The Qualitative Meta-Analysis of Visual Phonics: A Promising Strategy to Teach Reading

THESIS

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Ayse Nur Kart

Graduate Program in Education Teaching & Learning

The Ohio State University

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Master's Examination Committee:

Dr. Peter V. Paul, Advisor

Dr. Mollie Blackburn
Abstract

Inadequate development of code-related skills (e.g., phonemic awareness, letter names, grapheme-phoneme correspondence, and phonics) is one of the most important reasons for reading problems. d/Dhh learners may not benefit from traditional instruction used to teach code-related skills. Visual Phonics, an alternative intervention tool, has a potential to improve reading outcomes and may be the key to prevent reading difficulties. The purpose of this qualitative meta-analysis is to explore all relevant studies conducted on Visual Phonics to provide a comprehensive understanding of the effects on reading related outcomes. Thirteen articles containing fourteen studies met the inclusion criteria. The results demonstrate that Visual Phonics is an effective strategy to teach code-related skills for at risk hearing kindergarteners and d/Dhh students, regardless of the degree of hearing loss, grade placement, communication method, home language, and prevalence of an additional disability.
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Vita

June 2005 .................................................. Merzifon Super High School

2009 ............................................................... B.A. Primary School Education, Eskisehir

Osmangazi University

2015 to present ................................................. Sensory Impairments, The Ohio State

University

Fields of Study

Major Field: Education Teaching & Learning

Education of Deaf and Hard of Hearing Students
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Chapter 1: Introduction

This chapter provides an overview of the present study. First, demographics of students who are d/Deaf and hard of hearing (d/Dhh) are discussed. Second, reading achievement and difficulties of d/Dhh students are explained. Third, it justifies theoretical frameworks to support Visual Phonics with three primary sources: Simple View of Reading (SVR) (Gough & Tunmer, 1986; Hoover & Gough, 1990), the Qualitative Similarity Hypothesis (QSH) (Paul, Wang, & Williams, 2013), and the National Reading Panel (NRP, 2000). Next, Visual Phonics is explained. Then this chapter introduces the purpose of the study and proposes three research questions. It also briefly discusses the research methodology for gathering data relevant to the questions. The last part of the chapter provides details about the key terms of the study.

Demographics of d/Dhh Students

Hearing impairment is a generic term for all degrees of hearing loss, and hearing impairment is considered a low incidence disability because it does not occur in many children (Smith et al., 2015). There are approximately 70,000 elementary and secondary school age d/Dhh students in the US (Cawthon, 2009). The use of the phrase d/Dhh refers to all students with a wide range of hearing loss. This includes both audiological and sociocultural parameters of deafness and individuals who are members of Deaf culture.

There are five categories of hearing loss: slight (27-40 dB), mild (41-54 dB), moderate (55-69 dB), severe (70-89 dB), and profound (>90 dB). Individuals who have
the first three types of hearing loss have been referred to as hard of hearing, whereas students who have profound hearing loss are labeled as d/Deaf. Students who have severe hearing loss have been labeled either hard of hearing or d/Deaf (Paul & Whitelaw, 2011). Approximately 60% of d/Dhh students have hearing loss in the range of slight to moderate (Trezek & Hancock, 2013).

d/Dhh students are a very heterogeneous group of students. The existence of an additional disability or disabilities makes these students even more diverse, and one third to one half of d/Dhh students have an additional disability such as learning disabilities, deafblindness, cognitive disabilities, attention disorders, and autism spectrum disorders (Spencer & Marschark, 2010). Furthermore, d/Dhh students whose home languages are different than the mainstream language are other contributors of deafness and diversity (Guardino & Cannon, 2015).

Moreover, there are other facts about the demographics of d/Dhh students. According to Paul, Wang, Trezek, and Luckner (2009):

- The majority of d/Dhh students have mild, moderate, or unilateral hearing loss. A significantly smaller percentage of the population has severe or profound hearing loss.
- 95% of d/Dhh children are born into families with at least one hearing parent.
- In school, the majority of d/Dhh students (i.e., 52%) use speech only as their primary mode of communication; 34.9% use sign with speech, and 11.4% use sign only (p. 354).
Reading Achievement of d/Dhh Students

Reading is an essential skill for social life and academic success, and learning to read is a complex process. This complex process is effortless for some students, but others find it challenging. Reading difficulties of d/Dhh students are well documented by the large body of research. Most students with severe to profound hearing loss graduate from a high school with approximately a fourth-grade reading level (Paul, 2009; Paul et al., 2013; Traxler, 2000; Wurst, Jones, & Luckner, 2005). The fourth grade reading level is considered functionally illiterate because the literate level of reading for society’s documents is estimated to be at the 5th or 6th grade reading level (Paul, 1997). Thus, the majority of students with severe to profound hearing loss graduate from high school as functionally illiterate readers. Only 10% of the population’s reading level are above the sixth grade (Paul & Wang, 2012). Additionally, the annual growth of reading for d/Dhh students is 0.3 grade per year compared to that of typical literacy learners per year (Paul, 2009; Paul & Wang, 2012; Spencer & Marschark, 2010; Trezek, Wang, & Paul, 2010).

Reading Difficulties of d/Dhh Students

According to Mayer and Trezek (2015), several reasons contribute to reading difficulties of d/Dhh students. Code-related skills (e.g., phonemic awareness, letter names, grapheme-phoneme correspondence, and phonics) and/or language-related skills (e.g., morphology, semantics and syntax) could be the underlying reasons for these difficulties. Both code-related and language-related factors play a significant role in reading development; however, code-related and language-related abilities have a distinct role at different stages. Certainly, reading has two stages: learning to read and reading to
learn. During the learning to read stage, code-related skills become significant because once the children ‘crack the code’ then language-related abilities play a critical role in reading development.

Similarly, Trezek et al. (2010) examine d/Dhh students’ reading difficulties in two categories: reader (knowledge) and text (process) factors. Reader factors are related to developing mental representations that are necessary for comprehending and interpreting decoded items such as metacognition, working memory, and prior knowledge. On the other hand, text factors, connected to code-related skills, are required for decoding linguistic information from print such as word identification, phonics, fluency, and vocabulary.

Theoretical Frameworks

The role of phonology in learning to read is significant. Without an explicit and holistic framework of the role of phonology, this study would be incomplete because the focal point of this study is Visual Phonics and its reading related outcomes that are generally associated with phonemic awareness and phonics. The SVR, the QSH, and the NRP provide theoretical frameworks for this study because all these models highlight the role of phonology, and there is an overlap among these three models. They also build background knowledge for Visual Phonics.

This chapter briefly explains these three models. For instance, the QSH argues that the research on typical literacy learners may apply to d/Dhh students. Furthermore, the NRP suggests that phonemic awareness and phonics instructions are two components of an effective reading program. Moreover, the SVR emphasizes the importance of
phonology for decoding. More detailed discussion about these models will be in the next chapter.

