Using Mnemonics to Teach the Alphabetic Principle

by

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We accept this Graduate Applied Project as conforming to the required standard.
MNEMONICS AND THE ALPHABETIC PRINCIPLE

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Abstract

Learning to read is a foundational skill for children to develop, but many find it challenging. Early literacy research identifies that one of the reasons for this is that children find it hard to memorize the link between the alphabet letter form and the sound. This is known as the alphabetic principle. Brain research clearly shows that there are many factors that support the acquisition of skills and their retention in long-term memory. When information is meaningful, engaging and it makes sense, our students are more likely to be engaged and attend to the process. Also, the likelihood that the information will be coded in long-term memory increases. By using multi-modal strategies like presenting information through the visual, auditory, tactile-kinesthetic and even smell and taste senses, the process of storing information is more effective. Mnemonics, and more importantly embedded mnemonics, play an important role in helping students to make a link between the letter-sound associations. This project explored what types of images would be most relevant to the primary students in the Saanich School District and in particular those with Indigenous heritage. Research from this project culminated in the development of the Alphabet Linking Program – a multi-modal tool designed to help remedial teachers support students who struggle with learning the letter-sound associations.

Keywords: mnemonics, alphabetic principle, alphabet, brain, early literacy, memory
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Chapter 1

No one questions whether learning to read is an essential skill. It appears in every aspect of daily life: opening bank accounts, reading our mail, following a bus schedule, reading ingredients of food products, understanding medication or technical instructions, signing contracts, and more. Functioning in a society without literacy is difficult and those who cannot acquire basic literacy skills have fewer opportunities in every area of life: social, personal, physical, and economic (Cree, Kay & Steward, 2012). Research indicates that reading skills are directly related to a person's ability to get a job, earn a higher income, achieve personal goals, and be an informed productive member of society (Cree et al., 2012). The National Endowment for the Arts (2007) published a report which stated that poor reading skills are directly related to an increase in high school drop-out rates, unemployment and criminal activity. Clearly the importance of knowing how to read is vital to a person's success.

Teaching children how to read is one of the fundamental jobs of primary teachers. Yet, even with their best attempts, there are always students who struggle. “Without being addressed early in the educational process, reading and reading readiness failure severely jeopardizes a child’s ability to succeed in upper elementary, secondary, and post-secondary educational environments and to compete in an increasingly literate society” (Agramonte & Belfiore, 2002, p. 181). This idea is supported by Dr. Richard Allington, an author and professor of literacy studies at the University of Tennessee, who advocates for early intervention in kindergarten so that children get more practice to learn the skills they need (Allington, 2006, 2017). It is well known that early alphabet knowledge is one of the best predictors of later literacy achievement (National Early Literacy Panel [NELP], 2008). Alphabet knowledge includes identifying letter
names and sounds, and associating them with specific printed letters (NELP, 2008). Recent research shows that teaching letter names supports the acquisition of letter sounds (Huang & Invernizzi, 2012; Kim, Petscher, Foorman & Zhou, 2010; Piasta & Wagner, 2010). The letter names often provide auditory memory clues for the children to help them remember the sounds. For example, the letter name 'Bee' has the /b/ sound in it. Once children know the letter-sound associations, they can use this knowledge to read and spell words. It is important that we find ways to use this information to help our struggling students connect with the literacy world so they can meet with success.

**Personal Context**

I am the Integration Support Teacher at an elementary school located in British Columbia, Canada. I have been teaching for 21 years and working in the field of inclusive education for 16 years. Something that I am passionate about is finding and developing tools that help students learn best so that they can be and feel successful. I work with an amazing group of primary teachers to try and support the reading needs of our young students. These students arrive in kindergarten with diverse alphabetic knowledge. Some know a few of their letter names while others know none. Some have already mastered letter names and know many of the letter sounds. Children come to school with a varied skill set and as educators we try to meet each child at their readiness level and teach them how to read. According to the learning standards in the British Columbia New Curriculum, kindergarten students are expected to know “the association of letters and sounds” by the end of their school year (Ministry of Education, 2018).
Problem to be Investigated

In grade one, when the students struggle to master their letter-sound associations, which happens when they have trouble linking the sounds to the letters, they can be referred to the Reading Recovery® program or they receive remedial support through the Student Services Department. Reading Recovery® is a reading initiative that targets grade one students. They are taught in a 1-1 situation for 30 minutes each day by a qualified reading specialist. At our school, the Reading Recovery® teacher and I have observed a growing number of students who are in grade one who do not know their letter-sound associations; a fundamental skill needed in order to read words. When I work with these children I notice that they have trouble remembering the letter sounds and the shapes. Linking abstract sounds to meaningless letter shapes is a hard concept for some of our students, especially those who are visual concrete learners. The letter 'double-u' has no connection to the sound /w/ or the squiggly shape 'w'. We need to find ways to help them link this information together so they are more likely to remember it.

It is not only our kindergarten and grade one students who are slow to develop their alphabet knowledge. While we are fortunate in Saanich School District to have a tribal school to support the Indigenous People who live on the peninsula and a French Immersion School to support children who want to be immersed in another language, sometimes, if the children are struggling in those environments, the parents will move them to our school in grade two. These students most often need support in learning how to read. In particular, the primary students often need support to learn their alphabet sounds and link them to the letters. This is known as the alphabetic principle. Huang and Invernizzi (2012) describe the alphabetic principle as the understanding that language is made up of discrete sounds that are represented by written letters.
For example the letter 'f' makes the sound /f/. As the support teacher at my school my role is to help support these struggling students with intensive intervention.

Some of the students have developmental disabilities such as autism spectrum disorder, Down Syndrome, learning disorders and intellectual disabilities. In working with these students I have found that visuals help them to remember and understand information. In Temple Grandin's book *Thinking in Pictures*, she commented how her autistic mind is completely visual and if she has to remember abstract concepts she has to make a visual image. The students with autism find it easier to remember information using meaningful visual symbols. I am teaching one of my students with Down Syndrome to memorize abstract sight words (were, now, let) by using sign language. He will often sign the word first and then say it. This has helped him tremendously. Visual connections can help students with varying disabilities improve their ability to remember information.

All of the students I have worked with want to learn to read. They see their peers starting to learn the letter sounds; link them with the letter shapes and put sounds together to read words. They see them picking up books with more words in them, or pointing to words around the room and reading them and they want to understand how they can decode these words too. They want to figure out this alphabetic principle so they can be like everyone else. If they do not meet with success early on, they often fall behind and many develop a feeling that they are 'dumb'. This is the problem that guides my research: some children are struggling to learn their letter-sound associations and they need these skills in order to learn to read and to function successfully in society.
Brain Based Learning

Research is revealing much about how the brain learns and remembers. This knowledge will be very helpful in supporting our students who are struggling to remember the alphabet sounds and matching letters. The process of taking information into our brains through our sensory organs – manipulating it in working memory and eventually encoding it in long term memory so we can retrieve it later – is complicated (Marois, 2005). Understanding this process is fundamental to helping students remember information. Dr. David Sousa, an international consultant in educational neuroscience, and Dr. Carol Ann Tomlinson, a faculty member at the University of Virginia’s Curry School of Education and a leading presenter on differentiation, co-wrote the book *Differentiation and the Brain*. They recently shared information about the emergence of an exciting new discipline called educational neuroscience where cognitive psychology, neuroscience (how the brain functions), and pedagogy (the method and practice of teaching) combine to offer information and insights to “help educators decide whether certain curricular, instructional, and assessment choices are likely to be more effective than others” (Sousa & Tomlinson, 2011, p. 1). They suggest that we “need to find ways to use this brain research to develop strategies that will allow students to succeed in classrooms that contain a diverse mix of abilities, cultures, and languages” (Sousa & Tomlinson, 2011, p. 1).

As we learn more about the brain, these strategies continue to develop. Research shows us that we need to get our students engaged if they are going to have a chance to remember information (Jensen, 2005; Sousa & Tomlinson, 2011). If they care about something they are more likely to be motivated to remember it. We also have to help them link the information we are presenting with the schema (existing knowledge patterns and systems) they already have in
their brains. Using mnemonics, tools that help us remember, can be very helpful for creating these links. If you are trying to remember the meaning of the word 'melancholy' for example, you might picture a melon looking sad. The concrete nature of a picture and the funny engaging idea, helps our brain to remember. It has long been said that 'a picture is worth a thousand words' and it has certainly been proven to increase our ability to remember information. Eric Jensen, a leader in neuroscience, reminds us to allow children time to process, think about, evaluate and work with information and ideas (Jensen, 2005). Too often children are passively sitting and listening to the teacher talk and they are not engaging actively in their learning. This is not the best way to activate their brains to learn. They need to move around, talk to each other, problem solve and link new information with their prior knowledge. The more connections students have with information the more they are likely to remember it.

**Multi-modal Learning**

In 2015 I was at a conference in British Columbia listening to Dr. Gail Richard, a renowned speaker, certified speech and language pathologist and faculty member at Eastern Illinois University where she specializes in communication disorders and sciences. She spoke about the importance of using neurologically based models to treat language processing disorders. She reminded the gathered group of Speech and Language Pathologists and Integration Support Teachers that the brain learns best when a multi-modal approach is used. To best understand, the children need to hear, see, touch and move with the information. They need to wake up their cerebral cortex, an area of the brain responsible for consciousness, and make meaning out of what they are doing (G. Richard, personal communication, February, 2015).
Barry MacDonald in his book *Boy Smarts* tells us that boys use movement to kick-start their corpus callosums, the bundle of nerve fibers that connect the right and left side of the brain, to maintain alertness. The corpus callosum is the message exchange centre in the brain that provides a pathway for information to travel back and forth between the hemispheres of the brain. (2005, p. 28)

The movement increases the blood flow to the brain and helps the children process and learn information better. Kinesthetic learning or tactile learning is when the student learns by doing physical activities. Using different modalities is key to helping children learn and remember.

It is exciting to be teaching at a time when we know more about how the brain learns best. By looking at brain scans neuroscientists can see how different situations affect peoples' ability to learn information. They can measure the pattern of brain activity as people read, write, talk, think, multi-task and perform other mental tasks, which can be used to help them understand how well people remember different information that is stimulating them simultaneously (Fadel & Lemke, 2008). Teachers are now able to take advantage of this growing knowledge to support their students on their learning journey. Based on what the research says about how our brains learn best and what we know about the importance of learning our letter sounds as a foundational skill to learning to read, I started to wonder how I could combine the two to help the struggling young readers at my school.

**Purpose of my Research**

The purpose of my research is to design a multi-modal mnemonic tool, grounded in brain research, that will help remedial teachers support students struggling to learn letter-sound associations. I will be mindful of how the Indigenous students I work with can be served best by
this tool. In order to do this I will review the literature on what is known about early reading development and what skills are foundational for supporting students to read. Then I will review the literature on how the brain remembers and what strategies are effective in helping students remember. Specifically I will research about the use of embedded mnemonics (a system to improve memory) to support students struggling to learn their letter-sound associations. Through this process I will ask myself this research question: What is the best design for a multi-modal mnemonic tool that can help struggling readers link alphabet sounds to letter shapes? This research will culminate in the design of an Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and accompanying Teacher’s Guide that will help remedial teachers support students struggling to link the alphabet sounds to letter shapes (the alphabetic principle).
Chapter 2

Literature Review

Overview

This literature review examines the field of early reading development, brain-based research, and embedded mnemonics to devise a better way of teaching struggling students the letter-sound associations. In order to understand how we can help children remember their letter-sound associations it is important to look at how the brain takes in information and stores it for later retrieval. Mnemonics are important tools that help people remember information.

Firstly, this literature review examines the field of early reading development and explains why it is important for children to learn their alphabet sounds. It attempts to answer the question why it is hard for some students to acquire their alphabet sounds. In particular, it looks at the importance of phonemic awareness, phonics, and the difficulty of linking alphabet sounds with the letters.

Secondly, it explores the field of brain-based research and the complex process of how the brain functions and learns. Specifically, it looks at the three types of memory: sensory, working and long-term to determine how the brain processes information. Next, it describes brain-based measures that can be used to enhance student learning. The measures of: meaningful connections, student engagement, sense making, meta-cognition, rehearsal, mnemonics, multi-modal learning and dual coding theory are explored. Through this process it attempts to answer the question “In what ways can brain research help teachers to support students who have difficulty learning the letter-sound associations?”

Finally, it investigates studies that use embedded visual mnemonics to help students
acquire the alphabet sounds, and determines their effectiveness. Current studies that evaluate the commercial products of Itchy's Alphabet and Letterland are reviewed to see how they support children in the acquisition of their alphabet sounds through the use of brain-based learning; and, whether these products would be of use in a small group, pull out, remedial session. Of particular interest to my research is how this relates to students who are struggling with this concept and where there are gaps in the research. Based on this literature review I looked for ways to develop a mnemonic tool to help remedial teachers support students who struggle with learning the letter-sound associations.

