Progression in the General Reading Curriculum by Elementary Students Who are Deaf or Hard of Hearing

by

Leigh Kackley Smith, M.Ed.

A Dissertation

In

Special Education

Submitted to the Graduate Faculty
of Texas Tech University in
Partial Fulfillment of
the Requirements for
the Degree of
Doctor of Philosophy

Roseanna Davidson
Chair of Committee

Effie Laman

Amanda Williams

Dominick Casadonte
Interim Dean of the Graduate School

December, 2013

ACKNOWLEDGMENTS

There are many to whom I owe much thanks for their love, encouragement, and support throughout the process of pursuing my doctoral degree and writing this dissertation. Dr. Roseanna Davidson, thank you for the privilege of working with you and learning from you. For the opportunities you have provided me, I am most appreciative. Dr. Effie Laman, thank you for encouraging me to leave the realm of elementary school to pursue a career in higher education. For your early morning phone calls to check on me, I will always be grateful. Dr. Williams, thank you for serving on my committee, for your positive input regarding the analysis of my data, and for your always prompt reply to my inquiries. Dr. Reese Todd, thank you for your smiles, your words of encouragement, and for meeting me for coffee. Dr. DeAnn Lechtenberger, thank you for being my friend. I appreciate you.

I thank Barbara Hargrove, Pam Lindell, and Kelly Golden for what they do day in and day out. Thank you Barbara for making sure I was actually enrolled in my classes and for tending to other tedious paperwork, allowing me to concentrate on my course work. Pam, thanks for your willingness to drop what you were doing in order to help me complete a task. Thanks for taking one last look at this dissertation for me. Kelly, thanks for your enthusiasm and excitement for me as I worked to accomplish this goal.

I would like to thank my husband Jerry for coming alongside me as I worked to complete this degree. Thank you for believing in me, for putting up with me, and for understanding me. Mom and dad, thank you for providing the educational

foundation that led me to pursue this doctoral degree, and for instilling in me the drive and determination to succeed that has served me so well these last three years. Thank you for your support and encouragement in this endeavor.

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ABSTRACT

This study is a partnership between a Regional Day School Program for the Deaf (RDSPD) and Texas Tech University. Archival data from the RDSPD will be analyzed to determine: (a) the reading achievement level of fifth grade students who are deaf or hard of hearing and who participate in the general reading curriculum with support from *See the Sound/Visual* Phonics; (b) the reading progress of these students from second grade to fifth grade; and (c) how they compare in reading achievement to fifth-grade hearing students. Data beginning with the 2002-2003 school year and ending with the 2012-2013 school year will be examined; data collected will include district and state standardized test scores, as well as district assessments based on the objectives of the current reading curriculum.

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CHAPTER ONE

INTRODUCTION

How do children who are deaf or hard of hearing learn to read a language they cannot hear? Although students have been taught using oral language, sign language, and a combination of the two, students who are deaf or hard of hearing continue to struggle to learn language and literacy skills. They lag behind their hearing peers in reading ability and academic achievement (Easterbrooks, Lederberg, Miller, Bergeron, & Connor, 2008; Schirmer & McGough, 2005). At graduation from high school, the average reading level of a child who is deaf is somewhere between 4th and 5th grade (Adams, 1990; Easterbrooks et al., 2008 & Traxler, 2000); they tend to progress only about one third of a grade level each year they are in school (Schirmer & McGough, 2005).

The difficulties underlying this lag in the reading ability of students who are deaf/hard of hearing are multifaceted. Children who are deaf/hard of hearing have different characteristics such as: hearing loss, use of amplification, age of identification of hearing loss, communication mode, parents that are deaf or hearing, and instructional program. These students may utilize various strategies to make up for the lack of access to sound. Most researchers agree that in order to improve the reading achievement of students who are deaf/hard of hearing, they must be taught according to individual characteristics and must have access to many different instructional strategies.

The National Reading Panel (2000) was charged with identifying what skills were vital for children learning to read. The Panel identified five major skills that are needed for students to master when learning to read: (a) vocabulary, (b) comprehension, (c) phonics, (d) phonemic awareness, and (e) alphabetics. Schirmer and McGough (2005)

concluded that students who are deaf/hard of hearing learn to read similarly to students who are hearing. Students who are deaf follow the same steps in learning to read, although the process is typically slower for them. This being the case, it is reasonable to assume that phonological awareness should be included in reading instruction for students who are deaf/hard of hearing. However, the research in this area has been found to be inconsistent (Easterbrooks et al., 2008; Bergeron, Lederberg, Easterbrooks, Miller, & Connor, 2000; Allen et al., 2009)

Allen et al. (2009), Camilli et al. (2006), and Hammil and Swanson (2006) concluded that there is evidence in the literature that phonological skills are not necessary in order for students who are deaf/hard of hearing to learn literacy skills. In fact, these researchers propose that reading leads to phonological awareness rather than phonological skills being a precursor to reading. They advocate that whole word reading strategies be taught rather than an overemphasis on phonological coding skills.

Harris and Beech (1998) and Kyle and Harris (2010, 2011) came to the same conclusion when conducting studies to determine if speechreading predicted reading skills. In these studies, phonology was not predictive of reading ability over time. The researchers concluded that this indicated that after learning to read, students used decoding skills to improve reading.

Other researchers (Luetke-Stahlman & Neilson, 2003; Neilson & Luetke-Stahlman, 2002; Easterbrooks et al, 2008; Perfetti & Sandak, 2000, & Musselman, 2000) concluded from their research that students who are deaf/hard of hearing can and do access phonological information. Learning to write a sound-based language such as English requires students to learn letter-sound relationships (Perfetti & Sandak, &

Musselman). Easterbrooks et al. (2008) found that students with some access to spoken language could access phonology. Vocabulary knowledge was also found to contribute to the reading ability of these students.

Statement of the Problem

Students who are deaf or hard of hearing are now, more than ever before, being educated alongside their hearing peers and are being held to the same high standards, yet they continue to fall below the mark (Easterbrooks et al., 2008; Schirmer & McGough, 2005). Researchers have advocated that more research of all types of designs be conducted to help determine the factors that contribute to the reading success of students' who are deaf or hard of hearing, so that effective instructional practices may be developed and used to enable these students to read at a higher level (Luckner, 2006, Schirmer & McGough, 2005; Trezek & Hancock, 2013). As Luckner (2006) points out, "Students with hearing loss desperately need improved outcomes" (p. 51).

Purpose of the Study

The purpose of this study was to examine the reading achievement of fifth-grade students who are deaf or hard of hearing and who participated in the general reading curriculum supported with *See the Sound/Visual Phonics* from the second grade through the fifth grade.

Research Questions

The following questions will guide this study:

1. What is the reading achievement level of fifth grade deaf/hard of hearing students attending public schools, participating in a general reading program, and receiving support with *See the Sound/Visual Phonics*?

2. Do students who are deaf or hard of hearing and receive early reading instruction in a phonics-based reading program supported with *See the Sound/Visual Phonics* show improvement in reading from the second grade to the fifth grade as measured by isolated word reading and text comprehension?
3. How do fifth-grade students who are deaf or hard of hearing and who are participating in the general reading curriculum supported with *See the Sound/Visual Phonics,* compare in reading achievement to their hearing peers?

Conceptual Framework

This study is a partnership between a Regional Day School Program for the Deaf (RDSPD) and Texas Tech University. Archival data from the RDSPD will be analyzed to determine: (a) the reading achievement level of fifth-grade students who are deaf or hard of hearing and who participate in the general reading curriculum with support from *See the Sound/Visual* Phonics; (b) the reading progress of these students from second grade to fifth grade; and (c) how they compare in reading achievement to fifth-grade hearing students. Data beginning with the 2002-2003 school year and ending with the 2012-2013 school year will be examined; data collected will include district and state standardized test scores, as well as district assessments based on the objectives of the current reading curriculum.

Definition of Terms

Alphabetic principle is an "understanding of the systematic and predictable relation between phonemes (i.e., sounds) and graphemes (i.e., letters)" (Trezek and Hancock, 2013, p. 392).

American Sign Language (ASL) is a “natural language with its own vocabulary and syntax” (Musselman, 2000); a “visually based linguistic system” (Perfetti & Sandak, 2000).

Auditory-Oral Instruction “promotes the development of spoken language through training the use of residual hearing and speechreading” (Musselman, 2000, p. 10).

Balanced literacy involves spending a large amount of time teaching skills while supporting students as they use these skills to read and write (Schirmer, 2000).

Code-related skills refer to the principles of print (i.e. graphemes, directionality, and word boundaries, phonological awareness, and the alphabetic principle (Trezek & Hancock, 2013).

