in better persuasive essay writing than composing instruction including only teacher-guided scaffolding. Our reflective-discussion component included jointly describing (from the perspective of others), comparing, expressing opinions, considering both sides of an argument, and supporting and refuting arguments.

One upshot of the emerging literacy perspective (Clay, 1985) is realization that expository writing can be introduced during the early grades if sufficient teacher modeling and scaffolding are provided to assist children in the text-generation process (e.g., Englert et al., 1988, 1991; Harris & Graham, 1996, 1999). We were interested in instructional approaches for developing two forms of expository writing—informational and persuasive—in young writers. We began with composing informational essays because this kind of composing should be easier for children who are at a knowledge-telling stage of writing development (Scardamalia & Bereiter, 1986). We ended with composing persuasive essays, which we thought would provide more of a cognitive challenge because knowledge transforming is required.

### Hypotheses

Five hypotheses were tested: (a) Explicit instruction will result in relatively greater learning than mere practice alone (the control treatment), but explicit instruction aimed at spelling (spell and spell plus compose) would improve spelling, and treatment aimed at composing (compose and spell plus compose) would improve

composition; (b) explicit instruction in both alphabetic principle and its alternations (spell) would have added value over and beyond explicit instruction in alphabetic principle only (spell plus compose) in learning to spell words; (c) a reflective-discussion component in composition instruction, delivered in a social-constructivist context (compose), would have added value over and beyond explicit scaffolding only in composition instruction (spell plus compose); (d) explicit instruction in alphabetic principle (spell and spell plus compose) would increase learning of structure words as well as content words, even though the former are less predictable than the latter in terms of alphabetic principle; (e) explicit spelling training would generalize beyond learning taught words to spelling while composing.

## Method

### Participants

Twenty-two third-grade classes in seven elementary schools in three urban school districts completed a group-administered measure of compositional fluency during the third month of third grade. Students whose standard score for age on this nationally normed measure of compositional fluency fell below the average range (at or more than two thirds standard deviation below the mean) and whose parents granted informed consent were individually tested with a nationally normed measure of verbal reasoning. If their verbal IQ fell in the normal range (at or above 80) and their teachers confirmed the following, they were selected for participation: (a) persistent struggle in the classroom with expressing their ideas in writing, (b) struggle specific to writing rather than generalized across all academic domains, and (c) struggle with writing unrelated to English being their second language. Participants also completed a group-administered standard battery of pretest measures that included measures of handwriting automaticity, spelling, and compositional quality. (See section on standard battery later in *Method* section for information about the measures.) Except for compositional fluency and verbal IQ, which had inclusion criteria, all other measures on the battery were free to vary. Given the number of schools and classrooms involved, it was not possible to link this supplementary instruction to the regular writing program.

Altogether 96 third graders (35 girls, 61 boys) met the various inclusion criteria. About two thirds (69.8%) were of European American ethnic background, 5.2% were Asian American, 4.2% were African American, 4.2% were Hispanic American, 1.0% were Native American, and 15.6% were of other or unknown ethnicity. Half of the mothers and 45% of the fathers had not graduated from college. Of these, 3.1% of the mothers and 2.1% of the fathers had not graduated from high school either, but 24% of the mothers and 22.9% of the fathers had graduated from high school. Educational level of mothers and fathers was not reported for 15.6% of the sample. These children had an average verbal IQ at the population mean, but on the standardized measure of writing fluency—composing under time constraints—their average composing ability fell a full standard deviation below the mean (Table 1). Thus, as a group, these children were underachieving in fluency of written expression relative to their verbal ability and relative to their age peers. Moreover, their writing skills were less well developed than expected for their reading skills. The average of their Word Identification (real-word reading) and Word Attack (pseudoword reading) skills was a standard score for age of 92.3 (see Table 1), which is about one half of a standard deviation unit above their average standard score for age in compositional fluency (84.9).

### Experimental Design

Replications of each of four treatment conditions were randomly assigned to children in seven schools: spelling training only (spell), compo-

Table 1  
*Descriptive Statistics for Chronological Age, Verbal IQ, Pretest and Posttest Handwriting, Spelling, and Composition Measures*

Measure	Treatment group									
	Total sample		Spell		Compose		Spell + compose		Control	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age (months)	107.54	3.93								
ProVIQ <sup>a,i</sup>	100.78	16.21								
Alphabet task <sup>b</sup>										
Pretest	7.67	2.21	8.04	2.61	7.46	1.30	7.54	1.80	7.67	3.02
Posttest	11.04	2.66	11.04	2.13	9.33	1.81	11.38	3.47	12.42	2.17
WRAT-III Spell <sup>c</sup>										
Pretest	91.38	8.64	95.08	9.45	89.46	7.74	90.92	8.97	90.04	8.27
Posttest	95.14	9.86	99.75	10.75	92.92	8.31	95.50	9.33	92.38	10.31
Spell content <sup>d</sup>										
Pretest			8.25	3.14			8.29	4.58		
Posttest			14.58	3.07	8.17	3.93	12.42	4.72	7.38	3.58
Spell structure <sup>d</sup>										
Pretest			6.04	3.22			6.00	2.91		
Posttest			12.67	3.66	6.67	3.12	12.00	4.46	5.75	4.08
WJ-R Fluency <sup>e,i</sup>										
Pretest	84.98	10.49	86.00	10.47	84.96	9.38	84.83	10.43	84.13	12.71
Posttest	100.16	10.59	103.46	12.65	98.21	7.26	100.08	9.19	98.88	12.81
Inform comp <sup>f</sup>										
Pretest game	2.60	1.38	2.85	1.69	2.27	1.29	2.58	1.46	2.69	1.11
Posttest game	3.04	1.11	3.15	0.82	2.98	1.13	3.15	1.26	2.90	1.29
Midtest recess	2.98	1.42	2.25	1.10	3.12	1.36	3.69	1.57	2.85	1.37
Persuade comp <sup>g</sup>										
Pretest PE	3.67	2.26	3.21	2.17	4.71	1.79	4.29	2.29	2.46	2.29
Posttest PE	6.01	2.04	5.00	1.98	7.00	1.43	7.58	1.24	4.46	1.66
Posttest homework	5.52	1.87	5.29	2.03	5.67	1.60	6.71	1.71	4.42	1.56
WRMT-R WI <sup>h,i</sup>										
Pretest	93.77	10.76	97.29	10.55	92.42	9.19	93.62	12.30	91.75	11.30
Posttest	93.69	11.10	98.17	11.40	91.33	8.94	93.33	10.57	91.92	13.16
WRMT-R WA <sup>h,i</sup>										
Pretest	90.66	13.97	97.54	10.21	91.08	10.65	89.17	14.62	84.83	17.63
Posttest	94.00	11.56	103.08	10.51	91.71	9.27	91.62	11.10	89.58	11.32

*Note.* Scores are based on pairs for all measures except age and prorated verbal IQ (ProVIQ), which are based on individuals. WRAT-III = Wide Range Achievement Test—Third Edition; WJ-R = Woodcock-Johnson Psychoeducational Battery—Revised; Inform comp = informational composition; Persuade comp = persuasive composition; PE = physical education; WRMT-R Woodcock Reading Mastery Test—Revised; WI = Word Identification; WA = Word Attack.