The Simple View of Reading

The SVR defines reading comprehension as a product of decoding and language comprehension (Gough & Tunmer, 1986; Hoover & Gough, 1990). Decoding is a linkage of printed and spoken words. The reader’s success of decoding depends on establishing the relationship between letters and sounds, which requires phonics. Phonics along with phonological awareness provide a foundation for decoding (Adams, 1990; Birsh, 2011; Gough & Tunmer, 1986; Hoover & Gough, 1990). Both decoding and language comprehension are necessary for reading comprehension, and inefficiency in one component leads to overall reading failure (Birsh, 2011).

The Qualitative Similarity Hypothesis

The QSH states that English language and literacy development of d/Dhh students are qualitatively similar to that of typical literacy learners, but the development may be quantitatively slower or delayed (Paul et al., 2013). English language and literacy development of d/Dhh students either in first or second language are similar to that of the typical literacy learners whose first language is English. d/Dhh students proceed through similar stages, produce similar errors, and use similar strategies, but make more errors.

The QSH asserts that good teaching requires an adequate understanding of the disciplinary structure. If the discipline has a structure, fundamentals must be acquired by all learners. The QSH advocates that the curriculum should be roughly the same for all children, regardless of individual differences, but instruction should be differentiated, and
alternative approaches must be used to promote learning opportunities. For example, Visual Phonics is an alternative instructional approach to teaching phonemic awareness, phonics, and speech production to d/Dhh students.

*The National Reading Panel*

The NRP (2000) is a comprehensive meta-analytic research that examines the best practices of teaching reading and concludes that an effective reading instruction has five elements: phonemic awareness, phonics, fluency, vocabulary, and comprehension. These five components must be integrated into a balanced literacy instruction. Additionally, phonemic awareness and phonics are the most important precursors of later reading success. Therefore, mastering these skills during the early years helps students to become better readers in later years.

**Visual Phonics**

Visual Phonics, also known as See The Sound/Visual Phonics, is a multisensory teaching tool that has been used to teach early reading skills such as phonemic awareness and phonics. Visual Phonics has 46 hand cues and corresponding written symbols for the sounds (Waddy-Smith & Wilson, 2003). In 1982, Visual Phonics was created by a mother of three deaf children to give them visual and tactile access to the sounds (Woolsey, Satterfield, & Roberson, 2006). Visual Phonics hand cues mimics the articulatory features of sounds, and this provides visual and kinesthetic access to phonological information. Moreover, “written symbols (i.e., line drawings) that resemble the hand sign can be drawn under complex vowels, digraphs, and irregular spellings to
clarify sounds in printed words for struggling readers” (Gardner, Cihon, Morrison, & Paul, 2013, p. 30).

As an example, the hand cue for the /t/ sound is produced in two steps. First, the hand is held in a fist near the mouth with the thumb and index finger facing the body. Second, the tip of the index finger is quickly flicked upward off the thumb, representing the tongue flicking off the roof of the mouth and releasing the puff of air when this sound is produced. (Morrison, Trezek, & Paul, 2008, p. 13).

Providing multisensory representation of the sounds is vital for d/Dhh students because they do not have complete access to the sound via the auditory canal. This becomes especially crucial languages like English that has 26 letters, 45 phonemes, and 398 different spelling patterns (Morrison et al., 2008). Because of inconsistencies between letters and sounds, English is considered as an opaque orthography, and this makes it difficult to teach and learn, especially for students who has limited access to the phonology (Trezek et al., 2010). Phonology is fundamental for the development of reading skills, and acquiring phonology enhance comprehension, language structures, and vocabulary knowledge (Paul et al., 2013).

Visual Phonics has been used over 30 years in teaching d/Dhh students, and a growing and promising body of research supports the effectiveness of Visual Phonics (Beal-Alvarez et al., 2012; Narr, 2008; Smith & Wang, 2010; Syverud et al., 2009; Trezek, Wang, Woods, Gampp, & Paul, 2007). Previously conducted studies are valuable for us to learn more about Visual Phonics. However, there is no comprehensive research that critically synthesizes the existing research to understand the effects of Visual Phonics.
on reading related outcomes. Therefore, this study fills the research gap and presents an overall picture of effects of Visual Phonics on reading related outcomes especially phonemic awareness and phonics.

Purpose of the Study and Research Questions

The purpose of this study is to explore all relevant studies conducted on Visual Phonics to provide a comprehensive understanding of the effects on reading related outcomes. The research questions that guide this study are as follows:

1. How has Visual Phonics been investigated in primary research on reading related outcomes?
2. What are the general findings?
3. What are the recommendations for future research?

Qualitative Meta-Analysis

Qualitative meta-analysis was chosen to investigate the research questions of this study. Qualitative meta-analysis is a rigorous secondary analysis of primary findings (Timulak, 2009). “The goal of qualitative meta-analysis is to contribute to the construction, explication, and development of theory in order to provide a more comprehensive understanding of a particular field of study” (Wang & Williams, 2014, p. 325).

Two steps of literature search strategy were used: electronic searches with terms “visual phonics” or “see the sound”, and manual searches of selected articles’ reference lists. Three selection criteria were established to collect data: (1) studies that have been published from 1982 to 2017, (2) qualitative, quantitative primary, or mix-method
primary research studies that have been published in peer-reviewed journals, and (3) studies that focused on students in PK-12 educational settings and reading related outcomes. Studies that met the selection criteria were placed one of four population categories: (a) typical hearing students who were at risk for reading failure, (b) d/Dhh middle and high school students, (c) d/Dhh primary school students, and (d) d/Dhh preschoolers. After the placement of studies, detailed summaries about each study was written for systematic and transparent analyses of data. Summary reports contain information about the source (authors and year), research method, participants, purpose, research questions, notes, results, reading related outcomes, limitations, and directions for future research.

Description of Key Terms

This section provides a description of key terms that are extensively utilized in this study. Key terms listed alphabetically:

i. d/Deaf and hard of hearing (d/Dhh) refers to all students with a wide range of hearing loss. It includes both audiological and sociocultural parameters of deafness and individuals who are the members of Deaf culture.

ii. Grapheme is a letter or letter cluster representing a single phoneme (e.g., i, ph, igh).

iii. National Reading Panel is a comprehensive meta-analytic research that concludes phonemic awareness, phonics, fluency, vocabulary, and text comprehension are five essential aspects of reading and reading instruction.
iv. Phoneme is the smallest unit of speech that makes one word distinguishable from another (e.g., /f/ makes fat distinguishable from vat).

v. Phonemic awareness is an awareness of the smallest units of sound in the speech and the ability to isolate or manipulate the individual sounds in words. This area usually develops after phonological awareness and typically requires instruction.

vi. Phonics is an essential instruction, especially in early grades to teaching reading and spelling that emphasizes grapheme-phoneme correspondences.

vii. Phonological awareness is the knowledge and sensitivity to the phonological structure of a language. Phonemic awareness is one component of phonological awareness. The task of phonological awareness requires manipulating spoken units larger than phonemes such as generate words that rhyme, to segment sentences into words, to segment polysyllabic words into syllables, or delete syllables of words.

viii. Simple View of Reading is a reading model that defines reading comprehension as a product of lower level skills such as word recognition and higher level thinking process such as listening comprehension.

ix. Qualitative meta-analysis is a rigorous secondary analysis of primary findings.

x. Qualitative Similarity Hypothesis states that English language and literacy development of d/Dhh children and adolescents are qualitatively similar to that of typical English language and literacy learners, but may be quantitatively slower or delayed.

xi. Visual Phonics is a multisensory teaching tool that has 46 hand cues and written symbols for all English phonemes. Visual Phonics can be integrated into any phonics-
based reading program and can help d/Dhh students to enhance phonemic awareness, phonics, and speech production skills.
Chapter 2: Literature Review

This chapter provides the theoretical and research background for the present study with the focus on Visual Phonics. First, the role of phonological awareness in English reading is discussed with respect to the major principles common across of three models: Simple View of Reading (SVR), Qualitative Similarity Hypothesis (QSH), and the National Reading Panel (NRP). Next instructional strategies of phonemic awareness and phonics are examined. Then the theoretical foundations and description of Visual Phonics are covered.

