The Effects of a Multisensory Spelling Strategy on the Ability of Students with Dyslexia to Spell Irregular Words

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Literacy acquisition is the foundation of a student's success in school and the abilities to read and write are vital to achievement in society (Moats, 2005). One component of literacy, spelling, receives far less attention both in research and education, despite its relationship to both reading acquisition and writing ability (Howard, Da Deppo & De La Paz, 2005; Hochstetler, et al., 1995; Moats, 2005; Mushinski & Stormont-Spurgin, 1995). Evidence supports a reciprocal relationship between spelling and reading and spelling and writing (Hochstetler et. al, 1995). That is, students who are better spellers tend to be better readers and students who are better spellers tend to better writers. Interestingly, a study in 2008 determined that while a reciprocal relationship exists between reading and spelling, spelling had a greater impact on improving reading, than reading had on improving spelling (Conrad, 2008). This demonstrates that most students will not learn how to spell just by learning how to read. Students must have instruction in spelling in conjunction with instruction in reading and writing to achieve literacy goals.

Guidance for how spelling should be taught in schools however, is scarce. National assessments rarely include a direct measure of spelling and learning standards seldom clarify which words or patterns should be taught at which grades (Moats, 2005; Sayeski, 2011). Regardless of the lack of clarity for how and when to teach spelling, the expectation is still that written work will contain correctly spelled words. Inaccurate spelling not only impedes the ability to write fluently, but evidence exists that teachers will grade the same writing sample lower in all areas of writing, if spelling errors are present (Marshall & Powers, 1969). Moreover, employers frequently rule out job interviewees if spelling errors are found on application documents. The above information is particularly troubling for the student with a learning disability, for whom learning the intricate rules and patterns of the English language is extremely tedious (Davis & Braun, 1994; Shaywitz, 2003).

Spelling and Dyslexia

While some children seem to naturally be good readers and spellers, roughly 50% of students are unable to acquire literacy intuitively, or based on their own efforts. These children must be taught with a methodology that provides direct, explicit instruction about the structure of English (Bertin & Perlman, 2007, Moats, 2005). Within this half of the population is the individual with dyslexia, a learning disability characterized by difficulties with accurate and /or fluent word recognition, poor spelling and decoding abilities. (International Dyslexia Association, 2002). Spelling, more than any other ability, is the largest discriminator between students with learning disabilities and other students who have low achievement (Mushinski et. al., 1995). Students with dyslexia often continue to struggle with complex and irregular word spellings, even when the ability to read has been achieved. Spelling is a more demanding component of language than reading (Mushinski, & Stormont-Spurgin, 1995); requiring a student to identify the sequence of sounds in a regularly spelled word, associate those sounds with corresponding letters, and write the visual representation of those letters. However, in reading, the sequence and visual representations for the letters are already provided. For example, a student could see and blend the sounds of the letters in the word "*jump"* successfully, but when asked to spell the word, the student has to segment (break apart) the sounds in a word, and remember the letters associated with those sounds. A student learning to spell could just as easily come up with "*gump."* as the spelling for "*jump"* if the student had not yet learned the rules for when to use 'g' or 'j' for the sound of /j/.

Children with dyslexia have difficulty organizing individual sounds (phonemes) within words, and weaknesses in working memory and visual processing further complicate learning how to accurately spell (British Dyslexia Association, 2007). A recent study explored

contributing factors of spelling ability and found that more than a student's vocabulary knowledge or reading frequency, spelling success was correlated to orthographic processing, the ability to decipher the visual representations of letters (Johnston, McGeown, & Moxon, 2014). Orthographic processing along with phonological processing (manipulation of sounds) make up the visual-verbal highway utilized when reading and writing that can be problematic for children with dyslexia. Asking a student to produce the letter that makes the sound of /f/ like feather, may seem simplistic, but in reality the sound of /f/ has four graphemes (visual representations) of one sounds: *f* (fat), *ff* (puff), *ph* (phone), and *gh* (laugh). In fact, there are roughly 205 ways to spell 44 sounds in English (Luba, 2015). Learning the myriad sound combinations and visual representations of these sounds is extremely tedious for a student with weaknesses in orthographic and phonologic processing.

