

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

ETC 693 Master Project

Kindergarten Letter-Sound Fluency and Multi-Sensory Intervention

Zina Hurd

Submitted to the

Graduate School of Education

City University of Seattle

In Partial Fulfillment of the Requirements

For the Degree of Master in Teaching

I give permission to City University to store and use this MIT Project for teaching purposes.

Submitted by Zina Hurd 06/09/2018
Candidate's Name Date

Table of Contents

Abstract	5
Introduction	6
Dilemma	8
Rationale	9
Literature Review	12
Questions	21
Purpose	21
Methodology	22
Context	22
Participants	22
Intervention	23
Data Gathering Instruments/Assessments	24
Results	25
Discussion	40
Conclusions	40
Implications	42
Limitations	43
Recommendations	44
References	46
Appendices	51
Appendix A: Letter-Sound Fluency (LSF) One Minute Timed Test	51
Appendix B: Student Voice/Reflection on Multi-Sensory Intervention	52

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION	2
Appendix C: Example of Multi-Sensory Intervention Using Sand	53
Appendix D: Example of Multi-Sensory Intervention Using Shaving Cream	54
Appendix E: Example of Multi-Sensory Intervention Using Salt	55
Author Note	56

Tables

Table 1: Full Class Number of Letter-Sounds Correct in 1 Minute Data Chart	28
Table 2: Full Class Accuracy Percentage Data Chart	32
Table 3: Full Class Average Time Per Letter Response Data Chart	36

Figures

Figure 1: Average Number of Letters Correct in One Minute Graph	29
Figure 2: Average Accuracy Percentage Graph	33
Figure 3: Average Time Per Letter Response Graph	37
Figure 4: Overall Results: Average Time Per Response with Accuracy Percentage	38

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Abstract

This action research study tracks the letter-sound fluency of 21 kindergarten students from an upper middle class urban elementary school in the Pacific Northwest over an eight-week period. A multi-sensory intervention was established to practice letter sound fluency. A timed test was administered every two weeks to determine how the number of sounds students could say correctly in one minute was impacted by the intervention. Results from the intervention show that the average number of sounds correctly produced in one minute increased from 18 to 23, accuracy percentage increased from 80% to 92%, and the average time per letter response improved from 2.63 seconds to 1.50 seconds. These results, including students' positive responses about the process, suggest multi-sensory intervention is promising for literacy growth in kindergarten.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Introduction

Students must become fluent in reading not only to succeed academically and professionally (Ritchey, 2008) but also to communicate on a daily basis. Achieving reading fluency is not easy. There are multiple aspects of fluency, and according to Reading Rockets (2016), fluency is the ability to read with speed, accuracy, and proper expression. Comprehension is also a part of reading fluency, but speed, accuracy, and expression are necessary to achieve before students can read for comprehension. A focus on comprehension and reading with understanding takes place mostly in upper elementary grades, with primary grades spending time on early reading skills such as phonemic awareness tasks and phonics (letter-sound correlation) instruction. Phonemic awareness in kindergarten predicts growth in word reading ability in the future (Torgensen, Wagner, & Rashotte, 1994). Phonemic awareness provides the link between spoken language and written language that children need to become readers (Birsh, 2011). It is the “awareness of the smallest units of sound in the speech stream and the ability to isolate or manipulate the individual sounds in words” (Birsh, 2011, p 713). Letter-sound fluency (LSF) is an essential part of phonics and phonemic awareness instruction (Birsh, 2011). LSF, in which students can identify and pronounce the sound of each letter of the alphabet with accuracy and speed is a type of fluency that primary grades can work on and master as early as kindergarten.

An early indication of reading difficulties can help us provide targeted and specific instruction and intervention as early as kindergarten. In primary grades, assessing LSF is necessary to evaluate the reading progress made by pre-readers and early readers to determine appropriate interventions. Many common reading tests that target fluency rely on full word recognition and are not suitable for students in kindergarten because pre-readers and early

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

readers are not at the stage of word recognition yet. LSF assessments focus on letter sound recognition, not full word recognition and can start in kindergarten. LSF is a reliable indicator of a student's later reading ability (Ritchey, 2004). The efforts of general education teachers to provide student-specific support can have a significant impact on struggling learners (Allington & Walmsley, 1995), and using LSF assessment can help determine which pre-readers and emergent readers could benefit from intervention as soon as possible.

Most students who are struggling with LSF need to have opportunities to practice letter-sound knowledge (LSK) in meaningful ways. The activities that students participate in while practicing LSK need to be engaging and move beyond standard flash card drill practice. Flash card drill practice is one method of memorizing facts, but it does not offer young students opportunities to play or have fun while learning. One promising intervention that allows students to practice LSK and have fun at the same time uses multi-sensory techniques. The term multi-sensory is used to refer to any learning activity that combines two or more sensory strategies to take in or express information (Sayyed Obaid, 2013). Simultaneous multi-sensory teaching "is done using all learning pathways in the brain, visual, auditory, kinesthetic, tactile simultaneously to enhance memory and learning" (Birsh, 2011, p 19). Tactile multi-sensory interventions in literacy that involve writing are especially of interest for primary grades because, "research has shown that writing letters facilitates perception of letters in learning to read" (Berninger & Wolf, 2016, p 63).

One example of a multi-sensory activity targeting LSF is having students actively trace letters in shaving cream while orally producing the sound each letter makes after hearing the sound modeled as they look at the letter. This activity is tactile because it engages students with their sense of touch as their fingers feel the shaving cream. It involves writing as it engages the

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

hands and fingers with the task of forming each letter. Students are auditorily engaged as they listen to the sound pronounced and repeat it back. Students are visually engaged as they look at the letter while tracing it and by looking at their completed letter after tracing it.

The purpose of this study is to evaluate how the implementation of a multi-sensory intervention can support kindergarten students' development of letter-sound knowledge and improve their LSF. A full class will participate in the study, all with varying levels of literacy abilities. The study will evaluate the success of all readers while focusing on the impacts both to struggling readers and advanced readers as well as students' overall attitudes about the multi-sensory interventions.

Dilemma

Struggling readers are prevalent in schools in the United States and are at a disadvantage because literacy and reading skills are necessary throughout the entire school day. Despite national government efforts to help struggling readers such as Response to Intervention (RTI), schools in many cases are failing to address the needs of struggling readers (Allington & Walmsley, 1995). RTI is a federal initiative that was part of the reauthorization of Individuals with Disabilities Education Act (IDEA), with the purpose of preventing the escalating number of students identified as students with disabilities based on their struggles with reading (Allington & Walmsley, 1995). RTI itself is relatively broad, with room for schools to interpret interventions as they see fit; however, most have adapted the three-tier model of intervention and support that Washington state uses (Allington & Walmsley, 1995).

The purpose of RTI is to provide targeted, specific instruction to each student based on their individual needs (Allington & Walmsley, 1995, p x). To successfully implement RTI, one must first understand the needs of each student. It can be challenging to meet the specific needs

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

of kindergarten students in the area of reading fluency because their range of literacy development varies as a result of prior knowledge and exposure to books.

Some students have read over 1,000 books while others have read only a handful (Allington & Walmsley, 2009). Some kindergarten students do not have access to books at home, and also do not take advantage of the books that they can borrow from school. Others, however, trade in books for new books every day and read every night with their parents. Reading and exposure to books greatly impacts vocabulary (Allington & Walmsley, 2009). Kindergarten students without access to books have smaller vocabularies while kindergarten students who read often at home have extensive vocabularies (Allington & Walmsley, 2009). Some students enter kindergarten having mastered the majority of their LNK and LSK, while others enter with no knowledge of either. Preschool or lack of preschool can also impact students' vocabularies, LNK, and LSF. Thankfully, evidence shows that regardless of a student's vocabulary or exposure to books, we can create "kindergarten classrooms that that reduce, or expand, these initial differences" (Allington & Walmsley 2009, p 23).

Rationale

Our efforts to meet students' needs and provide intervention to struggling readers is essential not only because of efforts like RTI but also because it is our duty as educators. It is evident that time spent in active writing and reading is essential for students to make accelerated development in literacy skills (Allington & Walmsley, 1995). Teachers must create classrooms that encourage students to practice these skills in a sustained fashion. Unfortunately, many of the students who need to develop these skills and make significant gains in literacy development such as special education students are the least likely to be asked to read and write (Allington & Walmsley, 1995). Before students can read and write, however, a focus on necessary reading

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

skills such as LSF needs to be made a priority so students will not start their literacy journey behind their peers. Even more important, is identifying those students who are at risk in necessary reading skills and providing early intervention.

Studying methods of intervention that are exciting and interesting for kindergarten aged students can help us better understand how to help these early readers thrive, and in some cases, catch up and set their reading foundation for the rest of their school career. The ability to think about and manipulate individual sounds is an essential reading task called phonological awareness. Phonological awareness is defined as “both the knowledge of and sensitivity to the phonological structure of words in language (Birsh, 2011, p 713). Phonological awareness is critical to notice and manipulate sound segments in words and is the foundation for syllable counting and detecting first, middle, and last sounds in words. Without the ability to manipulate individual sounds, readers might fall behind or in some cases never catch up to their peers (Birsh, 2011). If the aim is to produce students that can read and write in any sustained fashion, a strong foundation in phonological awareness needs to be a focus of education in primary grades.

Many of the educational standards focused on in kindergarten involve phonological awareness tasks aimed to set a strong foundation in literacy early and there are two specifically that focus on letter-sounds. There is the kindergarten Common Core State Standard CCSS.ELA-LITERACY.RF.K.2 under the category of Phonological Awareness requires students to “demonstrate an understanding of spoken words, syllables, and sounds (phonemes)” (National Governors Association Center for Best Practices, [NGACBP], 2010). And the second, the kindergarten standard CCSS.ELA-LITERACY.RF.K.3.A, under the category of Phonics and Word recognition, requires students to “demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary sound or many of the most frequent sounds for each

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

consonant.” (NGACBP, 2010). Students in kindergarten need to master their letter-sounds to meet these standards and become future readers.