Cued Speech is a mode of communication that visually demonstrates the phonemes of spoken language (Charlier & Leybaert, 2000).

English-based sign is a code for English combining ASL signs with artificial signs in English word order (Musselman, 2000); visually represents English (Wang, Trezek, Luckner, & Paul, 2008).

Fingerspelling “consists of single hand shapes to represent each letter of the English alphabet (Haptonstall-Nykaza & Schick, 2007).

Fluency is the “ability to read a text accurately and quickly” (Armbruster, Lehr, & Osborn, 2001, p. 19).

Graphemes are the "smallest part of written language that represents a phoneme in the spelling of a word" (Armbruster et al., 2001, p. 3)

Language – related skills refer to the knowledge and use of structures of the English language such as morphology, syntax, semantic, and pragmatics (Trezek & Hancock, 2013).

Literacy refers to reading and writing (Schirmer, 2000).

Manually Coded English refers to a group of signing systems in which sign are borrowed from American Sign Language and syntactic structure from English (GoldinMeadow-Mayberry, 2001).

Morphemes are the smallest unit of meaning in the English language (Gaustad, 2000).

Morphology is the study of words and rules concerning their usage including the processes for combining and rearranging morphemes to form words (Gaustad, 2000).

Orthography is "a method of representing spoken language by letters; spelling (Snow, Burns, & Griffin, 1998).

Phonemes are the "smallest parts spoken language that make a difference in the meaning of words" (Armbruster et al., 2001, p. 3).

Phonemic Awareness is "the ability to hear, identify, and manipulate the individual sounds – phonemes – in spoken words" (Armbruster et al., 2001, p. 3)

Phonics is the "understanding that there is a predictable relationship between phonemes and graphemes" (Armbruster et al., 2001, p. 3).

Phonological awareness is a broad term that includes phonemic awareness and includes work with rhymes, words, syllables, and onsets and rimes (Armbruster et al., 2001).

Phonology is the sound structure of speech (Wang et al., 2008).

See the Sound/Visual Phonics is a supplemental strategy that may be used with any general reading curriculum providing visual and kinesthetic cues to the sounds that are

made by each of the letters of the English language (International Communication Learning Institute, ICLI, 1996).

Signing Exact English is a manually coded English sign system in which signs are borrowed from American Sign Language and the syntactic structure borrowed from English (GoldinMeadow - Mayberry, 2001).

Speech is an intrinsic part of spoken language but it not in itself meaningful; speech and language are not one and the same (Ling, 1989).

Speechreading is "understanding speech by watching the talker" (Ling, 1989).

Systematic phonics instruction is the "direct teaching of set letter-sound relationships in a clearly defined sequence" (Armbruster et al., 2001, p. 12).

Text comprehension is defined as understanding what one reads ((Armbruster et al., 2001, p. 41).

Total Communication is the simultaneous production of speech and manual signs (Rose, McAnally, & Quigley, 2004).

Whole language emphasizes the acquisition of language literacy through natural learning environments (Rose et al., 2004); priority is given in reading and writing activities to the child's construction of meaning (Snow, Burns, & Griffin, 1998).

Significance of the Study

This study is significant because it will provide information regarding the reading achievement of students who are deaf or hard of hearing, and who receive instruction in the general reading curriculum with support from *See the Sound/Visual Phonics*. Generally, this study will inform the field regarding the use of *See the Sound/Visual Phonics* as a supplemental activity, as well as inform regarding the reading achievement

of students participating in a phonics-based early reading program in which total communication was the class mode of communication. Specifically, this study will inform the RDSPD regarding current student achievement and future instructional decisions. The expectation is that this study will enable the RDSPD to continue implementing an evidence-based program of instruction leading to increased reading achievement for students who are deaf or hard of hearing.

CHAPTER II

LITERATURE REVIEW

There is some controversy within the field of deaf education regarding the best method of teaching children who are deaf or hard of hearing to read. Do they learn to read differently from, or similarly to, children who are hearing? Scholars that advocate that these students learn differently from hearing children argue that they learn to read by utilizing language-related skills such as morphology, syntax, semantics, and pragmatics (Trezek & Hancock, 2013). Others assert that children who are deaf or hard of hearing learn similar to hearing children by utilizing code-related skills such as phonological awareness skills and the alphabetic principle (Perfetti & Sandak, 2000; Schirmer & McGough, 2005; Trezek & Hancock, 2013). The answer to this question has implications for the type of instructional strategies that should be used with students who are deaf or hard of hearing. Research continues to be mixed on this issue, indicating that some students who are deaf learn using processes similar to those who are hearing, and that others utilize processes qualitatively different than hearing children (Musselman, 2000; Perfetti & Sandak, 2000). This literature review will discuss both sides of this issue.

Children who are Deaf Learn to Read Differently from Hearing Children

Those that hold to this position argue that children who are deaf learn quantitatively different from children who are hearing, and that instructional strategies used with hearing children are inappropriate for use with children who are deaf because they rely more on visual strategies than auditory strategies when learning to read (Wang et al., 2008). Learning general language skills such as American Sign Language (ASL), a

visual language, can provide a foundation for students to learn English language and literacy skills (Trezek & Hancock, 2013). Language skills specific to English can be learned visually by fingerspelling and using orthographical as well as morphographical information (Miller, 2007; Gaustad, 2000). Students who are deaf rely more on these language-related processes than phonological processes (Trezek & Hancock, 2013). The following section presents research that supports the perspective that students who are deaf or hard of hearing learn differently from children who are hearing.

Scholars have found that sign language can be a tool by which students who are deaf or hard of hearing learn to read (Alvarado, Puente, & Herrera, 2008; Izzo, 2002; Strong & Prinz, 1997). Alvarado, Puente, and Herrera (2008), in comparing coding strategies and reading skills in children who use Chilean Sign Language, concluded that fingerspelling-to-grapheme knowledge had the potential to facilitate reading for students who are deaf, much like phoneme-to-grapheme knowledge facilitates reading for children who are hearing. Izzo (2002) studied students who attended a school for the deaf and used primarily ASL to communicate. These students were ages 4-7. Izzo concluded that the ability to access letter-sound correspondences was not necessary for these children to learn literacy skills. He advocated that a orthographical/morphological instructional strategy might be more useful with some students. Strong and Prinz (1997) also found a relationship between ASL and reading, although they did not conclude that ASL was the only path by which students that are deaf can learn to read.

Haptonstall-Nykaza and Schick (2007) and Van Staden and Le Roux (2010) conducted investigations to determine if fingerspelling would facilitate word reading by students who are deaf or hard of hearing. The results of both of these studies indicated

that fingerspelling enabled students to recognize and read words. Haptonstall-Nykaza and Schick (2007) found that lexicalized fingerspelling was more effective in teaching new vocabulary than ASL. Van Staden and Le Roux (2010) explored the relationship between fingerspelling and phonological awareness finding that students used fingerspelling to access phonological information.

Miller (2007) and Transler, Leybaert, and Gombert (1999) examined whether students who are deaf use phonological or orthographic information when reading. Miller (2007) in his study compared the reading skills of deaf, dyslexic, and hearing students by examining how their phonemic, as well as their orthographic awareness skills, related to their ability to read words. Transler, Leybaert, and Gombert (1999) attempted to determine if students who are deaf process written words in phonological units. Results of both of these studies indicate that deaf readers use orthographic information rather than phonological processing skills.

Hanson, Shankweiler, and Fischer (1983) and Hanson (1986) investigated the relationship between orthography and spoken language. Hanson et al. (1983) examined the spelling patterns in deaf college students to determine the extent to which the acquisition of orthographic knowledge was dependent on spoken language. The authors concluded that it is possible for readers who are deaf to use orthographic as well as phonological knowledge when reading and that all deaf readers do not use the same linguistic structures when learning to read. Hanson (1986) examined the relationship between sensitivity to the orthographic structure of written language and speech intelligibility. Results indicated a relationship between sensitivity to orthographic regularity and good speech skills, although those with poor speech were not completely

insensitive to orthographical information, leading Hanson to posit, "what is crucial is not that speech is perfectly intelligible as perceived by listeners, but that the deaf individual is able to appreciate the phonological distinctions of the language" (p. 208).

Gaustad (2000) reviewed research in an effort to determine if readers who are deaf use morphographic strategies when identifying printed words. She concluded that there is value in using morphology as an alternative to phonology, but cautions that morphographic strategies are simply another avenue to word reading for students who cannot access phonological information. More research is needed to better understand how to provide this morphographic information to students who are deaf or hard of hearing. By comparing hearing and deaf students at both grade levels, Gaustad, Kelly, Payne, and Lylak (2002) examined the ability of students at the middle school and college levels to determine if students who are deaf apply knowledge of printed word morphology. Deaf students seemed to follow the same progression as the hearing students when developing morphographic knowledge, but at a much slower pace that does not allow them to utilize visual processing capabilities that fluency requires. They did not have the necessary word segmentation skills to allow them to focus on comprehending rather than decoding text.

