

## **The Use of Multisensory Approaches during Center Time, through Visual, Auditory, and Kinesthetic-Tactile Activities, to Enhance Spelling Accuracy of Second Grade Students**

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### **Abstract**

*Learning to spell is an essential skill for students to acquire at a young age. Historically, students used rote memorization to practice spellings words for a weekly test (Joshi & Aaron, 2005). Rote memorization may help students enter information into short term memory, but, using an active multisensory approach enhances the transfer into long term memory (Schwed & Melichar-Utter, 2008). The intention of this study was to determine if multisensory activities enhanced spelling accuracy on weekly tests. Through different activities that involved multiple senses, such as textured writing and Wiki Sticks, second grade students practiced weekly spelling words during language arts center time. Weekly pre and posttests, observational checklists, and open-ended questionnaires were used to triangulate data. The results of this data suggested that using multisensory activities may have helped to improve student spelling accuracy as students conveyed that they enjoyed using multisensory activities and welcomed their continued use.*

Teaching students to spell is a central part of any language arts program as it provides the foundation for reading success through the awareness of phonemes and letter patterns (Birsh, 2006; Carreker, 2005; Moats, 2005; Rogers, 1999). Students typically use rote memorization to practice spellings words for a weekly test (Joshi & Aaron, 2005) with the ultimate goal of committing proper spelling into long term memory. However, solely using rote memorization may not be the most successful method for some children (Moats, 2005). Rote memorization may aid in entering information into short term memory, but, using a more active multisensory approach may enable the transference of information into long term memory (Schwed & Melichar-Utter, 2008). Because multiple senses are involved in a multisensory approach, the spelling accuracy of students may be enhanced with a better chance for retention and retrieval of that information (Henry & Hook, 2006). Thus, multisensory instruction links two or more of the visual, auditory, tactile, or kinesthetic learning modalities simultaneously (Birsh, 2006; Donnell, 2007; Henry & Hook, 2006; Moats & Farrell, 2005; Rogers, 1999).

For example, students can trace sandpaper letters while orally stating the letter names. Through the use of this multisensory activity, connections are made with what students see, hear, touch, and do (Henry & Hook, 2006). When multiple modalities are used, there is a greater opportunity for students to successfully retain accurate spelling because more pathways to long term memory have been established (Rogers, 1999; Schwed & Melichar-Utter, 2008).

As elementary children learn to read and write, spelling is an important component that needs to be taught directly (Carreker, 2005; Moats 2005). Many words follow patterns and rules and can be easily taught. However, some words in the English language are considered irregular (Carreker). For those words, students need to be provided alternative strategies to aid in memorization (Moats & Farrell, 2005). This study was conducted to investigate whether the use of multisensory literacy centers in a second grade classroom would improve spelling accuracy. Since students have different learning styles, teachers need to deliver lessons in diverse ways.

### **Literature Review**

As early as 2300 BCE, students were learning to write in multisensory ways (Henry & Hook, 2006). Mesopotamian scribes traced existing signs as well as practiced writing from memory.

Early Greek and Roman scholars are referenced as encouraging multisensory avenues of instruction through the use of letter models, engravings, and finger tracings. Charlemagne in the 8<sup>th</sup> century and Locke in the 17<sup>th</sup> century were noted as having encouraged the use of the kinesthetic modality to teach reading (Henry & Hook).

In the 1880's, the use of the McGuffey's Eclectic Readers introduced the design of using multiple methods of instruction. Teachers could instruct using the Alphabet Method (focusing on the letters that make up a word), the Phonic Method (focusing on the sounds that make up a word), or the Word Method (memorizing the word as a whole) alone or in combination (Henry & Hook). Montessori presented the idea of having children trace sandpaper letters to combine the visual and tactile modalities for alphabet recognition (Henry & Hook). Fernald formalized the method often referred to as the VAKT (visual, auditory, kinesthetic-tactile) method. Orton expanded upon Fernald's work to incorporate a stronger phonetic component (Henry & Hook). Orton collaborated with Gillingham and Stillman to structure his ideas for use in the classroom. The result was *The Gillingham Manual*.