This study uses multi-sensory intervention to improve letter-sounds and LSF with kindergarten aged students. Multi-sensory activities are a beneficial intervention because they can be individualized to each students’ level to hold their attention and maximize on-task time. Multi-sensory activities can also be explicitly taught and modeled by the teacher. These are all qualities that are important for successful literacy instruction (Al Otaiba et al., 2008).

The specific multi-sensory interventions established in this study were tracing letters in shaving cream, salt, and sand. During each multi-sensory activity, students looked at a letter, listened to the letter-sound modeled by the teacher and produced the letter sound out loud. The multi-sensory interventions conducted in ten-minute small group sessions were planned in order to be targeted and more effective than full group instruction. Since LSF is an element of phonemic awareness and phonics instruction (Birsh, 2011), following principals that have worked in phonemic awareness and phonics instruction in the past was critical. Phonemic awareness is one part of the larger category of phonological awareness. Phonemic awareness is one of the most critical components of a comprehensive literacy program when it is taught in small groups and conducted in only small to moderate amounts (Birsh, 2011). Phonics instruction is also well suited for small groups. Phonics pays particular attention to letter-sound knowledge and focuses on developing automaticity or fluency for each student through direct and targeted instruction (Birsh, 2011).

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Literature Review

Reading fluency is one of the enormous hurdles students must tackle in early elementary school, and it is a process that can be chaotic and frustrating. Achieving reading fluency is ultimately one of the most rewarding accomplishments in a person's life, and it has a lasting impact on one's future success. As educators, we are aware of the power of the written word and the importance that reading plays in a student's life. Reading is especially critical for living in the information-based society in which we do today (Gunn, Smolkowski, & Vadasy, 2011). In today's world, we are inundated with text and reading through technology in the form of text messaging, email, and online platforms. To function and communicate effectively with today's technology, we all must be readers.

Most students learn to read in kindergarten and first grade. Fluency instruction starts in kindergarten with basic concepts of print, alphabetic principle, letter-sound relationships, and phonemic awareness. As we observe our students during these early years, we begin to monitor their progress through our observation, and we develop perceptions of students' success with reading based on these observations. Some of the clues we look for when we observe students are their sublexical skills. "Sublexical skills (letter identification, letter-sound knowledge, and phonological awareness) are necessary prerequisites for learning to read and the strongest correlates of later word reading" (Ritchey, 2004, p 374). The results from kindergarten studies prove that when reading instruction focuses on developing phonological awareness and alphabetic understanding it can strongly impact reading outcomes for both normally developing and at-risk children (Gunn et al., 2011, p 55-56).

One study conducted on first-grade students showed that students identified as at risk continued to struggle throughout the second grade (Speece & Ritchey, 2005). These students

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

were at risk because of their reading fluency. When compared with their typically achieving peers, these “at risk” students were reading on average less than half as many words per minute and their rate of words were growing at half the rate (Speece & Ritchey, 2005). These findings confirm that early identification of “at risk” students in developing reading fluency is critical because the reading gap that can develop as early as the second grade can be devastating.

There is considerable and compelling research confirming that children need high-quality reading instruction in kindergarten and first grade. Kindergarten and first grade are critical for reading development (Gunn et al., 2011). We know that the development of word reading skills and fluency differences begin early (Speece & Ritchey, 2005), but many of our reading assessments and the studies done about the validity of reading assessments focus only on upper elementary grades. Studying fluency tests in any grade can be challenging because not all fluency tests have the same focus on the same skills. Many fluency tests use full word recognition skills and according to Speece, Ritchey, Mills, and Hillman (2003, p 223), “most formal identification of students with reading disabilities, however, relies primarily on the use of IQ-achievement discrepancy formulas.”

Most studies that are investigating kindergarten children and their emerging writing abilities assess students’ ability to spell and use spelling as a predictor of future reading abilities. Some studies use interventions that include spelling as either the intervention or the outcome (Ritchey, 2008). This is problematic because spelling is an advanced skill for kindergarten students. Spelling can only be introduced once kindergarten students have a strong base in phonemic awareness. Studying spelling as an intervention or an assessment in kindergarten might work to assess advanced readers, but not if the goal is to identify struggling readers.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Assessment becomes an essential activity if schools wish to identify and provide early intervention to children who are at risk in literacy and underachieving in reading (Ritchey, 2008). Without appropriate and early assessment, struggling readers might not be identified until later grades. If struggling readers are identified in later grades, it is harder for them to catch up to their peers than if they were identified early and provided with appropriate supports and interventions immediately.

Many changes occur during each grade level, and students make leaps and gains every year regardless of their reading level. These giant leaps and changes during each school year make it essential to be able to collect short-term data on the development within each grade (Ritchey, 2004), instead of only focusing on long-term gains. A short-term gain refers to a specific skill or achievement that can be accomplished fairly quickly while a long-term gain refers to an overarching goal that can be accomplished over a longer period. An example of a short-term gain in kindergarten might be to recognize the final sound “t” in short three syllable consonant-vowel-consonant (CVC) words such as cat, bat, and mat. A long-term kindergarten goal might be to consistently be able to decode (recognize and determine pronunciation by noting the position of consonants and vowels) and blend (fusing individual sounds or syllables to produce words) all CVC words.

Assessments must often be used to reflect the short-term gains made by students. Short-term gains, when documented and supported by data collected from assessment, prove to be far more important than a teacher's perception of a student's gains based on their casual observation. Unlike casual observation, data-based assessments in reading fluency focusing on both short-term and long-term goals can show concrete evidence of what students know and what they are struggling with.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Reading fluency assessments are a critical part of the data-based assessments teachers should use to track short-term and long-term goals. Reading fluency assessments, like any literacy assessments aim to understand the level at which a reader is operating. Once it is established what a student knows, what they might be struggling with, and what they might need to improve, they can be grouped with similarly functioning students. Instruction can be targeted to those needs in a small group format in subject specific centers such as literacy centers.

Many reading fluency assessments are not suitable for kindergarten students. Since many assessments look at the rate and accuracy students can read, they are only suitable once a student has moved past the pre-reading or emergent reading level and already has strong knowledge in phonological awareness. Measures of reading fluency in the form of word reading accuracy are the most commonly used methodologies (Speece & Ritchey 2005) and are more commonly used than LSF tests, but word reading accuracy is not a feasible assessment in the younger grades because students are still developing the ability to read whole words quickly.

One strong example of a fluency assessment that is appropriate at the kindergarten level and thus, pre-readers and emergent readers is LSF (Ritchey, 2008). LSF assessments in which students say the sounds of letters of the alphabet is one of the most promising assessment measures of short-term reading gain. There are differences in the way one assesses letter-sound knowledge. Two types of assessment approaches that can be used to identify children who are at risk in letter-sound knowledge are screening (a one-time assessment), in which decisions are made based on the student's score, and progress monitoring (repeated assessments), in which results are evaluated in terms of change (Ritchey, 2008). Progress monitoring in the younger grades is far more effective than a screening approach because students are making gains all the time, and a screening approach does not take this type of growth into account. Assessing students

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

regularly in their LSF by testing their letter-sound knowledge is an example of using a progress monitoring approach.

A common letter-sound knowledge test asks students to identify and produce the sounds of letters that are jumbled and arranged in random order to see how many sounds they can read in one minute (Ritchey, 2008). “Because letter fluency tasks measure both the accuracy and speed with which a child can provide the names or sounds of the letters of the alphabet, letter fluency tasks may be particularly well suited for predicting later reading ability” (Speece, Ritchey, Mills, & Hillman, 2003, p 224). LSF eventually leads to whole word fluency in which students can instantly recognize whole words without having to take the time to decode individual phonemes (Harn, Stoolmiller & Chard 2008). Whole word fluency is the goal for students to achieve by the second grade (Harn et al., 2008) and by the third grade, students are supposed to be reading for comprehension (Cooper, Kiger & Robinson 2012, p 7).

Letter-name fluency (LNF) in which students say the names of letters of the alphabet has also proven to be effective. However, when one compares letter-name knowledge to identify a student’s LNF and letter-sound knowledge to identify a student’s LSF, differences emerge. The most notable difference between the two is that letter-sound knowledge requires a deeper understanding of the alphabetic principle (Speece & Ritchey 2003). “The alphabetic principle comprises two parts: alphabetic understanding, or the knowledge that words are made up of letters that represent different sounds, and phonological recording, or the relation between those letters and the sounds to pronounce and spell words” (National Institute of Child Health and Human Development [NICHD], 2000, p 107). Therefore, LSN provides a more surface level understanding of a student’s knowledge while LSF is more comprehensive because LSF tasks require students to have a deeper phonological awareness than LNF tasks. The close correlations

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

between LSF and phonological awareness are intriguing for study because of LSF's ability to predict future reading fluency and skill (Ritchey, 2004).

LSF has also been found to be essential for the skill of decoding (Peterson et al., 2014). Decoding text is another phonological awareness task that is critical to reading fluency. In decoding, students must be able to manipulate and identify sounds in spoken language. Not only has letter-sound instruction been identified as a critical skill related to phonemic awareness (McBride-Chang, 1999), but some research has proven that is beneficial for English language learning (ELL) students as well (Peterson et al., 2014 & Kamps et al., 2007). For young students regardless of if they are ELL or not, but who struggle with learning to read, instruction in tasks related to phonemic awareness is particularly important (Peterson et al., 2014) as well as early intervention.

Once students have been identified as struggling with LSF, intervention is the next step to provide explicit instruction in such a way that students can make progress toward the goal of fluency. Interventions in literacy must take place early and be targeted by incorporating explicit reading instruction (Al Otaiba et al., 2008 & Peterson et al., 2014). Time should not be wasted when initiating an intervention, because according to Speece and Ritchey (2003), intervention for reading difficulties is more challenging after years of reading failure. Early identification and intervention are critical for success.