<sup>a</sup>Standard score for age ( $M = 100$ ,  $SD = 15$ ), which is equivalent to the verbal-comprehension factor on the WISC-III (Psychological Corporation, 1991). <sup>b</sup>Raw score (Berninger et al., 1994). <sup>c</sup>Standard score for age ( $M = 100$ ,  $SD = 15$ ) on WRAT-III Spelling subtest (Wilkinson, 1993). <sup>d</sup>Raw score on spelling inventory for content words or structure words. <sup>e</sup>Standard score for age ( $M = 100$ ,  $SD = 15$ ) on WJ-R Writing Fluency (Woodcock & Johnson, 1990). <sup>f</sup>Raw score on experimenter-designed expository tasks for informative essay writing; no upper limit set on scores. <sup>g</sup>Raw score on experimenter-designed expository tasks for persuasive essay writing; upper limit on scores was 16. <sup>h</sup>Standard score for age ( $M = 100$ ,  $SD = 15$ ) on WRMT-R (Woodcock, 1987). <sup>i</sup>Sixty-eight percent fell between 85 and 115 in norming group.

sition training only (compose), combined spelling and composition (spell plus compose), and contact control. Children who met inclusion criteria within a school were randomly assigned to each of the treatment conditions so that (a) within schools 2 children were assigned to each replication and (b) overall 12 pairs of children were assigned to each treatment condition. Pairs were necessary because of the reflective-discussion component in a social context in the compose treatment. Overall there were 24 children in each treatment condition, but 12 pairs of children who were randomly assigned to each of four treatments. Thus, the unit of analyses was the pair.

Four tutors were assigned to three pairs of children in each treatment condition so that treatment-group differences could not be attributed to systematic differences among tutors. Each pair of children participated in

twenty-four 20-min sessions that were delivered by one of four tutors. Each tutor delivered instruction to 6 children in each of the four conditions. Sessions were distributed across a 4-month period that spanned January to April of third grade. Make-up sessions were scheduled when children were absent. Less than 6% of the children in each experimental condition (see next section) were receiving special-education services.

### Instructional Procedures

Each treatment condition had two instructional components: spell (explicit instruction in alphabetic principle plus explicit instruction in its alternations), compose (reflective discussion plus scaffolded levels of

language strategies for self-regulation), combined (explicit instruction in alphabetic principle plus scaffolded levels of language strategies for self-regulation), and contact control (keyboarding and composing practice without any instruction).

*Spelling-only treatment (spell).* Each session was structured the same way. For the first 4 min, the alphabetic principle was explicitly taught. For the next 6 min, the alphabetic principle was applied to spelling words. For the last 10 min, explicit instruction was directed to the alternations, which are the alternative ways of representing the same phoneme in English orthography.

The instructional approach used to teach the alphabetic principle and its alternations in our instructional experiment was systematic. First, a phonological-awareness component (segmenting the target phoneme in a spoken word) was embedded in the alphabetic-principle training. Second, automaticity of the alphabetic principle was encouraged through rapid, rhythmic student imitations of teachers' modeling of these phoneme-spelling correspondences. Third, alternations were presented either explicitly (in the spelling-only training) or implicitly (in the combined spelling-and-composing training). Fourth, alphabetic principle was not only trained in isolation but also applied to spelling real words.

The *explicit-instruction-in-alphabetic-principle component* was structured this way. During the first 4 min, 107 phoneme-orthographic correspondences (Berninger, 1998b) were taught explicitly. These correspondences were based on the most frequent phoneme-spelling correspondences in primary-grade written language (adapted from Fry, Polk, & Foutoukidis, 1984). These correspondences exposed children to alternations (e.g., different ways to spell /k/, /j/, /z/, etc.), but during this segment of the training children's attention was not explicitly drawn to the fact that a phoneme could have more than one spelling; that is, exposure to alternations was implicit rather than explicit. In any one session 12 to 24 correspondences were introduced or reviewed. All 107 correspondences were introduced by Lesson 8; each phoneme-spelling correspondence was reviewed four or five times during the course of the tutorial. Specific correspondences were introduced on the basis of difficulty level established in four prior reading or spelling instructional studies (reviewed in Berninger, 1998b): first, one-letter consonant spelling units and short vowels; then, two-letter consonant blends and long vowels with silent *e*; then two-letter vowel teams (diphthongs and digraphs); and finally, two-letter *r-* and *l-*controlled vowels and consonant digraphs or consonant combinations with silent letters.

These correspondences were taught and practiced in the direction of phoneme first and spelling unit second because spelling is a phoneme-to-spelling translation process. This spelling-translation process contrasts with decoding in that reading is a spelling-to-phoneme translation process. The correspondences were taught in the following way with both children looking at the student cards that displayed the pictures of spoken words containing the target phoneme and the associated spelling unit. The tutor named a pictured word containing the target phoneme associated with the spelling unit (e.g., star), produced the associated phoneme in isolation (e.g., /ar/), and then named the letters in the associated spelling unit (*a*, *r*). The children then repeated the sequence—naming the word containing the associated phoneme, producing the target phoneme, and naming the letter(s) in the associated spelling unit. The pace of tutor modeling and student imitation was quick and rhythmic to stimulate formation of automatic associations. Producing the target phoneme in and out of spoken-word context stimulated phonological awareness, which is critical for the spelling process of translating spoken words into written words. The student cards also illustrated how (a) short vowels are associated with closed syllables and long vowels are associated with open syllables, (b) the schwa or reduced vowel can be spelled differently, and (c) the *-le* spelling unit represents a special syllable type. These relationships between phoneme-spelling correspondences and syllable patterns were pointed out to the children. Following introduction of all correspondences and commencing with the review in Lesson 8, the tutor pointed to the picture as a

prompt and encouraged the children to produce the sequence—naming picture, phoneme, and letters in spelling unit on their own. However, if the children could not, the tutor modeled the sequence for the children to repeat.

During the next 6-min segment, children practiced applying alphabetic principle to spelling single words—both structure words and content words—from dictation. The structure words, which included prepositions, conjunctions, articles, and pronouns that appear frequently in primary-grade written language, were selected from Kemper, Nathan, and Sebranek (1995). The content words, which included nouns and verbs that also appear in primary-grade written language, were selected from Graham, Harris, and Loynachan (1994). During the first 12 sessions, 10 structure and 10 content words were practiced in each session, with a total of 120 structure words and 120 content words altogether. During the last 12 sessions, participants practiced only the 18 structure words and 18 content words that were rank ordered as the most difficult and on which most children were not accurate (far from ceiling) during the first 12 lessons.

All spelling units except those underlined in the examples that follow could be phonologically decoded using the phoneme-spelling correspondences in the student card that were taught during the first 4-min segment. Structure words included although, neither, either, while, been, though, since, until, might, before, where, should, above, would, nor, could, because, and unless. Content words included pupil, breakfast, rocket, uncle, penny, color, wool, basket, heat, rabbit, brain, music, bread, child, grade, lady, street, and talk. In each session they practiced six of these structure words and six of these content words; the specific mix of words varied across sessions as did order in which words were practiced. Thus, the content words had more phonologically recodable spelling units than did the structure words, but all structure words had some phonologically decodable spelling units that are not underlined in the previous examples. In a few instances spelling patterns were taught as word families rather than as units of spelling-phoneme correspondence (e.g., *ough* for /long o/ and *ould* for /short u/ plus /d/).

In all sessions the following procedures were used for teaching content- and structure-word spelling. First, to encourage full phonological analysis of the word before writing it, children were asked to count the number of phonemes in it and then to say each word phoneme by phoneme. Then, children were asked to write the word from dictation. Next, the tutor showed participants each word correctly spelled for feedback. Finally, the tutor selected all of the words either or both children missed and provided explicit instruction for spelling them. The tutor segmented the word phoneme by phoneme and for each phoneme showed the children which spelling unit on the student card represented the phoneme in the specific word context.