The Role of Phonological Awareness in Reading Development

Phonology is one of the most important components of a language. Therefore, it is called the building blocks of a language, and individuals must be able to access its phonology to learn the language. Phonology means the rules of sounds in the spoken language or the rules of hand movements in the sign language (Paul & Whitelaw, 2011). For the development of reading skills, phonology is fundamental. Acquiring phonology can increase reading acquisition, comprehension, language structures, and vocabulary knowledge (Paul et al., 2013). Thus, the rest of this section discusses the role of phonology in reading development within three major theoretical frameworks: the SVR, the QSH, and the NRP.
The Simple View of Reading

According to the SVR, reading comprehension (R) is the product of decoding (D) and linguistic comprehension (C) \( R = D \times C \) (Gough & Tunmer, 1986). Hoover and Gough (1990) highlight that SVR has two components – decoding and linguistic comprehension- and both are necessary for skilled reading. Based on the synthesis of several studies, the authors illustrate a correlational relationship between decoding, linguistic comprehension, and reading comprehension. Although decoding and linguistic comprehension are unrelated, both related to reading comprehension. During the early grades, correlation between decoding and reading comprehension is stronger than linguistic comprehension, whereas in the later grades, the relationship between linguistic comprehension and reading comprehension becomes stronger.

Gough and Tunmer (1986) advocate that decoding or word recognition is a skill that inevitably based on the grapheme-phoneme knowledge. Decoding also refers to phonological coding which is the process of transforming letters into sounds (Ehri, 1995). Therefore, decoding requires an important emphasis on phonemic awareness, and other phonological processes (Paul et al., 2013). Additionally, the positive relationship between phonological awareness and decoding is supported by a wealth of research (Adams, 1990; NRP, 2000; Snow et al., 1998).

Once the decoded words have been read several times, they become sight words, and the mature form of sight word reading is based on alphabetic principle and phonological code (Ehri, 1995). According to Ehri (1995), the development of sight word reading has four phases. The first phase is pre-alphabetic; children lack letter-sound
knowledge and use visual similarities while reading. During the next phase, partial alphabetic, children utilize some of the letter-sound relations. When children have a complete understanding of the connection between letters and sounds, the full alphabetic phase begins. The last phase, which is desired, is a consolidated alphabetic phase. Children’s sight-word vocabulary rapidly grows, and they become a skilled decoder. Gough and Tunmer (1986) defined a skilled decoder as “the reader who can read isolated words quickly, accurately, and silently” (p. 7). To sum up, decoding and phonological skills have a reciprocal relationship and are significant for reading development.

The Qualitative Similarity Hypothesis

“The QSH is a descriptive, testable hypothesis (or construct), with micro and macro components (sub-constructs), and is based on a synthesis of empirical and reason-integrative research concerning the acquisition of through-the-air English (i.e., speaking and/or signing) and English literacy (i.e., reading and writing)” (Paul et al., 2013, p.1). The QSH mainly focuses on English language and literacy development of d/Dhh children and adolescents, but if the QSH is valid, it can be extended to all learners and other disciplines such as science and mathematics (Paul & Lee, 2010).

The QSH states that English language and literacy development of d/Dhh students are qualitatively similar to those who are typically developing English language and literacy learners, but may be quantitatively slower or delayed (Paul & Lee, 2010). The QSH does not compare hearing students to d/Dhh students. Instead, it takes typically developing learners whose first language is English as a reference; hence, these typically developing individuals can be anyone who is actually performing on age or grade level.
Moreover, the QSH claims that the English literacy development of d/Dhh students either in a first or second language is similar to that of typical literacy learners, and d/Dhh students proceed through similar stages, produce similar errors, and use similar strategies, but the development could be quantitatively slower or delayed (Paul & Lee, 2010).

Two major underpinnings of the QSH seem to be a critical or optimal period and cognitive or discipline structures. “The growth of language is deemed to be optimal in the early years and slows down considerably – and is less optimal – after puberty” (Paul et al., 2013, p. 12). The idea of a critical or optimal period was heavily influenced by the work of Lenneberg (discussed in Paul et al., 2013) and Stanovich’s (1986) Matthew effect (the rich get richer, and the poor stay the same or become poorer) (Paul & Lee, 2010). Consequently, basic reading skills need to be developed within the critical period (up to about third grade) because students rarely catch up by the end of third grade. In this critical period, instruction should intensively focus on decoding and phonological skills (Paul & Lee, 2010).

Furthermore, the QSH asserts that good teaching requires an understanding of a discipline structure that matches the cognitive structures of individuals. “Most of the failure is due to a mismatch between the cognitive structure of the individual and the structure of the discipline” (Paul & Lee, 2010, p. 458). If a discipline has a structure with components having varying levels of difficulty, the fundamentals must be acquired by all learners. The QSH advocates that the curriculum should be roughly the same for all children, regardless of individual differences, but instruction should be differentiated, and
alternative methods are needed. For example, the NRP (2000) reports that the fundamentals of English reading and reading instructions are: phonemic awareness, phonics, fluency, vocabulary, and text comprehension. According to the QSH, reading development of d/Dhh students is similar to that of typical literacy learners; therefore, these five core elements of reading must be taught or be part of any reading curriculum.

There is an ongoing debate in the field of the education of the d/Dhh whether the reading development of these students is similar to that of typical students (Wang, Kretschmer, & Hartman, 2008). One view says it is different, and advocates of this view favor residential schools and bilingual-bicultural (BiBi) educational programs, which are also supported by a Deaf Epistemology. They think that deaf students learn differently than hearing students because they are visual learners, and sign language must be their first language. ASL instructions are delivered, and written form of the English is expected to be learned directly through the use of ASL (Johnson, Liddell, & Erting, 1989).