As for possible interventions to help kindergarten students improve their LSF, one can first look at how effective kindergarten teachers implement early and emergent reading instruction. It has been found that teachers who model strategies, teach explicitly, maximize student time on task, encourage small group and individualized instruction have more success teaching beginning literacy than those who do not (Al Otaiba et al., 2008). Small group

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

instruction can be used daily during literacy centers in kindergarten and is a way that the teacher can have close access to all students and instruct each group explicitly at their level.

ELL students often need extra support in reading and interventions for reading in the primary grades (Cooper et al., 2012). Therefore, the small group format also works well for instructing ELL students. Many ELL students struggle with letter-sound identification and general reading fluency tasks because they are used to sounds and letters from their native language. Even though it is widely accepted that ELL students often need additional support in literacy, there is little research on early literacy interventions with ELL students available (Peterson et al., 2014). However, Peterson et al. (2014) found in a study that a method of incremental rehearsal (IR) was an effective intervention method for ELL reading fluency. IR includes drill and practice in the non-traditional format (Burns, Dean & Foley 2004). IR has not only been proven effective in increasing the letter-sound expression of kindergarten ELL students (Peterson et al., 2014) but also effective in increasing the number of letter-sounds that non-ELL kindergarten students could correctly say within the period of one minute (Volpe, Burns, DuBois & Zaslofsky 2011).

Another strategy of targeting reading instruction that is well suited for the small group format is phonics based, systematic and explicit. The strategy is called Structured Literacy and was devised from Orton and Gillingham (Hamman, 2018). Structured Literacy instruction uses “multisensory elements to help learners retain the concepts that eluded them” (Hamman, 2018, p 1). Structured Literacy and multi-sensory activities can fit into the general education classroom as a form of intervention for students who are struggling and falling behind in reading. “A unified Structured Literacy approach within a school’s Response-to-Intervention (RTI) framework allows teachers in each tier to use the same curriculum to scaffold the learning and

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

intensify the instruction as needed, with extra repetition, smaller group sizes, and/or increased instructional time” (Hamman, 2018, p 1).

Multi-sensory activities like the ones used in Structured Literacy approaches are intriguing in working with struggling readers. Struggling students need extra repetition with necessary skills such as letter sounds if they are to make gains in their phonemic awareness. Students with special needs are often struggling readers (Allington and Walmsley, 1995). Students with special needs, much like ELL students, are at risk to fall behind in reading fluency and often need intervention in the early grades (Friend & Bursuck 2015, p 217). Multi-sensory interventions and activities have been found to be beneficial to students with special needs and are well documented (Abdulkarim, 2017; Sayyed Obaid, 2013).

In a kindergarten classroom, simple drill and recall activities are not stimulating enough to hold the attention of students for an extended period, and thus less likely to make a lasting impact on learning. Other tasks such as sounding out letters as one reads text are too challenging for students in kindergarten. Multi-sensory LSF activities, however, can both hold the attention of kindergarten students and make practice meaningful. Many students in the kindergarten age group struggle with sitting still, while others are developing fine motor skills related to writing such as holding their pencil (Ratcliffe, Franzsen & Bischof, 2013) and controlling their hand. Providing multi-sensory activities might help ease some of these struggles for students. Children have been shown to have the most development in fine motor skills before they enter the first grade, and the development of these skills has been shown to grow through activities and experiences (Ratcliffe et al., 2013, p 10). Activities that Ratcliffe et al. (2013) discussed from a study include but are not limited to molding playdoh, tearing paper, and tracing lines.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Examples of multi-sensory activities in LSF might include tracing letters on a piece of felt fabric while saying the letter-sound out loud or squeezing a stress ball as students practice their letter-sound knowledge. “For example, in learning letter-sound associations, the student is visually reinforced by looking at the letter; auditory reinforcement is derived from listening to and hearing the sound identified with the letter” (Farrell & Sherman, 2011, p 25). The benefits of one study conducted by Abdulkarim (2017) found that after eight weeks of multi-sensory intervention, students with dysgraphia and dyspraxia improved in many areas of literacy including rewriting, normal writing, spelling, writing expression, the academic problem, and reducing social-emotional problems. The intervention techniques in this study included colored bottle activities, working with patterns, pencil grip practice, and other activities scattered throughout literacy instruction with reading and writing. Although this study is specific to students with dysgraphia and dyspraxia, its success with literacy improvements is intriguing to consider for a general population of students as well, especially those developing fine-motor skills such as kindergarteners.

Not only has multi-sensory intervention been proven to be effective, but students also expressed enthusiasm for it. A multi-sensory storytelling study, for example, found that students viewed the experience as positive (Preece & Zhao, 2015). The approach of this study was to allow students to experience a story with multiple senses rather than only listening to a story. Stories were told throughout the day, and the stories came alive through the use of props related to the plot like blankets and flashlights. If a story was describing driving a car, a related prop might be a steering wheel that students could pass around and touch. The study, which was conducted on a group of students with wide educational needs, found that the multi-sensory approach contributed to students’ access to the curriculum, assessment, learning, and

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

socialization (Preece & Zhao, 2015, p 429). Based on the favorable view students had, and the positive impacts multi-sensory storytelling had on the impacts of instruction, it is clear that when multiple senses are activated in learning, the experience is more vibrant and more memorable.

A study conducted in which literacy was taught in a multi-sensory format to kindergarten students showed that as a result of the multi-sensory activities students were better able to segment words and decode nonsense words (Dilorenzo, Rody, Bucholz & Brady, 2011). Multi-sensory intervention is all about repetition and practice. It has been found that for a student who is meeting standard in literacy and is not struggling with reading, it takes them five exposures to master a concept, but for a student who is struggling, it may take twenty-five exposures (Hamman, 2018). Multi-sensory activities allow students to make gains in literacy by increasing their skills through repetition and practice in enjoyable and engaging ways.

Questions

How will letter-sound correspondence improve in kindergarten with the introduction of multi-sensory intervention? In what ways is a multi-sensory approach beneficial for letter-sound practice for kindergarten aged students?

Purpose

Kindergarten students will engage in a multi-sensory intervention. They will increase their LSF by tracing letters with their fingers in three different substances: shaving cream, salt, and sand. This targeted practice will take place in small groups where the researcher will hold up a card with the letter, they will model how to say the sound, and students will orally produce the letter sound back while tracing the letter in one of the three substances. The study hopes to explore further how we can help struggling readers in kindergarten make gains in phonological awareness and improve LSF.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Methodology

Context

The classroom in this study is from a middle to upper-class urban elementary in the Pacific Northwest. At the school, only 7.2% of total students are on free and reduced lunch (a strong indication that students are from middle to upper-class backgrounds), and there are zero students on free and reduced lunch in the classroom of focus for this study. The research conducted in the study follows an action research approach to collect data about kindergarten students' reading fluency while following a systematic inquiry-based model with ongoing reflection (Hendricks, 2009, p 2).

The researcher utilized a fluency assessment in which students said the sounds of letters of the alphabet. This assessment was appropriate for the kindergarten level since LSK is part of LSF (Ritchey, 2008, p 487), and one of the most promising assessment measures of short-term reading gain. Lowercase letters were used in this study because the study was conducted in the springtime when students were using lowercase letters in their writing and learning, and lowercase letters were the focus in the classroom. Had this study been done in the first half of the year, uppercase letters would have been used. Only short vowel sounds were practiced in this study because long vowels are not taught at the school in the study until first grade.

Participants

The participants of this study are twenty-one kindergarten students, nine boys, and twelve girls. All students are white except for one Hispanic student, and one Asian student. Six students in the classroom have been identified as struggling readers, and six students have been identified as advanced readers based on kindergarten Measures of Academic Progress or MAP testing

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

scores. That leaves nine students considered proficient or mid-level readers based on MAP scores.

There are two students on Individualized Education Plans (IEP). Both of those students are on the autism scale and enrolled in Special Education push-in services. One of the students has a classroom aid to assist them for 80% of the school day. Both students on IEP's are enrolled full-time in the general education classroom. One student is pulled out for occupational therapy related services and speech services weekly.

Intervention

The multi-sensory material, sand (example in Appendix C), shaving cream (example in Appendix D), and salt (example in Appendix E), will rotate from week to week so students will have an opportunity to use each. All multi-sensory practice will take place in the small group format for no longer than 10 minutes at a time to maximize instruction time. The 26 letters of the alphabet have been divided up into groups that separate letters with similar sounds such as M and N as well as D and B and spread them out over the 8-week intervention period. In Week 1, students will practice the letters A, H, O, and V. In Week 2, students will practice the letters, B, C and W. In Week 3, students will practice the letters, D, E, J, and K. In Week 4, students will practice the letters, L, X, and N. In Week 5, students will practice the letters, I, F, and G. In Week 6, students will practice the letters, R, S, and Y. In Week 7, students will practice the letters, T, M, and P. In the final week (Week 8), students will practice the letters U, Q, and Z.

The intervention was established weekly during literacy centers. The researcher would sit with the students on the floor in a circle. Each student would have a tray with the multi-sensory substance in front of them. The researcher would put a timer on for 10 minutes. First, the researcher would allow students 1 minute and 30 seconds of "free draw" time in which students

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

could get comfortable with the substance and have some freedom to explore it. After the free draw period, the researcher would hold up the first letter card and model orally the sound that the letter makes. Next students would write the letter in their tray with their finger and practice saying the sound out loud. They would continue to write the letter as many times as they could while each time saying the letter. The researcher would be listening to how students were saying the sounds and make corrections when necessary. The researcher would also encourage students to look up at the card and compare the letters they were writing to the card to make sure they were forming them correctly. After practicing like this for two minutes, the researcher would move on to the next letter. Each letter would have two minutes of focus. With any extra time, students could once again free draw. When the 10 minutes was up, they moved on to another literacy center, and a new group sat down with the researcher until all the groups had been through each station.