Children Who Are Deaf Learn to Read Similarly to Children Who are Hearing

Children who are deaf must learn to read a language they cannot hear; consequently, they have only a limited knowledge of the spoken language that English text represents (Musselman, 2000). "Children who are successful in learning to read English learn that in the English writing system letters (actually graphemes) correspond

to speech sounds, and they use this knowledge in reading" (Perfetti & Sandak, 2000, p. 34). Students who are deaf must learn the alphabetic principle in order to read a language based on a phonetic alphabet (Hanson, 1989; Schirmer & McGough, 2005). This causes a problem for children who cannot adequately access the sounds of the spoken language.

The knowledge that words are composed of letters that correspond to the sounds of language has been determined to be vital when learning to read (National Reading Panel, 2000). This knowledge does not need to be dependent on speech, but it must provide a complete and unambiguous representation of the written text (Hanson, 1989; Narr, 2006). Consequently, knowledge of letter-sound relationships is not dependent on actually hearing the sounds and articulating them properly, but understanding that they are the building blocks of language (Adams, 1990; Charlier & Leybaert, 2000). The following sections discuss various methods that readers who are deaf or hard of hearing utilize in order to decode words and construct meaning out of what they read.

Phonological Coding

Conrad's (1979) study is considered the seminal study regarding phonological coding for students who are deaf or hard of hearing. Conrad concluded that students who were deaf or hard of hearing were accessing and utilizing phonological information when using internal speech codes to decipher written text. Participants with less hearing loss and more intelligible speech were better able to use phonological information, which resulted in better reading comprehension.

Hanson and colleagues conducted several investigations in the late 1980's and early 1990's that added to the knowledge base regarding the manner in which deaf students comprehend written text. Hanson and Fowler (1987), when comparing the

reading process of deaf and hearing college students, used a lexical decision task in three different experiments, and the results of all three found that both groups accessed phonological information when reading words. The participants who were deaf had received instruction in speech, but sign language was their primary mode of communication, indicating that individuals who use sign language can and do utilize phonological information when reading. Hanson, Goodell, and Perfetti (1991) used a tongue-twister task with college students and found that participants made more errors when reading tongue-twister (phonetically similar) sentences than when reading control sentences, indicating that the students were using phonological information when reading.

Harris and Beech (1998), when comparing the reading progress of students with severe/profound hearing loss over the first two years of school with their hearing peers, found that reading was significantly correlated with oral skills and language comprehension. Two interesting patterns emerged among the deaf readers. The child with the highest reading score had good oral skills, had the highest score on implicit phonological skills, and scored at the ceiling in language comprehension, while the child with the second highest reading score had deaf parents, was a very good signer, scored high on comprehension and low on phonological awareness. These results led Harris and Beech to conclude that individuals who are deaf or hard of hearing may, in fact, follow different pathways when learning to read. These include using visual strategies unique to students who are deaf, such as sign language, as well as using phonological information similarly to how hearing students learn to read.

Luetke-Stahlman and Nielsen (2003) also examined the relationship of phonological skills and the ability of students who are deaf or hard of hearing to read. In addition, these researchers attempted to determine if background and program variables correlated with students' comprehension scores. Participants were ages 7-17, had a profound hearing loss of greater than 91 dB, and attended a variety of deaf education programs including a residential school for the deaf, a day-school program, and a public school program served by itinerant teachers. Signing Exact English (SEE) was used to teach English. Results indicated that students who were better readers possessed academic English knowledge as well as phonological awareness skills.

Easterbrooks et al. (2008) examined changes over a typical school year for young children with hearing loss who attended a self-contained deaf education classroom. All of the participants had some access to sound, with some students using oral language and others total communication. Growth over the school year in early literacy skills such as blending, elison, alliteration, and letter-sound correspondences supported the hypothesis that, even though delayed, children who are deaf have the ability to learn the phonological structure of spoken English. These authors found similarities as well as differences in early literacy skills of children who are deaf or hard of hearing concluding, as did Harris and Beech (1998), that children may learn to read using different paths and that perhaps two separate curricula should be developed: one for those students with more access to sound and one for those with little access to sound.

Bergeron et al. (2009) conducted an additional study to examine the effectiveness of using a semantic association strategy to teach phoneme-grapheme correspondences to children ages 3-7 who are deaf or hard of hearing. The semantic association strategy

integrates multisensory activities to help students develop phoneme-grapheme correspondences. Participants attended schools using an oral approach as well as schools that used total communication and ASL. The semantic association strategy was found to be an effective and efficient method for teaching phoneme-grapheme correspondences, supporting the position that students who have some access to sound can learn letter-sound relationships. These same authors replicated these findings in a second study that assessed the effectiveness of using the semantic association strategy embedded in their newly created literacy program called *Foundations for Literacy* (Lederberg, Miller, Easterbrooks, Bergeron, & Connor, 2009), a systematic and explicit emergent literacy program for deaf preschoolers.

By conducting two additional studies, Beal-Alvarez, Lederberg, and Easterbrooks (2012) continued the above referenced research on the effectiveness of the *Foundations for Literacy* (Lederberg, et al., 2009) in teaching young students who are deaf or hard of hearing grapheme-phoneme correspondences. In study one, Beal-Alvarez et al. (2012) asked the question: Can a DHH preschooler with minimal speech perception skills learn grapheme-phoneme correspondences using Visual Phonics in tandem with the *Foundations for Literacy* curriculum? Study one was a case study involving one participant who had minimal speech perceptions skills, used no vocalized speech at beginning of study, and used sign language to communicate. The intervention lasted 10 weeks and consisted of four 30-minute one-on-one sessions each week. The participant slowly and steadily learned grapheme-phoneme correspondences over the course of the intervention, also learning to produce the spoken phoneme for each of the correspondences learned.

In study two, Beal-Alvarez et al. (2012) asked three questions: (a) What are the effects of instruction in *Foundations for Literacy* and Visual Phonics on acquisition of grapheme-phoneme correspondences by deaf or hard of hearing preschoolers who vary in speech perception abilities? (b) Can preschoolers use grapheme-phoneme correspondences to decode and identify words? (c) How do preschoolers use Visual Phonics and spoken phonemes during reading and fluency activities? Concerning the effects of instruction in *Foundations for Literacy* and Visual Phonics on acquisition of grapheme-phoneme correspondences, all children acquired and maintained all of the grapheme-phoneme correspondences that were taught during the intervention. Regarding preschoolers using grapheme-phoneme correspondences to decode words, the findings of this study indicate that participants produced the sign in addition to the phonemes when decoding words from printed text. The participants seemed to use Visual Phonics on an as needed basis and decreased the use of this strategy as they became familiar with the word they were decoding.

The purpose of Syverud, Guardino, and Selznick's (2009) study was to determine if a direct-instruction curriculum improved phonological awareness decoding skills of a student who is deaf and learning to read. This was a case study in which both qualitative and quantitative data were collected. The participant was a 7-year-old male with a moderate to severe bilateral progressive hearing loss. The intervention took place 3 times a week for 30 minutes for 8 weeks. The direct-instruction curriculum used in the intervention was *Teaching Your Child to Read in 100 Easy Lessons.* Nonsense word tests and journal entries were used for data collection. Improvement was noted in the

development of letter-sound associations, phonological decoding, and the nonsense word assessment.

Guardino, Syverud, Joyner, Nicols, and King (2011) conducted a multiple case study to extend their previous (2009) study to include multiple cases rather than a single case. They had six participants ages 7-12 who attended a self-contained, oral deaf education classroom located in a public elementary school. Two of the participants had cochlear implants, two wore digital hearing aids, and one had a Starkey bone conductor. The independent variables were *Teaching Your child to Read in 100 Easy Lessons,* a direct teaching method, and *See the Sound/Visual Phonics.* The dependent variables were the number of pseudowords read correctly out of 20 on weekly assessments. Intervention journals were kept in order to include qualitative data in the study. All students made gradual gains in word identification skills, supporting the position that students who are deaf or hard of hearing can and do utilize phonological information when decoding words.

Speechreading

Kyle and Harris (2010, 2011) examined the role of a range of language and cognitive skills in predicting reading development of children who are deaf over time. Participants for both studies were from various language and school backgrounds, including schools for the deaf as well a deaf education programs in public schools. The participants communicated via sign language, spoken English, and total communication.