On the other hand, the dominant view is that the reading development of d/Dhh students is qualitatively similar to that of typical literacy counterparts (Mayer & Trezek, 2015; Paul, 2009; Paul et al., 2013; Paul & Wang, 2012; Trezek et al., 2010). Paul (2014) remarks that ‘qualitatively similar’ or ‘qualitatively different’ are ‘messy constructs’ because all of the doubts raise revolve around the role of phonological skills. One group says phonological coding (via sound) is unnecessary and unrealistic for Deaf readers (Allen et al., 2009; Miller & Clark, 2011). Others support that sound phonology is necessary and must be taught by using alternative methods such as Visual Phonics and
Mayer and Trezek (2014) reexamined the question whether reading is different for deaf individuals. The answer is definitely ‘no’ based on their scientific investigation. Deaf learners, as well as all learners who struggle with reading have deficits in phonological processing. Systematic phonemic awareness and phonics instruction need to be employed as a part of reading curriculum and prevent reading difficulties in the early years. For the authors, instruction needs to be differentiated (via modifications and accommodations) based on the individual learner’s strengths and weaknesses.

“Our key point is that phonology is a necessary aspect of learning to read, most especially in the early years, when the primary focus is on learning to decode. We recognize that, in and of itself, phonology is not sufficient to allow for comprehension (i.e., decoding in the absence of language); however, in the absence of the development of phonological sensitivity abilities and the ability to decode with ease and automaticity, comprehension is not possible” (Mayer & Trezek, 2014, pp. 366-367).

English is an alphabetic language, and one must understand the alphabetic principle that refers to letters in written words representing the sounds in spoken words (Adams, 1990; NRP, 2000; Snow et al., 1998). The alphabetic principle requires phonemic awareness and systematic, explicit, and direct instructions of phonics. Phonemic awareness and letter knowledge are strong predictors of reading achievement for all children (NRP, 2000).
Similarly, phonological skills are associated with higher levels of reading for d/Dhh students. The research suggests that skilled deaf readers used phonological coding (Hanson, 1989; Leybaert, 2005; Paul et al., 2013; Perfetti & Sandak, 2000; Schirmer & Megough, 2005). Phonological awareness development of d/Dhh students follows the same sequence of skill development as that of typically developing literacy learners (Paul & Wang, 2012; Paul et al., 2013; Wang et al., 2008), whereas the development may be slow or delayed.

The role of the phonological processor in learning to read is well documented (Adams, 1990; NRP, 2000; Paul et al., 2013; Snow et al., 1998). However, traditional instruction which is based on speech and hearing may not be adequate for a number of d/Dhh students. Evidently, phonological instruction does not need to be dependent on speech intelligibility and/or hearing (Hanson, 1989; Leybaert, 2005; Paul & Wang, 2012). Alternative methods of instruction such as Visual Phonics may be the key to improving English reading skills of students who are d/Dhh.

*The National Reading Panel*

The NRP (2000) conducted a comprehensive meta-analysis to examine scientific evidence for the best practices of teaching reading, and suggested that effective reading instruction contains five elements: phonemic awareness, phonics, fluency, vocabulary, and comprehension. To be effective, reading instruction must include these five components. At the beginning reading stages, phonemic awareness and phonics instructions are the most important aspects of reading. They are highly correlated with each other, and the most important precursors of later reading success (NRP, 2000).
Mastering these skills during the early years helps students to become better readers in later years. The findings of the NRP can be applied to d/Dhh students as well, because according to the QSH, English literacy development of d/Dhh students is similar to that of their typical literacy counterparts. Even though the focus of this study is phonemic awareness and phonics instruction, the rest of the section briefly explains all effective reading components.

“Phonemic awareness is the ability to notice, think about, and work with the individual sounds in spoken words” (Partnership for Reading, 2006, p. 1). Children must understand that spoken words are made up of phonemes. Phonemic awareness instruction is beneficial for all children who are learning to read and spell, and is more helpful when taught with letters in the small group instruction (NPR, 2000).

“Phonics instruction teaches children the relationships between the letters (graphemes) of written language and the individual sounds (phonemes) of spoken language” (Partnership for Reading, 2006, p. 11). English is an alphabetic language, and alphabetic principle requires children to understand written words are made up of graphemes that are written symbols of phonemes. The NRP (2000) stressed that if systematic and explicit phonics instruction begins in kindergarten or first grade, this produces the greatest impact on reading achievement.

Fluency is the ability to read a text effortlessly with proper expression, accurately, and as quickly as possible (NRP, 2000). Fluency is significant because it is a bridge between word recognition and comprehension (Partnership for Reading, 2006). The NRP found a strong relationship between fluency and comprehension. If students decode
words automatically, they can focus on meaning. Fluency develops gradually and requires practice. The NRP suggests that repeated and monitored oral reading is the best strategy to develop fluency.

Vocabulary is one of the most important aspects of reading and reading instruction (NRP, 2000). Vocabulary size at kindergarten entry is one of the most important predictors of learning to read and later success in school (Snow et al., 1998). Four types of vocabulary are: listening (or receptive) vocabulary, speaking (or expressive) vocabulary, reading vocabulary, and writing vocabulary (Partnership for Reading, 2006). Oral vocabulary refers to the words that are used in speaking and listening, whereas reading vocabulary refers to words that are recognized and used in print. Vocabulary is significant in learning to read and for reading comprehension. Oral vocabulary helps beginning readers to make sense of printed words, and readers must know most of the words in the text to understand what they are reading. Vocabulary can be developed directly through instruction and indirectly through incidental learning.

According to Partnership for Reading (2006), the main aim of reading is comprehension, and reading comprehension is purposefully obtaining meaning from text. Good readers have a purpose for reading and actively engage in what they are reading. Reading comprehension heavily depends on the reader’s oral language abilities, particularly the meaning of words and syntax along with semantic relationships among them (Snow et al., 1998; Trezek et al., 2010). Teaching text comprehension strategies can help students to develop comprehension, and teachers can teach text comprehension through explicit instruction and cooperative learning (NRP, 2000).
Instructional Strategies of Phonemic Awareness and Phonics

This section begins with theoretical and research background for phonemic awareness and phonics instructions for typical literacy learners. Even though research on instructional strategies for d/Dhh students is limited, this part of the chapter briefly synthesizes the existing research relevant to the topic.

Phonemic Awareness Instruction

The importance of phonemic awareness instruction is supported by a well-known body of research (Adams, 1990; NRP, 2000; Snow et al., 1998). Because of several reasons, the NRP (2000) identified phonemic awareness as a required aspect of any balanced reading program. First, correlational studies found that phonemic awareness and letter knowledge were strong predictors of reading achievement for the first two years of formal education. Second, many experimental studies examined the effectiveness of phonemic awareness instruction for reading acquisition, and the results revealed that statistically significant positive outcomes. Last, there is a current interest in phonemic awareness instructions among teachers, principals, publishers, and state adaptation committees.

Phonemes are the smallest unit of sound that can change meaning (Paul & Whitelaw, 2011). Changes in one phoneme could create new words such as /h/ makes hug distinguishable from bug (Brish, 2011). The English language has approximately 45 phonemes (Morrison et al., 2008). Individuals have various degrees of familiarity with the phonemes of a language. Research has shown that even infants at one month of age
can detect a phonemic distinction (Adams, 1990). Development of phonemic awareness begins with the age of 3 years old and improves gradually over the years (Snow et al., 1998). For example, Liberman and colleagues (1974) developed phonemic segmentation tasks and examined children’s performances who were between four to six years old; the results demonstrated that none of the four-year old was successful, and only 17% of five-year old succeeded, whereas 70% of six-year old were successful (as cited in Adams, 1990). Furthermore, most phonological rules are internalized by the age of 6 to 8 years (Paul & Whitelaw, 2011).