Abundant evidence exists suggesting that reading instruction of children with dyslexia should be direct, explicit, and systematic (Bertin & Perlman, 2007, Moats, 2005). Spelling instruction too then, should also follow a purposeful sequence and taught in a way that is proven to be successful. The Orton-Gillingham method is a systematic, multisensory reading practice that is considered the gold star of instructional techniques for working with students with dyslexia and many Orton-Gillingham based programs interweave the spelling of phonetically regular words as students are learning to read specific word patterns (Bertin & Perlman, 2007, Institute for Muslti-sensory Education [IMSE], 2008). This component is often referred to as multisensory because the visual, auditory, and kinesthetic modalities are taught simultaneously. For instance, a student may be learning to read words containing the sound of /sh/ (auditory), associate that sound with the letters "sh" (visual), while also learning the motor patterns for writing the letters "sh" (kinesthetic). This type of evidence based instruction is excellent for

learning to read and spell words that follow common English patterns. However, English is made up of a whole group of words that do not follow typical sound and spelling sequences.

Regular vs. irregular spellings

An irregularly spelled word is one that does not follow conventional English spelling patterns and cannot be spelled by sounding out the word. Take for instance the word "what." The letter "a" does not typically make the sound of /u/ as in hut. It typically makes the sound of /a/ as in "cat," "path" or "sand." So asking a student to sound out the word "what" when spelling it is misdirecting the student to rely on the wrong strategy for the part of the word that is irregular. Often times, irregular words are put into the category of "sight words" by teachers and publishing companies. The goal of these lists is for students to know the words by sight, or automatically and fluently. However, these lists typically contain regular and irregular spelling patterns with no instruction on how a student is to decipher which is which. As mentioned previously, spelling success was found to be connected to orthographic processing, being able to decipher the visual representations of letters. Further investigation showed a higher correlation between orthographic processing in irregular words and regular words (Johnston et al., 2014). This demonstrates that students learn, and should be taught, spelling of words that follow patterns, or regular spellings, differently than irregular word spellings, as different processing is relied upon when learning regular versus irregular words. Moreover, orthographic weakness in students with dyslexia demands that these students be provided instructional techniques highlighting orthographic detail to learn irregular spelled words.

Red Words

Many Orton-Gillingham programs label irregularly spelled words as Red Words (Bertin & Perlman, 2007; IMSE, 2008). Red words are words that are irregularly spelled, whereas Green Words are words that are decodable, and thus can be sounded out. The intention of the

label is to cue students when to use for specific strategies. A Green word means go ahead and decode and a Red Word means to stop, and rely on another strategy. Programs that teach Red Words often teach these words in a different way, requiring students to utilize memorization strategies (Bertin & Perlman, 2007). This type of instruction is utilized by thousands of teachers in various forms and professional development of teaching RED words is provided by multiple organizations, some as often as every week, across the nation (IMSE, 2008). For the purpose of this study, a variation of IMSE's protocol of teaching a Red Word will be focused upon. This particular method was chosen because of the abundant use by teachers across the United States. Although the practice of teaching Red Words is widely accepted by both teachers and specialists trained to work with students with dyslexia, little research evidence exists supporting that the technique of teaching a Red Word affects the ability to spell irregular words. The purpose of this study is to investigate the affect that teaching a Red Word strategy has on the ability of students with dyslexia to spell irregular words.

Research Question

What is the effect of a multisensory instructional technique on the ability of students with dyslexia to spell irregular words?

Methods

Participants

A minimum of six elementary students with a diagnosis of dyslexia will be asked to participate in the study, to allow for possible attrition. Students will need to have been diagnosed with dyslexia by a licensed psychologist or neurologist. Further, the students must meet state characteristics for Specific Learning Disability in Basic Reading Skills and qualify for an Individualized Education Plan in their school.