Results of Kyle and Harris's (2010) study indicated that reading ability was delayed for the students who were deaf, with the average reading delay increasing over time. Speechreading was an initial predictor of reading ability, while vocabulary was the

strongest predictor of reading achievement. Phonological awareness was not found to be a significant predictor of reading ability; however, the two became increasingly associated as the children aged, leading the authors to suggest that the earlier reading ability was associated with later phonological awareness, rather than a precursor to reading, as has been found for hearing children (National Reading Panel, 2000).

Kyle and Harris (2011) added a comparison group of hearing children and found that speechreading and vocabulary predicted beginning reading ability in both groups of children. In addition, letter-sound knowledge was related to beginning reading ability, although the rhyme and alliteration components of phonological awareness were not. Deaf readers appeared to use a whole language approach in early reading (vocabulary was a strong predictor of reading ability), than rely more on phonological information derived from speechreading (speechreading and letter-sound knowledge were predictors of reading ability after two years of instruction). Hearing readers relied on alphabetic knowledge throughout the reading process. Kyle and Harris concluded that deaf and hearing children utilize slightly different reading strategies at different stages of the reading process, while hearing students use a more consistent approach. Speechreading appears to provide a method of accessing phonological information for deaf readers helping to bridge the gap between the spoken language and the written text.

Cued Speech

Leybaert and colleagues conducted several studies investigating the effectiveness of Cued Speech in providing phonological information to students who are deaf or hard of hearing (Charlier & Leybaert, 2000; Colin, Mangus, Ecalle, & Leybaert, 2007; LaSasso, Crain, & Leybaert, 2003;). Cued Speech is a mode of communication that

visually demonstrates the phonemes of spoken language. It consists of 12 hand shapes that correspond to the sounds of the language providing phonological information visually rather than auditorily (LaSasso et al., 2003).

Charlier and Leybaert (2000) investigated the rhyming ability of students who used the French version of Cued Speech. They conducted two experiments to determine if early exposure to linguistic input determined the rhyming ability of the participants. Charlier and Leybaert (2000) created five groups of participants with different exposure to Cued Speech: (a) students who were exposed to Cued Speech at home, (b) students who only used Cued Speech at school, (c) students who were educated with the oral/aural method, (d) students who were native signers, and (e) students who used sign language at school but not at home. A hearing control group also participated in the study. Results of both studies indicated that students who were deaf were able to demonstrate the ability to make decisions regarding rhyme when using Cued Speech. In fact, the students who used Cued Speech at home scored only slightly below their hearing peers in rhyme generation tasks, indicating that they were in fact, using phonological information, not simply accessing it when reading.

Colin et al. (2007) conducted a longitudinal study to determine if phonological skills measured in kindergarten would be predictive of word reading skills in first grade. They also wanted to determine if exposure to Cued Speech would explain the differences between the phonological skills of participants who were hearing and those who were deaf. These authors, citing Gombert (1992), differentiated between epi-phonological awareness and meta-phonological awareness. Epi-phonological awareness refers to an implicit sensitivity to phonemes although the person does not yet have the ability to

manipulate them. Meta-phonological awareness, or explicit phonological awareness, is the ability to identify and manipulate phonemes. Meta-phonological awareness depends on pre-existing epi-phonological awareness and reading instruction. Colin et al. hypothesized that meta-phonological awareness skills in the first grade would be predicted by epi-phonological skills in kindergarten and that both epi and meta-phonological skills would correlate with individual word recognition skills. They also expected that the age of exposure to Cued Speech would be a strong predictor of phonological skills and written word recognition skills. Results revealed that phonological skills measured in kindergarten predicted written word recognition scores in first grade for both students who were hearing and those who were deaf. Students who were more accurate on epi-phonological awareness skills in kindergarten were more accurate on word identification skills in first grade. Age of exposure to Cued Speech was found to be a strong predictor of phonological awareness and word recognition for students who were deaf. However, hearing students were more accurate on all of the assessments than were the students who were deaf.

LaSasso, Crain, and Leybaert (2003) extended Charlier and Leybaert's (2000) study to participants 16-26 years old, and again included a hearing control group. Participants who were deaf or hard of hearing included those who used Cued Speech and those who did not. Participants using Cued Speech scored better than those participants who did not use Cued Speech, but lower than participants who were hearing. These authors concluded, as did Charlier and Leybaert (2000), that Cued Speech can provide a means for students who are deaf or hard of hearing to access and use phonological information when reading.

Visual Phonics

Another instructional strategy that has been identified as having the potential to facilitate the acquisition of phonological awareness skills in students who are deaf or hard of hearing is *See the Sound/Visual Phonics* (Cihon, Gardner, Morrison, & Paul, 2008; Narr, 2006; Trezek & Malmgren, 2005). *See the Sound/Visual Phonics* is a supplemental strategy that may be used with any general reading curriculum. This method of phonics instruction provides the student who is deaf or hard of hearing with visual and kinesthetic cues to the sounds that are made by each of the letters of the English language (International Communication Learning Institute, 1996). S*ee the Sound/Visual Phonics* consists of 45 hand shapes, movements, and written symbols that correspond to each of the 45 phonemes represented by the 26 letters of the English alphabet. There is one hand shape, one hand movement, and one written symbol that resembles the look and feel of the phoneme (sound) that each letter(s) represent(s), enabling students who cannot hear the sounds, to see and feel them (Woosley, Satterfield, & Roberson, 2006).

Narr (2008) explored the use of Visual Phonics with students who are deaf or hard of hearing in an attempt to determine if students receiving instruction in *See the Sound/Visual Phonic* improved in reading performance. Narr conducted a correlation study to examine the correlation between performance on phonological awareness tests and the use of *See the Sound/Visual Phonics*. Narr hypothesized that instruction with *See the Sound/Visual Phonics* would result in the use of phonological processing and decoding ability. Participants included nine students from a first through third grade public school deaf education class, ages 5-9, and one student from a Pre-K/Kindergarten class who was reading at the same level as the other participants. Students used a

combination of ASL and signed English. The results supported the hypothesis that the use of visual phonics would correlate with an increase in phonological awareness skills.

Trezek and Malmgren (2005) conducted a study to evaluate the effectiveness of a phonics treatment package implemented with middle-school students. Participants were ages 12-14 and attended a self-contained deaf education class located in a large urban school district. There were 23 participants including three teachers. The hearing loss of the students ranged from slight to profound. A quasi-experimental research design was used. The independent variable was the phonics treatment package which included a standard reading curriculum, the *Corrective Reading - Decoding A* reading curriculum, *See the Sound/Visual Phonics, Baldi Talking Head* – a computerized talking head, and a pictorial glossary. The *Decoding A* reading program is a systematic and explicit remedial phonics program consisting of four levels and providing a hierarchical skill development in reading for students in 3-12 grades. The comparison group used the standardized reading curriculum that was used in the deaf education program. The *Baldi* software package supported the pronunciation activities of the reading *Decoding A* reading program. The pictorial dictionary was used to help students understand the meaning of the new words learned in the intervention lessons. The dependent variable was an increase in the phonological processing and generalization ability of the students. There were 30 lessons in the intervention that lasted 8 weeks. A nonparametric matched-pair Wilcoxon statistical test was used to analyze the data. The students who received the treatment package were able to demonstrate acquisition of and generalization of the phonics skills.

Trezek and Wang (2006) extended Trezek and Malmgren's (2005) research by evaluating the effectiveness of utilizing *See the Sound/Visual Phonics* to support young children in developing phonological awareness skills. Participants included 13 kindergarten and first-grade students attending a self-contained deaf education class in a large school district. Three teachers were also included as participants. Students' hearing loss ranged from severe to profound, and the communication mode of the students was total communication. The reading program was *Reading Mastery I,* and the skills measured were word reading, pseudo word decoding, and comprehension. A quasi-experimental research design was used with a paired-sample *t* test being used to compare the means of the word reading portion of the assessment as measured by the Wechsler Individual Achievement Test II. Descriptive statistics were used to analyze the pseudo word decoding and comprehension sections of the assessments. Bivariate correlations between degree of hearing loss and performance on test measures were also conducted. Results indicated that improvements were made in word reading, pseudo word decoding, and comprehension and that the participants performed better than the national population for students who are deaf or hard of hearing.