The *explicit-work-with-alternations component* was structured this way. During the last 10 minutes, children in the spell treatment, but not the spell-plus-compose treatment, played sorting games (Bear, Invernizzi, Templeton, & Johnston, 2000; Graham, Harris, & Loynachan, 1996) that were designed to draw their attention to alternations in the alphabetic principle by which the same phoneme can be spelled in more than one way. In each lesson they played two kinds of sorting games: (a) sorting given words according to alternative spellings for the common phoneme across the words and (b) generating their own words to illustrate alternative ways of spelling the same target sound (phoneme). Children actively discussed the words they sorted and generated for each of the games.

For the first sorting game, children were told that just as a sports coach substitutes different players during a game so that no one player gets too tired, English spelling sometimes substitutes letters for some phonemes so that no one letter gets overworked and tired. Each child was given a laminated card to illustrate these "substitutions" (alternations) by grouping together in the same row all of the pictures of words containing a common target phoneme and associated spelling units for that phoneme from the student card for alphabet principle (used in the first 4 min). For example, the /long e/ phoneme had pictures of an equals symbol (for the *e* in an open

syllable) and an eagle, a sheep, and a baby, along with their corresponding spelling units *e*, *ea*, *ee*, and *y*. Each child was given a playing board. Children were encouraged to spell each word in a set of dictated words orally and then sort it into the correct spelling category for the common phoneme (e.g., long *e*). The child who first figured out the correct alternative spelling unit for the phoneme was given the card with the word to place on his or her playing board under the correct category; this competition to get the most cards on one's playing board was motivating to the children who perceived the activity to be a real game. For example, the following words that contain the /long *e*/ phoneme were placed under labeled columns for *e* in open syllable, *ea*, *ee*, and final *y* in two-syllable word: *be*, *dream*, *seen*, *lady*, *please*, *body*, *begin*, *reach*, *fifteen*, *body*, *return*.

For the second sorting game, children were encouraged to generate their own words that represented the targeted phoneme with each of the labeled spelling units and to write those words under the correct column. This time the winner was the one who generated the most words that were written under the correct column. For example, children were asked to think of words that have the long *e* sound and write them in the column for the way long *e* is spelled in that word. Tutors provided prompts if either child needed help in generating examples.

Phonemes (between slashes) with alternative spelling units (italicized) that were practiced included the following items: Lesson 1, /s/, *s*, and *c*; Lesson 2, /z/, *z*, *s*, and *x*; Lesson 3, /k/, *c*, *k*, *ck*; Lesson 4, /j/, *j*, *g*, *dge*; Lesson 5, /f/, *f*, *ph*; Lesson 6, /m/, *m*, *mb*; Lesson 7, /n/, *n*, *nk*; Lesson 8, /t/, *r*, *wr*; Lesson 9, /w/, *w*, *wh*; Lesson 10, /short *e*/, *e*, *ea*; Lesson 11, /long *e*/, in open syllable, *ea*, *ee*, and final *y* in two-syllable word; Lesson 12, /long *a*/, in open syllable, *a*, silent *e*, *ai*, *ay*; Lesson 13, /long *i*/, in open syllable, *i*, silent *e*, *ie*, *y* in open syllable; Lesson 14, /long *o*/, in open syllable, *o*, silent *e*, *ow*, *oa*; Lesson 15, /long *u*/, in open syllable, *u*, silent *e*, *ew*, *ue*, *oo*; Lesson 16, /aw/, *o*, *aw*, *au*, *a(l)*; Lesson 17, /short *oo*/, *oo*, *u(l)*; Lesson 18, /ow/ as in /out/, *ou* and *ow*; and Lesson 19, /er/, *er*, *ir*, *ur*, *or*. The last five lessons reviewed the alternations practiced in Lessons 1–20. Although most of these alternations were from the Anglo-Saxon layer of the language, a few (e.g., *kn* for /n/, *ph* for /f/, and *x* for /z/) were from the Greek layer of the language (see Balmuth, 1992; Henry, 1990).

*Composition-only treatment (compose)*. Three lessons were devoted to each of four informational essays and four persuasive essays. The first lesson focused on planning, the second lesson on translating, and the third lesson on reviewing and revising. The four informational essays were as follows: (a) Explain to a new student in the school how to get to the gym and the lunch room, (b) Describe a computer to a child who cannot see, (c) In what ways are dogs and cats alike and different?, (d) In what ways are pencils and computers alike and different?

The four persuasive essays were as follows: (a) Should schools have rules?, (b) Should children have to go to school in the summer?, (c) Should children be able to decide when they go to bed?, (d) Should children be able to watch TV whenever they want and choose the shows they watch?

The *reflective-discussion component* was structured this way. For the first 10 min, the pair of children engaged in a conversation designed to prepare them for the goal of the last 10 min of a given lesson—planning, text generating, or reviewing–revising. The tutor was given specific questions to initiate these reflective discussions to facilitate the preparation for a specific goal. However, the tutor prompts were meant only to get the discussion going, and tutors were instructed to let the children guide the discussion once it got started and to fade from direct control over it. As part of the evaluation of fidelity of treatment implementation, tutors were evaluated on whether they faded and allowed children to assume control of this discussion.

In lessons devoted to planning for informative essays, children were encouraged to brainstorm ideas (informative essays) or debate ideas (persuasive essays). This brainstorming and debating generated content for the writing phase. In lessons devoted to text generation for informative essays, children generated examples for word choice, sentence construction, and

text organization. In lessons devoted to reviewing and revising for informative essays, children reread their drafts from the prior session and evaluated word choice, sentence construction, and text organization. In lessons devoted to planning for persuasive essays, children expressed opinions and took a position. In lessons devoted to text generation for persuasive essays, children took sides in mock arguments and supported their side with reasons or evidence to counter the other side with reasons or evidence and to reach a conclusion. In lessons devoted to reviewing and revising for persuasive essays, children reviewed their compositions from the previous lesson and evaluated whether they took a position, supported it, considered a counterargument, argued against the counterargument, and reached a conclusion. A *levels-of-language framework*, spanning words, sentences, and text (e.g., Berninger, Mizokawa, Bragg, Cartwright, & Yates, 1994) pervaded the overall reflective-discussion component.

The *explicit-scaffolding component for composing* was structured this way. Graphic organizers, which were taken from or adapted from graphic organizers in Calfee and Patrick (1995), were used for each planning lesson: a *list plan* for writing directions in sequence for finding the gym and lunchroom; a *web plan* for describing a computer that included a grouping plan for organizing descriptions by categories; a *weave plan* for comparing how dogs and cats or a pencil and a computer are alike and different; an *argument plan* for the premise, reasons, and conclusion; a *taking-sides plan* for one's opinion, reasons for it, reasons against it, and conclusion; a *boxing-match plan* for point-counterpoint in refuting an argument; a *sides-of-the-argument plan* for stating two arguments and reasons for each. Children were given a duplicated copy of the graphic organizer, which they completed with explicit guidance from the tutor.

During the text-generation lesson, children were allowed to use their graphic organizer from the previous session to write their first draft. Also, tutors prompted them at the beginning of the session to think about text organization, sentence structure, and word choice as they wrote. Children wrote for 5 min and then, to ensure that they were writing for a real audience, they read their compositions to each other.