Only a small percent of the population is consciously aware of phonemes (Adams, 1990). Speech has no breaks of signaling, and phonemes are co-articulated; therefore, the focus is on the meanings, not on the sounds (NRP, 2000). Moreover, if one does not try to learn to read, there is no need to be conscious about the phonemes (Adams, 1990). Hence, teaching phonemic awareness is essential in the early stages of reading instruction to support reading acquisition and to prevent reading failures (Snow et al., 1998).

It should be clear that phonological awareness and phonemic awareness is enhanced by the understanding of instructional strategies. “Phonemic awareness refers to the ability to focus on and manipulate phonemes in spoken words” (NRP, 2000, p. 2-1). Moreover, phonemic awareness is one aspect of phonological awareness, which is a general appreciation of the sound structure of a language (Snow et al., 1998). Therefore, phonological awareness includes various types of awareness and larger units of sounds such as syllables, rhyming words, and onset-rime. (NRP, 2000).
It can be seen that phonemic awareness instruction is a critical component of reading curriculum in the early grades (Adams, 1998; NRP, 2000; Snow et al., 1998; Brish, 2011). All effective reading programs teach phonemic awareness to young children. Learning to read an alphabetic language, such as English, requires the understanding of the alphabetic principle, which states that spoken words can be analyzed into phonemes (Snow et al., 1998). Phonemic awareness plays a significant role in learning to read and increases comprehension (Paul, 2009).

In the early grades, all children have benefitted from the phonemic awareness instruction, which does not require a long period of time. Some students may need additional instruction such as nonreaders and students with disabilities, but 5 to 18 hours of instruction through average sessions of 25 minutes long in a small group reveals the best results (NRP, 2000). Explicit phonemic awareness instruction has both short and long term gains for all students.

According to Adams (1990), phonemic awareness is affected by a hierarchy of abilities such as:

- Nursery rhymes—The most primitive level just involves hearing sounds.
- The oddity tasks—Children are presented with a set of three or four words and asked which one is different such as give, pat*, girl, and go.
- Blending and syllable-splitting—Children become familiar with initial sound segmenting, and they can blend phonemes into words.
- Phonemic segmentation—Children can completely analyze words into phonemes.

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• Phoneme manipulation—Children can add, delete, or move a designated phoneme of words.

Based on this hierarchy of abilities, the most difficult tasks are phonemic segmentation and phoneme manipulation, which are highly related to beginning reading acquisition. When phoneme manipulation is taught with letters, the most effective results are yielded (NRP, 2000). The NRP identified the most commonly used phonemic awareness tasks: (1) phoneme isolation, (2) phoneme identity, (3) phoneme categorization, (4) phoneme blending, (5) phoneme segmentation, and (6) phoneme deletion. Examples of these tasks are:

• Phoneme isolation, “Tell me the first sound in paste” (/p/);

• Phoneme identity, “Tell me the sound that is the same in bike, boy, and bell” (/b/);

• Phoneme categorization, “Which word does not belong? bus, bun, rug” (rug);

• Phoneme blending, “What word is /s/ /k/ /u/ /l/?” (school);

• Phoneme segmentation, “How many phonemes in cat?” (3: /k/ /a/ /t/);

• Phoneme deletion, “What is smile without the /s/?” (mile) (p. 2-10).

Moreover, if the focus is on one or two of these phoneme manipulation tasks, students can benefit the most. For example, “teaching students to segment and blend benefits reading more than a multiskilled approach” (NRP, 2000, p. 2-41). Phoneme blending and segmenting are directly involved in reading, spelling, and decoding skills.
Phoneme blending skill involves decoding whereas phoneme segmentation is required for spelling.

*Phonics Instruction*

Reading is a complex process that needs to be taught. For beginners, an essential part of learning to read involves an understanding of the alphabetic principle that directly links to phonics instruction (Adams, 1990; Birsh 2011; NRP, 2000; Snow et al., 1998). Because phonemic awareness and phonics instruction are not the same, it is important to distinguish between them. Phonics instruction requires grapheme-phoneme correspondences, spelling patterns, and applying this knowledge during reading. The NRP (2000) provides solid evidence for contributions of systematic and explicit phonics instruction to reading acquisition.

The goal of all phonics programs is to enable learners to use the alphabetic code so that they can learn to read and understand written language. The focus of phonics instruction is on improving children’s ability to read and spell words. Phonics is foundational knowledge beneficial for all learners, especially effective for children with disabilities and at risk for reading problems (NRP, 2000, Snow et al., 1998). About 70 to 75% of the school population understand the alphabetic principle with ease, regardless of the teaching method; however, the other 25 to 30% of the school population, including students with dyslexia, require intensive systematic and explicit phonics instruction (Birsh, 2011).

What is systematic and explicit phonics instruction? Even though these two terms have been frequently used together, they are not synonyms. Systematic instruction refers
to introducing different letter-sound combinations from the most frequent and consistent ones to more complicated ones (Shaywitz, 2005). Easier skills have to be taught before the complex ones. When teachers directly tell their students what they are going to teach, this type of instruction is considered as an explicit instruction (Mesmer & Griffith, 2005).

The NRP (2000) has identified several different systematic and explicit phonics instruction types: synthetic phonics, analytic phonics, embedded phonics, analogy phonics, onset-rime phonics, and phonics through spelling. Even though there are variations of phonics programs that are explicit and systematic, the NRP compared synthetic phonics programs, larger-unit phonics, and miscellaneous phonics programs in the analysis. The results of the analysis demonstrated that all three types of phonics programs had statistically significant effects, but did not differ from each other. Thus, there is no particular phonics program that is better than others. All systematic phonics programs have revealed significant outcomes than non-systematic programs.

Even though the NRP did not state that synthetic phonics is the best approach, synthetic phonics programs are the most common and recommended ones (Joshi et al., 2009). “Synthetic phonics programs teach children to convert letters into sound or phonemes and then blend the sounds to form recognizable words” (NRP, 2000, p. 2-89). According to Shaywitz (2005, pp. 200-202), a typical systematic synthetic phonics program teaches:

- Simple one-to-one, letter-sound relationships. The focus is consonants because they have predictable relationships. The suggested teaching sequence may be m, t, s, f, d, r, g, l, h, c, b, n, k, v, w, j, p, y.
• Vowel sounds. Vowels can be long and short, and they are more difficult to learn than consonants. Long vowels say their names such as ‘a’ sound as in cake, but short vowels do not. Programs generally teach specific letters as a unit that contains six to eight consonants and two vowels. Vowels ‘a’ and ‘i’ are easiest to distinguish.

• Complex letter-sound patterns. Two or more letters may represent one speech sound such as –sh, -ch, -tch, or –eigh. Teaching these complex letter-sound patterns should begin during the late first grade and continue into second grade.