Trezek, Wang, Wood, Gampp, and Paul (2007) expanded the studies of Trezek & Malmgren (2005) and Trezek & Wang (2006) by exploring the results of utilizing *See the Sound/Visual Phonics* with another phonics-based reading curriculum. The *LACES* curriculum was developed by the local district in which the Regional Day School Program for the Deaf was located. The curriculum called for 90 minutes of daily instruction and consisted of five components: (a) literacy board, (b) read aloud, (c) vocabulary, (d) reading and enrichment, and (e) reteaching. *See the Sound/Visual Phonics*

was used to implement the literacy board section of the *LACES* lessons as well as used throughout the lesson to reinforce and teach vocabulary, word learning strategies, and comprehension. The participants included 20 students and four teachers from a Regional Deaf Program that served 200 students from preschool through high school. The students were in first grade, ages 5 and 6, and had hearing losses ranging from mild to profound. Participants were from oral/aural only classes as well as classes that utilized total communication. A mixed methods research design was implemented with a pretest-posttest control group design used for the quantitative portion, while teacher surveys were used for the qualitative piece of the study. The teacher survey revealed that the use of visual phonics allowed them to teach sections of the *LACES* curriculum such as identifying words with the same initial sound, but different letters. The *Dominie Reading and Writing Portfolio* was the standardized assessment used as the pre and post measure of achievement as this was used by the district to measure the student progress in the *LACES* curriculum. The skills assessed for the kindergarten students were the Sentence Writing Phoneme, Sentence Writing Spelling, and Phonemic Awareness Segmentation. First-grade students were assessed for the above three skills plus Phonemic Awareness Deletion, Phonics Onsets, and Phonics Rimes. The posttest scores for all measures were higher than at pretest and the paired-sample *t* test was statistically significant. The authors concluded that the *LACES* curriculum supplemented with Visual Phonics improved the reading skills of students who are deaf or hard of hearing.

The purpose of Trezek and Hancock's 2013 study was to investigate the implementation of a remedial instructional program with deaf or hard of hearing students in a bilingual model in which American Sign Language was the primary language used

during instruction. The goal was to explore the development of the alphabetic principle when receiving remedial instruction supported with *See the Sound/Visual Phonics.* Paired-sample *t* tests were used to compare pre-post scores on a curriculum-based measurement. Results showed a large and statistically significant difference from pre to post, supporting previous results that deaf and hard of hearing students can learn the alphabetic principle, and that explicit, systematic instruction in letter-sound relationships can be successful in helping these students make these connections (Trezek & Hancock, 2013).

Smith and Wang (2010) conducted a case study to determine if the use of visual phonics in conjunction with a phonics program would improve the phonological awareness and speech production of a young child who is deaf or hard of hearing. The participant was a 4-year-old from a Spanish speaking family who had received a cochlear implant at age 2. His communication mode was total communication at the time of the study. The intervention consisted of teaching the student letter sound associations using *See the Sound/Visual Phonics*. The intervention took place for 15-20 minutes four out of five days for six weeks. Pre and posttests were conducted as were interviews with the student's teacher. The student consistently scored higher on posttests of phonological awareness skills than he did on the pretests. The teacher reported that she noticed improvement in the student's skills as well.

Cihon et al. (2008) extended the use of *See the Sound/Visual Phonics* to kindergarten students ages 5 and 6, who are hearing and identified as at-risk for reading failure. The intervention took place over five weeks in the spring of the participant's kindergarten year. The visual phonics lessons occurred at least three times a week for 10-

12 minutes with 2-4 students. The *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS) was used to assess the literacy skills of the participants. Skills assessed were the initial sound fluency, letter naming fluency, phoneme segmentation fluency, nonsense word fluency, and word use fluency. Students receiving the *See the Sound/Visual Phonics* intervention not only did not fall further behind, but the gains they made were similar to the gains made by those students who did not receive the intervention. This study suggests that *See the Sound/Visual Phonics* could be an effective strategy to use with students who are hearing yet at-risk for reading failure.

The participants in the studies conducted by Syverud et al. (2009) and Guardino, Syverud, Joyner, Nicols, and King (2011) received supplemental instruction with *See the Sound/Visual Phonics*. The participants in these studies attended public school Deaf Education classrooms where they were taught to read using oral language. The results of the interventions implemented in these two studies showed that students made gains in word identification skills, thus adding to the body of knowledge that is being collected regarding the effectiveness of using *See the Sound/Visual Phonics* to support the phonological awareness development of students who are deaf or hard of hearing.

Beal-Alvarez et al. (2012) in continuing the research concerning the effectiveness of the *Foundations in Literacy* (Lederberg et al., 2009), studied the use of this curriculum in combination with *See the Sound/Visual Phonics*. The participants in their studies showed an improvement in their ability to decode words. Although, Beal-Alvarez (2012) were not able to determine if this improvement was the result of the support they received with *See the Sound/Visual Phonics* or the specific use of the *Foundations* curriculum, they did observe students using *See the Sound/Visual Phonics* to sound out words.

Summary

Students who are deaf or hard of hearing learn both differently from, and similarly to, children who are hearing (Hanson, 1989; Schirmer & McGough, 2005; Wang et al., 2008) with each student bringing a variety of individual characteristics to the task of learning to read (Perfetti & Sandak, 2000). Those holding to the position that children who are deaf learn differently from hearing children argue that they rely more on language-related processes than code-related processes (Trezek & Hancock, 2013). They contend that a visual language system such as ASL forms the foundation for students who are deaf or hard of hearing to become successful readers, while phonological awareness forms the foundation for hearing children when learning to read (Musselman, 2000; Trezek & Hancock, 2013). Those advocating that children who are deaf learn to read utilizing the same processes as hearing children, albeit at a slower pace argue that phonological processes cannot be bypassed and that phonological awareness must be taught (Wang et. al, 2008). They posit that the lag in reading achievement among deaf or hard of hearing students may be due to a lack of access to phonological awareness due to hearing loss and/or a lack of instruction in phonological skills (Musselman, 2000).

The mixed results of this literature review indicate that students who are deaf or hard of hearing use a variety of means and methods to access print, depending on a number of individual and school factors. A more balanced approach, in which both language-related knowledge and code-related skills are considered necessary, is beginning to be put forth by those in the field (Trezek & Hancock, 2013). Easterbrooks et.al. (2008) expressed the possibility of developing two separate curricula for students who are deaf or hard of hearing: (a) one for those that have at least some access to sound;

and (b) one for those that do not have any access to sound. Instructional curricula and teaching strategies used when teaching children who are deaf or hard of hearing to read should not be in competition, but should be parallel curriculums that would meet the needs of all students. Musselman sums it up best, "Understanding and facilitating the acquisition of literacy by deaf children clearly requires attention to a multitude of factors" (2000, p. 28).

CHAPTER III

METHODOLOGY

The purpose of this study was to examine the reading achievement of students who were deaf or hard of hearing participating in the general reading curriculum of a public school and who receive support with *See the Sound/Visual Phonics.*

Research Questions

The following questions guided this study:

1. What is the reading achievement level of fifth-grade deaf/hard of hearing students attending public schools, participating in a general reading program and receiving support with *See the Sound/Visual Phonics*?
2. Do students who are deaf or hard of hearing and who receive early reading instruction in a phonics based reading program supported with *See the Sound/Visual Phonics* show improvement in reading over time, as measured by isolated word reading and text comprehension?
3. How do students who are deaf or hard of hearing and who are participating in the general reading curriculum supported with *See the Sound/Visual Phonics* compare in reading achievement to their hearing peers?

Procedure

Archival data was used to describe the reading achievement of students who are deaf or hard of hearing attending a Regional Day School Program for the Deaf. Data beginning with the 2002-2003 school year and ending with the 2012-2013 school year was examined. Data collected included district and state standardized test scores, as well as district assessments based on the objectives of the current reading curriculum. An

employee of the deaf education program gathered the data from the district data base, de-identified the information, and forwarded it to the researcher. IRB approval was not necessary, as this study utilized archival data (See Appendix A).

Participants

The sample included 19 participants who are deaf or hard of hearing and 20 participants who are hearing. The participants who are deaf or hard of hearing were enrolled in a Regional Day School Program for the Deaf where they attended class located on the same public school campuses as the participants who are hearing attended class. All of the participants attended the same public school district located in rural west Texas.

Deaf or Hard of Hearing Participants

The Regional Day School Program for the Deaf (RDSPD) from which the sample was taken served 75 students that attended deaf education classes located on elementary, middle, and high school campuses during the 2012-2013 school year. In addition to these students, the program served approximately 90 students on their home campuses located throughout the educational region in Texas. The RDSPD provides a continuum of services including self-contained classrooms, co-teaching classrooms, and inclusion classrooms.

Nineteen students who attended the RDSPD during the school years 2002-2003 were chosen to be included in this study. The oldest participants were in the second grade during the 2002-2003 school year, and in the twelfth grade during the 2012-2013 school year; the youngest participants were in the second grade during the 2009-2010 school year and in the fifth grade during the 2012-2013 school year (See Table 3.1). Participants

will have been identified by the Texas Education Agency as auditory impaired, and will have received instruction in the general reading curriculum by a certified deaf education teacher. Instruction will have taken place in a self-contained deaf education classroom with total communication as the language of instruction. Participants will have received support in *See the Sound/Visual Phonics* as needed.