During the reviewing–revision lesson, children first reread their composition silently. Then they were asked to revise according to teacher prompts, which began at the text level, moved onto the sentence level, and ended with the word level. First, students were asked to add two ideas. Second, they were asked to improve two sentences by rewriting them. Third, they were asked to change two words into more interesting words. Finally, they read their revisions aloud.

Thus, throughout the explicit instruction in composition a *levels-of-language strategy* (e.g., Berninger et al., 1994) was emphasized. Children were prompted to think about text, sentences, and words when planning, translating, reviewing, and revising, and they were given feedback about each of these units of the writing process. In contrast to the reflective discussion in which tutors provided only initial prompts and withdrew to allow the children to take over the lead, during scaffolding tutors provided explicit instructional input and feedback.

*Combined spelling-and-composition treatment (spell plus compose)*. During the first 10 min, children received the same explicit instruction in alphabetic principle (implicit exposure to alternations) as the spell condition did. During the last 10 min, children received the same explicit comprehension instruction as the compose condition did. However, in contrast to the compose condition in which peer interaction was encouraged throughout the session, in this combined condition, all writing was teacher directed and completed by the student independently of discussion with the other child in the pair. Although the pair read their initial and final compositions to each other to create a sense of a real audience, they did not verbally interact about the writing process or their products. If children asked for spelling help during the composing part of the lesson, such feedback was provided (in reference to alphabetic principle illustrated on the student cards) during this spell-plus-compose condition but not in the compose-only condition in which children were told to spell the words the best they could.

*Treated (contact) control.* For the first 15 min, children were given keyboard training on AlphaSmart keyboards. Initially, they were asked to type dictated alphabet letters in random order—first with their eyes open and then with their eyes closed. As they became more proficient, they were asked to type alphabet letters in alphabetic order and with variations (in reverse; every other letter; alphabet with spaces, commas, or period between each letter; or alphabet in mixed-up order). Explicit instruction was not provided in transcription—handwriting or spelling—nor was feedback on whether they were typing on the correct keys. For the last 5 min, children practiced writing on a variety of topics (my school, my teacher, the principal, the school bus, recess, vacations, my family, my home, my favorite toy, my favorite sport, my favorite food, pets, television, gym class, art, music, lunch, pizza, ice cream, my best friend, rain, a sunny day, on weekends, learning to write), but no explicit instruction in composition was provided.

### *Fidelity of Treatment Implementation*

A four-pronged approach was used to ensure that the tutors, who were graduate students in educational psychology who had prior teaching or tutoring experience, delivered the intervention in a standard, consistent manner. First, the different segments of the intervention were timed to monitor that tutors were devoting the same amount of time to each component of the treatment. Second, tutors participated in training sessions before the instructional experiment began. They were required to read and master all procedural details in a manual that described all instructional components for each of the 24 lessons for each treatment condition. Third, ongoing consultation and monitoring were provided. Tutors attended a weekly meeting at which any problems that arose, either management or instructional, were discussed and resolved so that all tutors would handle them in the same way. In addition, tutors were required to (a) review the training manual periodically, (b) complete a self-monitoring checklist with procedures for each treatment following each instructional session, and (c) give this checklist to the research coordinator for review. Fourth, tutors audiotaped two sessions of each of the four treatments. The research coordinator reviewed these checklists that were also used for self-monitoring. The checklists assessed tutors' exact use of procedures, stimulus materials, time limits for each of the instructional components of each of the treatments, and child-management techniques. Perfect adherence to procedures received a 100% score. Fidelity scores were 100% for the spell condition, 98.9% for the compose condition, 98.3% for the spell-plus-compose condition, and 93.0% for the treated control.

### *Regular Writing Program*

Teachers of participating children completed questionnaires about their instructional practices in writing in the general-education classroom and their philosophy of writing instruction. All reported teaching composition explicitly and preparing students for the state assessment of writing. All reported using the following instructional activities: writing across the curriculum (e.g., in science and social studies), creative writing, and narrative writing. Most reported having children write book reports, and all reported some form of informative expository writing. Only two mentioned persuasive writing, but it was an occasional activity and not the focus of their writing program. All incorporated elements of process writing in their classrooms (e.g., journal writing, writers' workshop). Teachers reported that their students spent, on average, 2 hr a week in writing extended text (a paragraph or longer). Although the teachers favored systematic spelling instruction, they also were tolerant of "invented" spellings. On a scale of 1 (*strongly disagree*) to 5 (*strongly agree*), their average rating for the statement that children need systematic instruction in spelling was 4.1. On a scale of 1 (*very accepting*) to 5 (*not at all accepting*), their average rating for the statement that children should be allowed to use invented spelling when they compose was 2.3. Even when teachers reported using commer-

cially available spelling programs, they indicated that they use them in their own way; the spelling program appeared to be more influenced by teachers' personal philosophies than district mandated curriculum or textbooks used. No teacher mentioned explicitly teaching alphabetic principle, its alternations, or phonics as part of the spelling program. Overall, the classrooms from which the participating children were drawn provided a balanced writing program with frequent opportunity to practice writing skills.

### *Standard Battery*

*Verbal IQ.* Four subtests of the Verbal Scale of the Wechsler Intelligence Scale for Children—Third Edition (Psychological Corporation, 1991)—Information, Similarities, Vocabulary, and Comprehension—were given before the instructional intervention began. These four subtests yield a prorated verbal IQ that is equivalent to the verbal-comprehension factor (Psychological Corporation, 1991). Reported reliabilities for verbal IQ range from .91 to .95 (Psychological Corporation, 1991).

*Handwriting automaticity.* To assess their ability to retrieve alphabet letter forms from memory and produce them by hand quickly and effortlessly, children were asked to print the 26 alphabet letters in order from memory as quickly and accurately as they could. Their score was the number of legible letters produced in correct order in the first 15 s. This raw score was converted to a *z* score based on grade norms for a third-grade sample of 50 girls and 50 boys that was representative of the U.S. population in ethnicity and mother's level of education (Abbott & Berninger, 1993). This alphabet task has been shown to have good inter-rater reliability ( $r = .97$ ; Berninger et al., 1997), predictive validity for spelling (Berninger et al., 1998), and compositional fluency and quality (Graham et al., 1997).

*Nationally normed standardized measure of spelling.* To assess their ability to spell single words from dictation, children were given the Spelling subtest of the Wide Range Achievement Test—Third Edition (WRAT-III; Wilkinson, 1993). This test, which was given according to standardized instructions in the test manual, allows up to 15 s for spelling each word from dictation. Raw scores were converted to standard scores for age based on published national norms. The average stability coefficient for this subtest is .96 (Wilkinson, 1993).

*Spelling inventory for taught structure and content words.* Children in the spell and spell-plus-compose conditions were asked to spell 10 structure words and 10 content words from dictation in each of the first 12 sessions. Their initial performance on each of these 120 structure words and 120 content words practiced only once each was analyzed to identify the most difficult words on each list, according to these criteria: (a) The groups were not near ceiling on accuracy on the word item, and (b) most children had not mastered the word. Using these criteria, we identified 18 structure words and 18 content words that the children in both groups had not learned yet. At posttest, following the conclusion of the instructional experiment, only those 18 structure and 18 content words were readministered to the two groups that received spelling training and were administered for the first time to the two groups that did not receive spelling training. Time did not permit administration of the entire list of 240 words to the compose or control groups at pretest. Also, because of time constraints, the pretest score for the spell and spell-plus-compose groups was based on their accuracy during the initial presentation of these words during the first 12 sessions prior to any instruction or practice.