Data Gathering Instruments/Assessments

The researcher quizzed students' LSF before the intervention in a pre-assessment, after Week 2, Week 4, Week 6, and Week 8 as a final assessment using the letters shown on Appendix A. Students were asked to produce the sounds of letters on Appendix A which are jumbled and arranged in random order to see how many sounds they could read in one minute. It was important that the letters were jumbled so that students could not use their memorization of the alphabet to complete the task (Ritchey, 2008). The students had a print out of Appendix A in front of them while saying the letter sounds out loud while the researcher made notes of any mistakes and mispronunciations.

The quiz was timed so that students had one minute to get through as many letter sounds as possible. Keeping the quizzes to one minute of time helped students avoid becoming

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

intimidated, bored, or frustrated. The researcher marked when the timer beeped to indicate which letter a student stopped at, or in the case a student made it through all 26 letters, how much time was left on the timer. The format was the same each week throughout the testing, and quantitative data was recorded and collected throughout the process. This data provided a means to analyze if students' LSF scores changed or remained the same over the eight-week period in which multi-sensory letter sound intervention took place. The researcher collected qualitative data in the form of journal notes about the letters they observed students missing repeatedly and the overall observed experience of students participating.

Students also participated in a student voice survey (Appendix B) to evaluate their feelings toward the multi-sensory activities. The survey statements were read aloud to students, and they circled the emoji face that best matched their feelings about the statement. Qualitative data was interpreted from the answers students provided in the survey to determine how they felt about the intervention. The combination of quantitative data from the LSF scores from Attachment B, along with the evaluation of student responses in Attachment C, allowed the researcher to determine if multi-sensory practice activities were a beneficial approach not only for improving students' LSF scores but by also providing them with a positive experience.

Results

It was beneficial to conduct the same assessment throughout the study because the results over time were apparent. In Table 1 the full class data set of the number of letter sounds students pronounced correctly in one minute is visible. When recording these results, a mark was made next to each letter that students mispronounced or mixed up with another letter and marked as incorrect. Any skipped letters were also marked as incorrect. If the timer went off before students

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

could get through all 26 letters, a note was made of the letter that they ended on, and any unanswered letters were also marked as incorrect.

One student in particular who made significant gains was student five who started with nine letter sounds and ended with 25 letter sounds. Student five is considered one of six struggling readers in the class based on kindergarten Measures of Academic Progress or MAP testing scores. Out of those six struggling readers, student five made the most significant gains. Student fifteen and student seventeen are also struggling readers who doubled or nearly doubled their letter-sound knowledge throughout the study. Student fifteen started with five letter sounds and ended with ten while student seventeen started with 11 and ended with 21.

Student seven and student twelve also made substantial gains. Student seven started with 12 letter sounds and ended with 25, and student twelve started with 14 and ended with 20. The student that was the lowest in the pre-assessment was student nineteen. Student nineteen started with two letter sounds and by the end of the study had 12. At the end of the study, student nineteen was still the lowest in the class, but with 12 letter sounds was almost half-way to knowing the sounds of the full alphabet. This student's progress mimicked the trend of the class in which the most significant gains took place in the second half of the study after Week 4. In the first half of the study this student did not get more than two letter sounds, but in Week 6 they got four, and by Week 8 they had 12.

Mid-level or proficient readers based on MAP scores, made significant gains here as well, although overall, they made less of a percentage than struggling readers. Student nine is an excellent example of a mid-level reader. This student started with 16 letter sounds in the pre-assessment and ended with 25 in the final assessment. That is an increase in their overall number of letter sounds by nine letters throughout the study.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Looking at advanced readers is interesting because those are the readers who would not typically be part of an intervention. The impacts of the intervention are drastically less significant for advanced readers than they are for struggling readers. Student one, student three, student six, student eight, student thirteen, and student eighteen are considered advanced readers based on MAP scores. From the pre-assessment through the final assessment all advanced readers except one either remained constant or increased their number of letter sounds correct throughout the study. Students one, two and eight stayed the same. Student one and student eight started with 26 letters and ended with 26 letters. Student three started with 25 and ended with 25. Student six is the only student in the entire class that started with more letters than with which they ended. Student six started with 26 letters and ended with 25 letters. Students thirteen and eighteen started with 25 letters and ended with 26.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Table 1

Full Class Number of Letter-Sounds Correct in 1 Minute Data Chart

	<u>Pre</u>	<u>Week 2</u>	<u>Week 4</u>	<u>Week 6</u>	<u>Final Week 8</u>
Student 1	26	25	24	24	26
Student 2	19	17	20	23	24
Student 3	25	24	26	25	25
Student 4	23	23	21	23	24
Student 5	9	11	25	21	25
Student 6	26	24	22	23	25
Student 7	12	20	16	17	25
Student 8	26	25	26	26	26
Student 9	16	13	23	24	25
Student 10	15	21	22	25	25
Student 11	23	21	22	24	25
Student 12	14	18	12	19	20
Student 13	25	24	25	24	26
Student 14	18	25	25	25	26
Student 15	5	8	8	15	10
Student 16	22	19	23	25	26
Student 17	11	11	16	14	21
Student 18	25	26	25	26	26
Student 19	2	1	1	4	12
Student 20	21	23	21	23	25
Student 21	23	24	26	25	26
AVERAGE	18.381	19.190	20.429	21.667	23.476

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

The average number of letter scores correct in the pre-assessment before any intervention was 18.4. By Week 8 in the final assessment, the average was 23.5. Overall the average number of letter sounds students were able to produce correctly in one minute increased by about five letter sounds, a gain of 27.7%. In Figure 1, it is evident that there is a steady increase in the letter-sound averages. Between Week 6 and Week 8 the average jumped by about 1.8 letter sounds, more than any other increment between tests. The smallest increase was between the pre-assessment and Week 2 in which the average jumped by about 0.8 letter sounds.

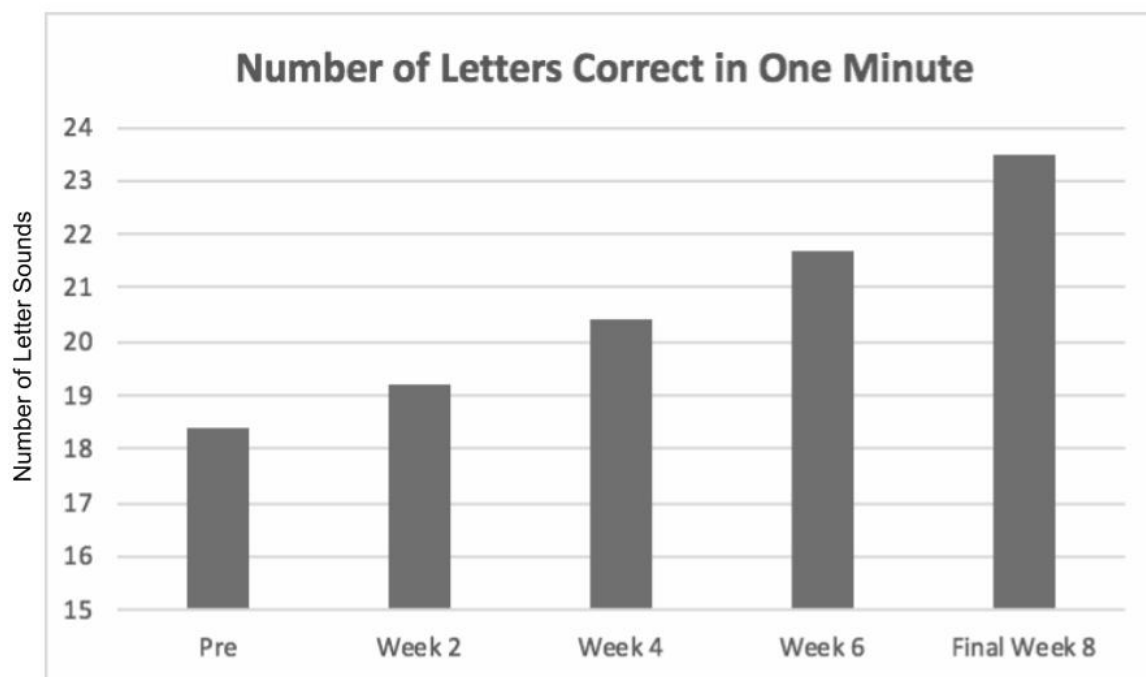


Figure 1

Average Number of Letters Correct in One Minute Graph

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Fluency and evaluating fluency consists of the speed of responses and the accuracy of responses. To evaluate the accuracy, only the letters students had answered were used. If there were letters that students did not get to in the allotted time, those were not included to evaluate accuracy. The total number of correct answers were calculated from only what the students answered. This evaluation not only helped get a sense of how frequently a student was producing errors but also to help identify students who might be guessing.

Table 2 shows the full class data chart of accuracy percentage over the course of the study. The average accuracy percentage increased from 80% to 92%. The average accuracy percentage for the class stayed consistent throughout the first half of the study. From the pre-assessment to Week 2 it stayed at around 80%. Then the accuracy percentage only increased by 1% to 81% by Week 4. The second half of the study, however, produced significant gains in accuracy percentage. Between Week 4 and Week 6, the accuracy percentage increased by 5% from 81% to 86%. From Week 6 to Week 8, the accuracy percentage increased by 6% from 86% to 92%.

For advanced readers, accuracy percentage did not change very much if at all. Student three, for example, started with 96.20% in the pre-assessment and ended with 96.20% on the final assessment. It makes sense that advanced readers accuracy percentage was this way because accuracy percentage can only increase when more letter sounds are being correctly answered. When students are already answering 24 or above letter sounds correct, they are already near the top as far as accuracy percentage.