**Early Reading Development**

Learning to read is a complex task. Children must coordinate many cognitive processes to read accurately and fluently. Unfortunately, for many students, the process of learning to read does not come easily. In 2000, the National Reading Panel (NRP) in the United States (US) released the largest, most comprehensive evidence-based review of literature designed to help identify key skills and methods central to reading achievement. The panel analyzed over 100,000 reading studies and the findings emphasized the importance of effective reading instruction in five areas: phonemic awareness, phonics, fluency, vocabulary and comprehension. Of these five areas, phonemic awareness and phonics form the foundation of reading by supporting decoding of text and spelling of words. For young students who struggle to learn to read, intensified instruction in phonics and phonemic awareness is particularly important for increasing the likelihood of later literacy success (NELP, 2008; NRP, 2000; Piasta, 2014). “The acquisition and fluency of letter name-sound associations become essential as building blocks in the process of learning to read, and the sooner these skill areas are mastered the better the odds
are for reading mastery over time” (Agramonte & Belfiore, 2002, p. 182). A large body of
evidence shows that the best predictors of learning to read in the early stages are measures of
letter-sound knowledge and phonemic awareness.

**Phonemic awareness.** Phonemic awareness is the ability to hear and manipulate the
individual sounds within words. The sounds within words are called phonemes, so awareness of
these sounds is phonemic awareness. Spoken words are composed of sounds. For instance, the
word 'that' has three sounds or phonemes: /th/ /a/ /t/ (conventional linguistic notation separates
individual sounds or phonemes with slash marks).

The National Reading Panel (2000) questioned whether children with a well-developed
ability to hear the sounds within words would be better equipped to learn how these sounds
match the letters. English is an “alphabetic language,” which means that the letters in the written
language correspond to the sounds in the spoken language. The research from the meta-analysis
of 52 studies showed that children who cannot perceive the separate sounds within words are at a
disadvantage when it is time to match these sounds with letters while learning to read (NRP,
2000; Snowling & Hulme, 2011; Sousa 2007). It is imperative that children develop phonemic
awareness skills before they are taught phonics.

**Phonics.** Phonics is the understanding that there is a relationship between the letters of
written language and the individual sounds of spoken language. The relationship between the
two, often called the alphabetic principle, is used to help children read and spell words.
Research shows that children who may be experiencing reading decoding difficulties (dyslexia),
have low or delayed alphabetic knowledge (Earle & Sayeski, 2016; Piasta, 2014; Piasta &
Wagner, 2010; Snowling & Hulme, 2011). Letter-sound knowledge is a strong predictor of a
student's ability to decode words and have later reading success (Huang, Tortorelli, & Invernizzi, 2014; Stahl, 2014). Approximately 50% of English words can be decoded by following letter-sound associations (Earle & Sayeski, 2016). It is therefore essential to make phonics part of all reading interventions.

The National Reading Panel (2000) analyzed 38 studies to determine what type of phonics instruction was the most effective for problem readers. They defined problem readers as children in kindergarten or grade one who were at risk for developing reading problems; older children of average or better intelligence who were not making normal progress in reading, referred to as disabled readers; and older children who were progressing poorly in reading and who varied in intelligence with at least some of them achieving poorly in other academic areas, referred to as low-achieving readers (NRP, 2000). Study findings concluded that systematic phonics instruction makes a bigger contribution to children's growth in reading than alternative programs providing unsystematic or no phonics instruction. Systematic phonics instruction typically involves explicitly teaching students a prescribed set of letter-sound relationships and having students read text that provides practice using these relationships to decode words (NRP, 2000). The research also demonstrated that phonics instruction provided substantial reading growth among younger children at risk of developing future reading problems and those children who were identified as being disabled readers. This emphasizes the necessity for explicit and systematic instruction of phonics for our struggling readers.

The synthesized phonics research done by the NRP has caused some controversy. Proponents of teaching phonics in a more organic way, where the teacher constructs lessons in response to the observed needs of children, argued that the panel's report overestimated the effect
size of the systematic phonics instruction. Camilli, Wolfe, and Smith (2006) analyzed the data and found nothing to contradict the findings of the NRP and reconfirmed the positive effects of systematic phonics instruction.

**Degree of difficulty in learning the alphabetic principle.** Even with systematic phonics instruction some children continue to have difficulty linking the alphabet sounds to the letters. There are several reasons for this breakdown in learning the alphabetic principle. First, the number of associations to be mastered is considerable: more than 40 sounds for 52 letter shapes (lower case and upper case), plus sounds for combinations of letters (“sh”, “br”). The associations between letters and sounds are often totally arbitrary, as there is nothing inherent in the visual symbol that suggests its name or sound (Ehri, Deffner & Wilce, 1984). This makes it harder for children to remember.

Furthermore, many of the lowercase letters are visually similar and hard to discriminate. A cup is a cup no matter which way it is turned; however, the letter 'd' can become the letter 'b', 'p', or 'q' depending on how it is turned. An 'm' can become a 'w' when it is flipped upside down. Huang and Invernizzi (2012) conducted a study on the confusability associated with lower case letters. They tested 653 kindergarten students from economically disadvantaged homes and confirmed that some lower case letters can be visually confusing based on their shape. Because lower case letters are more often found in text, it is important that a way be found to help children differentiate between them.

Finally, the method of instruction may inhibit the development of the alphabetic principle. Teachers frequently focus on teaching letter names and then introduce the letter sounds under the rationale that the sound of a letter is often similar to its name. For example the letter
name for 'B' includes the sound /b/ at the beginning. Research by Piasta and Wagner (2010) compared a group of preschoolers in the United States who received combined letter name/letter sound (LN-LS) instruction to a comparable group of children who received letter sound (LS) instruction. The LN-LS instructional group outperformed the LS instructional group in learning both letter names and letter sounds. The research showed that the name for 15 of the alphabet letters assists students in learning the letter sound. However, there are 11 letters that do not offer consistent clues to the sounds they represent on the basis of their name (eg. g, c, h,w). This research was further supported by research from Kim et al., (2010) who found that letter names helped kindergarten students identify letter sounds when the sound was embedded in the letter name visually. If children rely on the initial sound in the letter name as the cue for the letter sound, they are likely to make errors, such as, /duh/ for ‘w’. Some children may never make the letter–sound association using this method of instruction. This is often very confusing for struggling readers and alternative methods must be found.

After the National Research Panel (2000) finished analyzing the research on using phonics to support early literacy development, the panel focused on a number of topics for further research, including mnemonics. They posed the question: “to what extent do mnemonic devices speed up the process of learning letter shapes, sounds, and names and facilitate their application in reading” (NRP, 2000, p. 136). How can brain research and specifically mnemonics, help educators teach struggling readers to successfully link the alphabet sounds to the letter shapes?

**How the Brain Functions**

It is important to think about how the brain learns and remembers so that we can support
students to help them remember what they are taught. Teachers, are more likely to succeed when their work is informed by the latest research from the neurosciences (how the brain functions) and from the cognitive sciences (how people learn) (Fadel & Lemke, 2008). Scientists are using functional Magnetic Resonance Imaging (fMRI) scans to help us understand this amazing and complicated process.

According to David Sousa, “learning occurs when the synapses in our brain make physical and chemical changes so that the influence of one neuron on another also changes” (2007, p. 12). When you repeatedly make these changes, a strong memory occurs. Through the use of fMRI, we can see that the brain goes through these changes when it stores new information as a result of learning (Marois, 2005). Memory is the process of retaining skills and knowledge for the future. Research indicates that the brain has three types of memory: sensory memory, working memory, and long-term memory (see Figure 1) (Marois, 2005).

![Figure 1. The Memory Process. Adapted from (Fadel & Lemke, 2008).](image)

**Sensory memory.** Any information that is received from the environment is
experienced through the senses: auditory (hearing), visual (sight), tactile (touch), olfactory (smell), and gustatory (taste) and held in sensory memory for a very short time; between 5-30 seconds (Jensen, 2005). If the sensory information is not processed quickly, it automatically gets stored in long-term memory and becomes episodic knowledge (Fadel & Lemke, 2008). Episodic memories are generated through personal sensory experiences. These memories degrade fairly quickly. It is only when a person pays attention to the information in sensory memory that those experiences get introduced into working memory (Fadel & Lemke, 2008; Sousa & Tomlison, 2011). Sensory memory is like a gatekeeper to ensure that the brain does not become overloaded. Educators must understand that in order for their students to have a chance to remember the information they are teaching them, they need to pay attention and process the information quickly, so that it can move to working memory.

**Working memory.** This is where thinking gets done. “Once an experience is in working memory, the person can then consciously hold it in memory and think about it in context” (Fadel & Lemke, 2008, p. 10). Working memory, also called short term memory, decides if new information will be discarded, maintained in the working memory as it is analyzed and manipulated, or encoded into long-term memory for later recall. Recent research shows that people are able to store approximately four objects in visual working memory and seven objects in verbal working memory (Fadel & Lemke, 2008; Sousa & Tomlinson, 2011). If teachers are racing to cover material and present too much information at a time, the working memory will reach capacity. At this point, the working memory must decide whether to reject new incoming messages or to replace an item that is already there (Sousa & Tomlinson, 2011). It is important that time is taken to work with a limited amount of information in working memory and take
Measures to encode information efficiently in long-term memory, before more information is added to the system.

**Long-term memory.** The brain has two types of long-term memory: episodic and semantic. Episodic memory comes directly from sensory input and is involuntary. Personal experiences are considered episodic in nature. Your life happens and it gets recorded. Semantic memory stores information from working memory and it includes things such as: ideas, thoughts, processes that result from thinking, and facts (Fadel & Lemke, 2008). The processing in working memory automatically triggers storage in long-term memory.

When information gets encoded in multiple places in long-term memory it creates stronger neural pathways and memories are easier to retrieve (Sousa & Tomlinson, 2011). To know if a student has actually stored information in their long-term memory it is important to use assessment to determine if learning has occurred. This is a process where the teacher checks in with their students as they learn to see how they are doing and what skills need to be learned next or reviewed. In their book *Catching Readers Before They Fall*, Johnson and Keier (2010) state that “we need to keep track of all our readers' progress but struggling readers need selective attention and close observation. We must be intensely aware not only that they are struggling but also of what is contributing to their struggle” (p. 180). If you find out that a certain skill, such as learning the alphabet sounds, has not been retained, then you know other measures need to be used to help those students remember.

**Measures to Encode Information Efficiently**

**Meaning and relevancy.** When we attach meaning and relevancy to the information in working memory the brain is more apt to store this information in long-term memory (Fadel &
Lemke, 2008; Sousa & Tomlinson, 2011). Relevancy is a very personal thing and is greatly influenced by our own experience. A student who is interested in reading will find the literacy lesson on learning the letter sounds very relevant, and the likelihood that the information learned will be stored in long-term memory will be high. This is the reverse for a student who is not interested in reading. For children just beginning to learn to read, alphabet letter names are intangible and their sounds abstract, and the association between the letter shape and its name has relatively no meaning to the child (Shmidman & Ehri, 2010).

When a student perceives that an activity is lacking meaning, their attention is likely to divert to more stimulating and albeit off task activities. Conversely, when children think about how the information is relevant to them and they have time to process it in different ways, they create stronger neural pathways, imprinting the information in long-term memory (Jensen, 2005; Sousa, 2007; Sousa & Tomlinson, 2011). Teachers can make information more meaningful and relevant by actively engaging students in the lesson.

**Engagement and attention.** As mentioned previously, information will transfer into working memory when the students are engaged and attending to the situation. Eric Jensen and many others recommend that it is important for teachers to find a hook to capture their students’ interest (Jensen, 2011; Sousa & Tomlinson, 2011). Some suggestions are: make the lesson emotionally charged and exciting; create suspense; get the children personally involved; or do something novel (Jensen, 2011; Sousa & Tomlinson, 2011). Researchers, Wittmann, Bunzeck, Dolan and Duzel (2007) conducted a study with adult participants to see how they processed information related to novel images. The fMRI scans revealed that the hippocampus, a region in the brain associated with encoding memories, was activated when a novel image was presented.
They explained that this area of the brain is heavily populated with neurons that produce dopamine, a neurotransmitter associated with pleasurable experiences (Wittmann et al., 2007). When dopamine is released the brain responds with increased focus, memory and motivation (Wittmann et al., 2007). This tells us that if we make something engaging and stimulate our hippocampus, we have a greater likelihood of remembering it.