Table 3.1

Participants who are Deaf or Hard of Hearing Per Academic School Year

	Grade											
School Year	2	3	4	5	6	7	8	9	10	11	12	Total N
2012-2013	__	__	__	4	4	1	0	3	2	1	4	19
2011-2012	__	__	4	4	1	0	3	2	1	4	__	19
2010-2011	__	4	4	1	0	3	2	1	4	__	__	19
2009-2010	4	4	1	0	3	2	1	4	__	__	__	19
2008-2009	4	1	0	3	2	1	4	__	__	__	__	15
2007-2008	1	0	3	2	1	4	__	__	__	__	__	11
2006-2007	0	3	2	1	4	__	__	__	__	__	__	10
2005-2006	3	2	1	4	__	__	__	__	__	__	__	10
2004-2005	2	1	4	__	__	__	__	__	__	__	__	7
2003-2004	1	4	__	__	__	__	__	__	__	__	__	5
2002-2003	4	__	__	__	__	__	__	__	__	__	__	4
Total N	19	19	19	19	15	11	10	10	7	5	4	

Note. N = 19.

Hearing Participants

Twenty students who are hearing were included in the sample in order to compare the reading achievement of students who are deaf with the reading achievement of students who are hearing. These students were randomly selected from students who

attended the same public school as the deaf or hard of hearing students. Students who were in the fifth grade during the 2005-2006 school year through the 2012-2013 school year were included in the population from which the sample was taken. Approximately the same number of hearing participants as deaf or hard of hearing participants was included for each year of the study.

See Table 3.2 for more information.

Table 3.2

Fifth Grade Students Who are Hearing

School Year	Students
2012-2013	4
2011-2012	4
2010-2011	1
2009-2010	1
2008-2009	3
2007-2008	2
2006-2007	1
2005-2006	4

Note. N = 20

Assessments

Brigance® System

The Brigance Diagnostic Comprehensive Inventory of Basic Skills - Revised (CIBS-R) was used to measure the reading achievement level of students who are deaf or hard of hearing. This instrument was chosen because the test is given by the RDSPD to the participants at the beginning of the school year, in the middle of the school year, and at the end of the school year. This assessment may be used as a criterion-referenced or standardized assessment. The CIBS-R was standardized on a large population representative of the United States in terms of ethnicity, income, education under

conditions similar to those in which the assessment is used in public education. Forty-one students in kindergarten through sixth grade were tested and retested two weeks later for the 1998 standardization and validation study of the CIBS-R. The test-retest reliability correlation for the Basic Reading Composite score was .94 and the Reading Comprehension Composite correlation score was .97 indicating high reliability across testing sessions (Glascoe, n. d.). The CIBS-R was constructed based on the collaboration of hundreds of educators across the United States in order to help ensure content validity.

State of Texas Assessments of Academic Readiness

The State of Texas Assessments of Academic Readiness (STAAR) assessment was used to compare the reading achievement level of fifth-grade students who are deaf or hard of hearing with the reading achievement level of fifth-grade students who are hearing. Beginning in the spring of 2012 this became the Texas standardized assessment given to all students. Participants who are hearing took the STAAR test, while participants who are deaf or hard of hearing took the STAAR-M, a modified version of the test. The modified version of the test covers the same grade-level/course content, but has been modified in the following manner: (a) larger font size, (b) fewer items per page, (c) shorter test blueprint, (d) fewer answer choices, (e) simpler vocabulary, and (f) simpler sentence structure (Texas Education Agency, 2013a).

The STAAR tests are comprehensive assessments that align the state mandated curriculum with performance standards from grade 3 through grade 12 with the goal of preparing Texas students to be “postsecondary ready” (Texas Education Agency, 2013b). The Texas Education Agency (TEA), the Texas Higher Education Coordinating Board, test-development specialist, and Texas educators, including teachers and curriculum

specialists, worked together to develop the STAAR Assessments (Texas Education Agency, 2013c). The Texas Technical Advisory Committee, a national panel of testing experts, was created specifically for the purpose of providing ongoing consultation to the TEA in order to help ensure the validity of the STAAR assessments.

The TEA provides five types of validity evidence for the STARR assessments: (a) test content; (b) response processes; (d) criterion-related validity; and (e) consequences of testing (Texas Education Agency, 2013d). The test content is based on the Texas Essential Knowledge and Skills (TEKS) with evidence of validity coming from "the established test development process and the judgments of subject matter experts' about the relationship between the items and the test construct" (Texas Education Agency, 2013d). Through field testing, evidence to support response validity is collected regarding: (a) item difficulty; (b) item-test correlations, and (c) differential item functioning and then submitted for educator and expert review (Texas Education Agency, 2013d). A number of studies were undertaken to compare student performance on the STARR test with performance on other related tests and included the following comparisons: (a) STAAR-to-TAKS linking studies; (b) comparing STAAR performance across grade levels in same content; and (c) comparing scores on STAAR assessments across content (Texas Education Agency, 2013d). These studies were conducted at the secondary level; the results may be accessed from the TEA website. Surveys were used to collect feedback from a standard-setting committee regarding the intended and unintended consequences resulting from the STAAR Modified assessments. These results will be analyzed and used to promote ongoing improvement of the STAAR Modified program (Texas Education Agency, 2013d).

Reliability for the STAAR assessments was determined by two different statistics. The Kuder Richardson Formula (KR20) was used to determine the internal consistency for tests with only multiple choice items; stratified coefficient alpha was used for tests containing both multiple-choice and constructed-response items. The reliability coefficients for both the STAAR (Texas Education Agency, 2013e) and STAAR-M (Texas Education Agency, 2013f) can be found in Table 3.3.

Table 3.3

2012 STAAR Fifth Grade Reading Assessment Reliability

Form	STAAR[a]			STAAR-M[b]		
	Mean	SD	Alpha	Mean	SD	Alpha
1	31.037	8.305	0.884	19.506	5.553	0.736
2	___	___	___	19.215	5.566	0.737
3	___	___	___	19.096	5.837	0.764
4	___	___	___	18.846	5.671	0.749

Note. Stratified Alpha Reliability computed for tests/reporting categories involving short-answer and/or essay questions. KR-20 computed for all others. SD = standard deviation.

[a]n = 348793; [b]n 3865 form 1, 3272 form 2, 3475 form 3, 3464 form 4.

Texas Assessment of Knowledge and Skills

The Texas Assessment of Knowledge and Skills (TAKS) assessment was included in the assessments used to compare the reading achievement of fifth grade students who are deaf or hard of hearing with the reading achievement of fifth grade students who are hearing as this was the Texas standardized assessment for students in the fifth grade prior to the 2011-2012 school year. Participants who are hearing took the TAKS test while students who are deaf or hard of hearing took the TAKS-M, a modified

version of the TAKS test. The TAKS-M differs from the TAKS test in the following ways: (a) a larger font is used, (b) fewer items appear on each page, (c) there are fewer answer choices, (d) easier vocabulary is used, and (e) simpler sentence structure is used (Texas Education Agency, 2011a).

Test validity for the TAKS assessments are content based and tied directly to the statewide curriculum; validity is also provided for through the test development process, as well as from documentation from subject matter experts regarding the relationship between the test items and the test construct (Texas Education Agency, 2011b). Advisory committees consisting of educators from across Texas were created for each subject area and grade level in an effort to ensure content validity by connecting test items with the statewide curriculum. Test development specialists including the Texas Education Agency, Educational Testing Service, Pearson, and Questar, Inc. provided expertise in content as well as test building. Test items were reviewed by the test developers at each stage of development to verify that they were aligned with the objectives and are "offered as additional evidence for content validity" (Texas Education Agency, 2007-2008, p. 164).

> The sequential stages of item development and item review provide many opportunities for Texas educators to offer suggestions for improving or eliminating items and to offer insights into the interpretation of the statewide curriculum. The nature and specificity of these various review procedures provide additional strong evidence for the content validity of the TAKS, TAKS-M, TELPAS, and EOC assessments. (Texas Education Agency, 2007-2008, p. 161)

The reliability of the TAKS test was determined by the KR20 and the stratified coefficient alpha depending on the types of questions included in the assessment. The KR20 was used to determine the internal reliability for tests containing only dichotomously scored (multiple choice) item while the stratified coefficient alpha was computed for tests containing dichotomous and short answer type questions. Reliability coefficients for the TAKS (Texas Education Agency, 2011c) and the TAKS-M (Texas Education Agency, 2011d) may be found in Table 3.4.