Mid-level readers showed gains in accuracy percentage throughout the study. Student nine started in the pre-assessment with 76.20% and ended in the final assessment with 96.20%. Student nine increased their overall accuracy percentage through the study by precisely 20%.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Many mid-level students followed a similar trajectory of about 20% improvement in their accuracy overall.

The most significant gains were from evaluating the performance of struggling readers. From the pre-assessment to the final assessment, student five increased from 69.20% to 96.20%. Student fifteen jumped from 30.80% to 50%, student seventeen jumped from 75% to 95.5%, and student nineteen jumped from 20% to 63.2%. The overall average increase for the six struggling readers from the pre-assessment to the final assessment was about 25%. Advanced readers all stayed above a 95%.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Table 2

Full Class Accuracy Percentage Data Chart

	<u>Pre</u>	<u>Week 2</u>	<u>Week 4</u>	<u>Week 6</u>	<u>Final Week 8</u>
Student 1	100%	96.20%	92.30%	92.30%	100%
Student 2	82.60%	77.30%	76.90%	88.50%	92.30%
Student 3	96.20%	92.30%	100%	96.20%	96.20%
Student 4	88.50%	88.50%	80.80%	88.50%	92.30%
Student 5	69.20%	78.60%	96.20%	87.50%	96.20%
Student 6	100%	92.30%	84.60%	88.50%	96.20%
Student 7	70.60%	80%	76.20%	77.30%	96.20%
Student 8	100%	96.20%	100%	100%	100%
Student 9	76.20%	68.40%	88.50%	92.30%	96.20%
Student 10	75%	80.80%	84.60%	96.20%	96.20%
Student 11	95.80%	80.80%	84.60%	92.30%	96.20%
Student 12	73.70%	69.20%	60%	73.10%	76.90%
Student 13	96.20%	92.30%	96.20%	92.30%	100%
Student 14	85.70%	96.20%	96.20%	96.20%	100%
Student 15	30.80%	42.10%	44.40%	65.20%	50%
Student 16	84.60%	90%	88.50%	96.20%	100%
Student 17	75%	61.10%	72.70%	73.70%	95.50%
Student 18	96.20%	100%	96.20%	100%	100%
Student 19	20%	11.10%	8.30%	30.80%	63.20%
Student 20	80.80%	88.50%	80.80%	88.50%	96.20%
Student 21	88.50%	92.30%	100%	96.20%	100%
AVERAGE	80%	80%	81%	86%	92%

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Figure 2 displays the accuracy percentage gains made over the course of the study. The increase between the pre-assessment and Week 4 was minimal. The difference between the pre-assessment and Week 2 was negligible with both staying around 80%. The increase from Week 2 to Week 4 was by 1%. As clearly seen in Week 6, and Week 8, results escalated in the second part of the study.

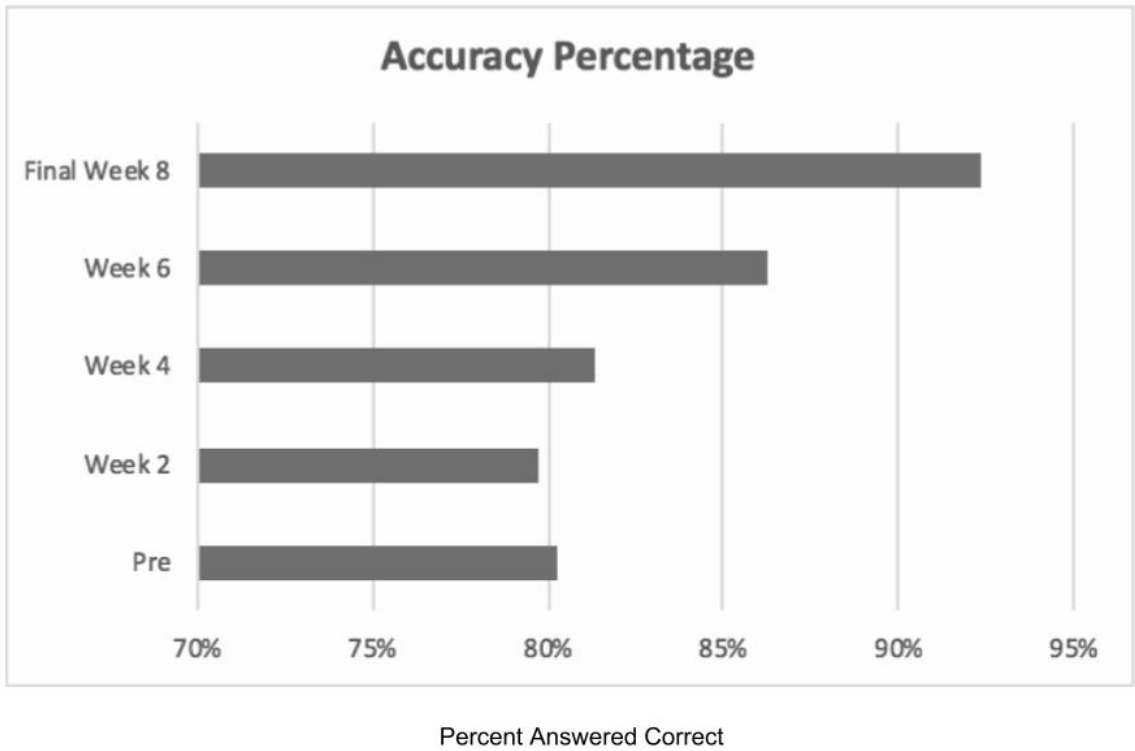


Figure 2

Average Accuracy Percentage Graph

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Similar to evaluating the accuracy, when evaluating time per letter responses, only the letters students answered were taken into account. If there were letters that the students did not get to in the allotted time, those were not included in the evaluation. Table 3 shows, the average time per letter response in the pre-assessment started at 2.63 seconds. That means that the average each student took to look, process, and respond with a sound for each letter was almost 3 seconds per letter. The average time per letter response improved from 2.63 seconds to 1.50 seconds throughout the study.

This category of results is the most interesting to examine the performance of advanced learners' performances. Student one, student three, student six, student eight, student thirteen, and student eighteen are considered advanced readers and all started with above 24 letter sounds. Since they were already starting with close to mastery of letter sounds, the number of letter sounds correct, and their accuracy percentage was constant throughout the study. They were, however, able to reduce seconds throughout the study on their average time per response.

Table 3 shows student one started with 1.65 seconds in the pre-assessment and ended with 1.27 seconds in Week 8. Overall, student one dropped 0.38 seconds from their average time per letter response. Student three and student six both started with 1.15 seconds in the pre-assessment and ended with 0.92 seconds in Week 8, dropping their times by 0.23 seconds. Student eight started with 1.54 seconds in the pre-assessment and ended with 0.92 seconds in Week 8 for a loss of 0.62 seconds in their average time per letter response. Student thirteen started with 1.62 seconds in the pre-assessment and ended with 0.92 seconds in Week 8 dropping their score by 0.70 seconds overall. Student Eighteen started with one second per response in the pre-assessment and ended with 0.69 seconds by Week 8, improving their average by 0.31 seconds. Advanced readers typically reduced their times between 20-30%.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Mid-level readers and struggling readers also had improvement to their average time per response. Many mid-level readers cut their average down by about one second. Student five, a struggling reader, is a student who started with an average time per letter response of 4.62 in the pre-assessment and ended with 1.27 in the final assessment. When they started, they were spending almost 5 seconds looking and thinking about each letter. By the end of the study, they improved their time by 3.35 seconds, for a nearly 73% reduction in time. Student nineteen, another struggling reader, started the pre-assessment only able to identify two letter sounds correct, and their average time per letter response was the highest in the class at six seconds. By the final assessment, their average time per letter response was 3.16 seconds, an improvement of 2.84 seconds overall. This student cut their average time per letter response down by almost three seconds while increasing their number of letter sounds to 12 on the final assessment.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Table 3

Full Class Average Time in Seconds Per Letter Response Data Chart

	<u>Pre</u>	<u>Week 2</u>	<u>Week 4</u>	<u>Week 6</u>	<u>Final Week 8</u>
Student 1	1.65	2.31	1.31	1.38	1.27
Student 2	2.61	2.73	1.73	1.88	1.58
Student 3	1.15	2.23	1.15	1.69	0.92
Student 4	2.27	1.46	1.73	1.46	1.88
Student 5	4.62	4.29	1.69	2.5	1.27
Student 6	1.15	1.46	1.15	1.23	0.92
Student 7	3.53	2.4	2.86	2.73	1.69
Student 8	1.54	1.27	0.88	1.27	0.92
Student 9	2.86	3.16	2.04	1.65	1.62
Student 10	3	1.81	1.77	1.38	1.15
Student 11	2.5	1.69	1.35	1.31	1.19
Student 12	3.16	2.23	3	2.23	2.11
Student 13	1.62	1.73	1	1.38	0.92
Student 14	2.86	1.35	1.23	1.31	0.96
Student 15	4.62	3.16	3.33	2.61	3
Student 16	2.04	2.86	1.92	1.42	0.92
Student 17	3.75	3.33	2.73	3.16	2.73
Student 18	1	1.12	1	0.81	0.69
Student 19	6	6.67	5	4.61	3.16
Student 20	1.73	1.69	1.58	2.12	1.5
Student 21	1.62	2.04	1.08	1.54	1.04
AVERAGE	2.632380952	2.428095238	1.882380952	1.889047619	1.497142857

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Figure 3 shows the steady decline of the average time per letter response over the course of the study. The only results that do not follow this steady decline are those of Week 6. Week 6 was the only week that was tested in the classroom with distractions. All other tests were conducted in the quiet hallway with no distractions. More on Week 6 regarding average time per letter response, and the impacts of the testing environment, are discussed in the Limitations section of this report. The class' average time per response for the pre-assessment was about 2.63 seconds while Week 8 was about 1.50 seconds for a difference of 1.13 seconds per response. The change equates to a class average improvement of 43%.