We have all had experiences where we didn't engage in a situation and our learning was affected. Our students are just the same. Researchers, Uncapher, Hutchinson and Wagner (2011), conducted a study using fMRI that revealed that people remembered information better when they were directed to attend to it. In order for our students to learn their alphabet sounds, we need to get their attention and make the process fun. If a student does not attend consciously to instruction, “then that student's learning is surely diminished, both for the content not initially encoded and any subsequent content that depends on this initial learning” (Szpunar, Moulton & Schacter, 2013, p. 5). Without attention there is no learning.

Making sense. Making sense refers to whether a student can understand the information that is being presenting. Educators need to find out what the students understand before starting a lesson, in order to ensure that the students have the necessary prior knowledge to participate effectively. When children enter kindergarten they demonstrate a wide range of alphabet knowledge. If the process of learning the alphabet sounds is going to make sense to the students they need to be taught at a level they can comprehend. Piasta (2014) advocates for teaching children their alphabet sounds in differentiated groups related to what they already know. Through her research she shows that when we determine which letters should be taught to whom, greater efficiency in alphabet learning is created (Piasta, 2014; Piasta & Wagner, 2010).
Educators need to help the students to see relationships between what they are teaching and what they already know (Prasannakumar & Saminathan, 2016). Making connections to prior knowledge strengthens the neural connections or pathways between working memory and long-term memory and helps to solidify the new knowledge in long-term memory (Jensen, 2005; Sousa, 2007).

**Meta-cognition.** Meta-cognition is a term that refers to the process of thinking about our own thinking. Memory is enhanced when students develop meta-cognitive strategies. They approach their learning by trying to predict outcomes, explain ideas to themselves, ask questions, learn from their failures, and activate prior knowledge (Fadel & Lemke, 2008). These are the students who, knowing that each week they learn another letter sound, predict the next letter to be studied based on the pattern of the alphabet. Then, when they find out a letter has two different sounds, they might tell you that they heard one of the sounds earlier in a story. They are actively engaged in the learning process. It is the educators' job to help children engage in and think about, the process of thinking. When information is analyzed and organized in working memory, it is more likely to be stored efficiently in long-term memory.

**Repetition and rehearsal.** Activating memories helps to maintain them. According to Sousa (2007), this rehearsal is made up of two patterns. Rote rehearsal is used when students need to remember and store information exactly as it is entered into working memory. We use rote rehearsal when we want to remember a poem, the multiplication tables, telephone numbers, facts, or the names and sounds of the alphabet. With practice this semantic knowledge gets stored in long-term memory. People often find semantic knowledge the hardest to remember and often boring, but Jensen (2005) states that if you link the information with something concrete
such as a picture, or you chunk the information together instead of keeping it in separate units, then the ability to remember is increased. This has great implications in the design of a tool to help students link the alphabet sounds with the letter formations.

Another form of rehearsal is elaborative rehearsal. This is used when there is no need to store the information exactly as it is presented (Sousa, 2007). It is a more complex process where information is reviewed several times, making connections to prior knowledge, spending time analyzing the information and assigning meaning to it. This process takes more time but the likelihood that the information is stored in long-term memory is greater (Jensen, 2005).

Rehearsal does not guarantee information will be transferred to long-term memory, but there is almost no long-term memory without rehearsal (Sousa, 2007). For educators, it is important to be mindful of slowing down the learning process. Students who struggle to remember need more time and guidance than other students. They need more practice or rehearsal to consolidate their learning.

Mnemonics. Mnemonics are easy strategies designed to improve the storage and retrieval of information from long term memory. If material is presented in a way which fits in or relates meaningfully to what is already known, then it will be retained for relatively long periods of time and thus retrieval through verbal or visual clues becomes quite easy. “Mnemonics are effective when they speed up learning, reduce confusion among similar items, and enhance long-term retention and application of the information. They are especially valuable when the information to be learned is unfamiliar, complex, abstract, and extensive” (Shmidman & Ehri, 2010, p. 160). When you need to remember the names of the planets in order, it is often helpful to use a mnemonic. The first letter of every word in a sentence
corresponds to the planet names in order. For example, "My Very Educated Mother Just Served Us Nachos" represents "Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune". The phrase "Every Good Boy Deserves Fudge" has helped countless piano players remember the treble clef lines in music. The letters of the alphabet are abstract shapes and many kindergarten students would benefit from using a mnemonic to enhance their memory of these sounds. By using mnemonic strategies, teachers can relate new information to information students already have locked into their long-term memory.

**Multi-modal / multi-sensory learning.** Multi-sensory learning is the process of learning new subject matter through the use of two or more senses. This may include combining visual, auditory, tactile-kinesthetic, and even smell and taste. When children engage in active play the processes they take part in are much more complex and require a greater source of sensory input to the brain than mere cognitive activity (Jensen, 2005). “Students who engage in learning that incorporates multi-modal designs, outperform students who learn using traditional approaches with single modes,” such as sitting and listening to the teacher (Fadel & Lemke, 2008, p. 13). Adding visuals to verbal learning can result in significant gains in basic and more developed learning. Teachers who use multi-sensory instruction, capitalize on the different learning styles of their students by utilizing as many pathways as they can for acquiring knowledge and skills (Burke & Dunn, 2003; Walet, 2011).

The Orton-Gillingham approach to teaching was founded by Samuel Orton, a neuropsychiatrist and pathologist and Anne Gillingham, an educator and psychologist. Their approach was primarily used with individuals who had difficulty with reading, spelling, and writing associated with dyslexia. Their teaching practices were known for having a strong
pedagogy in using multi-modal teaching. Students are directed to see the letter, trace it, say the name and sound. They use visual, auditory and kinesthetic-tactile connections as shown by their 'learning triangle' (Henry, 1998). Situations have been observed where teachers clap the letter sounds out or place tokens in sound boxes to help their students identify the specific phonemes in words. Teaching alphabet skills should use multi-modal learning if it is to be effective. The more locations in the brain that can be engaged in learning and memory, the better the learning and the sharper the recall.

**Dual coding theory.** The Dual Coding Theory (DCT) of memory was initially proposed by Allan Paivio in 1971 in order to explain the powerful mnemonic effects of imagery that he and others had uncovered (Sadoski, Paivio & Goetz, 1991). In one experiment, participants saw pairs of items that differed in roundness (e.g., tomato, goblet) and were asked to indicate which member of the pair was rounder. The objects were presented as words, pictures, or word-picture pairs. The response times were slowest for word-word pairs; intermediate for the picture-word pairs; and, fastest for the picture-picture pairs (Sadoski et al., 1991). The concept that language can evoke imagery and imagery can evoke language was heavily studied with the result that there is not a one-to-one correspondence between images and language. One image could evoke lots of language or no language at all and vice versa.

These experiments led to the dual coding theory which is built on the assumption that information is processed and stored in memory by two separate but interconnected codes – one verbal and the other nonverbal (Sadoski & Paivio, 2001). This means if some piece of information is coded both verbally and nonverbally, the probability of retrieval is doubled (Sadoski et al., 1991). Peoples' brains are wired to process visual input very differently than
sound or text. Recent technological advances in using fMRI scans confirmed Paivio's theory of a dual coding system, where the brain processes visual and text/auditory input in separate channels in working memory (Fadel & Lemke, 2008). A good visual of this can be seen in Figure 1 on page 15.

Sadoski and Paivio’s (1991) research demonstrates that pictures are far more likely to be stored both visually and verbally. That is, we remember the picture, and the name it is spontaneously associated with, is retrieved. For example, a picture of a worm in the shape of the letter 'w' provides adequate cueing in both verbal and non-verbal memory to help students remember the letter sound /w/. This has huge implications for the curriculum development work in building a mnemonic tool to support students in learning their alphabet sounds. Children can learn the alphabetic symbols and sounds by combining their oral language knowledge (naming items) with pictures and print.

Another interesting discovery from the research on DCT produced the knowledge that the primary codes for concrete concepts (the worm) are learned before, or more easily than, abstract concepts (the letter 'w'). This is because the concrete concepts are processed and stored as images and verbal representations, whereas abstract concepts are primarily stored as verbal representations, which have less access to the nonverbal code (Sadoski et al., 1991). This knowledge can be used when we teach children the alphabet sounds by linking a concrete visual (worm) with the letter formation 'w'.

**Embedded Mnemonics**

**Effective mnemonics.** Given what is known about the difficulty children have with learning the letter-sound associations and the benefit of using mnemonics to help people learn
abstract information, researchers have sought to combine the two to see if they could improve student success. “How to facilitate the task of learning visual-verbal associations that are meaningless and arbitrary has been studied extensively using the paired-associate learning paradigm”, (Ehri et al., 1984, p. 881). There are three components to this way of thinking: learn a letter's shape (stimulus learning); learn the letter names and sounds (response learning); and, learn which shapes correspond to which names/sounds (associative learning). One approach used to teach these components is rote learning. Learners repeatedly rehearse the information item by item without any context. It is known, through the study of brain-based research and best practice, that this way of learning does not produce adequate results. “A more supportive approach involves mnemonic devices that are designed to enhance memory for the items” (Shmidman & Ehri, 2010, p. 160).

Ehri et al. (1984) believed that it was important to have a concrete, meaningful, interactive and imaginable connection that linked the visual stimulus with the response terms in memory. They thought it was important that when the learner saw the letter shape they would be reminded of the mnemonic picture or action. In 1984 they conducted a study to determine if a simpler type of embedded mnemonic helped prereaders learn letter-sound associations. The letter-sound associations of the letter ‘f ’ and the sound /f/, were each represented in one picture whose shape included the lower case letter (e.g., letter ‘f ’ drawn as the stem of a flower) and whose name (flower) began with the letter's sound. The experimental group was taught using these types of embedded mnemonics. The second group, called the disassociated-picture control group, learned letter–sound associations with pictures having the same names as the integrated pictures, but drawn without letter shapes (e.g. letter ‘f” was shown with a flower but it did not
During the training phase, the integrated mnemonic group were told that thinking of the flower and saying its beginning sound would help them remember what sound the letter made. At the end of the study, when the children were tested, they were just shown the alphabet letter and they had to say the sound and the picture associated with it. The results revealed that the children who used embedded mnemonics were able to recall significantly more letter names and sounds than the control group, who were given disassociated mnemonics. For example, 86% of the embedded picture group could say the sound of the letter 'f', compared to 42% of the control group. Results revealed that correct recall of sounds was accompanied by correct recall of pictures in the majority of cases in both groups (98% among experimental subjects, 74% among control subjects). Interestingly, incorrect responses were characterized by a failure to respond with any sound or picture name (88% among experimental subjects, 90% among control subjects), rather than by incorrect associations. These findings revealed that the key to the integrated subjects' success was their ability to recall and name the pictures associated with the letters. "Integrated pictures were effective because they linked two otherwise unconnected items in memory" (Ehri et al., 1984, p. 880).
Ehri et al. (1984) wanted to determine the importance of pictures by conducting a second study with a second control group that did not receive any pictures associated with their letters. The results of the second experiment were quite interesting. Like the first experiment, the group with the embedded mnemonic overlayed on the alphabet letter significantly recalled the most letter sounds. The control group, who did not have any picture, did as well as the control group with a dissociated picture. In the end, it was apparent that all experimental pictures did not have the same effect. Effective embedded mnemonics were those created with direct visual association between the letter shape and the picture image when they were embedded together with a simple image. They were also effective because the pictures revealed the sound of the letter in their names (i.e. flower for /ʃ/), thus enabling the participants to connect letter shapes with their sounds in memory. These results will help me to design my alphabet mnemonic learning tool, as I will make sure that my images are embedded with the letter shape.

**Making embedded mnemonics meaningful.** Brain research shows that if information that is meaningful is used, it will help students to remember. In the study by Ehri et al. (1984) they used a yak picture for the letter 'y' and a pole and a pillow connected like the letter 'p'. It is questioned whether these would be meaningful to early primary students. My own ideas and interest in this regard has led me to explore this area in hopes of creating my own meaningful visual tool for students. Further investigation will be needed to explore what properties of pictures mnemonics make them more effective.

**Long-term memory.** Two studies were analyzed that looked at the effects of embedded mnemonics on long-term memory. Shmidman and Ehri (2010) and White (2006) both did studies with at-risk kindergarten students and found that the majority of students were still able
to remember the target alphabet sounds after two-three weeks. According to Sousa (2007), information is held in working memory for up to two weeks and then moved to long-term memory. These two studies demonstrated that using mnemonics enhanced memory encoding as the children remembered the information for a significant period of time.

Two Current Programs Using a Multi-Sensory Approach

With the success of using visually embedded mnemonics to help children learn the alphabet sounds some teachers have developed programs that incorporate this approach into a multi-sensory experience in their classrooms. These programs have added songs, movement, stories, hands-on manipulatives, and lots of visuals. Their methodology is mentioned in the work from Ehri et al., (1984). These programs have gained much attention and they have been turned into commercial products that are available to teachers who want to teach the letter sounds using a multi-sensory approach. Two examples that use embedded mnemonics include Itchy’s Alphabet and Letterland.