The Orton-Gillingham approach developed as a result of extensive work with dyslexic students (Gillingham & Stillman, 1997; Henry, 2003; Henry & Hook, 2006; Moats & Farrell, 2005) and is based on the principle of multisensory teaching linking learner visual, auditory, tactile, and kinesthetic receptors to make sense of the printed word (Moats & Farrell). For example, students are presented with visuals, such as puppets or hand motions that help them learn and remember short vowel sounds. When students see that visual cue, it helps to trigger the memory of the corresponding sound. Other programs following the Orton, Gillingham, and Stillman method for struggling readers and writers are Project Read and the Wilson Language Program (Birsh, 2006; Moats & Farrell, 2005).

### ***Spelling***

Learning to spell is a process which children must develop in a gradual and systematic way (Joshi & Aaron, 2005). There are four stages in the spelling process. Beginning spellers do not yet know how to separate sounds or understand the purpose for different letters. These children are in the "pre-alphabetic" stage (Gunning, 2008; Moats, 2005). The next stage is the early alphabetic stage. Children at this point understand that letters represent sounds. However, they will only represent a few of those sounds such as beginning and ending consonants (Gunning; Moats). At the late alphabetical stage, children are writing words phonetically, understanding that words need a vowel, and that some sounds are made by various letter combinations. The final stage of spelling is the conventional stage. At this point, the speller has a strong sense of phonemic awareness, the various rules that govern the English language, and a working knowledge of irregular words (Gunning; Moats).

Children must master many components to become skilled spellers (Moats, 2005). They need to discriminate vocalized sound, recognize the various phonemes, and then transfer the phoneme to a grapheme, the visual representation of a phoneme (Moats). For example, after a teacher says the word cat, a child hears the word cat, hears a sound, decides which letter represents that sound, and finally writes c-a-t on the paper. Next, students must learn that some words do not follow a phonetic pattern or spelling rule (Moats). For example, the words *the* and *was* cannot be sounded out phonically. Rather, their spelling needs to be learned as a unit.

Carreker (2005) classifies words into three spelling categories. The first category is regular words. These words have letters which clearly represent the sound heard such as *hen*. The next category is rule words, which like regular words are spelled the way they sound but may also follow a specific pattern. One example is the doubling of a final consonant of a short vowel word like *hit* before adding an inflected ending to make *hitting*. The last category is irregular words. These are more difficult to spell because the written word does not match the pronounced word, thus, the spelling of these words needs to be memorized.

### ***Spelling and Multisensory Instruction***

Multisensory instructional practices are techniques used to engage multiple sense receptors simultaneously as students learn and practice language skills (Birsh, 2006; Carreker, 2006.) Using visual, auditory, kinesthetic, and tactile methods for instruction may help students who learn best through differing modalities (Schwed & Melichar-Utter, 2008). Students who use multisensory activities during spelling instruction may enhance their spelling accuracy because the greater the number of senses involved in the learning process, the greater the chance for retrieval and retention of that information (Henry & Hook, 2006).

Inherently, spelling is a multisensory activity as spellers receive an auditory message which is then transcribed to a visual representation in written form (Carreker, 2005). Schwed and Melichar-Utter (2008) proscribed specific activities including flashcards, mnemonics, audio taping, and textured writing. When using these techniques, the spelling of a word is received through multiple senses.

For example, when students engage in textured writing, they see a word, use a crayon to copy it, then trace over the raised surface with their fingertip while orally spelling the word. They are seeing, feeling, and hearing the spelling of the word. Rogers (1999) suggested Spelling Cheerleading as an activity that incorporates three modalities. The students see the spelling word, hear the letters chanted, and physically move their bodies to go with the letter patterns. Because multiple modalities are used, there is a greater chance for students to effectively retain accurate spelling (Rogers).

Therefore, for this study, multisensory spelling activities were designed to analyze their effectiveness in increasing student spelling accuracy. Because spelling is a complex skill that requires regular practice (Hayes, Kessler, & Treiman, 2005), young children need multiple exposures to words to master their spelling. Multisensory activities may be one possible way to achieve this (Carreker, 2006).

### ***Methodology for Action Research***

To evolve as professionals, educators must participate in action research (Hendricks, 2009). Action research is a study implemented by educators within their school community focusing on an area of need (Hendricks). As data is collected within a teacher's classroom, he or she becomes the decision maker and is empowered (Mertler, 2009). Thus, the result is taking action based on findings and gaining an understanding to effect positive change (Mills, 2011).