Participating students will be enrolled in grades second through fourth. Students in grades below second will be excluded because they may not have developed the prerequisite skills needed to complete the intervention. Students will be assessed prior to intervention in skills such as knowledge of letter sound correspondence, letter formation, and phonemic segmentation to determine readiness for irregular word spelling. The intervention, which utilizes crayons and fabric screens, is considered immature for students above fourth grade, and thus these grades will be excluded from the study. Further, students above fourth grade may have previously received instruction in irregular words and it could be more difficult to establish a baseline.

Students' gender, age, grade, ethnicity, diagnosis, age of diagnosis, years of instructional support and school qualifications will be collected and reported.

Setting

This study will take place in several elementary schools within one school district in the southwest. In order to provide as naturalistic a setting as possible, the intervention will be completed in the same location that the students receive instruction for their IEP goals during the time that they are scheduled for support services in the area of reading. Instruction will take place in either a small group, or individualized setting.

Materials

Each student will require a red crayon, fabric screen, Red Word paper, writing paper and pencil. For each student the instructor will require the Instructional Protocol for Teaching Red Words (see Appendix A), Red Word Recording Sheet (see Appendix B), the irregular word list (see Appendix C), sentence dictations, and two Curriculum Based Measurement writing probes.

Dependent Variable

The accuracy of spelling targeted irregular words is the dependent variable in this study. Correct spelling is defined as writing the appropriate letters in the accurate sequence each time the word is spelled. Irregular words are those which do not follow regular orthographic-phonologic mappings (i.e. letter-sound correspondence) and cannot be spelled accurately by segmenting the sounds (Johnston, McGeown, and Moxon, 2014). Words such as *what*, *because*, *your*, *there*, and *people*, have unusual spelling patterns and are examples of irregular words. A complete list of the irregular words used in this study can be found in Appendix C.

Independent Variable

A multi-sensory spelling technique will be implemented to examine the effects of the instructional strategy on the ability of students with dyslexia to spell irregular (non-decodable) words. This method was adapted from the Institute for Multi-Sensory Education's instructions of teaching a Red Word (2008).

A Red Word is defined as a word that does not follow typical spelling patterns, cannot be decoded (sounded out) and relies on memory and orthographic processing in order to be spelled correctly. In this instructional procedure, the teacher introduces a word in both oral and written format, the student traces the word while orally spelling the word, the student checks for accuracy, writes the word from memory, and uses the word in an original sentence. Protocol for this instructional method can be found in Appendix A.

Experimental Design

For measuring the effect of a spelling intervention on the ability of students with dyslexia to spell irregular words, a multiple baseline design across word sets will be implemented. This design allows for the measurement of the efficacy of the independent variable without unnecessary, continuous baseline measures. The ability to spell a particular set of words does not require a prolonged and continuous baseline measure. Furthermore, learning to spell a word is an ability that cannot be withdrawn and multiple baseline design does not require withdrawal of the intervention. Finally, this design can be easily implemented in a school setting, across several participants to increase validity.

Procedures

General procedures. All pre-assessments, baseline, intervention, and post-assessments will take place in the student's regular school during regular school hours. Prior to the baseline of the study, a pretest will be administered in a one-hour session requiring students to spell 40 irregular words randomly chosen from the Irregular Word Test (Shefelbine, 1999). Each participant's word list will be based upon results of the pretest. Word lists will be broken into three sets of three words each. A grade appropriate Curriculum Based Measurement writing probe will also be administered to each student during a separate 30 minute session before baseline procedures begin. This sample will serve as an example of each students' spontaneous writing and this sample will be analyzed for correct spelling of irregular words.

After pretest procedures the study can be broken down into three phases for each set of words: a) baseline phase, b) intervention phase, and c) generalization phase. During the baseline phase, spelling instruction will follow the same structure that the teachers followed before the study began. No new instruction will be provided, but the researcher will take measurement of

each student's ability to spell his/her targeted irregular words in the form of dictations to ensure that students do not already have the ability to spell the targeted words.

The intervention phase will include instruction of each set of three targeted words as well as spelling probes. Instructional sessions will continue until all words have been taught and data are stable. During the generalization phase of each set of words, spelling probes following the same structure during previous phases will be administered to determine if the ability to spell the targeted irregular words is maintained without instruction. A Curriculum Based Measurement writing probe will also be administered post generalization to provide a sample of post spontaneous writing. As in pretest procedures, the sample will be analyzed for irregular word spellings.