**Itchy's Alphabet.** Itchy's Alphabet, a program to teach letter-sound associations, was created by Brenda Larson, a Learning Assistance teacher in Kelowna, B.C. In my email correspondence with her she was asked how she got started and she mentioned:

there were Orton-Gillingham tutors at my first school (1972) and the Orton program had a few cues in the shape of the letters. When I used these, I found the students were able to remember both the sound and formation easily and if I didn’t have a cue in the shape both the student and I had to work a lot harder to teach/learn the skills!!! As a student would struggle with a sound, I would try to think up a picture cue that would work and eventually (probably took 20 years) ended up with all 26 that worked for the kids! (B.
These visual cues are featured in her program and their success is supported in a study by DiLorenzo, Rody, Bucholz and Brady (2011). They wanted to see if kindergarteners could learn their alphabet sounds, segment a word into sounds and decode nonsense words, after using the Itchy's Alphabet program. They worked with three kindergarten classrooms where one classroom was the control group and did not receive any of the training using Itchy's Alphabet. The other two classroom teachers taught their whole class using the program for 90 minutes each day for three months. Results showed that the kindergarten students in the Itchy’s Alphabet group performed significantly better than did those in the control group (DiLorenzo et al., 2011).

**Letterland.** Letterland is another, albeit larger, multi-sensory program used to teach students their letters and sounds with the use of embedded mnemonics. It was originally developed by Lyn Wendon, from England, who created a whole land devoted to Letterland characters. Souther (2015) conducted a study to investigate whether Letterland could help with the literacy goals in North Carolina for students in kindergarten through grade two. She used 22 classrooms in four schools and did pre- and post- tests as well as observation and surveys to collect her data. All the teachers in the study had already incorporated Letterland into their teaching program. Two schools had been using the program since 2010 and other two since 2013. To guide her research she questioned whether it was an effective program; whether it had an impact on student achievement; and, whether it improved student engagement. Opinion results and classroom assessments, showed that everyone thought that Letterland was most effective for learning the beginning sounds (100%) and less effective for improving fluency (57.14%) (Souther, 2015). The highest gains for students in the Letterland program were in the
area of early literacy skills. This indicates that it is an effective program for beginning readers.

Themes emerging to support product design

Multi-sensory learning. A main feature of Itchy's Alphabet and Letterland is that they use a multi-sensory approach. Visual, auditory, kinesthetic and tactile learners will find activities built just for them. Both use the embedded visual mnemonics to enhance the picture/letter connection. This method is firmly supported by brain research. They also use: songs; stories; actions; games; some hands-on manipulatives for the vowel sounds (Itchy's Alphabet); and many visuals (posters, flashcards, worksheets) to support the students' ability to engage in a variety of ways with the alphabet sounds and lower case letters. To increase a student's ability to retain the alphabet letter sounds, a multi-sensory approach should be used.

While Letterland has actions for all its letters, Itchy's Alphabet only has actions for a few. I asked Ms. Larson about this and she said that most children in her experience learn the sounds without the added actions (B. Larson, personal correspondence, February 22, 2018). Because of increasing knowledge about how the brain learns, it would appear to be a good idea to try to develop actions for all the letters so that those children, who connect with their learning in a kinesthetic way, could have access to material in their preferred modality.

Engagement. Interviews with the classroom teachers, after the Itchy's Alphabet study, showed that the students and teachers enjoyed learning with Itchy's Alphabet and they wanted to carry on using it after the study was finished (DiLorenzo et al., 2011). Similar results were found in Souther's study. Engagement scores in all schools participating in the study were high and when Souther (2015) observed students using Letterland at their schools she found that they were engaged behaviouraly, cognitively and socially. Many children exclaimed that they loved
Letterland and it was “their favourite” (Souther, 2015). This connects back to what Jensen (2005) said about how the brain remembers information better when it is engaged and enjoying what it is doing. If the teachers and students in the present study are representative of others, then multi-sensory programs certainly are engaging for students and thus enhance their ability to remember the information in long-term memory.

**Meaningful and relevant.** We know that it is easier for children to remember information when it is meaningful and relevant. If students are learning the sound for the letter 'c' and the mnemonic visual is a cookie with a bite out of it, they are more likely to remember the image because it is something they like and they are familiar with. We do not have to teach them about what a cookie is and then the sound of 'c', because they already have knowledge about cookies in their memory. It is easier for students to learn when they link new information with information already stored in their long-term memory (Jensen, 2005). Both the Letterland and Itchy's Alphabet programs contain many meaningful visuals for the students. They use apples, baseballs, dogs, houses, octopi, snakes, people yawning, queens, kings, elephants and firefighters. These are all images that most children can relate to and connect with.

There are also letters in Letterland and Itchy's Alphabet that are not necessarily meaningful or easy for primary students to relate to. Weldon (2011) created her program in England and some of her visual mnemonics and terms are not very familiar to North American children. For example, she introduces the characters 'Lucy Lamp Light', 'Impy Ink' and 'Vicky Violet' but most of North American students are not familiar with a lamp light, ink well, or violets. These images have to be explained before a meaningful connection can be made. Larson uses a combined image of a needle and thread for her letter 'n' but primary students are
not often engaged in using a needle and thread and the item is unfamiliar to many. Sousa and Tomlinson (2011) say that “if we expect students to find meaning, we need to be certain that today's curriculum contains connections to their past experiences and not just ours” (p. 50). The diverse learners at my school would benefit from images that are more current and connected to the First Nations culture. When teaching the letter sounds it is important, therefore, to update programs and make sure teachers have relevant images.

**Effective embedded visuals.** Research states that embedded singular visuals are remembered better than embedded pictures or cluttered visuals (Shmidman & Ehri, 2010). The images have to be clear to the children and free of distractions. For example, it is easier for children to learn the letter 's' when it is in the shape of a snake, rather than if the snake was laying flat on the ground (Ehri et al., 1984).

In the Letterland program some of the visuals are not embedded as effectively as research has suggested. For example, the character Noisy Nick is showing his face inside the letter 'n'. He is not part of the 'n'. Golden Girl is sitting on a swing that is in the shape of the letter 'g' and her golden hair forms part of the swing. The letter 'u' has an umbrella hanging above it which is not embedded in the least.

In Itchy's Alphabet a picture of two people kissing is used for the image of 'x' (see Figure 3). When I asked Larson about the use of this visual, she explained that even though some people had been uncomfortable with the kiss image, it worked well with the children that she taught. Her goal was to teach the sound /ks/ and kiss was the best way she found to do that (B. Larson, personal communication, March 16, 2018). I find that when I look at her mnemonic for the letter 'x' I do not see two people kissing because it is visually distracting. The letter 'x' is
certainly embedded in the picture but so much so that it is hard to identify. It is easier for the brain to encode information that is simplistic (Jensen, 2005).

![Figure 3. Itchy's Alphabet letter 'x'. Reprinted with permission (B. Larson, 2018).](image)

**Figure 3.** Itchy's Alphabet letter 'x'. Reprinted with permission (B. Larson, 2018).

**Letter confusion.** As previously mentioned, letter confusion is a big component of what makes reading difficult for some children. When primary teachers print letters on the board they use a basic script that does not embellish the letters. This helps the children to see the letters like they are formed in leveled books that they use when they are learning to read. The Century Gothic font prints like the text children see in books (g, t, a). In the Letterland program they use a different style of font for their 't' and 'l'. Both these letters have hooks on the end and even with this subtle difference some children do not recognize them as 't' and 'l'. It is important to make learning the letters and their sounds as easy as possible for struggling learners, so a traditional font (G) should be used. Both programs teach the lower case letters first as these are the ones most seen in text.

**Summary**

The literature indicates that an essential part of the reading process for beginning readers involves learning the alphabetic principle (how alphabet sounds link with letter shapes). It is imperative that these foundational skills are mastered so that students can learn how to read.
Brain research has shown that there are specific techniques that affect how a student remembers and recalls information. Specifically, when information is meaningful, it is more memorable. Additionally, when information is engaging, the children attend better. Also, when children are able to access their prior knowledge, they have a better chance of making sense of what they are learning. Further, when students have time to work with the information, rehearse it, and process it using higher level thinking, it is better encoded in long-term memory. Next, when information is made concrete, like when we use mnemonics, it is more memorable than when it is abstract. Also, when we engage in a variety of visual, auditory, kinesthetic, gustatory and olfactory experiences, our students will encode information in different ways thus facilitating better recall. Each of these variables – meaningfulness, engagement, sense making, metacognition, rehearsal, mnemonics, and multi-modal learning, contributes towards a theoretical framework for explaining how teachers can help struggling readers learn the alphabetic principle.

Specifically, research using embedded visual mnemonics has shown that it is an effective tool in helping young readers learn alphabet sounds and link them with the letter shapes (DiLorenzo et al., 2011; Ehri et al., 1984; Shmidman & Ehri, 2010; Souther, 2015). Two commercial programs, Letterland and Itchy's Alphabet, were analyzed and it was determined that they were effective in increasing most of the young primary children's ability to learn their letter sounds, although they can be improved (DiLorenzo et al., 2011; Souther, 2015). The knowledge
from the research has given me valuable information in which to design a multi-modal mnemonic tool, grounded in brain research that will help teachers to guide students struggling to learn the alphabetic principle.

**Gap in the Research Design**

While the Letterland and Itchy's Alphabet programs are geared to be used in the classroom setting, I would like to design a simpler tool that can be used in a remedial setting. In this setting up to five children can be pulled out of their classroom and given remedial (corrective) support. My tool needs to be designed within the structure of this remedial framework. This means that the tool needs to be quick and easy to use and work well with other methods that the support teacher employs. Teachers might use a sight word program, a reading program and a spelling program, all from different creators. Many remedial teachers do not follow a prescribed curriculum such as Letterland or Itchy's Alphabet because we need to build the programs with student individuality in mind.

While the commercial programs are comprehensive, they are too busy for a remedial setting. Research shows that teaching phonics should be part of a literacy program that gives the students practice at decoding text and spelling words (NRP, 2000). In the half an hour lessons that I provide, the students are taught specific skills based on what a formative assessment identifies as important to their learning; have time for lots of rehearsal; and, then have practice applying them to reading or writing. There was no time to sing songs, create puppets, do dances, and have drama sessions that are incorporated into the Letterland and Itchy's Alphabet programs. While this may be perfect for the kindergarten setting, it is not for the pull out remedial setting.

My design is based on what has been learned from the latest research on how the brain
best encodes information. I provide mnemonic visuals that are engaging to young children so they can create meaning out of the abstract alphabet symbols. Some of the images in the Letterland program are not relevant to the children at my school. It is important that visuals be created with today's child in mind, as their interests and connections are different from the children 20 years ago. Specifically, I was mindful of my students with First Nations heritage and created some designs that they may find culturally meaningful. Research shows that when the visual design becomes too busy, like in the Itchy's Alphabet 'x' example, it is hard for children to easily identify the letter. My designs are simple and uncluttered so that students can make connections to the images quickly without having to figure out what the design represents.

Using multi-modal learning experiences (visual, auditory and kinesthetic) enhances the children's ability to remember what they are learning. In the kindergarten and grade one Letterland program these experiences are often more playful as children quack like a duck for the /q/ sound or wiggle their arms above their heads like bunny ears while they say /b/ for bunny. In my project design I am mindful that I am also working with grade two and three children, who need to learn the letter sounds and who will not want to be using actions that make them stand out in their classrooms. The actions in my design are therefore smaller and less obtrusive.

Both Letterland and Itchy's Alphabet teach the letter sounds first and discourage teaching the letter names until after the letter sounds have been mastered. New research revealed that the letter names provide auditory cues for learning the letter sounds and I have incorporated this knowledge into my project design. It is my hope that my new design will benefit other support teachers who are looking for a streamlined and effective learning tool to help teach their primary students the letter-sound associations.
Chapter 3

Description of the Applied Project

Overview

The purpose of my research is to design a multi-modal mnemonic tool, grounded in brain research, that will help remedial teachers support students struggling to learn the letter-sound associations. This project takes the form of a digital Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and accompanying Teacher's Guide that will be easy to make into a hard copy. Each letter of the alphabet is drawn with an embedded visual mnemonic, and all of them are displayed on one 8.5” x 11” chart for easy reference. The Teaching Cards display each alphabet image in a bigger 4” x 5” format for easy viewing. The Alphabet Mnemonic Chart shows the memory strategies to use when teaching the individual letters. The Teacher's Guide explains the knowledge behind the project; how the letters are linked to the mnemonic visual; and, how the association could be taught.

This chapter begins by providing the context in which the Graduate Applied Project is created. It provides personal illustrations that explain why this project is important for those teachers creating remedial programs to small groups of students. Next, a description is given of the applied project and each of its components. Then, a general time line is given to support the development of the products. Finally, possible venues where this project may be presented is explored. The completed project can be found in the appendix at the end of this document.