• Rules. Some useful rules are taught. For example, the silent e rule is taught in the first grade.

• Spelling. Technically, it is not a part of phonics program, but it is important. Children need be asked to spell words that they can read. The instruction should begin mid-first grade, but typically children cannot accurately spell words until second grade. Spelling (goes from sound to the letter) is the reverse of decoding and strongly reinforces reading acquisition. The spelling of irregular words must be memorized.

According to the NRP, a phonics program has the biggest impact when it begins in kindergarten or first grade, and instruction should continue for 2 to 3 years. All lesson delivery systems (i.e., tutoring, small group, or whole class) are effective. It is important to highlight that phonics instruction is not a complete reading program, and it should be integrated with other balanced reading instruction components such as phonemic
awareness, reading sight words, fluency, vocabulary, reading comprehension strategies, and enhanced language experiences (NRP, 2000; Shaywitz, 2005).

Mesmer and Griffith (2005) identified six most commonly used phonics teaching methods such as songs, word sorts, making words, scripted teacher directions, worksheets, and games. The researchers surveyed 362 primary teachers. Teachers remarked that word sorts and making words are highly explicit and systematic teaching methods. Teaching with these methods is an active process and requires more lesson planning. Students actively engage in these activities; for example, students individually spell words while making word lists. Because these activities involve manipulation of words, learning is more concrete. In contrast, teachers generally use worksheets to review students' understanding and to provide feedback. Worksheets are less active teaching methods than making words and word sorts.

There are plenty of materials available to teach phonics, and using a scientifically tested top-quality phonics program is important to ensure that all students can benefit from instructions (Shaywitz, 2005). Between 30% to 50% of students with disabilities and students who are at risk do not benefit from traditional phonics instruction that is beneficial for typical learners (Morrison et al., 2008). The NRP and Shaywitz (2005), who was a member of the reading panel, particularly mentioned two highly effective phonics programs that use hand motions and actions to reinforce learning – Jolly Phonics (Lloyd, 1993) and Letterland (Wendon, 1992).

Jolly Phonics was developed for the youngest beginning readers (four to five-year-olds in the United Kingdom). The program uses a multisensory approach and
includes playful, creative, and flexible activities and instructions. Children are taught with mnemonics and hand movements to help them to remember the letter-sound correspondences. For example, when introducing s sound, the program advises:

Start by telling the story about a boy who takes his dog for a walk, hears the dog barking and then sees a snake rear up hissing 'ssssssssssssss'. The suggested story line is given in note form so it can be told in a personal way. The sound and action is incorporated in each story. In this case, the snake makes the 'ssss' sound and the action is the children waving their arms, imitating the movement of the snake, and saying 'ssss' The children are told that this is one of the letter sounds (Lloyd, 2007, p.6).

After one year of instruction, children who were taught with Jolly Phonics or a whole language approach were compared. The findings revealed that children in the Jolly Phonics group outperformed those in the whole language group (NRP, 2000; Shaywitz, 2005). Another effective phonics program that adds unique actions to teaching phonics is Letterland. The program has animated characters that represent the shapes of letters, and characters’ names prompt the relevant sounds such as Annie Apple, Fireman Fred, Hairy Hat Man, and Sammy Snake, and each one has an action (more information can be found at www.letterland.com).

The motivational value of associating letters with interesting characters or hand motions and incorporating this into activities and games that are fun is important for promoting young children’s learning. If the task of teaching letters is stripped bare to one of memorizing letter shapes and sounds, children will become bored
and easily distracted and will take much longer to learn the associations (NRP, 2000, p. 2-125).

Instructional Strategies for d/Dhh Students

In 2005, Schirmer and McGough conducted a literature review on d/Dhh students’ reading development and reading instruction and compare their findings with those of the NRP’s findings. Little or no research on instructional interventions of all five elements of effective reading instruction was discovered. The scholars emphasized that the research demonstrated more similarities than differences between the reading processes of d/Dhh students and those of hearing (i.e., typically developing) learners and recommended that future research on d/Dhh students investigates effective instructional practices for typically achieving hearing readers.

Additionally, Schirmer and McGough (2005) revealed that the studies on phonemic awareness were more often interested in how d/Dhh students cognitively coded printed words such as use of phonological codes, fingerspelling, or sign language codes. The results indicated that the more skilled d/Dhh readers displayed greater access to phonological information. The researchers found one study that examined the teaching of phonemic awareness, but no instructional strategies were provided in that study. Schirmer and McGough could not find any studies about phonics instruction. In conclusion, the research on phonemic awareness and phonics instruction and intervention was very limited; thus, Schirmer and McGough could not draw conclusions about the use of instructional strategies.
Likewise, Luckner and his collaborators (2005/2006) conducted an extensive literature review in the field of d/Dhh education; they reviewed more than 40 years of research. They located 22 studies that examined different dimensions of literacy; however, there was not enough research to offer specific instructional guidelines about literacy and deafness. Although Luckner et al. (2005/2006) did not find any studies that investigated phonological coding skills of d/Dhh students, the researchers stated that obstructed access to the phonological code was one of the five most cited problems of reading.

Similarly, Easterbrooks and Stephenson (2006) conducted research to identify best practices in the field of d/Dhh education. They identified 10 highly cited instructional strategies of literacy and 10 for mathematics and science instructions. One of the instructional strategies was phonemic awareness and phonics. They argued that the evidence provided mixed views about the benefits of phonemic awareness and phonics instructions. As a result, they asserted that traditional phonemic awareness and phonics instruction helped some students, but not all. They concluded that additional research in the area of phonemic awareness and phonics instructions is needed.

Theory of Visual Phonics

d/Dhh students’ phonological skill development is similar to that of hearing readers, but the development of phonological skills has delayed (Schirmer & McGough, 2005; Wang et al., 2008). One of the most important reasons for reading difficulties of d/Dhh students is difficulty in accessing phonology (Paul et al., 2013), and the research confirms that skilled deaf readers use phonological coding (Leybaert, 2005; Perfetti &
Sandak, 2000). Traditional instructions that are based on speech and hearing may not be appropriate for some d/Dhh students (Easterbrooks & Stephenson, 2006). Furthermore, phonological processing does not need to depend on speech and hearing abilities, and the use of alternative approaches such as Visual Phonics might be the key to developing d/Dhh students’ phonological knowledge and improving their reading skills (Paul & Wang, 2012).

There are approximately 45 phonemes in English, and Visual Phonics, a multisensory approach, has 46 hand cues and corresponding written symbols for the phonemes (Paul & Whitelaw, 2011). The 46th hand cue is for the silent /e/, so there is a one-to-one correspondence between phonemes and hand cues (Woolsey et al., 2006). Each cue is unique and mimics the articulatory features of sounds (Morrison et al., 2008).

For example, the sound of /c/ could be a hard /c/ as in cookie, /k/ as in king, or a soft /c/ as in cereal. The hand cue for the beginning sound of both cookie and king begins at the side of the mouth in a C-like cue moving slightly forward. The first sound in cereal is /s/ cue, a wavy index finger moving slightly out from the lips (Woolsey et al., 2006, p. 453).