### ***Participants***

This study was conducted in a school district located in an upper/middle class suburban community outside a large metropolitan area. The participants in this study were second grade students, ages 7 – 8 years old, in a K-2 elementary school. The second grade class consisted of 22 students. However, only 20 students, 9 boys and 11 girls, were included in the study because 2 students received their language arts instruction in a Resource Room setting. Of the 20 students, 3 were in the gifted and talented program, 2 received Basic Skills instruction for language arts, and 15 were working on grade level. Of the two researchers of this study one was also the teacher of the class.

### ***Materials***

Three data collection instruments were implemented. First, pre and posttests for the weekly spelling words were completed for each of the 6 weeks of this study. As an example of a formative assessment, using a pretest baseline helps the teacher and student know spelling words that need to be practiced, thus, producing a benchmark (Glanz, 2004) and providing the teacher with an opportunity to make any adjustments to instruction (Mills, 2011). The summative nature of a posttest allows the teacher to assess learning (Hendricks, 2009). The second form of data collection was observational records. Observational data provides the researcher with the *why* an activity was or was not successful (Hendricks) by gathering data about actual student actions and behaviors (Mertler, 2011) that may affect outcomes. This teacher researcher observed students as they completed the spelling activities. Observation records were kept throughout this study (Hendricks, 2009) and included detailed information on subject behavior as well as a 1 to 3 score of overall engagement. The spelling activities varied in duration from 10 to 20 minutes. A student received a 1 if he or she was not focused on the task or needed to be redirected for more than half of the time, a 2 if he or she was focused on the task more than half of the time, and a 3 if most or all of the time he or she was focused on the task.

The final method was an open ended questionnaire. The questionnaire allows a researcher to gather information from all participants (Hendricks, 2009) and offers unexpected thoughts and feelings from them (Mertler, 2011). Participants were asked 6 questions regarding their feelings about the multisensory spelling activities. To protect the confidentiality of all participants, once the data was collected, participant names were replaced with numbers, so that the results could be analyzed anonymously. At no point in this study or in the written report were names used.

The researchers of this study collected and analyzed data using a mixed methodology approach to provide for triangulation and the opportunity to collect quantitative and qualitative data (Hendricks, 2009). Triangulation was achieved by collecting multiple forms of data through pre and posttests, observational data, and an open ended questionnaire. Using triangulation may increase the validity and reliability of the data collected during the study (Hendricks) as students engaged in multisensory spelling activities during center time to improve their spelling accuracy. Using more than one data approach may give a problem more accurate data, provide a complete understanding of the given problem (Glanz, 2004; Mertler, 2011), and confirm that data represents what is actually being measured (Mills, 2011).

### ***Framework of the Study***

Prior to this study, these second grade students were instructed in proper behavior during center time. Dependent upon the activities, students were expected to work independently or with a partner on literacy activities while this teacher researcher taught small group, guided reading lessons. The study occurred in a language arts class over a 6 week period. Spelling words were supplied from the district approved language arts program, *Treasures* (Bear, et al., 2007). In each of the first 5 weeks of the units, students were presented with a new list of 15 spelling words. Ten words were based on the phonics skill taught that week, 2 words were review words based on the previous week's skill, and 3 words were high frequency/sight words. The sixth week was a unit review week. During this study, participants were required to visit the spelling center at least once each week. Time spent at each center differed based on each activity and student engagement.

On the first day of each school week, the students completed a spelling pretest. Lessons and activities were presented throughout the week. Instructions for each activity were given and modeled. The students worked on centers Monday through Thursday and were given the weekly spelling test on Friday. For 6 weeks, this teacher researcher observed a previously determined group of randomly selected students during center time as they engaged in the targeted multisensory spelling activities (see Table 1).