Personal Context

As the integration support teacher at my school I work with approximately 20 students who have great difficulty learning to read. One of the key skills they are missing is the ability to
link the letter sounds with the letter formations, which is also called the alphabetic principle. Research shows that “the acquisition and fluency of letter name-sound associations become essential as building blocks in the process of learning to read, and the sooner these skill areas are mastered the better the odds are for reading mastery over time” (Agramonte & Belfiore, 2002, p. 182). It is important therefore to help these students meet with success as soon as we see that they are struggling to master these early literacy concepts. For some reason they are not meeting with success in their classrooms and specific alternative intervention must be considered.

The children, who range in ages from five to nine, come to my small office, in groups of no more than five, so that I can provide intensive intervention in order to support them. According to Barbara Wasik, a professor at Temple University who is interested in early childhood education, five children is the maximum size a small group should be as it allows the teacher the opportunity to focus the needed attention on individual children and make sure each child is learning (Wasik, 2008). Richard Allington (2006) advocates for having no more than three children in a group. He says that “the evidence available indicates that both tutoring and very small-group instructional support is more commonly effective than the traditional larger-group (four to seven students) remediation” (Allington, 2006, p. 151). He goes on to say that with very small group lessons the teacher can pace the lesson to take advantage of every minute of time to be more effective (Allington, 2006). Research shows that more opportunities to rehearse information helps students remember the information.

Having students in a separate room has benefits as well. Wasik (2008) states that “for children who have trouble discriminating sounds in words, too much background noise can interfere with their processing” (p. 518). She goes on to remind us that small groups give
children “the opportunity to see how the teacher's mouth forms the letter sound and hear the sound with minimal distractions” (Wasik, 2008, p. 518). It also gives the teacher the opportunity to hear the individual sounds a child produces and provide corrective feedback instantaneously (Wasik, 2008). Children who are struggling with any concept benefit from a small group setting that is free of distraction and background noise. The research shows that children who attend better, remember better. It is imperative that these children are able to hear the sounds of the letters clearly and receive corrective feedback. In the small group, pull out remedial setting, the quality and quantity of individualized instruction is increased. The small group setting allows teachers to provide quick constructive feedback so that the students are spending more time rehearsing the correct sounds and letter connections. Approximately half of the students who I see are First Nations. Most are boys and half of those are very active and have a hard time focusing on the learning intentions in their classrooms. The small group setting supports these children as there are fewer distractions in my room and the intervention is intentionally geared with them in mind.

The research clearly indicates that using visual mnemonics helps children learn the letter sounds and link them to the letter formations. In this paper we have also learned that all mnemonics are not created equally, and by making the visuals more meaningful to the students, we will help them to better remember the letters and their sounds (Fadel & Lemke, 2008). For this project I have created Alphabet Linking tools that will help my struggling students, those who are predominately First Nations or boys, link the letter sounds with the formations in meaningful ways. Based on brain research and the importance of using a multi-modal approach to increasing a student's ability to remember information, I have also linked a kinesthetic
mnemonic to each visual.

Description of the Project

My project is composed of four products. First, I have created an 8.5” x 11” Alphabet Linking Chart, that displays all 26 alphabet letters embedded in their own simple visual image. Second, I have created individual 4” x 5” Alphabet Teaching Cards, using the same images from the Alphabet Linking Chart. Having individual cards will enable the teacher to highlight one letter at a time when they are teaching. Third, I created an Alphabet Mnemonic Chart where the different mnemonics are displayed for each letter. This will be an easy reference chart for the teacher. Fourth, I have created a Teacher’s Guide that describes current research evidence about the importance of teaching phonics and how information about the brain can be used to help students remember the letter sounds and link them to the letter formations. In the guide I provide instructions on how to use the Alphabet Linking Chart, Alphabet Teaching Cards, and Alphabet Mnemonics Chart. I share information on instructional settings, assessment, letter teaching order, and teaching scripts, for the teacher to use, so that there is consistency of language.

Alphabet linking chart. The Alphabet Linking Chart is intended for public display so that the children can reference it when they are learning letters and sounds. Each embedded alphabet letter is colourful, meaningful and engaging for children. A primary lower case font is used as the base of the image and the embedded picture is hand-drawn around it. For example, the letter 'b' is embedded in the head and ears of a bunny rabbit. The layout displays each of the alphabet letters, with their embedded visual, in alphabetical order as this is the most familiar way for children to see the letters. The name of the image is printed beside and below the letter to help the teachers remember what each picture is. It is important to make a connection between
the sound of the letter and first sound in the name of the picture. For example, the word 'snake' is printed next to the image of a snake (see Figure 4 below). Saying the word 'snake' helps the children to hear the /s/ sound.

![Snake](image)

*Figure 4. Image of a snake for letter ‘s’.*

Lower case letters were used, like they used in Letterland and Itchy's Alphabet, because the lower case letters are the ones seen more often in text. If the purpose is to help the children decode words and spell, then it is imperative that they know their lower case letters first (Carter & Wendon, 2011; Larson, 2001).

Each letter is embedded with a visual image (see Figure 5). The letter 'f' looks like a flower. Linking the letter formation with a meaningful picture helps the children recall the sound of the letter. When they see the 'f' they will think 'flower' and say /ʃ/ for 'flower'. Hence the image of the flower acts as a mnemonic for remembering the sound of /ʃ/.

![Flower](image)

*Figure 5. Image of a flower for letter ‘f’.*

As the research has indicated the more meaningful the pictures are made the better
connection there will be to having the students remember the image and the sound of the letter (DiLorenzo et al., 2011; Ehri et al., 1984; Shmidman & Ehri, 2010; Souther, 2015). Because many of my students are First Nations, I have incorporated some First Nations art work into the chart so it is more meaningful to them. For example, 't' could be thought of as a totem pole. The First Nations teacher at my school helped in the selection of these visual symbols as the BC New Curriculum is encouraging the incorporation of Indigenous art work into the curriculum. The art pieces were drawn by Dee Jay Abbott, a member of the Pauquachin First Nation, in North Saanich, BC. I wanted to choose a member from one of the local nations to do the art work, as it has more of a connection for my students.

**Alphabet teaching cards.** The individual 4” x 5” Alphabet Teaching Cards will help the teacher focus on teaching one letter at a time. The larger format will also help the students to see the images more clearly. These Teaching Cards are exact duplicates of the images on the Alphabet Linking Chart, except they are bigger.

**Alphabet mnemonic chart.** To help educators remember the different mnemonics they can use to support their students, I have included an easy to reference Alphabet Mnemonic Chart. It displays the visual, kinesthetic, and auditory mnemonics and describes some mindful information when teaching the students (See Figure 6). When a letter is repeated between slash marks (/fff/) it indicates that the sound is held.

Research revealed that children use some of the letter names as auditory mnemonics for remembering the letter sounds (Huang & Invernizzi, 2012; Piasta, 2014; Piasta & Wagner, 2010). The letter names for b, d, j, k, p, t, v and z have the letter sound in the first part of their name. For example, /b/ is heard when you say the name 'B'. The letter names for n, f, m, s, l, r, and x all
have the letter sounds in the final position of their name. For example, they all start with the sound /e/ and end with their letter sound, as in /e/ + /n/. While this may be helpful for 15 of the 26th letters, we will need stronger mnemonics for the other 11 letters. I have incorporated this research into the Alphabet Mnemonic Chart and provided other mnemonics to help the children make the letter-sound associations. The chart will be structured like this:

<table>
<thead>
<tr>
<th>Letter</th>
<th>Visual</th>
<th>Kinesthetic + Auditory</th>
<th>Think</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td><img src="image" alt="Flower Visual" /></td>
<td>Put your fist to your nose and sniff like you are smelling a flower. Say “flower, /fff/”.</td>
<td>f looks like the leaves and stalk of a flower. The letter name F has the /f/ sound in the second syllable.</td>
</tr>
</tbody>
</table>

![Figure 6. Alphabet Mnemonic Chart sample for the letter ‘f’](image)

According to Fadel and Lemke (2008), “students engaged in learning that incorporates multi-modal designs, on average, outperform students who learn using traditional approaches with single modes” (p. 13). All of the visuals link to an action that the students perform while saying the sound. For example, I drew swords that are similar to the ones from the popular children's movie “Teenage Mutant Ninja Turtles” to form the 'x' letter by crossing the swords. The children would cross their arms in front of their bodies and say /ks/. This action forms the letter shape, is meaningful, and has the auditory component as the children say the sound. The auditory, visual, and kinesthetic senses are engaged and enhance the ability to remember the information to be learned because more neural pathways are connected to the information (Fadel & Lemke, 2008; Richard, 2015; Sousa, 2007).
As mentioned before, I have done some personal work on teaching children sight words by using sign language. I have chosen sign language actions for the pictures where there is a natural visual connection. Whatever image or action I used, I wanted to make sure that it was meaningful for the students and easy to perform. The American Sign Language (ASL) action for ‘net’, asks the student to weave their two hands together. This visually looks and physically feels like a net. If an action is too busy then the children will not want to perform these actions in front of their peers when they get back to their classrooms. If they are trying to read or spell a word in their classroom and they use quick, small motor mnemonic actions, this will be less obtrusive and easier for them to perform. It is important that the children are comfortable and able to use the strategies taught so they benefit from them in all settings.

Teacher's guide. First, the Teacher's Guide provides background information about the importance of early reading development and the importance of teaching phonics. Second, it describes the information on how brain research can help teachers support children to remember the link between the letter sounds and the formation. Third, it describes the components of the program: Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and Teacher’s Guide. Fourth, it provides information on why it is valuable to teach the program in a small group setting. Fifth, it describes why formative assessment is important and how it could be conducted. Sixth, it provides information for educators to consider, when thinking about what order they want to teach the letter sounds in. Finally, it culminates with scripts that can be used to teach the sounds to students.

To help teachers use the Alphabet Linking Chart a general script is modeled. This script demonstrates a model-lead-test format, which many educators and instructional programs use for
explicit teaching (Bursuck & Damer, 2015). The model-lead-test format is brief and allows students the opportunity to see and hear an example of correct letter-sound associations (model), practice with teacher guidance (lead), and then produce the sound independently (test). The directions and script will look and sound like this:

1. Draw the lower case letter 'f' on the board.

2. Say, *This is the letter 'f' and it makes the /fff/ sound. To help us remember this we can pretend that the 'f' looks like a flower.*

3. Use the visual image from the Teaching Card as a reference, and draw two leaves, one on either side, where the small line crosses the 'f' and put a few petals at the end of the 'f'. If you are uncomfortable with drawing the image, just present the Teaching Card with the embedded visual drawn on it.

4. Say, *The letter 'f' looks like a flower so we say flower, /fff/. Now you try. (flower, /fff).*

*Great job of saying /fff/.*

I describe why it is important that the children link the letter visual with the first sound of the object to enhance memory and later recall, as evidenced by the work on dual coding theory by Sadoski and Paivio (1991). I describe the importance of reviewing the letters the children have previously learned. Brain research tells us that rehearsal reinforces the ability for long term retention in our brains (Fadel & Lemke, 2008; Sousa, 2007). The script for letter review look and sound like this:

1. Draw the alphabet letter to be reviewed on the board e.g. 'f'.

2. Ask, *What does this letter say?* If the child looks like they are having trouble ask, *What does the letter look like?*
3. If they still don't know, show them the embedded Teaching Card letter and say, *this letter looks like a flower so we put our fist up to our nose and say flower, /fff/. Now you try* (flower, /fff/). *Good effort of saying /fff/**.

4. Remember to help students connect the action with the visual and the auditory mnemonic.

5. Erase this letter and draw the next letter for review on the board.

6. After this review sequence, teach two new letters based on your initial assessment.

   It is important for the children to have a lot of practice with a skill before we introduce more skills (Fadel & Lemke, 2008; Sousa, 2007). Once the teachers learn the general scripts for introducing and the reinforcing the letters, the Alphabet Mnemonic Chart will be used as a guide so they can easily see the important memory information that needs to be taught for each letter. The Alphabet Linking Chart and Alphabet Teaching Cards will be displayed so that children can use them as visual mnemonic references.

**Project Time Line**

I began the design of my project in the Spring of 2018, and completed the project in August 2018, in time to be used for the start of school in September. I will make a beta version of my design available to two of my support teacher colleagues to receive constructive feedback to improve my design. We use best practice when we invite our critical peers to analyze what we have done so that it may be improved (Cohen, Manion & Morrison, 2013; McNiff, 2016).