The primary goal of Visual Phonics is to clarify the phoneme-grapheme relationship between spoken and print English, and it can be used when help is needed with the pronunciation of a spoken word or decoding of a written word. “Visual Phonics is used to improve reading through the development of phonological awareness skills, writing through the development of spelling skills, and speech through the development of articulation/mouth movements” (Waddy-Smith & Wilson, 2003, p. 14). When a child
masters the target skills such as phonemic awareness and phonics, the use of Visual Phonics fades.

It is important to highlight that Visual Phonics is not a communication method, language, or reading curriculum (Wang et al., 2008). Visual Phonics is a classroom-based teaching tool that is most effective in conjunction with a phonics-based reading curriculum (Paul & Wang, 2012; Waddy-Smith & Wilson, 2003). For example, Waddy-Smith and Wilson (2003, p. 16) offered a few activities that enable the incorporation of Visual Phonics:

- Rhyming words—words can be presented using Visual Phonics hand cues when rhyming.
- Phoneme counting—students can count phonemes with Visual Phonics hand cues.
- Oddity task—when discriminating the beginning, ending, and medial sounds in words, teachers can use Visual Phonics hand cues.
- Sequencing and segmenting sounds—present sounds in words via Visual Phonics hand cues to provide visual feedback and enhance the student’s ability to sequence/segment the sounds in words.

Furthermore, Morrison et al. (2008) stressed the importance of phonemic awareness and phonics instruction for beginning readers and highlighted that there is little information available on how to supplement and enhance instruction for d/Dhh readers. They proposed Visual Phonics as a one possible way to improve the effectiveness of instruction and emphasized using Visual Phonics in conjunction with traditional
approaches. For example, teachers can use Visual Phonics hand cues and written symbols when introducing new letter-sound combination. They stressed that teachers’ imaginations can produce a range of engaging activities for children.

Similarly, in the book, *Literacy Instruction for Students who are Deaf and Hard of Hearing*, Easterbrooks and Beal-Alvarez (2013) claimed that using Visual Phonics may enhance the use of phonological coding. They provided a case vignette of Ms. Rose and Justin who is in kindergarten.

“When Ms. Rose introduces the new sound for the week, she uses the Visual Phonics hand cue along with the phoneme, and all of the students in her class have adopted the use of these visual cues. When she works with Justin individually on his decoding skills, she provides visual support for phonemes when needed. For example, Justin is tracing the letters “c-a-t” while saying the sounds. When he is stuck on the sound for /t/, Ms. Rose cues him with the Visual Phonics handshape. Justin produces the /t/ sound, repeats blending “c-a-t,” and says “cat!” aloud, pointing to the printed word. Visual Phonics serves as a bridge between his limited vocabulary and the new skill of letter-sound relationships” (p. 123).

**Summary**

The reading achievement of d/Dhh students is lower than of their typical literacy counterparts. Code related skills (phonemic awareness and phonics) could be the underlying reasons for reading difficulties. Three underpinnings of the present study—SVR, NRP, and QSH—have a significant emphasis on code-related skills during the early
years. The SVR defines reading as a product of decoding and language comprehension. During the early years, the focus is on decoding, which is the ability to apply letter-sound knowledge to sound out words. The NRP identifies phonemic awareness and phonics instructions as fundamental components of a balanced reading instruction. Moreover, the QSH states that the reading development of d/Dhh students is similar to that of typical literacy learners. Thus, components of the reading curriculum should be almost the same, but the instruction must be differentiated, and alternative approaches are needed.

When it comes to the role of phonology in reading development of d/Dhh students, there are two major views in the field. Even though some scholars and teachers agree it is beneficial to teach phonological skills to d/Dhh students who use speech, not everybody agrees that this is the case for d/Deaf students whose primary mode of communication is sign. Teachers and scholars who hold a Deaf epistemology point of view believe that sound-based phonological skills are unnecessary and unrealistic for d/Deaf readers. On the other hand, teachers and scholars who consider the reading development of d/Dhh students to be similar to rather than different from that of typical literacy learners advocate that sound-based phonological skills are necessary and realistic for d/Deaf readers.

Visual Phonics is an alternative approach to teaching phonemic awareness and phonics that are fundamental for learning to read. Visual Phonics is a multisensory teaching tool and has been used over 30 years to teach d/Dhh students. It mimics the articulatory features of sounds and provides an access to speech sounds other than the auditory channel. Phonological skill development of d/Dhh students is similar to that of
hearing (or typical literacy) readers, but d/Dhh students’ phonological skill development is delayed due to limited access to sounds. Therefore, Visual Phonics may be a solution to the development of early literacy skills.
Chapter 3: Methods

Reading is one of the most significant academic skills, and numerous d/Dhh students have not attained adequate reading achievement levels through their formal education (Paul, 2009). Reading difficulties of d/Dhh students are well documented, and most students with severe to profound hearing loss graduate from high school with approximately a fourth-grade reading level (Traxler, 2000; Wurst et al., 2005). There are several reasons for reading failures of d/Dhh students. For example, inadequate development of code-related skills (e.g., phonemic awareness, letter names, grapheme-phoneme correspondence, and phonics) contribute predominantly to early reading problems (Mayer & Trezek, 2015).

Reading in any alphabetic language, such as English, requires understanding of the alphabetic principle, which is directly related to code-related skills (Adams, 1990). Readers need to understand that spoken words are made up of speech sounds, and letters in the written words are representations of sounds. Students with reading difficulties have deficits in phonological knowledge, necessary for learning to read (Snow et al., 1998).

The theoretical perspectives that guide the present study are the Simple View of Reading (SVR), the Qualitative Similarity Hypothesis (QSH), and the National Reading Panel (NRP). According to the SVR, reading comprehension is a product of decoding and language comprehension (Gough & Tunmer, 1986; Hoover & Gough, 1990). Therefore, the SVR underlines the importance of phonology for decoding. Moreover, the NRP
(2000) suggests that a balanced reading instruction program has five components: phonemic awareness, phonics, fluency, vocabulary, and comprehension. Phonemic awareness and phonics instruction are important, especially at the early stages of learning to read. Hence, the most important precursors of later reading achievement are phonological processing skills along with letter knowledge (NRP, 2000). Furthermore, the QSH argues that the literacy development of d/Dhh students is similar to that of typical literacy learners (Paul & Lee, 2010; Paul et al., 2013). Therefore, the curriculum should be roughly the same for all children, regardless of individual differences, but instruction should be differentiated, and alternative approaches should be used while teaching literacy (Paul et al., 2013).

The literature has indicated that phonemic awareness skills result in positive outcomes on decoding and spelling skills. Additionally, several studies have revealed that phonemic awareness and phonics instruction can improve reading achievement and reduce the risk of reading failure (Adams, 1990; NRP, 2000; Snow et al., 1998). Because of their hearing loss, d/Dhh learners may not benefit from traditional instruction used to teach code-related skills; consequently, alternative instructional methods are needed (e.g. Visual Phonics) (Paul & Wang, 2012). Visual Phonics is a multisensory teaching tool with 46 hand cues and corresponding written symbols for the sounds (Waddy-Smith, & Wilson, 2003).