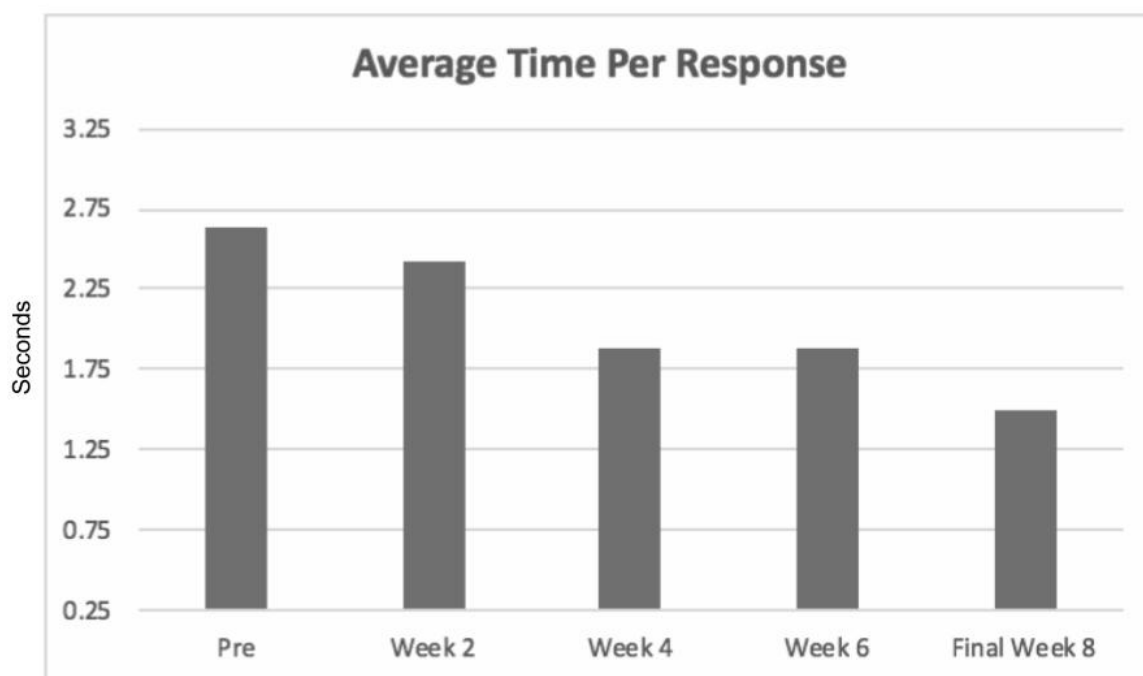


Figure 3

Average Time Per Letter Response Graph

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Overall, the results are positive and show that fluency increased, the average time per letter response decreased, and the accuracy percentage increased over the course of the study. Figure 4 shows these results with the bar graph showing the decline in average time per letter response and the line graph showing the increase in accuracy. When looking at these results simultaneously and keeping in mind that the number of letter sounds correctly answered in one minute increased by an average of five letters, it is clear that students made tremendous progress in eight weeks.

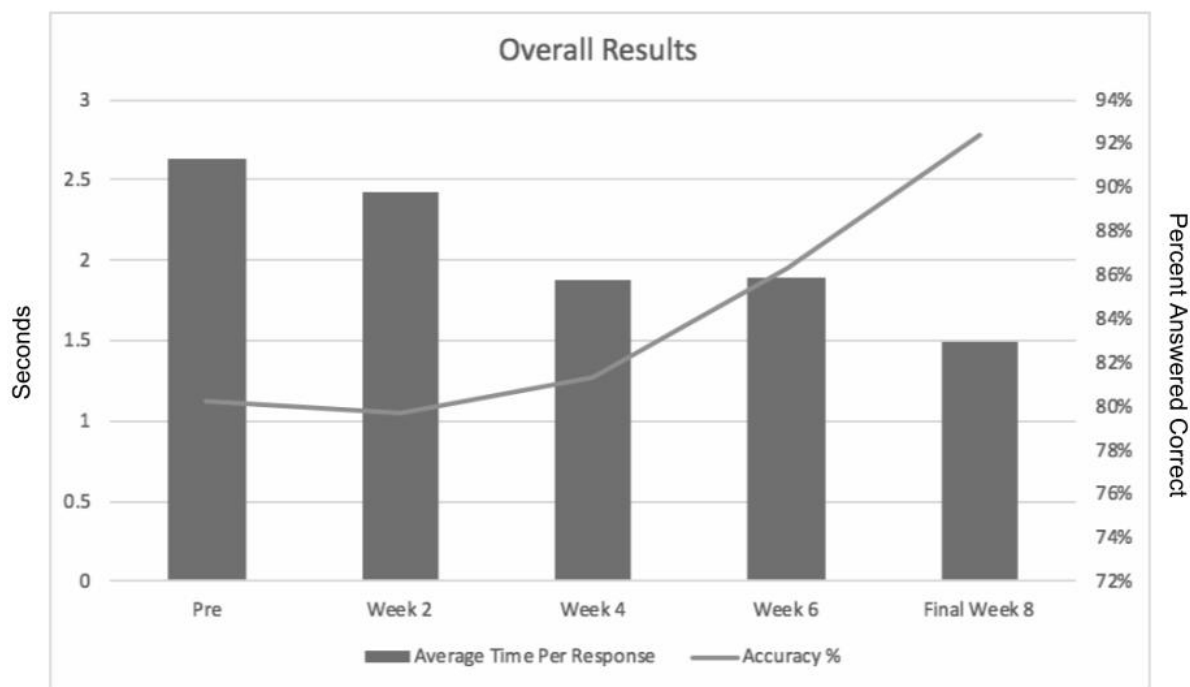


Figure 4

Overall Results: Average Time Per Response with Accuracy Percentage

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

On the student voice surveys (Appendix B) students took at the end of the study, students answered four statements relating to the study. For each statement, students circled an emoji to represent their feelings in response to the statement on the survey. The emojis were explained to them before they answered with the smiley face representing “agree,” the straight mouthed face representing “not sure” and the frown face representing “disagree.” Students filled out their surveys individually to prevent them from being influenced by others.

The first statement was, “I enjoyed touching shaving cream, salt, and sand.” 20 out of 21 students circled agree. The one student who circled disagree was a student who had expressed that he did not like touching sand because he thought “it was dirty,” and the shaving cream made him feel messy. This statement helps to get an overall sense of how students responded to multi-sensory interventions and if it was a positive or negative experience for them.

The second statement was “I would like to practice other skills such as numbers the same way in the future.” Again, 20 out of 21 students circled agree, and the one student who circled disagree on the first statement also circled disagree on this statement. This statement is a good indicator that the overwhelming majority of students would enjoy using the multi-sensory intervention approach to practice in disciplines other than literacy as well.

The third statement was “I feel like I got better at my letter sounds by practicing this way.” This statement was aimed to evaluate students’ perceptions of their success in this study. 19 out of 21 students circled agree, while two students circled not sure. This statement shows that overall, students felt that they made progress during the study as a direct result of the intervention.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

The final statement was “overall I think the experience was positive and fun.” 20 out of 21 students circled agree, and one student circled disagree. The same student that circled disagree on the first and second statements also circled disagree on this final statement. The majority of students found the intervention and practice using multi-sensory materials to be enjoyable. The one student who did not might have benefited from a choice of materials that were not messy such as tracing letters on felt fabric, or sandpaper.

The journal notes made by the researcher based on casual observation provide qualitative data to support the overall impression that students enjoyed the process and experience of multi-sensory intervention. The notes also show that students most struggled with the letters q, l, d and b. According to the notes, students struggled with producing the sound that q made because it was not a sound that they were familiar with hearing and they did not recognize the letter easily. Q is not a common letter in the English language and it is not surprising that kindergarten students struggled with it. Students had difficulty with d and b because they often switched their sounds. When they would see d, they would make the sound for b and vice versa. Students struggled with l because they often mistook it for the capital letter I.

Discussion

Conclusions

To best support the kindergarten age group, the supports and interventions we provide must be enjoyable in order to be effective. They also need to be tailored to kindergarten students' level developmentally. Using LSF as an identifier of struggling readers is an appropriate early kindergarten assessment because of its proven accuracy with predicted reading levels. Furthermore, using an intervention incorporating a multi-sensory activity such as tracing letters with the writing finger in shaving cream while saying the letter-sound out loud, proves to be an

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

enjoyable and effective intervention for students struggling with their LSF. This intervention is easy to set up, and because of the minimal amount of time it requires to implement, it can frequently be repeated.

A substantial benefit of both this assessment and intervention technique is that they require minimum planning and are time efficient to carry out. The assessment is especially time efficient, taking only one minute to conduct. The intervention can be individualized to the letters that students most missed on an assessment, or it can use letters students are already familiar with but include a handful of letters for which students need more practice. It is evident that the practice that students get during this type of multi-sensory intervention improves their overall LSF within eight weeks.

Not only were the results of the study shown to be effective in improving the quantity of letter sounds students could answer correctly, their accuracy percentage, and the average time per response, but the student voice surveys also showed students liked the intervention. All students made significant gains, especially struggling readers for whom most interventions would target. Student Nineteen was the lowest performer on the pre-assessment, scoring only two correct letter sounds, holding a 20% accuracy percentage and averaging 6 seconds per average letter sound response. This student was the most in need of an LSF intervention. In the final assessment the student improved their number of letter sounds correct to 12, their accuracy percentage increased to 63.20% and their average time per letter response improved to 3.16 per letter. This student's results are inspiring, especially considering they made these gains in only eight weeks.