**Table 1: Multisensory Activities**

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*Textured Writing* – a piece of paper listing words is placed on top of a plastic needlepoint canvas. Using a crayon, each word is traced. The paper is removed leaving raised tracings of the words

*Wiki Sticks* – wax covered strings used to form each spelling word

*Shape Writing* – outline of each word where students connect the word to its shape

*Whisper Phones* – small plastic headsets in which a student whispers into the mouthpiece and hears his or her spelling of the word amplified

*Skywriting* – large motor movements using the dominant arm to spell each word

*Human Typewriting* – a large scaled keyboard recreated on a bed sheet

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During week 1, students engaged in Textured Writing after completing a pretest. Students placed a piece of paper listing the spelling words on top of a plastic needlepoint canvas. Using a crayon, they traced each spelling word 3 times. After, the paper was removed from the canvas and placed flat on a table. Using his or her pointer fingertip, each child spoke the letters aloud as it was traced 3 times. This teacher researcher observed the target students as they rotated through the center. A spelling posttest was given on Friday.

For the next 5 weeks, the process remained the same, however, the activities varied. The activity during the second week of this study was called Wiki Sticks. Students used wax covered strings to form each of their spelling words. After the words were formed, students used their fingertips to trace and recite the letters of each word 3 times.

During the third week of this study, students completed a Shape Writing activity. A worksheet included a word bank and the outline of each of the 15 spelling words. Working with a partner, students looked at each shape and determined which word would fit. After each word was placed in its shape, the students took turns reading a word to their partner and spelling it.

The activity for week 4 was called Whisper Phones. For this activity, students used whisper phones (small plastic headsets) to recite their spelling words. The students were provided with a list of the words. They spoke a word, recited each letter individually, and finally spoke the whole word again. Students read through the list at least twice.

For the fifth week of this study the students engaged in skywriting. For this activity, students made large motor movements using their dominant arm to spell each word. Again working in pairs, one student called out a word and checked the spelling as the other student “wrote” the word in the air. While skywriting, the student verbalized each letter as it was spelled.

For the sixth and final week of this study, students engaged in “Human Typewriting”. A large scaled keyboard was recreated on a bed sheet. In this activity, students worked in pairs. One student called out one of the 15 words and the other student jumped on the correct keys to spell the word. Students took turns being the caller and the jumper. On Friday, a posttest for the 15 high frequency/sight words was given.

On the last day of this study, all students completed an open-ended questionnaire pertaining to the six different activities engaged in during the prior weeks.

### **Results of Data**

Data from pre and post spelling tests, an open-ended questionnaire, and teacher observation were collected and analyzed to determine if multisensory activities used in a second grade classroom would enhance spelling accuracy.

The first method of data collection was pre and post spelling tests which measured student ability to spell assigned words. The tests were based on a total score of 15. Twenty students completed the spelling tests and all improved their spelling accuracy of the weekly words on the posttests (see Table 2).

**Table 2: Pre and Post Spelling Tests**

N=20	Pretest mean	Pretest Standard Deviation	Posttest mean	Posttest Standard Deviation
Week 1	12.55	2.31	14.55	0.94
Week 2	11.95	2.28	14.55	0.99
Week 3	12.50	2.06	14.65	0.81
Week 4	12.20	2.26	14.10	1.07
Week 5	9.95	3.20	14.10	1.45
Week 6	13.65	2.68	14.80	0.52

In week 1, the pretest mean score was 12.55 with a standard deviation of 2.31; the posttest results indicated that student knowledge improved as the mean increased to 14.55 and standard deviation decreased to 0.99. This increase in the mean and decrease in standard deviation indicates that all students improved. Similar results were found in weeks 2, 3, and 4. In weeks 2, 3, and 4, the pretest means were 11.95, 12.50, and 12.20 respectively and standard deviations of 2.28, 2.06, and 2.26 respectively. The posttest means all increased, 14.55, 14.65, and 14.10 respectively, and standard deviations all decreased 0.99, 0.81, and 1.07 respectively, thus, showing all students increased their knowledge of spelling words during these weeks.

The spelling words for week 5 were more difficult than in other weeks. That was evident in the low mean score of 9.95 on the pretest and the high standard deviation of 3.20. However, the posttest results revealed an increase in student performance with a 14.10 mean score and a decreasing standard deviation of 1.45. Week 6 was a review week. All of the words were high frequency words given in the 5 prior weeks. Only 4 students made more than 2 errors on the pretest resulting in a mean score of 13.65 and a standard deviation of 2.68. The posttest data revealed a mean score of 14.80 with a low standard deviation of 0.52. This data reveals that there may have been a strong level of retention of the spelling of these words.