*Compositional fluency.* To assess their ability to compose sentences under time constraints, children were given the Writing Fluency subtest of the Woodcock-Johnson Psychoeducational Battery—Revised (WJ-R; Woodcock & Johnson, 1990). This test, which was used to establish whether children met the inclusion criterion for compositional fluency, requires children to construct a sentence from three supplied words. Additional words may be included, but the word forms cannot be modified, for example, by adding endings for plurals (e.g., *-s* or *-es*), tense (e.g., *-ed*), or morphology (*-al*, *-ly*, *-ing*). The score is based on the number of

complete, grammatically acceptable sentences that can be written within a 7-min time limit. Thus, this measure, which provides words to use, minimizes the planning requirements but not the fluency requirements for translating ideas into written text under time constraints. The internal consistency reliability coefficient is .77 (Woodcock & Johnson, 1990).

**Compositional quality.** To assess the two kinds of expository genre—informative and persuasive essays—taught in the instructional experiment, prepublication writing prompts from the Wechsler Individual Achievement Test—Second Edition (WIAT-II; Psychological Corporation, 2001) or investigator-designed measures were used. For each genre, one of these was given both before and after the instructional intervention, and the other was given only at the conclusion of the 12 lessons on that genre—for comparison with the other measure of that genre to evaluate reliability of findings across two measures of the same construct. The repeated measure of informational essay writing from the WIAT-II instructed the children to write about their favorite game. The other measure of informational essay writing instructed children to describe recess to a Martian and was given only at midtest after the 12-lesson sequence on informational essay writing. The repeated measure of persuasive essay writing from the WIAT-II instructed children to write an essay on whether physical education should be required. The other measure of persuasive essay writing instructed children to write an essay on whether the principal should increase homework. Children wrote for 5 min on each topic for the informational and persuasive essays. An experienced teacher, who was also a professional typist, transcribed children's written productions and corrected any spelling but not grammar or other language errors. Thus raters evaluated quality of the transcribed compositions without being influenced by the handwriting or spelling (transcription skills) of the child. Because the published coding scheme for the WIAT-II was not yet available and the time limits were different for the published norms and those that we used, Virginia W. Berninger and Steve Graham developed coding schemes for each of the genres, and Virginia W. Berninger and Katherine Vaughan evaluated the interrater reliability of each of the coding schemes.

For informational essays, 1 point was awarded for each descriptive statement explicitly related to the discourse topic (my favorite game), for each explanation or reason, for each comparison or contrast statement, and for each conclusion or summary statement. One half point was awarded for each statement that was implicitly, but not explicitly, related to the discourse topic; the total score for these implicit links, which required that the reader derive them through inference, could not exceed 2 points. Double coding of 34 informative essays yielded an interrater reliability coefficient of .90.

For persuasive essays, four parts of the essay were weighted equally (maximum of 4 points allowable). For *stating one's position on the argument*, 4 points were given for stating one's position on the argument explicitly and with elaboration, 2 points were given for stating one's position but without elaboration, and 1 point was given for implying but not stating one's position. For *providing reasons for the position*, 4 points were given for two or more reasons, or 2 points were given for one reason. For the *counterargument*, 4 points were given for explicitly stating the counterargument with reasons and refutation, 3 points were given for explicitly stating the counterargument with more than one reason but no refutation, 2 points were given for explicitly stating the counterargument with one reason or a refutation, and 1 point was given for stating a counterargument without a reason or refutation. For the *summary-conclusion*, 4 points were given for explicit statement of a conclusion with elaboration, and 2 points were given for a stated conclusion without elaboration. Double coding of 42 persuasive essays yielded an interrater reliability coefficient of .91.

**Single-word reading.** To assess real-word reading, the Word Identification subtest of the Woodcock Reading Mastery Test—Revised (WRMT-R; Woodcock, 1987), which has an average reliability coefficient of .97, was given. To assess pseudoword reading, the WRMT-R Word

Attack subtest, which has an average reliability coefficient of .87, was given.

## Results and Discussion

### Data Analyses

First, we analyzed whether there were pretreatment differences between groups. Of all the dependent measures in Table 1, only two had statistically significant pretest differences among groups. These (persuasive essay on physical education requirement and WRMT-R Word Attack) were analyzed with analyses of covariance (ANCOVA), with the pretreatment measure as a covariate. For these measures, a repeated-measure analysis of variance (ANOVA) was also conducted on the pretest and posttest measures to evaluate whether they changed significantly over time.

Second, for the remaining measures for which we had both pretest and posttest measures for all treatment groups, we performed an ANOVA with time (pretest to posttest) as a within-subjects variable and treatment group as a between-subjects variable. We lacked pretest and posttest measures for the taught content and structure spelling words and the informational recess essay given only at midtest and the persuasive homework essay given only at posttest. Time effects were interpreted as evidence that children across groups improved significantly in a specific writing or a related skill over the course of the tutorial. Significant Time  $\times$  Treatment interactions were interpreted as evidence of treatment-specific effects, because groups differed in the amount of their improvement over time. A few theory-driven contrasts between treatments were conducted to determine whether treatment groups that varied in mix of instructional components were significantly different from each other in the predicted ways.

Third, for the taught spelling words, we performed two kinds of analyses on the 18 structure words and 18 content words. The first used a one-way ANOVA with group (four levels) to evaluate an overall main effect among the four treatment conditions, two of which received explicit spelling instruction and two of which did not. The second used a three-way ANOVA with two repeated measures (word type [content or structure] and time[pretest or posttest]) and one between-subjects treatment (spell or spell plus compose). This analysis was used to test the hypothesis that spell, which taught alternations of alphabetic principle explicitly, would have added benefit over spell plus compose, which only exposed children implicitly to alternations. Because timewise it was impossible to administer a 240-word spelling test at pretest, the pretest measure for taught words for the spell and spell-plus-compose treatments were based on first spelling of a word during the initial 12 instructional sessions (20 words per lesson). From those 240 words, only the selected 18 structure words and 18 content words on which all children were far from ceiling were entered into analyses comparing the two groups that received spelling training over time and the analyses of all four treatment groups at posttest. There were no statistical differences between the pretest measures of the 18 content and 18 structure words for the groups that received explicit spelling instruction (spell and spell plus compose) and the measures of these words given for the first time at posttest for the groups that did not receive spelling instruction (compose and control). Thus, the initial scores of the groups that received no explicit spelling instruction were comparable with the

initial scores of those groups that did receive spelling instruction. Any observed treatment effects at posttest between these groups should therefore represent treatment-specific effects.

Fourth, for the second informational essay on recess given only at the completion of the instructional sequence on informative essay writing at posttest and for the second persuasive essay given only at the completion of the instructional sequence on persuasive essay writing at midtest, we conducted one-way ANOVAs, with group as a between-subjects variable. The purpose of these ANOVAs was to evaluate whether there was converging evidence across two measures of informative essay writing or across two measures of persuasive essay writing regarding treatment-specific effects. In each case the other measure of informative essay writing was given both at pretest and posttest.

Fifth, we compared the number of correctly spelled words in the expository prompt given both at pretest and posttest for the group that received spelling training with explicit alternation instruction and the group that received spelling training without explicit alternation instruction.

### Findings

Table 1 contains the means and standard deviations on pretest and posttest measures of handwriting, spelling, and composition for the total sample (48 dyads) and each treatment condition (12 dyads) of the instructional experiment. Because treatments were delivered in dyads, the mean score for the 2 children in each pair is the unit in all analyses.