Students also responded positively to the student voice surveys as 93.75% responded "agree" to all statements. Their responses prove that not only did students enjoy the process, but

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

they thought it helped their LSF. They were also ready to do it again and try it in other subject matters.

Implications

If we do not focus on LSF and appropriately track student progress and growth throughout the kindergarten year, we will be doing a disservice to our students. Failure to reach a satisfactory level on necessary skills such as letter identification and letter sounds can be an indication of future reading disabilities (Ritchey, 2008) and it can also predict which students will be struggling in later grades (Ritchey, 2004). Students have many different learning styles, and to match instruction with those styles, teaching methods and practices need to match those preferences (Sayyed Obaid, 2013). Some of these preferences and learning style differences can be traced to the brain, such as brain asymmetry or a mixed-dominance of brain hemispheres (Christie, 2000). Be it a chemical brain influence, or learned behavior influences that contribute to a student's learning preferences and styles, these need to be taken into account when teachers are deciding on classroom activities that meet the needs of struggling students. Multi-sensory interventions offer a way for teachers to target instruction in an area for early elementary students in a way that is positive and fun at the same time.

Teachers are always looking for quick and impactful activities that add to student learning and hold student interest. This study shows that only ten minutes per week for eight weeks impacted students' overall learning in all three areas being measured. If a teacher wants to implement this format into their classroom, it only requires a minimal amount of time and planning.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Limitations

This study indicated that the intervention improved LSF overall in letter-sound knowledge, accuracy percentage, and speed. One limitation of the data might be the setting in which the LSF test was taken in Week 6. The results from the average time per response or speed show that from Week 4 to Week 6, the time went up instead of down like the trend on the rest of the graph. This variation was interesting because based on an unforeseen limitation, Week 6's tests were conducted during a free choice period in the classroom instead of out in the hallway like the other tests. The researcher assumed that due to the noise and the chaos of free choice time in the classroom, students were more distracted and thus took more time per average response. By the final test after Week 8, the average time was the lowest it had been throughout the study. Since Week 8's tests were conducted individually out in the hallway like all tests except for Week 6, it is safe to assume the noise and activity level of the testing environment could impact the results.

Initially, the researcher had set out to do full class and individual multi-sensory interventions as well as small group interventions each week. However, based on scheduling conflicts and curriculum demands, it was not practical to do more than one intervention each week. The only time the research was able to be fit into the busy schedule was in the small group format.

Another limitation of this study is that the researcher did not follow a script when conducting the interventions. Even though everything was explicitly timed out, if one group or one student was struggling more than others with saying sounds, the researcher would possibly model those sounds more than they would for other groups. As a result, some groups in some weeks might have received more direct modeling of letter sounds than other groups.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Recommendations

If the study were duplicated, the first suggestion one might consider would be to do the study over a more extended period. Subsequently, LSF testing could take place weekly instead of every other week to generate more data. This study would also benefit from being conducted in other schools with different demographics. This study took place in an urban upper middle-class area with only two students who identify as other than white. Since there were no ELL students in the classroom of focus, it would also be interesting to track how the multi-sensory intervention might impact those students as well.

It would be interesting to try this study using upper-case letters instead of lowercase letters. This study used lowercase letters because it was conducted in the spring when students were focused on lower case letters and encouraged to use them in their writing and work. Had the study been done in the fall or winter when students were primarily using upper-case letters, the study would have used upper-case instead. One can assume that the results would be the same whether upper-case or lower-case letters were used, but it would be interesting to test that hypothesis and find out for sure.

Only short vowels were practiced in this study. Long vowels were ignored because at the school the study was conducted in, long vowels are covered in the first grade rather than in kindergarten. “Vowel sounds and spellings are the most difficult patterns for many students to learn” (Henry, 2010, p 89). One of the difficulties regarding learning vowel sounds is the similarity in short vowel sounds. Since many short vowels have a similar sound, students can get confused. It would be interesting to study how multi-sensory intervention specifically might help students learn short vowel sounds and long vowel sounds as well as differentiating between similarly sounding vowel sounds.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

It would also be of interest to experiment using multi-sensory experiences with integrated skills practice in other subject matters such as math and handwriting. Expanding the multi-sensory intervention technique to full group instruction as well as small group instruction would be interesting. Teachers might benefit from setting up multi-sensory practice stations during literacy centers and math centers in which students are already familiar with what to do. That way students could practice independently while the teacher offered targeted instruction at other stations. One might consider including some options that are not messy such as tracing letters on felt fabric since the student voice survey showed that one student did not enjoy the types of substances chosen in this study. Since students overall showed resounding positivity on their student voice surveys while reflecting on their experience with multi-sensory activities, implementing multi-sensory experiences into many areas of the classroom is an encouraging area of future study.

References

- Al Otaiba, S., Connor, C., Lane, H., Kosanovich, M. L., Schatschneider, C., Dyrland, A. K., Miller, M. S., & Wright, T. L. (2008). Reading first kindergarten classroom instruction and students' growth in phonological awareness and letter naming-decoding fluency. *Journal of School Psychology, 46*(3), 281.
- Allington, R., & Walmsley, S. (2009). *What really matters in response to intervention*. New York, NY: Teachers College Press. Print.
- Allington, R., & Walmsley, S. (1995). *No quick fix: Rethinking literacy programs in America's elementary schools, the RTI edition*. Boston, MA: Pearson Education, Inc. Print.
- Abdulkarim, W. F. (2017). The effect of a multi-sensory program on reducing dyspraxia and dysgraphia among learning disabled students in rafha. *Journal of Educational Sciences and Psychology, Ii (Ixix)*(1) Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/1908419276?accountid=1230>
- Berninger, V. W., & Wolf, B. J. (2016). *Dyslexia, Dysgraphia, OWL LD, and Dyscalculia; Lessons for Science and Teaching* (2nd ed.). Baltimore, MA: Paul H. Brookes Publishing.
- Birsh, J. R. (2011). Connecting Research and Practice. In *Multisensory teaching of basic language skills* (3rd. ed., pp. 1-24). Baltimore, MA: Paul H. Brookes Publishing.
- Burns, M. K., Dean, V. J., & Foley, S. (2004). Preteaching unknown key words with incremental rehearsal to improve reading fluency and comprehension with children identified as reading disabled. *Journal of School Psychology, 42*(4), 303-314.
DOI: 10.1016/j.jsp.2004.04.003.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Christie, S. B. (2000). The brain: Utilizing multi-sensory approaches for individual learning

Styles. *Project Innovation* (Alabama). Retrieved September 10, 2017 from

<http://web.b.ebscohost.com.proxy.cityu.edu/ehost/pdfviewer/pdfviewer?vid=1&sid=b0c68fd9-6387-4113-8642-e0c94dac92e3%40sessionmgr101>

Cooper, D. J., Kiger, N. D., & D., M. D. (2012). *Literacy: Helping Students Construct Meaning*.

Belmont, CA: Wadsworth. Ch. 5. Print.

DiLorenzo, K. E., Rody, C. A., Bucholz, J. L., & Brady, M. P. (2011). Teaching letter-sound connections with picture mnemonics: Itchy's alphabet and early decoding. *Preventing School Failure: Alternative Education for Children and Youth*, 55(1), 28.

doi:10.1080/10459880903286763

Farrell, M. L., & Sherman, G. F. (2011). Multisensory structured language education.

In *Multisensory teaching of basic language skills* (pp. 25-46). Baltimore, MA: Paul H. Brookes Publishing.

Fluency. (2016). *Reading Rockets*. Retrieved August 10, 2017, from

<http://www.readingrockets.org/helping/target/fluency>

Friend, M. & Bursuck, W. (2015). *Including students with special needs: A practical guide for classroom teachers*. Upper Saddle river, New Jersey. Seventh Edition. Ch. 7. Print.

Gunn, B., Smolkowski, K., & Vadasy, P. (2011). Evaluating the effectiveness of read well kindergarten. *Journal of Research on Educational Effectiveness*, 4(1), 53.

doi:10.1080/19345747.2010.488716.

Hamman, J. (2018, February 28). A Powerful Approach to Reading Instruction. Retrieved from

<https://www.edutopia.org/article/powerful-approach-reading-instruction>

Harn, B. A., Stoolmiller, M., & Chard, D. J. (2008). Measuring the dimensions of alphabetic

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

- principle on the reading development of first graders: The role of automaticity and unitization. *Journal of Learning Disabilities*, 41(2), 143-57. Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/194224584?accountid=1230>
- Hendricks, C. C., (2016). *Improving Schools Through Action Research: A Reflective Practice Approach* (4th Edition) (4th ed.). Pearson Education. Print.
- Henry, M. K. (2010). *Beginning Readers*. In *Unlocking literacy: Effective decoding & spelling instruction* (2nd ed., pp. 87-116). Paul H. Brookes Publishing.
- Jimerson, S. R., Hong, S., Stage, S., & Gerber, M. (2013). Examining oral reading fluency trajectories among english language learners and english speaking students. *Journal of New Approaches in Educational Research*, 2(1), 3-11. Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/1541488059?accountid=1230>
- Kamps, D., Abbott, M., Greenwood, C., Arreaga-Mayer, C., Wills, H., Longstaff, J., Walton, C. (2007). Use of evidence-based, small-group reading instruction for english language learners in elementary grades: Secondary-tier intervention. *Learning Disability Quarterly*, 30(3), 153-168. doi:<http://dx.doi.org.proxy.cityu.edu/10.2307/30035561>
- McBride-Chang, C. (1999). The ABCs of the ABCs: The development of letter-name and letter-sound knowledge. *Merrill - Palmer Quarterly*, 45(2), 285. Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/230126055?accountid=1230>
- National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards (English Language Arts Standards:*

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Kindergarten Foundational Skills). National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C.

