

OUTCOMES REPORT

SPELL

SPELL-Links to Reading & Writing

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The effects of a multiple linguistic, prescriptive approach to spelling instruction: A case study. (2004)
Kelman, M. & Apel, K. *Communication Disorders Quarterly*, 25, 2, 56-66.

Abstract

A case study was conducted using the *SPELL Spelling Performance Evaluation for Language & Literacy* assessment protocol, coupled with instructional methods featured in the *SPELL-Links to Reading & Writing* word study curriculum. *SPELL* is a research-based software program that assesses linguistic skill areas that underlie reading and spelling and makes specific recommendations for differentiated instruction. *SPELL-Links to Reading & Writing* is a research-based word study curriculum that provides decoding and spelling instruction across multiple linguistic skill areas – phonological awareness, orthographic knowledge, vocabulary, morphological knowledge, and mental images of words.

“Simply put, looking closely at how students spell words offers powerful insight into the nature of their word knowledge and thus the types of information they use when they read and write words.”

Shane Templeton PhD

In the study, a fifth grade student was administered a paper and pencil version of the *SPELL* prescriptive assessment. The prescriptive assessment results led to a differentiated instruction plan targeting

orthographic knowledge and phonemic awareness skills. Instructional methods featured in *SPELL-Links to Reading & Writing* were implemented in a short term intervention program. The results revealed clinically significant improvement in spelling performance. Word-level reading ability also improved without direct reading instruction.

Method

Lily*, an 11-year-old English-speaking girl with a history of difficulty in spelling skills, was referred to one of the investigators at the end of fourth grade. According to her parents, the instruction received at school had not been successful in improving Lily’s spelling ability.

Lily had a reported history of difficulty with spelling, though her reading skills were judged to be within age and grade expectations. Classroom teachers described Lily as an “average to above average” student.

“For the two years prior to the case study, Lily’s teachers made accommodations for her spelling difficulties by shortening the number of spelling words for testing from 20 to 10 per week, and allowing extra days for studying. Lily successfully memorized the spelling of words to pass her weekly tests (averaging 7 or 8 correctly spelled words out of 10); however, Lily did not retain the correct spelling of most of the words weeks later. As the spelling

* A pseudonym was used to maintain confidentiality.

requirements in fourth grade became more challenging (e.g., longer multi-syllabic words), it was increasingly difficult for Lily to successfully pass her spelling tests. In addition, her written compositions continued to include misspelled words. Lily frequently replaced multi-syllabic words with less complex words she could spell confidently, thus limiting the content of her written work. Lily's avoidance of multi-syllabic words in her written work is consistent with previous reports of students with spelling difficulties choosing not to spell multi-syllabic words (Berninger, 2000; Graham & MacArthur, 1988). Near the end of fourth grade, it was evident to her parents that the teaching strategies employed thus far had not been effective in improving Lily's spelling skills. Lily did not receive any direct speech and language intervention services prior to the case study" (Kelman & Apel, 2004).

Lily's spelling skills were assessed using a variety of samples of authentic writing and a spelling to dictation task. In the authentic writing samples, Lily misspelled a significant number of words, many of which were single-syllable. One spelling sample – a letter written to her teacher – contained 9 spelling errors out of 62 words (15%). Ten spelling errors out of 45 words (22%) were found in another similar writing sample.

Other writing genres also were assessed. A narrative writing sample contained 372 words, with 92 spelling errors (25%). In an opinion essay, Lily wrote 102 words, 40 of which were spelled incorrectly (39%). When asked to find the words she spelled incorrectly in each written assignment, Lily was able to identify 75% of them but was unable to correct these misspellings.

"Lily's spelling skills also were assessed using a paper and pencil version of *SPELL Spelling Performance Evaluation for Language and Literacy* (Masterson, Apel, & Wasowicz, 2002). A total of 120 words were presented

by dictation and evaluated. The 40-word screening, containing words of one to three syllables in length, resulted in 25 errors (63%). The Level 1 task, consisting of 80 one- and two-syllable words, yielded spelling errors in 24 words (30%). Overall, spelling errors occurred in 49 of the 120 words (41%).