Table 3.4

Fifth Grade TAKS Reading Assessment Reliability

	TAKS			TAKS-M		
Year	Mean	SD	Alpha	Mean	SD	Alpha
2011	35.525	5.749	0.858	23.553	5.979	0.832
2010	35.095	5.819	0.853	23.121	6.182	0.840
2009	33.781	6.783	0.882	23.516	6.503	0.865
2008	34.111	6.467	0.871	23.093	6.693	0.871
2007	33.783	6.283	0.862	___	___	___
2006	33.217	6.555	0.870	___	___	___
2005	33.101	6.596	0.870	___	___	___

Note. Statistics reported for Grade 5 Total Group Complete Reading Subtest.
SD = Standard Deviation.

State-Developed Alternative Assessment (SDAA)

Participants who were deaf or hard of hearing and in the fifth grade during the 2005-2006 and 2006-2007 school years took the State-Developed Alternative Assessment (SDAA) rather than the TAKS-M. The SDAA assessment was created to assess student knowledge of the same state-mandated curriculum that all students are required to learn, but different forms of the test were created on different instructional levels. During the

time period in which the SDAA was given, the Admission, Review and Dismissal (ARD) committee was able to select the appropriate instructional level for each student so that the assessment given was based on the instruction that was received in the classroom (Texas Education Agency, 2004) This assessment differed from the TAKS assessment in the following ways: (a) the reading passages were shorter, (b) there were more illustrations, (c) the font size was larger, (d) there was more white space on each page, and (e) the tests were slightly shorter than the comparable grade level tests (Texas Education Agency, 2004).

Test validity for the SDAA was, "content based and tied directly to the statewide curriculum" (Texas Education Agency, 2004, p. 108). The construct tested on the SDAA was the academic content of the statewide curriculum so that the construct validity is grounded in the content validity of the test (Texas Education Agency, 2004). Since, "the TAKS test is measuring what is required to be taught to all students and is given under standardized conditions, it has the same validity for all students" (Texas Education Agency, 2004, p. 109). The evidence for the validity of the SDAA also lies, "in the content of the state-mandated curriculum being measured" (Texas Education Agency, 2004, p. 109).

The reliability of the SDAA assessment was determined by the KR20 and the stratified coefficient alpha depending on the types of questions included in the assessment. The KR20 was used to determine the internal reliability for tests containing only dichotomously scored (multiple choice) items, while the stratified coefficient alpha was computed for tests containing dichotomous and short answer type questions (Texas

Education Agency, 2011b). Reliability for the SDAA assessment can be found in Table 3.5.

Table 3.5

Fifth Grade SDAA Reading Assessment Reliability

Year	Mean	SD	Alpha
2007	19.234	7.130	0.857
2006	20.167	7.324	0.868

*Note.*Statistics reported for Instructional Level 5 SDAA II Total Group Complete Reading Subtest. SD = Standard Deviation.

Data Analysis

Question One

Question one is: What is the reading achievement level of students who are deaf or hard of hearing and in the fifth grade who attend a public school, participate in a general reading program, and receive support with *See the Sound/Visual Phonics*?

Descriptive statistics were used in order to provide an overview of the reading achievement of students who were in the fifth grade from 2000-2013. The Word Recognition and Text Comprehension sub-tests of the CIBS-R were used as the measurement of reading level.

Question Two

Question two is: Do students who are deaf or hard of hearing who receive early reading instruction in a phonics based reading program supported with *See the Sound/Visual Phonics* show improvement in reading over time as measured by isolated word reading and text comprehension? A dependent samples *t* test was used to determine student improvement in reading from second grade to the fifth grade. The Word Recognition and Text Comprehension sub-tests of the CIBS-R were used as the

assessment measure. Instruction in the alphabetic principle is usually completed by the end of the second grade (Trezek & Hancock, 2013). Therefore, second grade was chosen as the pretest data point.

Question Three

Question three is: How do students who are deaf or hard of hearing participating in the general reading curriculum supported with *See the Sound/Visual Phonics* compare in reading achievement to their hearing peers? This question was answered using an independent sample *t* test to compare the reading level of students in the fifth grade who are deaf or hard of hearing with students in the fifth grade who are hearing. The STAAR, STAAR-M, TAKS, TAKS-M, and SDAA exam scores will be used to compare the reading achievement of deaf or hard of hearing students with hearing students. These measurements were chosen because the participants will have taken one of these assessments in the fifth grade. Results are standardized and will be converted to percentiles allowing for comparison across different measurement instruments.

Summary

This study was a partnership between a RDSPD and Texas Tech University. Archival data was collected for the purpose of examining the reading achievement of fifth-grade students who are deaf or hard of hearing. The reading level of fifth-grade students attending the RDSPD from 2012-2013 was described using descriptive statistics. The reading progress of deaf or hard of hearing students from the second grade to the fifth grade was determined using a dependent *t* test. The reading achievement of fifth-grade students who are deaf or hard of hearing was compared with the reading achievement of fifth-grade students who are hearing by conducting an independent *t* test.

CHAPTER FOUR

RESULTS

Three research questions were addressed in this study. Descriptive statistics were used to describe the data. A dependent-samples *t* test was used to compare second grade and fifth-grade reading achievement. An independent-samples *t* test was used to compare deaf or hard of hearing students with hearing students. The results are discussed by question.

Question One

Question one was: What is the reading achievement level of students who are deaf or hard of hearing and in the fifth grade who attend a public school, participate in a general reading program, and receive support with *See the Sound/Visual Phonics*? Measures of central tendency were computed to summarize the data for the word recognition and text comprehension sub-tests of the CIBS-R. Measures of dispersion were computed to describe the variability of scores for these sub-tests.

The CIBS-R reports a grade level for word recognition and text comprehension. This is how the scores were coded: Lower 1st = 1.3; 1^{st} = 1.5; upper 1st = 1.8; lower 2nd = 2.3; 2^{nd} = 2.5; upper 2^{nd} = 2.8; lower 3^{rd} = 3.3; 3^{rd} = 3.5; upper 3^{rd} = 3.8; lower 4^{th} = 4.3; 4^{th} = 4.5; upper 4^{th} = 4.8; lower 5^{th} = 5.3; 5^{th} = 5.5; upper 5^{th} = 5.8. The grade level score for each participant was entered into the SPSS statistical software that was used to calculate the statistics. As shown in Table 4.1, the descriptives for the fifth-grade word recognition sub-test are: N = 17; M = 1.47; and SD = 1.04. The descriptives of the text comprehension sub-test are N = 17; M = 2.67; SD = 1.29.

Table 4.1

Descriptive Statistics for Deaf or Hard of Hearing

	2nd Grade		5th Grade	
Assessment	M	SD	M	SD
Word Recognition	.20	.19	1.47	1.04
Text Comprehension	.21	.33	2.67	1.30

Note. N = 17; M = mean; SD = standard deviation

Question Two

Question two was: Do students who are deaf or hard of hearing and who receive early reading instruction in a phonics based reading program supported with *See the Sound/Visual phonics* show improvement over time as measured by the word reading and text comprehension sub-tests of the CIBS-R? A Wilcoxon Matched-Pairs Signed-Ranks test was conducted to compare word reading and text comprehension in the second grade to word reading and text comprehension the fifth grade. This test was chosen because the distribution of scores was not normally distributed (George & Mallery, 2011). There was a significant difference between the word recognition scores in the second grade (N = 17, M = .2, SD = .19) and word recognition scores in the fifth grade (N = 17, M = 1.47; SD = 1.04); z = -3.41, p = .001. There was also a significant difference between the text comprehension scores in the second grade (N = 17, M = .21, SD = .33) and text comprehension scores in the fifth grade (N = 17, M = 2.67, SD = 1.30); z = -3.62, p = < .001.

Question Three

Question three was: How do students who are deaf or hard of hearing and who are participating in the general reading curriculum supported with *See the Sound/Visual Phonics* compare in reading achievement to their hearing peers? Scores on the standardized state assessments that students are required to take yearly were used to compare the reading achievement of students who are deaf or hard of hearing with their hearing peers; scores from participants' fifth-grade year were used for this comparison. An independent-samples *t* test was conducted in order to compare these two independent samples (George & Mallory, 2011). A significant difference was found between the scores for the participants who are deaf or hard of hearing (N = 19, M = .39, SD = .15) and the participants who are hearing (N = 20, M = .75, SD = .1); t (37) = 8.74, $p < .001$. The mean of the scores on the state assessments for the participants who are deaf or hard of hearing was .39. The mean of the scores on the state assessment for participants who are hearing was .75.