Retrieved from <http://www.corestandards.org/ELA-Literacy/RF/K/>

National Institute of Child Health and Human Development (NICHD). (2000). Report of the National Institute for Literacy. Retrieved from

<https://www.nichd.nih.gov/publications/pubs/documents/NELPReport09.pdf>

Peterson, M., Brandes, D., Kunkel, A., Wilson, J., Rahn, N. L., Egan, A., & McComas, J. (2014).

Teaching letter sounds to kindergarten english language learners using incremental rehearsal. *Journal of School Psychology, 52*(1), 97.

REQUESTED JULY 19th, 2017

Preece, D., & Zhao, Y. (2015). Multi-sensory storytelling: A tool for teaching or an intervention technique? *British Journal of Special Education, 42*(4), 429-443. doi:10.1111/1467-8578.12116.

Ratcliffe, I., Franzsen, D., & Bischof, F. (2013). Development of a task-based bilateral fine motor skill assessment for grade 0 children in south africa. *South African Journal of Occupational Therapy, 43*(1) Retrieved from

<http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/1759951489?accountid=1230>

Ritchey, K. D. (2004). From letter names to word reading: The development of reading in kindergarten. *Reading Research Quarterly, 39*(4), 374-376. Retrieved from

<http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/2121780?accountid=1230>

Ritchey, K. D. (2008). The building blocks of writing: Learning to write letters and spell words.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Reading and Writing, 21(1-2), 27-47.

doi:<http://dx.doi.org.proxy.cityu.edu/10.1007/s11145-007-9063-0>

Sayyed Obaid, M. A. (2013). The impact of using multi-sensory approach for teaching students with learning disabilities. *Journal of International Education Research*, 9(1), 75.

Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest.com.proxy.cityu.edu/docview/1433387255?accountid=1230>

Speece, D. L., & Ritchey, K. D. (2005). A longitudinal study of the development of oral reading fluency in young children at risk for reading failure. *Journal of Learning Disabilities*, 38(5), 387-99. Retrieved from

<http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/194223585?accountid=1230>

Speece, D. L., Mills, C., Ritchey, K. D., & Hillman, E. (2003). Initial evidence that letter fluency tasks are valid indicators of early reading skill. *The Journal of Special Education*, 36(4), 223-234. Retrieved from

<http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/194702735?accountid=1230>

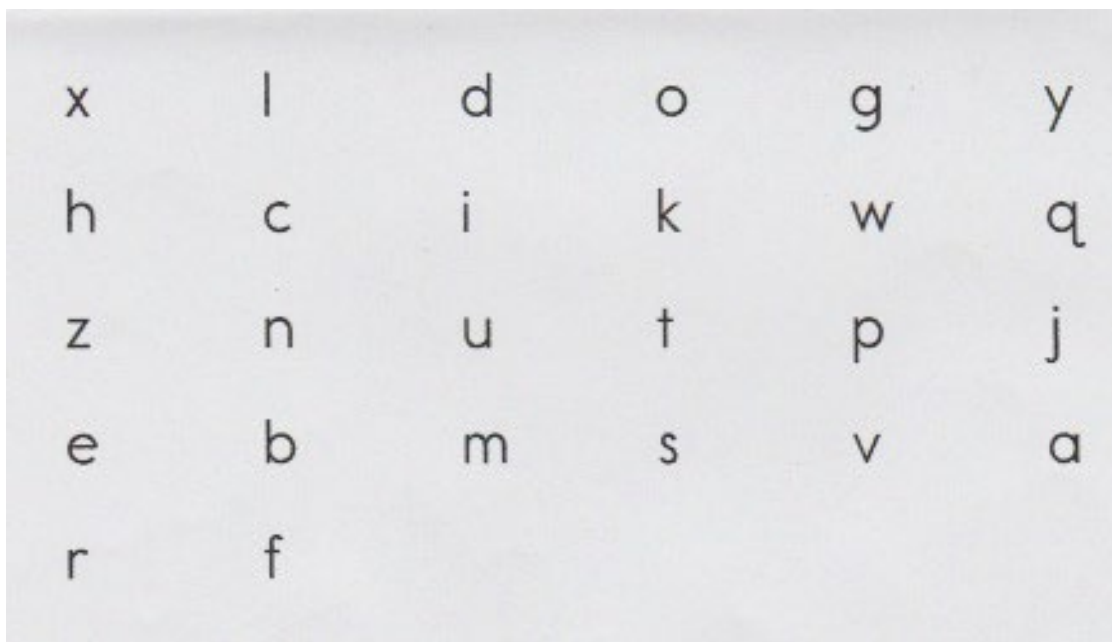
Torgensen, J.K., Wagner, R.K., & Rashotte, C.A. (1994). Longitudinal studies of phonological processing and reading. *Journal of Learning Disabilities*, 27, 276-286.

Volpe, R. J., Burns, M. K., DuBois, M., & Zaslofsky, A. F. (2011). Computer-assisted tutoring: Teaching letter sounds to kindergarten students using incremental rehearsal. *Psychology in the Schools*, 48(4), 332-342. doi:10.1002/pits.20557.

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Appendices













Appendix A

Letter-Sound Fluency (LSF) One Minute Timed Test

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Appendix B

Student Voice/Reflection on Multi-Sensory Intervention

	AGREE	NOT SURE	DISAGREE
1. I enjoyed touching shaving cream, salt, and sand.			
2. I would like to practice other skills such as numbers the same way in the future.			
3. I feel like I got better at my letter sounds by practicing this way.			
4. Overall I think the experience was positive and fun.			

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Appendix C

Example of Multi-Sensory Intervention Using Sand

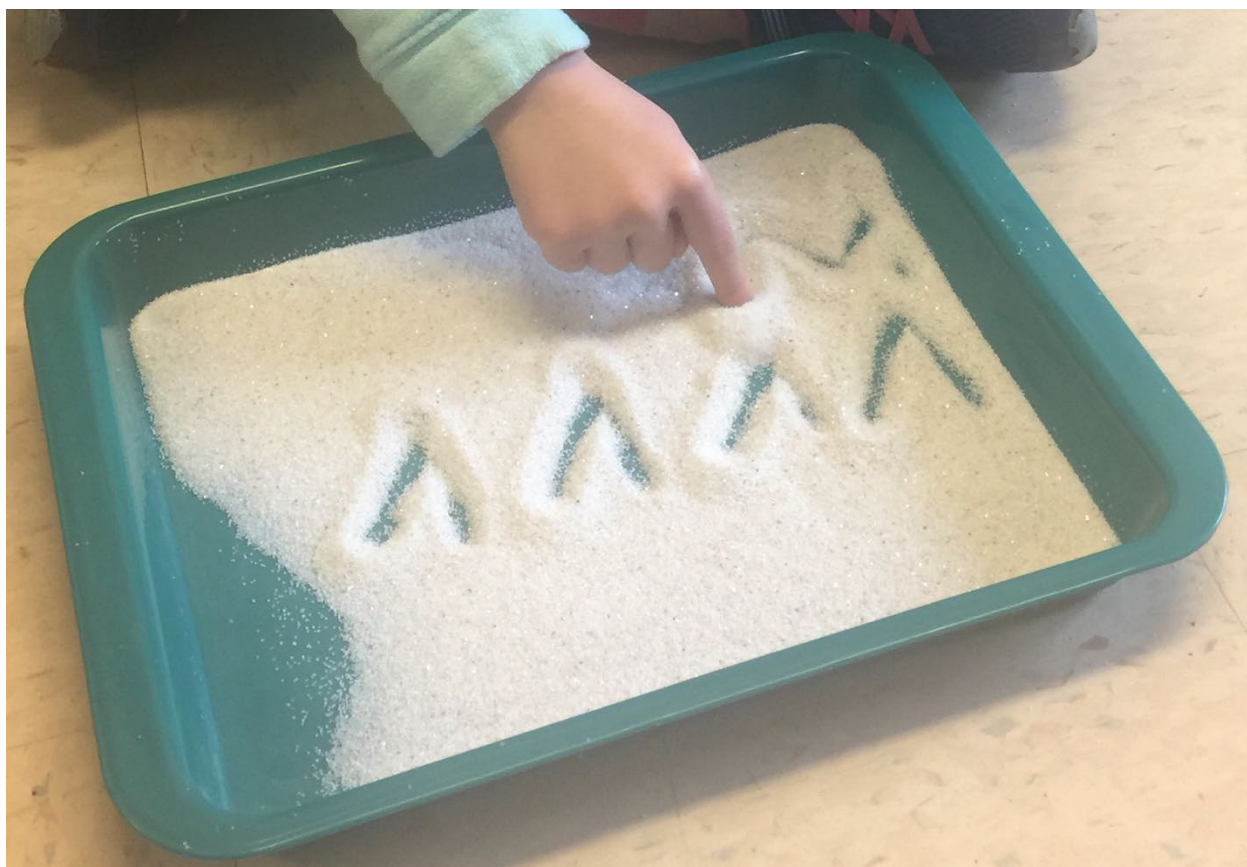
LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Appendix D

Example of Multi-Sensory Intervention Using Shaving Cream

LETTER-SOUND FLUENCY AND MULTI-SENSORY INTERVENTION

Appendix E

Example of Multi-Sensory Intervention Using Salt

Author's Note

Zina Hurd is a kindergarten teacher who grew up in Seattle Washington. Zina received an undergraduate degree in Interdisciplinary Visual Art from the University of Washington with a minor in Art History. She received her Masters in Teaching from City University of Seattle with an Endorsement in Elementary Reading and graduated with President's Honors. She is passionate about helping early readers and pre-readers and believes that setting a strong foundation in early reading is essential for later reading success. Zina likes to integrate art into her classroom and believes that her passion for art and early reading are what inspired her to research multi-sensory interventions and study the benefits of the hands-on learning approach to letter-sounds in this study. When she is not teaching she enjoys going to dog parks with her dog Millie, drawing, reading, and listening to podcasts on long walks.