A bi-gram analysis was conducted on the pre-intervention testing of the spelling to dictation task (80 words) to determine how closely Lily's spellings approximated the target words (Vaughn, Schumm, & Gordon, 1993). In this analysis, one point is awarded for every letter pair in correct sequence, including one point for each correct initial and final grapheme. For example, Lily's spelling of *catch* (spelled "cach") resulted in a count of 4 bi-grams; one point for *c*, one point for *ca*, one point for *ch*, and one point for *h*. The total number of correctly produced bi-grams during the pre-test was 347 (86%)" (Kelman & Apel, 2004).

Lily's samples of authentic writing and responses from the *SPELL* were analyzed to determine whether there was a pattern to her errors, thus providing insight for differentiated instruction goals.

"The study of spelling is the study of words – their history, meaning, grammatical rule and linguistic structure. SPELL will direct teachers toward these aspects of language and encourage the use of more enlightened instructional practices that truly educate students in word study."

Louisa Moats EdD

The detailed error analysis revealed that Lily's errors were due to deficits across multiple linguistic skill areas. "Orthographic

errors were consistently predominant in the writing samples and the dictation task. Errors based on insufficient phonological awareness, though less significant in the dictation task, occurred more frequently in the writing samples. This may have been due to the higher level of linguistic demand (e.g., knowledge of syntax, audience, genre) required for the written composition. Deficits attributed to poor or faulty mental images of words were equivalent in both samples” (Kelman & Apel, 2004).

“Until recently . . . there have been few resources that offered guidance to educators and clinicians in applying . . . strong research in spelling assessment and instruction. SPELL provides this guidance in a focused and effective format.”

Shane Templeton PhD

Additional testing was conducted to assess nonverbal intelligence, phonological processing, decoding skills, and narrative abilities and provide a more complete perspective of Lily’s language and cognitive skills. The additional tests included *The Comprehensive Test of Nonverbal Intelligence* (Hammill, Pearson, & Wiederholt, 1996), *The Comprehensive Test of Phonological Processing* (CTOPP; Wagner, Torgesen, & Rashotte, 1999), and The Word Attack subtest and The Word Identification subtest of the *Woodcock Reading Mastery Tests-Revised* (WRMT-R), Form G (Woodcock, 1998).

Based on the detailed spelling error analysis, a differentiated instruction plan was created for Lily, one that focused on two specific orthographic rules and patterns (long/short vowels and “r-controlled” vowels) and

phonemic awareness skills (particularly blending and segmentation).

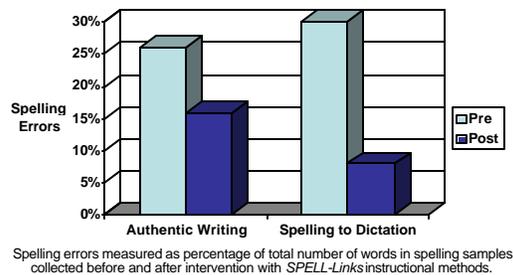
Lily received 9.6 hours of direct intervention. Sessions ranged from 45 to 90 minutes, with an average length of 60 minutes. There were 11 sessions in total, spanning a period of eight weeks. Lily’s spelling instruction program aligned with current spelling theory and empirical research and consisted of instructional methods featured in the *SPELL-Links to Reading & Writing* word study curriculum. In addition, at the end of sessions #2, 4, and 7, Lily completed activities from the computer game *Earobics* (Cognitive Concepts, 1997), focusing on listening and sound awareness skills. *Silly Sounds Playground* (McKinley, Schreiber, Sterling-Orth, & Tabalsky, 1999), a board game designed to build phonological awareness skills and *Sound Wizard* (Lenchner, 2001), a series of strategy-building games for phonological awareness, were sent home for practice. Lily and her mother were directed to engage in game playing every other day for a minimum of twenty minutes.

Results

Striking changes in Lily’s spelling abilities were observed at the end of the eight-week intervention period. “She had begun to integrate her newly learned skills and show evidence of understanding how to spell by incorporating the strategies she had learned” (Kelman & Apel, 2004).

Post-intervention testing was conducted two weeks after intervention ended. Lily’s spelling skills were reassessed with a sample of authentic writing and the Level 1 task from the *SPELL*. An essay writing sample, consisting of 223 words, contained 36 spelling errors (16%), indicated a reduction in misspelled words from her pre-intervention samples (26%). Lily corrected some spelling errors.