The second method of data collection was observational records. Four preselected students were observed completing each of the weekly multisensory spelling activities (see Table 3).

**Table 3: Learning Center Observation Scores**

Scores	3	2	1
N=4			
Week 1	4	0	0
Week 2	3	1	0
Week 3	3*	0	0
Week 4	4	0	0
Week 5	2**	1	0
Week 6	4	0	0

\*1 student absent

\*\*1 student did not complete activity

During the first week, all four students received scores of 3 on the observational check list indicating that they were very engaged in the Textured Writing activity. They went directly to the activity, were focused on the task, and completed it quickly. During the second week, 3 of the 4 students earned a 3 on the checklist as each enjoyed the activity with the Wiki Sticks. The fourth student earned a 2 as he was somewhat distracted and did not complete the activity. For the third week, 1 of the selected students was absent several days and was unable to complete all of the literacy activities. The remaining 3 students each earned a 3 on the rating scale as they completed the Shape Writing Activity. The students were engaged, but the activity was completed quickly and with little excitement.

The activity for the fourth week was Whisper Phones. All observed students displayed a high level of engagement, once again earning a score of 3. Students appeared to be fascinated by the whisper phones which amplified their voices so a whisper is heard louder. For the Sky Writing Activity in the fifth week, 2 students were very engaged and earned a 3, 1 student was somewhat engaged and earned a 2, and 1 student did not complete the activity. The final activity was The Human Typewriter. All 4 of the selected students earned a 3. In this activity they were the most animated in their completion of the task when compared with other the activities.

The final data collection method, the open ended questionnaire, revealed that the students enjoyed the overall experience of using multisensory activities to practice their spelling words. Only 18 of the 20 students completed the questionnaire because 2 students were absent. When asked if they liked doing the activities that made them see, touch, hear, and do to practice spelling words, most responded positively. For example, one student stated, "I really liked them. They help me think more." Another said, "Yes, I liked them because they help you memorize the words in different ways." Only one student answered the question in the negative. He said, "No, because I love writing and spelling." This could possibly mean that he preferred paper and pencil tasks instead. Next, most students felt that these activities helped them learn their spelling words. One child responded, "I do think the activities helped me learn my spelling words because I can hear, touch, look and do them all and that sends messages to my brain." Another replied, "I think these activities helped because it made me get most of the spelling words right on my spelling test." Only 2 students answered in the negative. One replied, "No, because I already know how to spell these words." And the other said, "I did not. It is fun to see, touch and hear but you can't memorize the spelling words." This child may not have seen connection between these activities and long term memory. Therefore, the teacher must make sure that he or she clearly explains the connection between the activity and the reason for it.

Student answers varied as they responded to which one was their favorite activity. The Human Typewriter was the favorite of many respondents followed by Wiki Sticks. One student stated, "I like human typewriter because there is a lot of action." And another said, "Wiki Sticks, you can learn words and be creative." When asked which activity was their least favorite, answers varied as students selected Whisper Phones, Textured Writing, Wiki Sticks, and Skywriting. Some chose Skywriting as their least favorite because they complained that it made their arm tired or hurt. Students were required to move their arm in large motions to spell out each of the 15 spelling words. Other students chose Wiki Sticks as their least favorite for reasons such as "... you get sticky" and "...it takes a long time to do." A few students felt that Textured Writing was boring and hard to write on the bumpy surface and others stated that Whisper Phones were their least favorite because "...all you did was say the words to yourself."

Next, many students responded that working with another student helped them learn their spelling words. One student said, “Yes, because it was fun working with a friend and they taught me new things.” Another stated, “I did like working with other students because I feel better that I know that someone is helping me.” A couple disagreed as one student commented, “I didn’t like working with other students because it was hard to focus with your friend.” While another said, “Not really because you are just doing it with a friend. You should give yourself confidence and do it yourself because maybe a friend would tell you the answer.”

Every student wanted to continue using these multisensory activities to practice their spelling words. Comments were all positive such as, “I would love to continue these spelling activities because it was fun practicing in the classroom”, “Yes, because they are fun and they help us study”, and “Absolutely!!!! They are very good ideas that you came up with. Thanks so much!!” It is clear from this data that the students would welcome additional multisensory activities in the future.