**Resource Sharing**

My applied master's project: the Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and associated Teacher's Guide, is intended to be used by remedial teachers or other support teachers working with small groups of students who are struggling with
learning the letter sounds and linking them with the letter formation. It may also be beneficial to classroom teachers as well. In order to share my product with others, I intend to make a presentation at the local B.C. Teachers' Federation (BCTF) association meeting. The Special Educator's Association of Saanich (SEAS) has chapter meetings every month for the integration support teachers in our district. As the president of this association I have connections to both the Victoria and Sooke associations and I will offer to share my project at one of their meetings as well. Our school district's Elementary Literacy/Early Learning coordinator has expressed an interest in having me share my project with the Reading Recovery® teachers in the district of Saanich. At this time, there is no mnemonic tools used in this program and the district coordinator is interested in incorporating the idea of using visual mnemonics to help those students who are not making the gains expected from such intensive instruction. I am also going to approach the local ŁÁU, WELṈEW Tribal school to see if they are interested in learning about my project. I think the addition of First Nations visuals will be of interest to them.

I will discuss the possibility of housing my project on the school district's website, with the district Instructional Support Teacher for Saanich. My intention is to make the tools easily accessible for everyone in the Saanich school district or for those visiting the website. The Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and Teacher's Guide are created in such a way that it should be able to be used without having to attend a presentation.

Summary

The Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart, and accompanying Teacher's Guide are user friendly tools to support remedial teachers in their efforts
to help students who are struggling to learn the associations between the letter sounds and their formations. Its design is strongly grounded in research that shows that embedded visuals improve students’ ability to make these letter-sound associations (DiLorenzo et al., 2011; Ehri et al., 1984; Shmidman & Ehri, 2010; Souther, 2015). Brain based research shows that when information is meaningful, multi-modal, engaging and makes sense, it is easier for children to understand and remember. The design of this curriculum is grounded in these factors. I am excited to share this resource in the hopes that it makes a difference in the lives of some of our struggling readers. The Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and accompanying Teacher's Guide can be found in Appendix A at the end of this document.
Conclusion

The purpose of this project was to design a multi-modal mnemonic tool, grounded in brain research, to help remedial teachers support students who struggle with learning their letter-sound associations. Through my research on early literacy and brain based learning, the Alphabet Linking Program was created.

Learning to read is an essential skill and if students do not meet with success early on they can be challenged in the social, personal, physical and economic aspects of their life later on (Cree, Kay & Steward, 2012). It is therefore imperative that we use tools to support early literacy development. Letter-sound knowledge is a strong predictor of a student's ability to decode words and have later reading success (Huang, Tortorelli, & Invernizzi, 2014; Stahl, 2014). Unfortunately some students, especially those with learning disabilities, struggle to learn their letter-sound associations and need remedial support. They find it difficult to remember that the squiggly shape 'w', that we call 'double-u', says the sound /w/. We need to find a way for them to remember the information.

As described in the literature review, brain research has a huge impact on helping students remember academic skills. Scientists are using functional Magnetic Resonance Imaging (fMRI) scans to help educators understand the complicated process of understanding how the brain the brain stores information. Memories must be encoded into long-term memory efficiently so that students can retrieve the information accurately. There are many ways to make that happen. First, when information gets stored in multiple places, it creates strong neural
pathways and memories are easier to retrieve (Sousa & Tomlinson, 2011). Using multi-modal strategies like presenting information through the visual, auditory, tactile-kinesthetic and even smell and taste senses supports the process of storing information. The Dual Coding Theory created by Paivio and Sadoski (2001), states that information can be stored in memory both verbally and nonverbally. This means that if some piece of information is coded in both ways, the probability of retrieval is doubled (Sadoski, Paivio & Goetz, 1991). Through their research they discovered that pictures are stored both verbally and nonverbally, and that there are strong connections between language and imagery. In this project visual, auditory and kinesthetic mnemonics are used to provide strong connections for the children. Each letter of the alphabet is embedded with a visual image that is linked in shape to the letter. When the children say the letter sound they perform a simple action that corresponds with the image.

Second, when the information that is presented has meaning, relevancy and makes sense for the students, they are more likely to store it in long-term memory (Fadel & Lemke, 2008; Sousa & Tomlinson, 2011). The images in this project are based on items that the students would find meaningful. For example, cute animals, sports, familiar objects and games they play, are all used so that the children can find meaning in what they see. Because many of my students are First Nations, I have added images that use First Nations designs to make a connection for them. Making connections to prior knowledge strengthens neural connections between working memory and long-term memory and helps to solidify the new knowledge in long-term memory (Jensen, 2005; Sousa, 2007).

Third, research reveals that children remember information more easily when they are engaged and attending (Uncapher, Hutchinson & Wagner, 2011). If they perceive that an activity
is lacking meaning or it is too hard then they are likely to divert to more stimulating tasks. The tools in the Alphabet Linking Program are meaningful, colourful and fun, so I am confident that they will capture the students' attention. The Teacher's Guide also recommends that the program is delivered in a quiet pull-out setting. According to Barbara Wasik (2008) a small group setting gives the teacher the opportunity to hear the individual sounds a child produces and provide corrective feedback instantaneously and it gives the child the ability to hear the sounds, modeled by the teacher, clearly. Children who are struggling with any concept benefit from this setting that is free of distraction and background noise.

Fourth, the research is clear that activating memories helps maintain them. The human brain uses rote rehearsal, or the practicing of remembering information in a specific way, to link the letter sounds with the letter shapes. This semantic knowledge is often the hardest to remember and must be rehearsed often before it goes into long-term memory. Eric Jensen (2005) states that if you link the information with something concrete such as a picture, the ability to remember is increased. The Alphabet Linking Program is based on this concept where visuals are linked with semantic knowledge. The small group setting also provides the perfect setting for an abundance of practice. Richard Allington (2006) says that teachers can pace the lessons according to individual needs, and take advantage of every minute of time, so that there can be more rehearsal of skills taught and thus be more effective.

Finally, the literature review shows that mnemonics are easy strategies designed to improve the storage and retrieval of information from long-term memory. “They are especially valuable when the information to be learned is unfamiliar, complex, abstract and extensive” (Shmidman & Ehri, 2010, p. 160). For some young students, linking the letter sounds with letter
shapes fits this criteria. The Alphabet Linking Program provides an embedded visual mnemonic to help the students remember the letter sounds. For example, the letter 'w' is shaped like a worm. When the children see the worm, they say the name 'worm', and hear the first letter of the word, /w/. This links the sound with the letter shape and helps them to remember the letter-sound association. Research by Piasta and Wagner (2010) also showed that 15 letter names give students auditory mnemonics to the letter's sound. The letter name 'b' has the sound /b/ in the first phoneme. Mnemonics are powerful tools to support the storage and retrieval of memories.

The concept of creating a visual alphabet is not new. Both Letterland and Itchy's Alphabet were reviewed and I have used the research to create an improved design for my students. What the literature review has afforded me is a clear view of what must be involved in creating a visual alphabet program. It must be meaningful, relevant and make sense to the children so that they are engaged and want to remember the information. It must use a multi-modal approach, encompassing clear embedded mnemonics that are simple to understand, so that memories are stored and retrieved efficiently. The primary font must be in lower case as that is what is seen most often in books. Also, the children must be able to attend to the lesson and a small group setting is best for this. As well, the children need to have time to make connections with prior knowledge and have lots of rehearsal practice. The Alphabet Linking Program is updated and uses current research to create a framework for helping struggling readers learn the letter-sound associations.

**Implications**

Because the visual alphabet has been created with modern, meaningful and fun images in mind, it will be easier for students to remember their letter sounds and link them to the letter
formations. The implications of learning their letter-sound associations will be limitless. Once a child starts to realize that letters have sounds, it is only a matter of time before they link them together and start reading and writing what they hear. This is one of the biggest gifts we can give our students.

Both classroom teachers and remedial teachers will benefit from this program as it is easy to use and can be used to complement other programs. The findings from the early literacy and brain research will help educators make informed decisions about their current practice. It is important that teachers update their knowledge and incorporate best practice into what they do. It is recommended that this information be incorporated into our teaching practice, so teachers can help all children encode information more effectively.

The British Columbia, Ministry of Education is encouraging an increase in First Nations content in the educational curriculum. This project is a step towards meeting this goal, as there are six images that depict First Nations art work and themes. I recommend that other educators find ways to incorporate Indigenous art and traditions into their practice. It is important to understand that Indigenous art work be drawn by Indigenous people. When a dominant culture uses elements from a minority culture, the deep meaning expressed in the original elements could be changed. Cultural appropriation is often considered harmful to the minority culture and looked on as a violation of their collective intellectual property.

As I thought about creating this resource for remedial teachers, I could not help but think whether parents would benefit from it as well. Perhaps an Alphabet Linking children's book could be created that parents could use with their young children, as they begin to learn the alphabet shapes and sounds. Many parents are looking for fun ways to jump-start kindergarten
and help their children get a solid foundation in literacy before they start school. For those children who are visual learners, the Alphabet Linking book may be the perfect tool.

**Limitations**

One of the limitations of this project is that it is hard to make one tool that is meaningful to everyone. Relevancy is a very personal thing and is greatly influenced by our own experience. While a strong attempt has been made to create engaging and familiar images for my students, there is no guarantee that they will connect with them. For example, when they look at the letter 'f' they may not see it and remember it as a flower, which is the image that I have chosen. They may see another image in the letter 'f'. One possibility to correct for this limitation, would be to create an individual linking alphabet for each child.

Also, as times change, objects that are meaningful change. In one of the reviewed alphabet programs, they used an inkwell as the image for the letter 'i'. Few students know what an inkwell is. I have used a lightsaber for the image of the letter 'l', which is very meaningful to my students at the present time. There may be a future time when Star Wars is not popular and lightsabers are no longer known. These visual alphabets should be updated and changed to meet the interests of the students they are meant to support.

Another limitation of this project is that we do not want students to become dependent on only seeing the embedded letter images. We want them to see an 'f' and think 'flower'. In a future edition of this product I will make Teaching Cards that have a plain 'f' on the back of the embedded flower 'f'. In this way teachers can show the plain card and ask the student what the letter says. If the student forgets, they can turn the card over to reveal the embedded visual letter 'f'.


**Final Reflection**

There has been a lot of work and thought put into the creation of this project and I wonder how I can help more children benefit from this tool. I am excited to present my tool to interested parties, but I have, with encouragement from other colleagues and friends, begun to consider that I may want to publish and share this resource more widely. Before that happens I will share a beta version of my project with a few critical friends so that they can use it with their students. I will invite feedback from their experience and change the images as necessary. I look forward to continuing this educational journey and seeing how the project changes.
References


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Teacher's Guide for...

The Alphabet Linking Program

h → h

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Appendices

Appendix A – Alphabet Linking Chart
Appendix B – Alphabet Teaching Cards
Appendix C – Alphabet Mnemonic Chart
Appendix D – Letter Assessment

* Conventional Linguistic Notation:

- separate individual sounds or phonemes are represented between slash marks e.g. /w/ or /th/
- when a sound is to be held, there are three repeating letters between slash marks e.g. /sss/
1. Introduction

The Alphabet Linking Program is a multi-modal mnemonic tool, grounded in brain research, that was created to help resource teachers support students struggling to learn letter-sound associations. While it is beneficial in this setting, it is not limited to that context.

Linking abstract sounds to meaningless letter shapes is a hard concept for some of our students. The letter name 'double-u' has no connection to the sound /w/ or the squiggly shape 'w'. Traditional reading programs often associate the letter with a picture. For example the letter 'w' could be linked to a picture of a whale. This helps some children remember the sound of /w/ because whale starts with /w/, but for many children they will see the letter 'w' again and do not remember its sound.

Researchers, Ehri, Deffner and Wilce (1984) thought it was important that when the learner saw the letter shape they would be reminded of the mnemonic picture or action. In 1984 they conducted a study to determine if a simpler type of embedded mnemonic would help prereaders learn letter-sound associations. The letter-sound associations of the letter f and the sound /f/, were each represented in one picture whose shape included the lower case letter (e.g., letter f drawn as the stem of a flower) and whose name (flower) began with the letter's sound. Their research revealed that "integrated pictures were effective because they linked two otherwise unconnected items in memory" (Ehri et al., 1984, p. 880). The Alphabet Linking Program incorporates this research to help children remember the letter-sound associations.

2. Early Reading Development

Learning to read is a complex task. Children must coordinate many cognitive processes to read accurately and fluently. Unfortunately, for many students, the process of learning to read does not come easily. In 2000, the National Reading Panel (NRP) in the US released the largest, most comprehensive evidence-based review of literature designed to help identify key skills and methods central to reading achievement. The panel analyzed over one hundred thousand reading studies and the findings emphasized the importance of effective reading instruction in five areas: phonemic awareness, phonics, fluency, vocabulary and comprehension. Of these five areas, phonemic awareness and phonics form the foundation of reading by supporting decoding of text and spelling of words.
For young students who struggle to learn to read, intensified instruction in phonics and phonemic awareness is particularly important for increasing the likelihood of later literacy success (National Early Literacy Panel, 2008; NRP, 2000; Piasta, 2014). “The acquisition and fluency of letter name-sound associations become essential as building blocks in the process of learning to read, and the sooner these skill areas are mastered the better the odds are for reading mastery over time” (Agramonte & Belfiore, 2002, p.182). A large body of evidence shows that the best predictors of learning to read in the early stages are measures of phonics and phonemic awareness.