Table 2 summarizes the significant Time and Time  $\times$  Treatment effects for each of the ANOVAs and ANCOVAs for the five kinds of analyses described in the *Data Analyses* section. Table 3 compares results across these analyses for those dependent measures

that showed both time effects and treatment-specific effects. Results are first reported and discussed for time effects, which are relevant in an era in which accountability for student-learning outcome is high on the national agenda. Showing that instruction raises student-learning outcome is just as important as identifying which instructional approach is most effective. Then significant Time  $\times$  Treatment interactions in ANOVAs involving more than one variable or main effects for treatment groups in ANOVAs involving only one variable are discussed as evidence of treatment-specific effects.

*Time effects for handwriting, spelling, and composition.* The sample as a whole improved during the tutorials in all writing skills except informational essay writing and real-word reading. The main effect for time (pretest to posttest) was significant for handwriting automaticity,  $F(1, 43) = 70.52, p < .001$ ; WRAT-III Spelling standard score for age,  $F(1, 43) = 37.17, p < .001$ ; WJ-R Fluency,  $F(1, 44) = 111.59, p < .001$ ; the persuasive essay that was repeatedly administered,  $F(1, 44) = 36.29, p < .001$ ; and the taught spelling words that were repeatedly administered to the spell and spell-plus-compose groups— $F(1, 22) = 226.54, p < .001$ , for content words, and  $F(1, 22) = 109.83, p < .001$ , for structure words. Because the WRAT-III spelling and WJ-R fluency scores are standard scores for age, these time effects represent relative gains compared to age peers.

*Treatment-specific effects for handwriting.* A treatment-specific effect was not found for handwriting automaticity,  $F(3, 43) = 2.38, p > .05$ . This finding is not surprising because none of the treatments were aimed at handwriting automaticity.

*Treatment-specific effects for spelling and reading.* A treatment-specific effect (Significant Group  $\times$  Time interaction) was not found for the standardized measure of spelling, on which

Table 2  
Results of ANOVA and ANCOVA with Dyad as the Unit of Analysis

Measure	Treatment			Time			Time $\times$ Treatment		
	<i>F</i>	<i>df</i>	<i>MSE</i>	<i>F</i>	<i>df</i>	<i>MSE</i>	<i>F</i>	<i>df</i>	<i>MSE</i>
Alphabet task	1.51	3, 43	7.61	70.52***	1, 43	3.77	2.38	3, 43	3.77
WRAT-III Spelling	1.29	3, 44	159.80	37.17*	1, 44	9.13	0.79	3, 44	9.13
Spell content words									
2 groups, over time	0.45	1, 22	29.84	226.54***	1, 22	1.45	10.10**	1, 22	1.45
4 groups, posttest only	9.48***	3, 44	14.98						
Spell structure words									
2 groups, over time	0.07	1, 22	21.55	109.83*	1, 22	4.35	0.27	1, 22	4.35
4 groups, posttest only	10.24***	3, 44	14.91						
WJ-R Fluency	0.30	3, 44	182.79	111.59***	1, 44	49.54	0.37	3, 44	49.54
Information composition									
Game	0.42	3, 44	1.38	2.49	1, 44	1.89	0.17	3, 44	1.89
Recess	2.32	3, 44	1.85						
Persuasive composition									
Physical education (ANCOVA)	9.20***	3, 43	2.62						
Homework	3.59	3, 44	3.01						
WRMT-R Word Identification	0.78	3, 44	236.90	0.03	1, 44	5.37	0.75	3, 44	5.37
WRMT-R Word Attack (ANCOVA)	3.36*	1, 43	36.66						

Note. ANOVA was used unless ANCOVA noted. ANOVA = analysis of variance; ANCOVA = analysis of covariance; WRAT-III = Wide Range Achievement Test—Third Edition; WJ-R = Woodcock-Johnson Psychoeducational Battery—Revised; WRMT-R = Woodcock Reading Mastery Test—Revised.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Table 3  
*Summary of Statistically Significant Effects in the Data Analyses*

Type of analysis	Dependent measure	Significant effects <sup>a</sup>
ANCOVA <sup>b</sup>	Persuasive essay on PE WRMT-R Word Attack	Treatment <sup>c</sup> Treatment <sup>c</sup>
Repeated Measures Two-way ANOVA <sup>d</sup>	Handwriting automaticity WRAT-III Spelling WJ-R Writing Fluency Informational essay on game Persuasive essay on PE Taught spelling words for all four treatment groups at posttest	Time Time Time None Time and Time × Treatment Treatment and Type × Treatment
Three-way ANOVA <sup>d</sup>	Taught spelling words for spell and spell plus compose	Time, word type, Time × Word Type
One-way ANOVA <sup>d</sup>	Informational essay on recess Persuasive essay on homework	None, but significant contrast Treatment

*Note.* ANCOVA = analysis of covariance; PE = physical education; WRMT-R = Woodcock Reading Mastery Test—Revised; ANOVA = analysis of variance; WRAT-III = Wide Range Achievement Test—Third Edition; WJ-R = Woodcock-Johnson Psychoeducational Battery—Revised.

<sup>a</sup>Effects or interactions not listed are not statistically significant. <sup>b</sup>Pretest measure used as covariate. <sup>c</sup>One variable is a between-subjects treatment group variable. <sup>d</sup>Also significant time effects on repeated measures ANOVA.

all groups improved. Treatment-specific effects may be missed on nationally normed standardized tests in which items are discarded that do not differentiate among students at the same age or grade level and are designed to be sensitive to developmental changes rather than to instructional effects. However, a significant treatment-specific effect was found for spelling taught words at posttest when results were available for all four treatment groups:  $F(3, 44) = 9.48, p < .001$ , for content words, and  $F(3, 44) = 10.24, p < .001$ , for structure words. Groups receiving spelling treatment did better on spelling these words; see Table 1. Also, a significant main effect for word type,  $F(1, 22) = 41.15, p < .001$ , was found. Accuracy was higher for content than for structure words; see Table 1. The Treatment × Word Type intervention was not significant. For content words, the spell treatment did not result in significantly greater spelling achievement than the spell-plus-compose treatment,  $F(1, 44) = 1.88, p > .05$ , but did result in significantly greater spelling achievement than the compose treatment,  $F(1, 44) = 16.49, p < .001$ , or the control treatment,  $F(1, 44) = 20.81, p < .001$ . Likewise, for structure words, the spell treatment did not result in significantly greater spelling achievement than the spell-plus-compose treatment,  $F(1, 44) = 0.18, p > .05$ , but the spell-plus-compose treatment did result in significantly greater spelling achievement than the compose treatment,  $F(1, 44) = 11.45, p < .001$ , or the control treatment,  $F(1, 44) = 15.72, p < .001$ . See Table 1 for means. Thus, for both content and structure words, children had better outcomes in spelling words if they received explicit instruction in spelling them, whether or not the spelling instruction was combined with composing instruction.