### ***Analysis of Data***

Using the triangulation of the data in this study, multisensory activities may have been one factor that helped students learn weekly spelling words. Pre and posttest scores illustrated that all of the students improved their accuracy of the assigned words. For each week, the mean increased while the standard deviation decreased. Moreover, the observational data suggested that most of the students were engaged while completing the multisensory activities. In all but 2 weeks, each of the observed students scored a 3 on the observational checklist. Such engagement may be a factor for improvement in spelling accuracy. If students are engaged in an activity, they are focusing on the material. Repetition of material may help to create additional pathways to long term memory.

The open-ended responses also suggested that multisensory activities may have been one factor that helped to increase student accuracy with spelling. One student stated, “I believe these activities did help me learn my spelling words because I tried different things to help me remember.” The data from the responses revealed that all students wished to continue the multisensory activities in the future. All of the activities were selected as a particular favorite from at least one student. Thus, student engagement and enjoyment may be another factor in achievement. Using multisensory spelling activities was one strategy that enabled second grade students to master weekly spelling tests.

### ***Limitations***

There were a few limitations experienced during this study. One limitation was the small sample size for the observational data. It was also difficult for this teacher researcher to observe the participants the entire time due to the fact that she needed to conduct guided reading lessons concurrently. Another limitation was the fact that students could have also practiced their spelling words at home. It is, therefore, impossible to conclude that it was solely the multisensory activities that aided in retention of spelling accuracy.

### ***Discussion***

Rogers (1999) and Schwed and Melichar-Utter (2008) assert that there is a better opportunity for students to successfully retain accurate spelling when multiple modalities are used because a greater number of pathways to long term memory have been created. Data revealed that all students increased their accuracy of their spelling words by the end of the week. Results each week revealed that the mean scores increased while the standard deviations decreased. One reason may have been these activities reinforced language arts lessons throughout the weeks. In addition, most students were highly engaged in the various activities. Throughout four of the weeks, the observed children all earned a 3 on the observational checklist. Only during weeks 2 and 5, did some students display less engagement. In addition, most indicated on the open response questionnaire that they wished to continue practicing their spelling words in multisensory ways.

Research suggests that when students practice skills in an interactive, multisensory way, they are more fully engaged (Carreker, 2005). This was evident as students commented, “Yes, I did enjoy doing a lot of the activities because it was obvious that it was great fun to use some of our senses to practice spelling words.” And “Yes, I would like to continue the spelling activities because they were fun and I liked to try new activities.” The observational data also demonstrated that most students remained engaged during these activities. They were animated and focused as they completed the tasks in a timely fashion.

### ***Implications for Teaching***

These researchers believe that using multisensory activities had a positive impact on students for practicing and learning their spelling words. By using these multisensory avenues, students were engaged in activities, which may have helped create multiple paths to the brain to store knowledge in long term memory (Schwed & Melichar, 2008). Next, the students enjoyed working through these centers and would welcome similar tasks in the future. The multisensory activities, as students reported, brought excitement to spelling, a topic that historically has been practiced by rote memorization.

Overall, all students increased their accuracy from the pre to the posttests. In addition, the review test in week 6 revealed that students retained knowledge of the high frequency/sight words. They enjoyed the different activities and remained engaged, thus, this teacher has continued to use such activities and is continually developing additional ways students can study in multisensory ways. Suggestions to parents can be made for ways they can create multisensory opportunities to practice spelling at home. A PVC elbow pipe can easily become a whisper phone and Wiki Sticks and plastic needle point canvases are inexpensive manipulatives. Because it worked so well with spelling, increasing opportunities for multisensory learning in all disciplines should be explored. The Human Typewriter was a favorite among students, and one can envision creating a Human Calculator or Number Line to use during math. Students could also use whisper phones to recite their math facts.

The purpose of this study was to determine if multisensory activities would improve spelling accuracy of second graders on their weekly assigned spelling words. The data revealed that multisensory activities may have been one factor to help students spell these words correctly. Posttest scores improved as compared with pretest scores and students were interested in completing the tasks and would welcome the continued use of multisensory activities.

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