Summary

The purpose of the research questions in this study was to examine the reading achievement of students who were deaf or hard of hearing with students who were hearing. The first question described the fifth-grade word recognition and text comprehension of students who were deaf or hard of hearing. The second question compared the word recognition and text comprehension scores of students who were deaf or hard of hearing when they were in the second grade to their word recognition and text comprehension scores when they were in the fifth grade. The third question compared the

reading achievement of students who were deaf or hard of hearing to the reading achievement of students who were hearing.

The first question was answered by using descriptive statistics. The results show that fifth-grade students who were deaf or hard of hearing had a word recognition level of first grade. The text comprehension level for these students was slightly higher at second grade.

The second question was answered by conducting a dependent-samples *t* test. The mean word recogntion score for students in the second grade who were deaf or hard of hearing was pre-kindergarten; the mean text comprehension score for these students was also pre-kindergarten. By the fifth grade, these students had a mean word recognition score of mid-first grade and a mean text comprehension score of mid- to upper-second grade. Students who were deaf or hard of hearing made statistically significant progress from the second grade to the fifth grade in word recognition and text comprehension.

The third question was answered by conducting an independent-samples *t* test. Students who were deaf or hard of hearing had a mean of 40% correct on the state assessment, while students who were hearing had a mean of 75% correct on the assessment. Students who were deaf or hard of hearing did not achieve in reading at the same level as their hearing peers.

CHAPTER 5

DISCUSSION

Students who are deaf or hard of hearing deserve to develop reading skills at the same high level as do their hearing peers. These students continue to lag behind their hearing peers in reading achievement and currently graduate with about a fifth-grade reading level (Easterbrooks et al., 2008; & Traxler, 2000). Individual factors such as language experience, use of amplification, access to sound, speech production, home language, and hearing status of parents contribute to the ability of students who are deaf or hard of hearing to learn to read, as do school factors such as the instruction setting, the instructional mode of communication, and the reading curricula (Perfetti & Sandak, 2000). Consequently, research has been inconclusive regarding the most effective instructional strategies to use with these students when teaching them to read (Musselman, 2000), leading some to advocate for a more balanced approach (Easterbrooks et al., 2008) dependent on the unique needs of each student.

Results of this study indicate that fifth-grade students who are deaf or hard of hearing had an average word recognition score at a mid-first-grade level. The text comprehension for these students was at a mid- to upper-second-grade level. The standard deviation indicates that the word recognition and the text comprehension scores were within one standard deviation from the mean.

Results of the dependent - samples *t* test demonstrate that students who are deaf or hard of hearing made significant progress in both word reading and text comprehension from the second grade to the fifth grade. Students had a word recognition score, as well as a text comprehension score, at a pre-kindergarten level in the second grade. By the

fifth grade, students had improved to a mid-first-grade level in word recognition and a mid- to upper-second-grade level in text comprehension.

Schirmer and McGough (2005) report that students who are deaf or hard of hearing progress about one third of a grade each school year. In word recognition, students in this study progressed one and one third grades from second to fifth grade or one third of a grade each school year. However, in text comprehension, students in this study progressed two and two thirds grade levels from the second grade to the fifth grade, one grade level per school year.

Results of the independent – samples *t* test show that students who are deaf or hard of hearing score, on average, lower than students who are hearing on the end-of-the-year state assessments. Students who are deaf or hard of hearing correctly answered approximately 40% of the questions on the assessment, while students who are hearing correctly answered about 75% of the questions. While students who are deaf or hard of hearing did not have the same success that students who are hearing had on this assessment, it is worth noting that four out of six (66%) students in the study who are deaf or hard of hearing who took the TAKSM test "met expectations" on the assessment. Neither the SDAA nor the STAAR assessments indicated whether students "met expectations," so the percentage of students meeting expectations on these tests could not be reported.

Limitations

Two limitations to this study have been identified. One limitation to this study is that there were gaps in the available data, due to the nature of the unique characteristics of students who are deaf or hard of hearing. Second-grade word recognition scores, as

well as text comprehension scores, were at times not reported due to participants' lack of ability to read words and comprehend text. Students who were deaf or hard of hearing who received instruction in the general education class did not have word recognition or text comprehension scores because they were not given the CIBS-R, as it is used only to assess special education students. Consequently, the results did not include these students' scores. A second limitation is the small sample size. This study examined the reading achievement of a specific population of students who are deaf or hard of hearing, resulting in only 19 participants. Generalizing the results to other populations of students who are deaf or hard of hearing should be considered with caution.

Recommendations

Several recommendations for the RDSPD have been identified. The first recommendation is that one assessment be given from the date of entry into the deaf education program until the student either leaves the district or graduates from high school. This would allow the RDSPD to do two things: (a) track the progress of their students receiving instruction in the deaf education class as well as their students receiving instruction in the general education class, and (b) compare the reading progress of their students from kindergarten through high school. The second suggestion is to use an assessment with students in kindergarten through second grade that will more finely differentiate early phonological development. This will provide the opportunity to track the early reading skill development of these students allowing future research to examine the reading progress of students in kindergarten through second grade. Students in this study had a word recognition level of first grade; therefore, a third recommendation is to provide intense phonics instruction through middle school. Trezek and Malmgren (2005)

implemented a phonics-based reading program to middle school deaf or hard of hearing students and found that these students gained knowledge of phonics as measured by sound identification in isolation, sound identification within words, and word reading.

There are several future research opportunities for the RDSPD. Suggestions include: (a) examining the early reading development of deaf or hard of hearing students in kindergarten through the second grade attending this RDSPD, (b) conducting control-group studies comparing students receiving support with *See the Sound/Visual Phonics* and those not receiving this support, and (c) single-subject studies to monitor the reading progress of individual students. Qualitative research describing the reading curriculum as well as the instructional strategies implemented should also be considered.

Conclusion

The manner in which children who are deaf or hard of hearing make sense of the printed language is only beginning to be understood by researchers (Musselman, 2000). Individual student factors and institutional variables interact in a complex manner to influence the ability of the deaf child to learn language (Perfetti & Sandak, 2000). Individual factors such as language experience, use of amplification, access to sound, speech production, home language, hearing status of parents, and degree of hearing loss affect the child's ability to learn to read, as do institutional variables such as instructional setting, mode of communication used in the classroom, and reading curricula (Perfetti & Sandak, 2000). Research has yielded contradictory results depending on the individual and school variables of the participants in the study (Musselman, 2000).

The purpose of this study was to examine the reading achievement of fifth-grade students who were deaf or hard of hearing and who participated in the general reading

curriculum supported with *See the Sound/Visual Phonics.* This study examined the word recognition and text comprehension of fifth-grade deaf or hard of hearing students. This study compared the word recognition and text comprehension of those students when they were in the second grade to their word recognition and text comprehension when they were in the fifth grade. The study also compared the reading achievement of students who are deaf or hard of hearing with their hearing peers. The results showed fifth-grade students who are deaf or hard of had a word recognition score of the first grade and a text comprehension score of the second grade, and that they read at a level significantly below that of their hearing peers. However, they made statistically significant progress in word recognition and text comprehension from the second to fifth grade.

The expectation was that this study would enable the RDSPD to continue implementing an evidence-based program of instruction, leading to increased reading achievement for students who are deaf or hard of hearing. A baseline for the reading achievement of students in second through fifth grades who are deaf or hard of hearing has been established. The information regarding the reading achievement of their students who are deaf or hard of hearing has been utilized by the RDSPD in making instructional decisions for the 2013-2014 school year.

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APPENDIX

INSTITUTIONAL REVIEW BOARD POLICIES AND PROCEDURES FOR RESEARCH WITH HUMAN SUBJECTS (EXCERPT FROM SECTION 3.0)

Examples of activities that fall outside the jurisdiction of the IRB because they do not involve interaction or intervention with human subjects and the data do not constitute identifiable private information include, but are not limited to:

☐ Studies using aggregated archival data that is de-identified

☐ Studies using people to obtain information that does not involve human subjects (e.g., "how many widgets did you produce last quarter?" or "how many sick days were taken last year by people who work in your school district?")

Identifiable Private Information includes information that can be either directly or indirectly linked to specific individuals. An example of information that could be directly linked to a specific individual would be that person's social security number. An example of information that could be indirectly linked to a specific individual would be coded information, if a key to decipher the code exists.

However, when the investigator(s) cannot readily ascertain the identity of the individual(s) to whom the coded private information pertains, this constitutes non-identifiable information. Examples of non-identifiable information include:

☐ Identifiable information that is coded (name or social security number could be replaced with a number, letter, symbol, or combination thereof), AND the key to decipher the code is destroyed before the research begins.

☐ Coded information in a situation in which the investigator(s) and the holder of the key enter into an agreement prohibiting the release of the key to the investigator(s) under any circumstance.

Questionnaire Response Form