A three-way ANOVA with repeated measures on word type (structure or content) and time (pretest or posttest) was used to compare the two spelling treatments—combined with explicit instruction in alternations or with explicit composition training. Three statistically significant effects were found for time,  $F(1, 22) = 173.33, p < .0001$ ; word type,  $F(1, 22) = 44.15, p = .0001$ ;

and Time × Word Type interaction,  $F(1, 22) = 5.91, p = .024$ . As already discussed, children improved over time, and content words were easier to spell than structure words. The significant Time × Word Type interaction involved relatively greater gains in spelling content words, which tend to be more phonologically decodable, than structure words, which tend not to be completely phonologically decodable. See Table 1 for means. There was no treatment-specific effect for real-word reading (Word Identification in Table 2). However, the ANCOVA on Word Attack (see Table 2), with pretest score as a covariate, showed a significant treatment-specific effect,  $F(3, 43) = 3.37, p < .03$ . Spell, which had explicit training in alternations, was superior to spell plus compose, which did not,  $F(1, 43) = 6.09, p < .02$ , for developing phonological decoding skill. See Table 1 for means.

*Transfer of spelling training to spelling during composing.* For number of words spelled correctly during the repeated persuasive essay, the contrast between spell and spell plus compose was significant,  $F(1, 44) = 4.44, p = .0409$ . Spell increased from a mean of 31.46 ( $SD = 15.39$ ) to a mean of 40.12 ( $SD = 17.71$ ), but spell plus compose decreased from a mean of 28.79 ( $SD = 12.04$ ) to a mean of 28.75 ( $SD = 8.67$ ). These results are encouraging because explicit training in the alphabetic principle underlying spelling appears to improve spelling in authentic communication contexts.

Taken together, the results for spelling instruction show the following. Teaching specific words increases ability to spell taught words (word-specific spelling). Teaching the alternations of alphabetic principle explicitly increases phonological decoding, which has been shown to contribute uniquely to primary-grade spelling (Berninger et al., 1992). Teaching the alternations explicitly also transfers to spelling while composing.

*Treatment-specific effect for compositional quality.* When all four treatments were considered, there was no treatment-specific effect for either informational essay—the repeated one given at pretest and posttest,  $F(3, 44) = 0.73, p > .05$ , or the one given

only at midtest following the instructional sequence focused on informational essay writing,  $F(3, 44) = 2.32, p > .05$ . However, when only the two spelling treatments (with training in alternations or in composition) were compared at midtest on the recess composition (see Table 1), the one with composing treatment was significantly better on compositional quality,  $F(1, 44) = 6.70, p < .013$ , than was the one without it.

However, there was a treatment-specific effect for both measures of persuasive essay writing, providing converging evidence that explicit composing instruction was effective for this expository genre in at-risk third-grade writers. Using an ANCOVA with the pretest measure as a covariate, we found a statistically significant treatment-specific effect for persuasive writing on whether physical education should be required,  $F(3, 43) = 9.20, p < .001$ . Adjusted means for each treatment condition were as follows: spell, 5.00 ( $SD = 1.63$ ); compose, 7.01 ( $SD = 1.67$ ); spell plus compose, 7.59 ( $SD = 1.64$ ); and control, 4.44 ( $SD = 1.69$ ). The two treatments involving composing were significantly different from the combination of spell and control (neither of which included explicit instruction in composing),  $F(1, 44) = 26.22, p < .001$ . Also, spell plus compose was significantly different from spell alone,  $F(1, 44) = 14.92, p < .001$ , or control alone,  $F(1, 44) = 20.62, p < .001$ . However, spell plus compose was not significantly different from compose,  $F(1, 44) = 0.76, p > .05$ , both of which provided explicit instruction in composing. Likewise, there was a treatment-specific effect for the persuasive essay on homework that was administered only at posttest,  $F(3, 44) = 3.59, p = .0209$ ; see Table 1 for means. Spell plus compose and compose were significantly different from spell and the control,  $F(1, 44) = 7.08, p < .02$ ; spell plus compose was significantly different from spell,  $F(1, 44) = 4.00, p < .05$ , but spell plus compose and compose were not significantly different,  $F(1, 44) = 2.16, p > .05$ . See Table 1 for means.

*Comparison of the alternative treatments across outcome measures.* On the writing skill for which these students were selected—composing fluency—all treatment groups improved. We conclude that each treatment had at least one effective instructional component for increasing students' fluency in expressing their thoughts in written language. However, all treatments were not equally effective for all writing outcomes. Spelling treatment increased low-level transcription (spelling) but not high-level compositional quality. In contrast, teaching composing, whether or not it was combined with spelling, increased composing quality for both persuasive essays and one informational essay at midtest. Spelling structure and spelling content words were significantly better in groups that received explicit instruction in spelling than in the control group that received only practice or only composing training. Overall, only the combined treatment that included both low-level transcription and high-level composing increased both transcription and composition. These beneficial effects of the combined treatment were only evident when results across multiple outcomes were examined for each treatment separately. Given teachers' limited instructional time, treatments that increased more kinds of writing skills are the most efficient, as well as effective, instructionally.

## General Discussion

The first hypothesis that children will learn the writing skills explicitly taught and that explicit instruction will result in rela-

tively greater learning than mere practice alone (the control treatment) was supported for taught spelling words and quality of persuasive essay writing. Spelling training, with or without composition training, improved spelling of taught words. With or without spelling training, the composition training improved persuasive essays writing on two different measures.

The second hypothesis that explicit instruction in both the alphabetic principle and its alternations would add value over and beyond explicit instruction in the alphabetic principle alone was supported for the phonological-decoding component of spelling but not for word-specific learning of taught spelling words. It is also encouraging that spelling training focused on the alphabetic principle and its alternations transferred to spelling while composing a persuasive essay. Additional research is needed on whether (a) there is an optimal stage in writing development for focusing explicitly on alternations so that children do not perceive written English to be hopelessly irregular, (b) there is a requisite amount of explicit training in alternations that at-risk writers need to show added benefit beyond mere exposure to the alternations, (c) normally developing writers benefit from instruction in alternations, and (d) incorporating training on alternations in teacher education programs would result in more effective spelling instruction. Perhaps teachers who have metalinguistic awareness of alternations would be able to provide more effective instructional feedback to struggling spellers.

The alphabetic principle is not the only important strategy for teaching third graders to spell. For example, strategies for automatizing lexical retrieval of correct spelling for familiar words (e.g., Steffler, Varnhagen, Friesen, & Trieman, 1998) are also important. In addition to the segmental knowledge of phonological-orthographic correspondences taught in this study, children also acquire, from exposure to written words, context-dependent knowledge of how phonological information (especially for vowels) is represented in the orthography; this knowledge generalizes to new spellings for a phoneme (Bernstein & Treiman, 2001). Most likely good spellers are able to make better effective use of both the segmental and contextual information about phonological-orthographic correspondences than poor spellers, a topic awaiting additional research.

We focused solely on the alphabetic principle and segmental phonology because they are often neglected as strategies for learning to spell, possibly because of the myth that English is hopelessly irregular. In fact, English spelling is predictable but varies in its predictability, just as the correspondences between the phonological and semantic codes for words are not perfectly predictable. For example, the spoken form of *rose* can be a common noun, a proper noun, or past tense of a verb, and its spelling has a homonym that refers to horizontal groupings. Yet no one claims that sound-meaning correspondence is hopelessly irregular in English. The human information-processing system is capable of dealing with some amount of variability in predictability of the spelling system, which is fundamentally a code for representing spoken language. Teachers might use the alternations of written English to develop students' metalinguistic awareness that the relationships between spoken and written language are predictable despite the alternations, a relatively small set of options.