3. Phonics

Phonics is the understanding that there is a relationship between the letters of written language and the individual sounds of spoken language. The relationship between the two, often called the alphabetic principle, is used to help children read and spell words. Research shows that children who may be experiencing reading decoding difficulties (dyslexia), have low or delayed alphabetic knowledge (Earle & Sayeski, 2016; Piasta, 2014; Piasta & Wagner, 2010; Snowling & Hulme, 2011). Letter-sound knowledge is a strong predictor of a student's ability to decode words and have later reading success (Huang, Tortorelli, & Invernizzi, 2014; Stahl, 2014). It is therefore essential to make phonics part of all reading interventions. The Alphabet Linking Program is aligned with these findings.

After the NRP finished analyzing the research on using phonics to support early literacy development, they focused on a number of topics for further research, including mnemonics. They posed the question: “to what extent do mnemonic devices speed up the process of learning letter shapes, sounds, and names and facilitate their application in reading and writing” (NRP, 2000, p. 136). How can brain research, and specifically mnemonics, help educators teach struggling readers to successfully link the alphabet sounds to the letter shapes?
4. How the Brain Remembers

It is important to think about how the brain learns and remembers so that we can support our students who struggle to remember what they are taught. As teachers our efforts are more likely to succeed when our work is informed by the latest research from the neurosciences (how the brain functions) and from the cognitive sciences (how people learn) (Fadel & Lemke, 2008). Scientists are using functional Magnetic Resonance Imaging (fMRI) scans to help us understand this amazing and complicated process.

Brain research shows that there are specific techniques that affect how a student remembers and recalls information. Specifically when information is meaningful, it is more memorable. Additionally when information is engaging, the children attend better. When the children attend they remember. Also when children are able to access their prior knowledge, they have a better chance of making sense of what they are learning. Further when we have time to work with the information, rehearse it, and process it using higher level thinking, it is better encoded in long-term memory. Next when information is made concrete, like when we use mnemonics, it is more memorable than when it is abstract. Also when we engage in a variety of visual, auditory, kinesthetic, gustatory and olfactory experiences, our students will encode information in different ways thus facilitating better recall. Each of these variables – meaningfulness, engagement, making sense, meta-cognition, rehearsal, mnemonics, and multimodal learning- contributes towards a theoretical framework for explaining how we can help struggling readers learn the alphabetic principle.

The Alphabet Linking Program uses early reading research, brain based research and specifically the concept of embedded visual mnemonics to help children link the letter shapes with familiar objects. Each visual letter has been created with the most meaningful and engaging picture so that children can remember it more easily and link it to the letter sound. Each picture is also associated with a kinesthetic action that is performed when the child says the sound of the letter, thus solidifying the information more deeply in memory. The program advocates for the tool to be used in quiet small group settings so that children may attend better and have lots of practice in rehearsing the skills they are taught.
5. Components of the Program

The Alphabet Linking Program is comprised of three parts: an Alphabet Linking Chart, Alphabet Teaching Cards, Alphabet Mnemonic Chart and this Teacher's Guide. These can be found in Appendix A.

- **The Teacher's Guide** describes how to use the Alphabet Linking Chart, Alphabet Teaching Cards and Alphabet Mnemonic Chart in a small group setting. It provides information on assessment and the order in which you could teach the letters. It culminates with teaching instructions and scripts for using this program.

- **The Alphabet Linking Chart** displays all the embedded lower case letters on one 8.5” x 11” chart for easy reference. The lower case letters are used as these are the ones children see most often in books and will need to know first when they learn to read (Bursuck & Damer, 2015). The chart is intended for public display so that the children can reference it when they are learning their letters and sounds.

- **The Alphabet Teaching Cards** display one embedded letter per 4” x 5” card to allow the teacher to present one letter at a time to help the children to focus on one larger shape.

- **The Alphabet Mnemonic Chart** displays each embedded visual mnemonic, matching kinesthetic mnemonic, auditory mnemonic, and thinking mnemonic. It was created so that educators would have an easy mnemonic reference when instructing the children.
6. Instructional Setting

The Alphabet Linking Program has been developed with the remedial teacher in mind, but anyone wishing to help children remember the letter sounds, is welcome to use the program. In the remedial pull out setting a resource teacher has the ability to work intensely with a small group of children on the program. According to Barbara Wasik, a professor at Temple University who is interested in early childhood education, five children is the maximum size a small group should be as it allows the teacher the opportunity to focus the needed attention on individual children and make sure each child is learning (Wasik, 2008). Richard Allington, an author and professor of literacy studies at the University of Tennessee, advocates for having no more than three children in a group (2006). He says that “the evidence available indicates that both tutoring and very small-group instructional support is more commonly effective than the traditional larger-group (four to seven students) remediation” (Allington, 2006, p. 151). He goes on to say that with very small group lessons the teacher can pace the lesson to take advantage of every minute of time to be more effective (Allington, 2006). Research shows that more opportunities to rehearse information helps us remember it.

Having students in a separate room has benefits as well. Wasik states that “for children who have trouble discriminating sounds in words, too much background noise can interfere with their processing” (Wasik, 2008, p. 518). She goes on to remind us that small groups give children “the opportunity to see how the teacher’s mouth forms the letter sound and hear the sound with minimal distractions” (Wasik, 2008, p. 518). It also gives the teacher the opportunity to hear the individual sounds a child produces and provide corrective feedback instantaneously (Wasik, 2008). Children who are struggling with any concept benefit from a small group setting that is free of distraction and background noise. The research shows that children who attend better, remember better. It’s imperative that these children are able to hear the sounds of the letters clearly and receive corrective feedback. In the small group pull out remedial setting the quality and quantity of individualized instruction is increased.

7. Assessment

Assessment involves “the wide variety of methods or tools that educators use to identify student learning needs, measure competency acquisition, and evaluate students’ progress toward meeting provincial learning standards” (Ministry of Education, 2018). According to the learning standards in the British Columbia New Curriculum, kindergarten students are expected to know “the association of letters and sounds” by the end of their school year (Ministry of Education, 2018).
Formative or pre-assessments are used to determine what students know about the new content to be learned, and to provide information to the teacher to help them build successful plans for the students so they can move ahead in their learning (Sousa & Tomlinson, 2011). This increases the likelihood that each student will know, understand and be able to do what is required to demonstrate proficiency on the summative assessments (Sousa & Tomlinson, 2011). This aligns with the Know-Do-Understand (KDU) curriculum model supported in the ministry of education's new curriculum guide (Ministry of Education, 2018).

There are many ways to test a student's knowledge of the letter names and sounds. Most school districts and literacy programs have a screening tool that you can use. Here are some key components to keep in mind:

1) You should have a data sheet with the lower case letters on it, a place for your recording data, and a place for the date (see blackline master in Appendix D).

2) You should have a student sheet with the lower case letters placed in a random order (don't place letters that are confusing beside each other i.e. b/d). You should have a cover sheet so that you can show the student one line at a time OR you should have lower case letter magnets or cards to show the child one at a time (see blackline master in Appendix D).

3) Show the child a letter and ask them what the name of the letter is. They should respond within two-three seconds. Then ask them what the sound of the letter is. Record their answers on the data sheet. If they get the name or sound correct, put a check mark in the box. If they say an incorrect letter or sound, put that in the box. If they don't know, leave the box blank. All this information will help you to determine in what order you will teach the letters.

4) In later assessments if the child is stuck on a letter sound, ask “What does the letter look like?”. If the child gets the letter sound correct with the help of the mnemonic prompt, write a lower case 'p' in the data recording spot on the assessment sheet and put a check mark by it to indicate that they got it right with the prompt (p✓). If they did not get the letter sound correct, record 'p' without the check mark.
8. Teaching the Letter Sequence

Educators will use their assessments and professional judgment in regards to what order they should teach the letter sounds. Here is some information that you may want to consider in making your decision:

1. **Scaffolded Instruction** - Teach easier to pronounce sounds before harder sounds. Continuous sounds like /mmm/, /fff/, and /sss/ are easier for children to pronounce and blend than stop sounds like /d/, /p/, /g/, and /b/ (Bursuck & Damer, 2015).

2. **Visually Similar Letters** – separate the teaching of visually similar letters like (m & n), (b & d). Research has shown that students needed significantly more time to master visually similar letters when they were introduced at the same time than they needed when they were separated over time (Earle & Sayeski, 2016; Huang & Invernizzi, 2012; Piasta & Wagner, 2010).

3. **Spelling Practice** – teach letters like 'm', 'a', 't' and 's' first to allow for immediate spelling practice of words like mat, sat, am and Sam (Bursuck & Damer, 2015; Earle & Sayeski, 2016). The book “Spelling Through Phonics” by McCracken and McCracken (2012) demonstrates one possible order in which to teach the letter sounds in this way.

4. **Letter-Name Structure** – some letter names provide clues to their corresponding letter sound. For example, the letter name 'B' has the /b/ sound at the beginning of its name. Some names have the clue at the end of their name as in 'F' for /f/ (Huang & Invernizzi, 2012; Piasta, 2014). Research shows that corresponding the teaching of letter names and sounds helps students remember the letter sound.

5. **Most Frequent** – it is useful to teach the most frequently used letter sounds first. For example, you would teach, m/f/s/t/b/ before z/v/q.

6. **Most Common** – teach the most common sound before you teach the alternate sound. For example teach the 'c' as in 'cat' before the 'c' as in city.
9. Teaching Instruction

After you have decided which letters you want to teach first, follow this teaching guide to teach the letters to your students. Choose the pace of your instruction based on the needs of your students. Your instruction should be direct, explicit and systematic as this is ideal for discrete skill development like phoneme-grapheme mapping (NRP, 2000). Remember that the small group remedial setting provides the opportunity for you to listen to your students pronounce the letter sounds and give corrective feedback as needed. It allows them ample time to practice their new skills. It is better to teach accurately and slowly instead of rushing and reteaching later. In the remedial setting, less is more.

To start using the Alphabet Linking Program you will need: appendix A, B and C, this Teaching Guide; a white board; and dry erase markers. The Teaching Cards in the appendix are displayed with four pictures on each page. Before you start teaching, they should be cut so that each embedded letter is displayed on its own card. You may wish to laminate them for prolonged use.

The teaching scripts in this guide demonstrates a model-lead-test format, which many educators and instructional programs use for explicit teaching (Bursuck & Damer, 2015). The model-lead-test format is brief and allows students the opportunity to see and hear an example of correct letter-sound associations (model), practice with teacher guidance (lead), and then produce the sound independently (test).

The directions and script will look and sound like this:

1. Draw the lower case letter 'f' on the board.

2. Say, *This is the letter 'f' and it makes the /f/ sound. To help us remember this we can pretend that the 'f' looks like a flower.*

3. Use the visual image from the Teaching Card and draw two leaves, one on either side, where the small line crosses the 'f' and put a few petals at the end of the 'f'.

4. Say, *The letter 'f' looks like a flower so we say flower /fff/. Now you try. (flower, /fff/). Great job saying /fff/.*
It is important that the children link the letter visual with the first sound of the object to enhance memory and later recall, as evidenced by the work on dual coding theory by Sadoski and Paivio (1991). Linking the shape 'f', with a picture of a flower and saying 'flower' helps the children to isolate and remember the sound /f/. After you have taught the sound and letter connection through drawing, you can show the children the Teaching Card associated with the embedded letter. Display this in an area where the children can refer to it often.

According to Fadel and Lemke (2008), “students engaged in learning that incorporates multi-modal designs, on average, outperform students who learn using traditional approaches with single modes” (p. 13). Each visual in this program links to an action that the students perform while saying the sound. Refer to the Alphabet Mnemonic Chart for a list of the kinesthetic movements and auditory mnemonics for each letter. For example, for the letter 'f' the children hold their fisted hand up to their nose as if they are sniffing a flower and they say “flower, /fff/”. This action links to the visual picture, is meaningful and has the auditory component as the children say the picture name and sound. The auditory, visual and kinesthetic senses are engaged and enhance the ability to remember the information to be learned because more neural pathways are connected to the information (Fadel & Lemke, 2008; Richard, 2015; Sousa, 2007). Teach the letter action after you teach the letter sound connection. Then rehearse the sequence of teaching the letter sound connection followed by the action for each letter selection to be taught in your remedial session.