“Post-intervention testing with the spelling to dictation task (*SPELL*, Level 1) revealed 6 spelling errors (8%), which was an improvement from her pre-intervention sample, in which errors occurred in 30% of the words. Of the 6 errors, 4 were judged to be due to incomplete orthographic knowledge and 2 were hypothesized to be due to poor mental images of words.

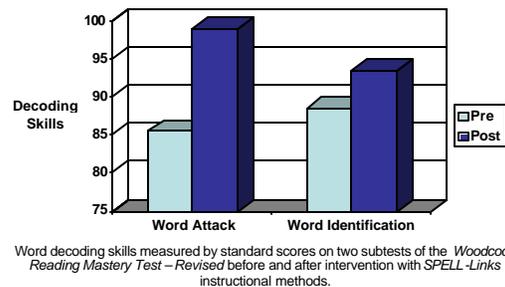


A bi-gram analysis was conducted on the post-intervention testing of the spelling to dictation task (80 words) as a comparison to the pre-intervention bi-gram analysis. The total number of correctly produced bi-grams during the post-test was 388 (97%). This represented an 11% increase in accuracy.

An effect-size measure (Cohen, 1988) was calculated to determine the extent to which treatment had a clinically significant effect on Lily’s spelling abilities, as measured by the number of correctly produced bi-grams on the two spelling to dictation tasks. Results indicated a moderate effect size ($d = .5$) suggesting a clinically significant improvement in spelling performance.

The Word Attack and the Word Identification subtests (WRMT-R; Form G) were re-administered to determine whether improvement in decoding ability occurred as a consequence of spelling intervention. On the Word Attack subtest, Lily obtained a raw score of 30, which converted to a standard score of 99 ($M=100$, $SD=15$), indicating decoding skills within typical limits. On the Word Identification subtest, Lily achieved a raw score of 70 and a

standard score of 94, indicating reading for sight words to be within typical limits for her age. Using the standard error of measurement (SEM) to calculate a 95% confidence interval for standard scores for this test, Lily’s pre-intervention true score on the Word Attack subtest fell between 83-88 and her post-intervention true score fell between 96-102. For the Word Identification subtest, her pre-intervention true score fell between 87-90 and her post-intervention true score fell between 92-95.



Lily’s scores, then, suggest marked improvement in word-level reading abilities. Given that the only directed literacy instruction Lily received during the treatment period was the spelling intervention reported above, it appears that the multiple linguistic factors spelling approach also led to an increase in word-level reading abilities.

“SPELL is a critically important resource at a time when literacy assessment and instruction are being considered in light of the degree to which they reflect solid research. SPELL helps educators and clinicians meet the critical challenge of providing effective and appropriate literacy instruction for all learners.”

Shane Templeton PhD

In summary, within a relatively short period of intervention (less than 10 hours), Lily achieved clinically significant changes in her spelling performance and word-level reading ability. A considerable reduction in the number of misspelled words and a shift in the type of errors produced were evident when comparing Lily's pre-intervention and post-intervention samples" (Kelman & Apel, 2004).

Conclusion

The results of this case study indicate that the prescriptive assessment approach of *SPELL* coupled with instructional methods featured in *SPELL-Links to Reading & Writing* improves spelling and decoding skills.

“Spelling knowledge is now understood as being central to learning to read and write and to the processes of reading and writing.”

Shane Templeton PhD

The case study highlights the positive effects of differentiated instruction that focuses on a multiple linguistic factors approach for teaching spelling. The case study also demonstrates the positive impact of spelling instruction on word-level reading skills when no direct reading instruction is provided. The results reported are consistent with studies cited by Treiman (1998) and support the finding that learning to spell enhances word-level reading ability.

Thus, a collective body of current research and the empirical findings of this study demonstrate the importance of providing spelling instruction as an integral part of any reading curriculum.

Professionals must address all linguistic aspects of spelling and reading within their curriculum, with an emphasis on the integration of all linguistic skills that underlie word-level reading and spelling – phonological awareness, orthographic knowledge, vocabulary, morphological knowledge, and mental images of words.

Prior to instruction, students should receive a prescriptive assessment to determine individual student needs and connect learning needs to the classroom curriculum. The *SPELL* program directs the teaching process with its detailed recommendations for word study instruction. The *SPELL* software program – featuring an engaging multimedia format that holds student attention – requires little or no supervision during administration. *SPELL* automatically determines where to begin and end testing and which modules and test items to administer for each student.