Baseline Measures. A baseline phase will be established for each of the three sets of words, for each student. During each baseline phase no new or additional instruction of spelling will be provided. Each session will begin with the researcher providing the student with paper and a pencil to complete the spelling probe. Each spelling probe will consist of decodable sentence dictations created by the researcher that contain the irregular words being targeted for spelling. Each sentence will be dictated to the student, the student will repeat the sentence once with the instructor, and then repeat the sentence a third time independently. If the student requests, the instructor can repeat the sentences as many times as is needed for each student to write all the words necessary to complete each sentence. The spelling probes will be administered a minimum of three times on three separate days, or until the data is stable to determine baseline.

Intervention. Instruction of each set of red words using a multisensory approach is the focus of the intervention phase. The teacher will hand each student a red crayon, fabric screen, and three sheets of red word paper, one for each word. Instruction will begin with one word. Exact protocol for teaching a red word can be found in Appendix A. The word will be introduced both visually and verbally by the instructor. The student will place the red word paper on top of the screen and copy the word onto the paper with the crayon. Using the screen underneath the paper is intended to provide sensory reinforcement of the letter formations in each word as the students are able to feel the letters they created. The student will go through a series of tracing the words with his/her fingers while spelling each word aloud. This is repeated until the student believes he/she is ready to spell the word from memory. The student then flips her/his paper over and attempts to write the word for memory, compares the word to the teacher's and repeats several times. The final step in the Red Word technique is for the student to create an original sentence using the targeted word. This instruction is repeated for each word in the set.

Generalization. The final phase of this study will mimic the baseline measures for each of the three sets of words. No instruction will be provided but the instructor will administer spelling probes consisting of new sentences containing the targeted words. The purpose of this phase is to ensure that the ability to spell the irregular words are a result of the multisensory intervention.

Data Collection and Analysis

Dependent Variable. Interobserver agreement will be collected across all participants for at least 33% of the sessions. For each spelling probe, a data collection sheet containing each of the participant's targeted words will be utilized for scoring correct spelling (see Appendix B).

A sentence containing the correct spelling of the targeted word will earn a "1" and a sentence containing an incorrect spelling of the targeted word will earn a "0". No other aspects of the student's sentence will be corrected. To ensure reliability, the first evaluator will score the spelling probe separately from the second evaluator and neither will mark on the student's work.

Independent Variable. Fidelity of the red word intervention will be collected to ensure that the intervention is implemented in the way in which it is intended. The researcher will be observed for a minimum of 25% of the sessions across students. Fidelity will be measured by observing the researchers' behavior follows a checklist of the specific steps listed in the Protocol for Teaching a Red Word that is listed in Appendix A.

Social Validity. Spelling is important not only because of societal expectations, but the reciprocal relationship between reading and spelling, as well as writing and spelling, and are just cause for providing direct spelling instruction. Social validity measures in the form of teacher and student interviews will align with the aim of this study, measuring the effectiveness of a spelling instructional strategy. Teachers and students will be asked to rate the spelling strategy by its perceived efficacy, practicality, implementation, cost effectiveness, and level of enjoyment to determine the level of social validity this study provides.

Appendix A

Instructional Protocol for Teaching Red Words

Introduction of Word

Teacher:

1. Remind student that a red word cannot be sounded out (either as a statement or through questioning).

2. Write the word on a white board in red letters, state the word aloud, spell the word aloud while pointing to each letter, restate the word aloud while underlining the word with fingers. (If the word is multisyllabic than the teacher will also break the word into syllables).

3. Orally provides two-three sentences using the word in context.

4. Asks the student to repeat what the word is.

Learning of Word

Student:

a) Copies word onto red word paper (see image --) on top of screen, using a red crayon. (If multisyllabic have student draw scoops under each syllable).

b) Using writing finger, trace crayon bumps verbalizing each letter, and say the word aloud while underlining whole word with finger (repeat 3 times)

c) Place screen on top of paper, trace letters while verbalizing, and say the word aloud while underlining whole word with finger (repeat three times).