The third hypothesis that reflective discussion between peers prior to composing would have added value over and beyond teacher-guided, scaffolded instruction in composition was sup-

ported only by qualitative analysis: Only at-risk writers who participated in the reflective discussion considered more than one side of an argument or produced reasons for counterarguments in their persuasive essays at posttest. We suspect that reflective discussion might become increasingly effective at later stages of writing (e.g., Wong et al., 1991, 1994, 1996). More research is needed on use of reflective discussion as prewriting activity in teaching composition at different stages of writing development.

The fourth hypothesis that explicit instruction in the alphabetic principle would improve spelling of structure words as well as content words was supported. Children improved in spelling structure words, but even more in spelling content words. Even though structure words may have some spelling units that are not decodable, they can still be learned by applying alphabetic principle to those spelling units that are decodable; memorizing all of the letters is not the only spelling strategy that can be used for structure words. See Ehri (1992) for a similar argument for learning sight words in reading.

All treatment groups improved in compositional fluency, the skill on which they were selected for being at risk. Further research is needed on whether there is an optimal combination of explicit instruction in transcription skills, practice in transcription skills, explicit instruction in composition, and practice in composition in enhancing compositional fluency. Compositional fluency is of practical importance for two reasons. First, children who write more under time constraints are more likely to be rated better writers on standardized assessment instruments and high-stakes assessment of writing. Second, children who are able to generate text fluently are more likely to enjoy writing and think of themselves as good writers and are therefore more motivated to work hard to continue to hone and improve their writing skills. Children who are not fluent may avoid writing, and their writing skills may not develop further.

Improved compositional quality at the third-grade transition stage of writing development appeared to depend on more than transcription. Explicit instruction in composition was also beneficial, especially for persuasive essay writing. We speculate that persuasive essay writing provided more of a cognitive challenge in the developing writers' zone of proximal development than did informational writing. On the basis of the teacher questionnaires, it appeared that these children had far more practice with informational writing than persuasive writing in their regular instructional programs in writing. Developing writers may show the most growth when their writing instruction is not aimed at their current developmental level but is aimed above—but not too far above—and is designed to move them along the zone of proximal development (see beginning of this article). Also, qualitative analysis indicated that some children were more likely to engage in knowledge telling in informational essay writing, whereas they were more likely to use the schema of an argument as a knowledge-transforming strategy in the persuasive essay writing (c.f. Scardamalia & Bereiter, 1986).

We emphasize that these at-risk third graders improved in but did not master persuasive essay writing. For example, consider the change from pretest to posttest in the persuasive writing of this child who was given explicit instruction in composition. At pretest, the reader can infer that the child favors the physical education (PE) requirement but by posttest the position is explicitly stated. At pretest, the child free associates about an irrelevant issue of who

the teacher should be. By posttest, the child can use discourse markers for the reasons for his position, even if the fourth reason is a repetition of the first one, and provide a summary statement of his position. He has learned some, but not all, the elements of a written argument.

### *Pretest*

Dear Daniel: I think it is a good idea to have gym class but I want Mrs. \_\_\_\_\_, and I think we should have her back. I also think that Mrs. \_\_\_\_\_ should be a substitute. I like games we play. They are lots of fun, but with Mrs. \_\_\_\_\_ we played much funner games like we got to play scooters more often and we got to play octopus and Chickens run home. With the new teacher we don't get to play those.

### *Posttest*

Children should have PE every day in school. One, because they would have a lot of fun. Two, they would learn more about sports. Three, you would get more exercise. Four, you would have fun playing games and doing other stuff. Children should have PE every day in school.

Only those children in compose who argued orally prior to writing their arguments considered more than one side of an argument and/or used reasons for counterarguments (sometimes explicitly and sometimes implicitly). Consider these examples of their writing at posttest.

#### *Child 1*

I think it would be fun to have more homework. And I think we have enough right now, but if we get more homework then it would take more longer to finish. But sometimes you can get smarter! And I would only agree with you if it was mostly fun.

#### *Child 2*

I think we should have PE because you can exercise and you could play lots of fun games. And talk to him and sometimes he's nice. I think we should not have PE because we have to run a lot.

The mark of successful writing instruction at this developmental stage is not that it transforms developing writers into writing experts but rather that it moves them along the continuum of writing development. From an emerging literacy perspective, it takes many years of formal instruction and practice in writing to master the writing process. It is important that state assessment of writing standards draw on research on writing development to set reasonable levels of expectation for writing in specific genres; for example, see Crowhurst (1987, 1990) and McCann (1989) for persuasive writing. We should not judge child, developing writers by the standards of the adult, skilled writers but rather by (a) what is developmentally appropriate for their stage of writing development and (b) whether they are farther along that developmental continuum at the end of the school year than at the beginning.

Limitations of this study included the amount of time available for the instructional sessions and writing assessment. Given the sample size and scheduling constraints in schools, we were only able to schedule two sessions per week of 20 min each over a 4-month period. Now that teachers are held accountable for stu-

den's performance on state assessments, they are increasingly reluctant to have students leave their classrooms for special pullout programs including research studies. The need to equate the total time for each instructional approach for purposes of experimental comparison also imposed artificial constraints on the instructional sessions. In our experience the 5-min time limit works well for primary-grade students selected for problems in compositional fluency who do not write as much as peers and need a lot of adult prompting to continue to write. For example, tutors noted that students in the control condition often stopped before the 5-min time limit for unaided composing. In addition, the need to equate time across conditions means that the treatments do not contrast on a single dimension but rather contain a mix of instructional components; on the one hand, this complicates interpretation of the results, but on the other hand, it affords comparisons of a specific instructional component like spelling when it is and is not combined with another component like teacher-guided compositional instruction.

Despite the limitations, this study has implications for effective instructional practices, based on the simple view of writing, for students at risk for meeting state standards in writing. Given equal amounts of time, the instruction aimed at both low-level transcription and high-level text generation, close in time, increased both transcription and composing skills, suggesting that this approach is an efficient way to improve writing skills when instructional time is limited. Although instruction in transcription may directly transfer to increased amount of composing (see beginning of this article), such instruction is probably necessary, but not sufficient, to nudge emerging writers along their zone of proximal development in quality of composing, which also requires explicit scaffolding of the composing process. The most effective teaching of writing may incorporate multiple instructional components such as the following: (a) alphabetic principle, (b) its alternations, and (c) levels of language strategies for self-regulation; (d) reflective discussion; (e) keyboarding; and (f) composing practice. The effectiveness of such a multicomponent instructional package might be evaluated using design experiment methodology (Brown, 1992) in the regular instructional program.

In conclusion, the results of this study should be generalized only to (a) third graders at risk for compositional fluency—expressing their ideas in writing when there are time limits, (b) the specific ways we operationalized instructional components, and (c) supplementary writing instruction outside the regular instructional program. Future research should address effective instructional approaches for helping at-risk writers in the regular writing program. Training spelling or merely practicing composing did not directly transfer to improved quality of composing—only explicit training of composition transferred to improved quality of composing text. From the emergent literacy perspective, compositional fluency is an important goal early in writing development, but by the third-grade transitional stage, compositional quality requires explicit instruction and becomes an increasingly important goal and expectation. Teachers should continue to teach transcription skills, but it is equally important that they also explicitly teach strategies for self-regulation of composition (e.g., for specific genres and all levels of language; see Harris & Graham, 1992, for other strategies). That is, all of the components in the simple view of writing (see beginning of this article) need to be considered in planning an instructional program for at-risk writers in the third

grade transitional stage in writing development. This observation is consistent with research on effective teaching of writing in first-grade classrooms that was associated with teaching both mechanics (handwriting and spelling) and higher order composition processes (Pressley et al., 2001).

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