When testing is complete, *SPELL* automatically scores and analyzes the individual student's responses. The student's spelling of each spelling pattern is examined to identify which spelling patterns are most frequently misspelled (i.e., those that do not meet the pre-determined performance criterion of >60%). These are the spelling patterns that will be targeted with explicit instruction at the word level to remediate specific language knowledge deficits. Spelling patterns that are infrequently misspelled (i.e., those that exceed the pre-determined performance criterion of >60%) are more appropriately addressed by facilitating and reinforcing the student's consistent application of spelling knowledge and by developing the student's self-monitoring and proofing of his or her own written work in the context of authentic writing tasks.

SPELL then creates a differentiated instruction lesson plan for each student,

creates formal reports for the student's portfolio and writes letter-style reports so that results may be easily shared with parents and classroom teachers.

SPELL saves teachers countless hours of paperwork while achieving substantially more accurate results. During development of the *SPELL* software program, hundreds of spelling samples were collected and used to assess the performance accuracy of all components of the program. The collected data were hand-scored and analyzed by a language-literacy specialist highly skilled in the diagnosis and remediation of spelling and by the *SPELL* software program. The results of the human evaluation were then compared with the results from the software program to assess *SPELL*'s accuracy of performance. When discrepancies were identified, the source of each discrepancy was investigated, identified and corrected. The final analyses revealed *SPELL*'s accuracy of performance to be 98% versus the human's accuracy of performance of 75%.

“Professionals must go beyond phonological awareness instruction and address all linguistic aspects of spelling and reading within their curriculum, with an emphasis on the integration of the multiple linguistic skills that underlie word-level reading and spelling.”

Kenn Apel PhD

Once a differentiated instruction plan is created for each student, students should receive word study instruction that encourages the use of a repertoire of linguistic knowledge to read and spell. This requires professionals to become knowledgeable about the phonological,

orthographic, semantic, morphological, and visual/orthographic underpinnings of English spelling, and be able to use that knowledge in an integrated manner as they instruct students. With *SPELL-Links to Reading & Writing*, professionals can be certain that they are providing integrated, research-based decoding and spelling instruction across these multiple linguistic skill areas.

Phonological Awareness: *SPELL-Links to Reading & Writing* provides multi-sensory instruction that establishes and reinforces critical phonological awareness concepts. Students develop the ability to segment words into phonemes and syllables, to sequence and manipulate phonemes, to identify and discriminate between phonemes, and to distinguish between stressed and unstressed syllables.

Orthographic Knowledge: *SPELL-Links to Reading & Writing* engages students in systematic and explicit phonics and word analysis exercises to develop their understanding of the alphabetic principle, to teach the specific relationships between the sounds of spoken language and the letters of written language, and to develop knowledge of conventional letter patterns and spelling rules. Through explicit instruction in mapping sounds to letters, students grasp a solid understanding of the link between spoken and written language and begin to establish the critical letter-sound connections that link individual written words to their pronunciations and meanings in long-term memory. Through integrated spelling, reading, and writing activities, students learn to apply their knowledge of phonics and word-analysis strategies as they read and write.

Vocabulary: With *SPELL-Links to Reading & Writing*, students receive direct vocabulary instruction to learn the meanings of specific

words and to learn how to use word meaning to help spell words. Through these activities, students become aware of the importance of word meaning when reading and writing.

Morphological Knowledge: Students develop effective word learning strategies that enable them to decode, understand, and spell unfamiliar words when they receive *SPELL-Links to Reading & Writing* instruction. Through active learning, students become proficient in using meaning to spell prefixes, suffixes, base words, and word roots and uncover useful rules for modifying words when adding prefixes and suffixes. Students learn to use dictionaries and other resources to broaden and deepen their knowledge of word meaning and to correctly spell words.

Mental Images of Words: *SPELL-Links to Reading & Writing* provides the precise instruction students need in order to develop clear and complete mental images of words and word parts, which are vital for automatic word recognition and reading fluency. Through careful examination of the letters that make up the spelling of words and word parts, thoughtful discussions of word meanings, and multiple opportunities to read and spell words, students secure mental images of words in long-term memory.

The detailed error analysis of the *SPELL* assessment and the games, hands-on activities and guided self-discovery learning opportunities of *SPELL-Links to Reading & Writing* make it easy and fun to teach spelling and reading using proven effective, research-based methods.

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