Demonstrating Understanding

Teacher:

Remove white board out of site.

Student:

Flip Red Word paper over and place screen to the side. Using a pencil, write word once on top line.

Teacher:

Show the student the red word on the white board and ask student to check to see if the two words match. If incorrect, repeat student step b or c. Before proceeding to independent writing.

Student:

a) If line 1 is correct than repeat writing and checking on lines 2 and 3.

b) When all three lines have been written correctly, write an original sentence and underline the Red Word with red crayon.

c) Read sentence aloud to teacher while checking spelling of Red Word.

Teacher:

Assist student checking of accurate spelling of Red Word. Sentence correction should focus upon correct spelling of Red Word.

Appendix B

Red Word Recording Sheet

1=correct, 0=incorrect

Student Name_____ Scorer Name_____

Red Word	Session #	Session #	Session #	Session #	Session #	Session #
1.						
2.						
3						
4						
5.						

Appendix C

List of Irregular Words

(Bertin & Perlman, 1993: Shefelbine, 1999)

the	one	would	water	put	world
of	what	other	very	again	want
a	were	into	word	once	different
to	there	two	where	great	together
you	your	could	most	should	school
was	their	been	through	give	head
are	said	who	another	something	enough
they	do	people	come	thought	sometimes
from	many	only	work	both	four
have	some	find	does	often	warm

References

Bertin, P., & Perlman, E. (1993). Preventing academic failure: A multisensory curriculum for teaching reading, spelling and handwriting in the elementary classroom [Teaching Manual]. Retrieved from http://www.PAFprogram.com

Conrad, N. (2008). From reading to spelling and spelling to reading: Transfer goes both ways. *Journal of Educational Psychology*, *100*(4), 869-878. doi: 10.1037/a0012544

Hochstetler, E., McLaughlin, T. F., Derby, K. M., & Kinney, M. (2013). The Effects of cover, copy, and compare to teach spelling to middle school students with learning disabilities and OHI. *Educational Research Quarterly*, *36*(4), 25-48

Howard, S., DaDeppo, L., & De La Paz, S. (2008). Getting the bugs out with PESTS: A mnemonic approach to spelling sight words for students with learning difficulties. *Teaching Exceptional Children Plus 4*(5), Article 3.

Institute for Multisensory Education (2008). A Multi-sensory Reading Methodology [Teacher Training Manual]. Retrieved from www.orton-gillingham.com

Johnston, R., McGeown, S. and Moxon, G. E. (2014), Towards an understanding of how children read and spell irregular words: the role of nonword and orthographic processing skills. *Journal of Research in Reading*, 37: 51–64. doi: 10.1111/jrir.12007

Luba, V. (2015, February 9). Retrieved from The Atlantic: http://www.theatlantic.com/archive/2015/02/how-the-english-language-is-holding-kids-back/385291/

Marshall, J. C. & Powers, J. C. (1969). Writing neatness, composition errors, and essay grades.

Journal of Educational Measurement, *6*, 97-101.

Moats, L. C. (1999). *Teaching reading is rocket science*. Washington, DC: American Federation of Teachers.

Moats, L. C. (2005). How spelling supports reading. *American Educator, 29*(4), 12-22, 42-43.

Moats, L. C. (2009). Knowledge foundations for teaching reading and spelling. *Reading and Writing, 22*, 379-399.

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

Rose. J. (2009). Identifying and teaching children and young people with dyslexia and literacy difficulties [An independent report for the British secretary of state for children, schools, and family. Retrieved from http://www. http://webarchive.nationalarchives.gov.uk

Sayeski, K. L. (2011). Effective spelling instruction for students with learning disabilities. *Intervention In School & Clinic, 47*(2), 75-81. doi:10.1177/1053451211414191

Salinger, T. (2003). Helping older, struggling readers. *Preventing School Failure*, *47*, 79-85.

Shefelbine, (1999). Irregular Word Test. Retrieved from http://www.reg8.net/users/0012/docs/iiirregwords10_06.pdf