At the start of the next lesson it is important to review the letters the children have previously learned. Brain research tells us that rehearsal reinforces the ability for long term retention in our brains (Fadel & Lemke, 2008; Sousa, 2007). The script for letter review will look and sound something like this:

1. Draw the alphabet letter to be reviewed on the board e.g. 'f'

2. Ask, What does this letter say? If the child looks like they are having trouble ask, What does the letter look like?.

3. If they still don't know, show them the embedded Teaching Card letter and say, This letter looks like a flower so we put our fist up to our nose and say flower /fff/. Now you try. (flower /fff/). Good effort saying /fff/.

4. Remember to help them connect the action with the visual and the auditory mnemonic.
5. Erase this letter and draw the next letter for review on the board.

6. After this review sequence, teach two new letters based on your initial assessment. It’s important for the children to have a lot of practice with a skill before we introduce more skills.

   It is also important to teach the sounds correctly. One common error is the accidental inclusion of the schwa in conjunction with consonant production. The schwa is the unstressed vowel sound pronounced /uh/ as in 'other' that is often added to the end of the consonant pure sound. Stop sounds like /b/, /d/ and /t/ are more susceptible to this mistake. (e.g. buh or tuh). This makes it harder for the children to hear the pure sound /b/, /t/. The pure sound is what they hear when the letter is in a word, for example 'bat'. When you hear 'bat', you don't hear buh-aaa-tuh. Teachers need to be mindful of articulating the sounds clearly. It is helpful to listen to audio models before teaching the letter sounds.


# Appendix A

## Alphabet Linking Chart

<table>
<thead>
<tr>
<th>Letter</th>
<th>Image</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>🍏</td>
<td>apple</td>
</tr>
<tr>
<td>B</td>
<td>🐰</td>
<td>bunny</td>
</tr>
<tr>
<td>C</td>
<td>🍚</td>
<td>clam</td>
</tr>
<tr>
<td>D</td>
<td>🦌</td>
<td>deer</td>
</tr>
<tr>
<td>E</td>
<td>🐔</td>
<td>egg</td>
</tr>
<tr>
<td>F</td>
<td>🌸</td>
<td>flower</td>
</tr>
<tr>
<td>G</td>
<td>🐰</td>
<td>girl</td>
</tr>
<tr>
<td>H</td>
<td>🏡</td>
<td>house</td>
</tr>
<tr>
<td>I</td>
<td>⛳</td>
<td>itch</td>
</tr>
<tr>
<td>J</td>
<td>🏉</td>
<td>jump</td>
</tr>
<tr>
<td>K</td>
<td>🔫</td>
<td>kick</td>
</tr>
<tr>
<td>L</td>
<td>✄</td>
<td>lightsaber</td>
</tr>
<tr>
<td>M</td>
<td>🏔</td>
<td>mountain</td>
</tr>
<tr>
<td>N</td>
<td>🦈</td>
<td>net</td>
</tr>
<tr>
<td>O</td>
<td>🦑</td>
<td>octopus</td>
</tr>
<tr>
<td>P</td>
<td>🐶</td>
<td>puppy</td>
</tr>
<tr>
<td>Q</td>
<td>👑</td>
<td>queen</td>
</tr>
<tr>
<td>R</td>
<td>🦅</td>
<td>raven</td>
</tr>
<tr>
<td>S</td>
<td>🐍</td>
<td>snake</td>
</tr>
<tr>
<td>T</td>
<td>🦃</td>
<td>totem pole</td>
</tr>
<tr>
<td>U</td>
<td>🔝</td>
<td>up</td>
</tr>
<tr>
<td>V</td>
<td>🌸</td>
<td>vase</td>
</tr>
<tr>
<td>W</td>
<td>🐍</td>
<td>worm</td>
</tr>
<tr>
<td>X</td>
<td>🗡️</td>
<td>x-x-x</td>
</tr>
<tr>
<td>Y</td>
<td>🧽</td>
<td>yawn</td>
</tr>
<tr>
<td>Z</td>
<td>🦓</td>
<td>zebra</td>
</tr>
</tbody>
</table>

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**Appendix C**

**Alphabet Mnemonic Chart**

**Notations:**  
- *ASL* = *American Sign Language*  
- `/b/` = sound of phoneme (short sound is said for vowels, hard sound is said for *c* and *g*)  
- `/sss/` = prolonged sounds

<table>
<thead>
<tr>
<th>Letter</th>
<th>Visual</th>
<th>Kinesthetic + Auditory</th>
<th>Think</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>![Image of an apple]</td>
<td>Put your hand at your open mouth as if you’re about to take a bite of an apple. Say “apple /aaa/”</td>
<td>a looks like an apple</td>
</tr>
<tr>
<td>b</td>
<td>![Image of a bunny's head]</td>
<td>With your left hand put your index and middle finger up while holding your other two fingers down with your thumb. Wiggle your fingers like bunny ears. Say “bunny /b/”</td>
<td>b looks like a bunny’s head and ears. The letter name B has the /b/ sound in the first syllable</td>
</tr>
<tr>
<td>c</td>
<td>![Image of a clam]</td>
<td>Make a sign language <em>c</em> with both hands. Then open and close them like a clam. Say “clam /c/”</td>
<td>c looks like a clam.</td>
</tr>
<tr>
<td>d</td>
<td>![Image of a deer]</td>
<td>The ASL sign for deer is made by spreading both your hands out and touching your thumbs to the sides of your head. It’s like you have antlers. Say “deer /d/”</td>
<td>d looks like the deer’s head and antlers. The letter name D has the /d/ sound in the first syllable</td>
</tr>
<tr>
<td>Letter</td>
<td>Visual</td>
<td>Kinesthetic + Auditory</td>
<td>Think</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>------------------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| e      | ![Image](image1.png) | The ASL sign for egg is made by touching two H sign language hands together is a peaked position and then moving them down and away from each other like you are cracking an egg.  
Say “egg /e/” | e looks like an egg. The yolk is the hole in the ‘e’. |
| f      | ![Image](image2.png) | Put your fist up to your nose and sniff like you are smelling a flower.  
Say “flower /fff/” | f looks like the leaves and stalk of the flower.  
The letter name F has the /f/ sound in the second syllable |
| g      | ![Image](image3.png) | Mime holding a glass of juice and gulping it down your throat.  
Say “gulp /g/, /g/, /g/” | the circle of the g is the girl’s head and the lower part is her hair. |
| h      | ![Image](image4.png) | The ASL sign for house is made by putting your finger tips together to form a roof. Then moving them to form the sides of the house.  
Say “house /h/” | h looks like a house. The tall line is the chimney. |
<table>
<thead>
<tr>
<th>Letter</th>
<th>Visual</th>
<th>Kinesthetic + Auditory</th>
<th>Think</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Use your finger and pretend you have an itch. Scratch your itch. Say “itch /i/”</td>
<td>I looks like a finger with the nail being the dot on top of the i.</td>
</tr>
<tr>
<td>j</td>
<td><img src="image2.png" alt="Image" /></td>
<td>The ASL for jump is made by imitating a jumping motion by putting your two fingers of your right hand on your left flat palm. Say “jump /j/”</td>
<td>the dot of the j looks like the head and the rest of the letter is the body. The letter name J has the /j/ sound in the first syllable</td>
</tr>
<tr>
<td>k</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Put two fingers pointing down and make a kicking motion. Say “kick /k/”</td>
<td>k looks like someone kicking a ball. The letter name K has the /k/ sound in the first syllable</td>
</tr>
<tr>
<td>l</td>
<td><img src="image4.png" alt="Image" /></td>
<td>Slowly cross a pointed finger in front of you like you have a lightsaber. Say “lightsaber /lll/”</td>
<td>I looks like a lightsaber from Star Wars. The letter name L has the /l/ sound in the second syllable</td>
</tr>
<tr>
<td>letter</td>
<td>Visual</td>
<td>Kinesthetic + Auditory</td>
<td>Think</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>------------------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| m      | ![m](image) | Make a sign language m.  
Say “mountains /mmm/” | m looks like mountains  
The letter name M has the /m/ sound in the second syllable |
| n      | ![n](image) | The ASL for net is made by crossing your open fingers across each other twice as if you are making the mesh.  
Say “net /nnn/” | n looks like a lacrosse net or a net for catching fish.  
The letter name N has the /n/ sound in the second syllable |
| o      | ![o](image) | The ASL sign for octopus is made by putting your non-dominant hand in a claw position with your fingers facing down. Put your other hand in a smaller claw position on top to make the head. Wiggle your lower fingers.  
Say “octopus /ooo/” | o looks like an octopus head. |
| p      | ![p](image) | The ASL for puppy is made by slapping the right flat hand against the right leg, and then snapping the right middle finger.  
Say “puppy /p/” | The p looks like a puppy’s head and floppy ears.  
The letter name P has the /p/ sound in the first syllable |
| q      | ![q](image) | Nod your head.  
Say “queen /q/” | q looks like the shape of a queen’s head. |
<table>
<thead>
<tr>
<th>Letter</th>
<th>Visual</th>
<th>Kinesthetic + Auditory</th>
<th>Think</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td><img src="image1.png" alt="Image" /></td>
<td>The ASL for bird is made by making a pinching motion in front of your lips, like a bird’s beak opening and closing. Say “raven /r/”</td>
<td>r looks like the beak and body of a raven. The letter name R has the /r/ sound in the second syllable</td>
</tr>
<tr>
<td>s</td>
<td><img src="image2.png" alt="Image" /></td>
<td>The ASL for snake is made by making a sign for v and then bending your fingers like fangs. Then you make a slithering motion forward. Say “snake /sss/”</td>
<td>s looks like a snake The letter name S has the /s/ sound in the second syllable</td>
</tr>
<tr>
<td>t</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Put your non-dominant hand out, palm facing towards you. Karate shop your other hand across the palm. Say “Totem pole /t/”</td>
<td>t looks like a totem pole. The wings of the eagle are spread wide at the top. The letter name T has the /t/ sound in the first syllable</td>
</tr>
<tr>
<td>u</td>
<td><img src="image4.png" alt="Image" /></td>
<td>Make a thumbs up motion with a bit of a scoop. Say “up /u/”</td>
<td>scooping looks like a u.</td>
</tr>
<tr>
<td>v</td>
<td><img src="image5.png" alt="Image" /></td>
<td>Form a letter v by touching your palms together. Say “vase /vvv/”</td>
<td>v looks like a vase. The letter name V has the /v/ sound in the first syllable</td>
</tr>
<tr>
<td>Letter</td>
<td>Visual</td>
<td>Kinesthetic + Auditory</td>
<td>Think</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>------------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td><img src="image1.png" alt="W" /></td>
<td><strong>Make a sign language w.</strong></td>
<td><em>w</em> looks like a worm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Say “Worm /w/”</strong></td>
<td></td>
</tr>
<tr>
<td><strong>X</strong></td>
<td><img src="image2.png" alt="X" /></td>
<td><strong>Cross both arms in front of your body to make an X and form swords. Pretend your swords are clashing.</strong></td>
<td><em>x</em> looks like the crossed swords.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Say “swords /ks/”</strong></td>
<td>The letter name X has the /ks/ sound in the second syllable</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td><img src="image3.png" alt="Y" /></td>
<td><strong>Raise your arms in a y shape above your head, as if you are yawning.</strong></td>
<td><em>y</em> looks like your arms raised while yawning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Say “yawn /y/”</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td><img src="image4.png" alt="Z" /></td>
<td><strong>The ASL for zebra is made by extending and separating your fingers of one hand. Starting with your hand on the opposite side of your body with the palm facing you, drag the hand across your body. It’s like you are painting zebra strips.</strong></td>
<td><em>z</em> looks like a zebra’s body.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Say “zebra /zzz/”</strong></td>
<td>The letter name Z has the /z/ sound in the first syllable</td>
</tr>
</tbody>
</table>
### Letter Assessment – Data Collecting Sheet

Name: _______________________ Grade: ___ Date: ___________

School: ______________________ Tested by: ________________

<table>
<thead>
<tr>
<th>Letters</th>
<th>Name</th>
<th>Sound</th>
<th>Letters</th>
<th>Name</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>n</td>
<td></td>
<td>d</td>
<td>q</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>o</td>
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Score: Score

### Testing Procedure:

Show the child a letter and ask them what the name of the letter is. They should respond within two-three seconds. Then ask them what the sound of the letter is. Record their answers on the data sheet. If they get the name or sound correct, put a check mark in the box. If they say an incorrect letter, put that in the box. If they don't know, leave the box blank.

In later assessments if the child is stuck on a letter sound, ask “What does the letter look like?”. If the child gets the letter sound correct with the help of the mnemonic prompt, write a lower case 'p' in the data recording spot on the assessment sheet and put a check mark by it to indicate that they got it right with the prompt (p✓). If they did not get the letter sound correct, record 'p' without the check mark.

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