There is a lot to learn from previous research. The purpose of this investigation is to synthesize our understanding about the effects of Visual Phonics on reading related outcomes. The research questions that guide this study as follows:
1. How has Visual Phonics been investigated in primary research on reading related outcomes?

2. What are the general findings?

3. What are the recommendations for future research?

Design of the Study

Different labels have been used to describe this type of research such as qualitative meta-analysis, meta-study, meta-synthesis, meta-ethnography, grounded formal theory, meta-summary, meta-data analysis, meta-method, and metatheory (Finfgeld, 2003; Timulak, 2009). The most popular terms are qualitative meta-analysis or meta-synthesis. Generally qualitative meta-analytic or meta-synthetic studies include only qualitative studies in their analyses. However, various methodological studies, including qualitative, quantitative, and mixed methods primary research studies were included in the present study. Because Wang and Williams (2014) included both qualitative and quantitative studies in their qualitative meta-analyses, that study was chosen as a model. Similar to Wang and Williams, the term qualitative meta-analysis was utilized throughout the present study.

Qualitative meta-analysis is a rigorous secondary analysis of primary findings (Timulak, 2009). “The goal of meta-synthesis is to produce a new and integrative interpretation of findings that is more substantive than those resulting from individual investigations” (Finfgeld, 2003, p. 894).
Search Procedures

Two literature search strategies were used to identify relevant studies. First, the electronic search engine EBSCOhost was used with specific databases including:

- Academic Search Complete
- Education Search Complete
- Eric
- PsycINFO

Additionally, significant journals in the field were targeted to ensure that all relevant studies were included. The journals are:

- *American Annals of the Deaf*
- *The Journal of Deaf Studies and Deaf Education*
- *Volta Review*

The search terms were “visual phonics” and “see the sound”. After this electronic search, 43 studies were reviewed, and 10 of them met the selection criteria (discussed below).

Second, manual searches of every identified study’s reference list were completed, and three more relevant articles were included. Thirteen primary research articles with fourteen studies (one article has two studies) were included in this qualitative meta-analysis.

Selection Criteria

The purpose of this investigation is to examine the effects of Visual Phonics on reading related outcomes. Specific selection criteria were established to pursue that aim. First, studies need to be published between 1982 and 2017. The beginning date was
determined as 1982 because Visual Phonics was created on that date. Second, qualitative, quantitative, or mixed methods primary research studies published in peer-reviewed journals were selected. Unpublished research (e.g. action research reports, dissertations, and theses), books, and book chapters were excluded. Similar to other researchers (e.g. Luckner et al., 2005/2006), only published refereed journal articles were included. Finally, studies focused on students in PK-12 educational settings and reading related outcomes were included for this comprehensive review. A total of thirteen primary research articles with fourteen studies (Beal-Alvarez, Lederberg, & Easterbrooks (2012), contains 2 studies) met the selection criteria and were reviewed (see Table 1).


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Table 1. Reference List of Selected Studies
Table 1 continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
</tr>
</thead>
</table>

**Excluded Studies**

Some published studies of Visual Phonics were excluded from this meta-analysis because they did not have reading related outcomes. For instance, Visual Phonics is a commonly used tool among speech and language pathologists (Montgomery, 2008); therefore, studies that only focused on speech perception skills were excluded.

Furthermore, the study by Narr and Cawthon (2011) was not included because these researchers investigated teachers’ perception of Visual Phonics and their use of Visual Phonics during daily instruction. Moreover, the study that examined the effects of Visual Phonics on learning to read Italian was excluded (Cihon, Morford, Stephens, Morrison, & Shrontz, 2013).
Data Analysis

Each study was reviewed and coded for objective and transparent analysis of data. First, studies were placed into one of four categories: (a) typical hearing students who were at risk for reading failure \((n = 2)\), (b) d/Dhh middle and high school students \((n = 2)\), (c) d/Dhh primary school students \((n = 5)\), and (d) d/Dhh preschoolers \((n = 5)\). After the categorization, each study was coded according to the research questions of this study. Codes were derived from the important meta-analytic works in the field with modifications (Luckner et al., 2005/2006; Wang & Williams, 2014). Codes were: the source (author and year), research method, participants, purpose, research questions, notes, results, reading related outcomes, limitations, and directions for future research. A Microsoft Excel file was created to collect data. All data was collected in the same file with four sheets (see Table 2 and 3 for examples).
<table>
<thead>
<tr>
<th>Source</th>
<th>Research Method</th>
<th>Participants</th>
<th>Purpose</th>
<th>Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cihon, T., Gardner, R., Morrison, D., &amp; Paul, P. (2008)</td>
<td>A nonconcurrent multiple baseline design</td>
<td>12 hearing kindergarteners who are at risk for reading failure. Three girls and two boys who ranged in age from 5 to 6 years old selected for Visual Phonics intervention. Al was repeating kindergarten and was the oldest student in the intervention group; he was also deaf in one ear. Sue, Fawn, Al and Ike were receiving free or reduced lunches.</td>
<td>The purpose of this investigation was to extend the STS/VP approach to teach phonemic awareness and initial phonics to kindergarten children identified as at-risk for reading failure.</td>
<td>a) Do kindergarten children identified as at-risk for reading failure show gains on DIBELS assessments after receiving instruction in phonemic awareness and initial phonics via STS/VP? b) If so, how do those gains rival those of their grade-level, non-risk peers? c) What are the effects of STS/VP instruction on the identification of lettersound relations? d) Do participants learn letter-sound relations taught with the STS/VP written code in fewer teaching trials than letter-sound relations taught without the STS/VP written code? e) Do participants identify letter-sound relations taught with STS/VP correctly more frequently than those letter sound relations taught with typical classroom instruction?</td>
</tr>
<tr>
<td>Gardner, R., Cihon, T. M., Morrison, D., &amp; Paul, P. (2013)</td>
<td>A nonconcurrent multiple baseline design</td>
<td>Six hearing kindergarten students required more than one Tier 2 intervention to learn letter-sound relations.</td>
<td>The purpose of this investigation was to extend the initial efforts in using STS/VP to teach phonemic awareness and initial phonics as a Tier 2 intervention to kindergarten children identified as at risk for reading failure.</td>
<td>1. What are the effects of STS/VP on the identification of letter-sound relations with kindergarten children who are at risk for reading failure? 2. Does the rate of acquisition differ if the STS/VP written code is included or excluded from teaching sessions? 3. What are the effects of discrimination training on the identification of lettersound relations for letter-sound combinations previously taught in isolation? 4. Will the effects of instruction using STS/VP be maintained after one month? 5. What are the effects of STS/VP on pre and post DIBELS scores?</td>
</tr>
</tbody>
</table>

Table 2. Example of Excel Sheets
### Table 3. Example of Excel Sheets

<table>
<thead>
<tr>
<th>Notes</th>
<th>Results</th>
<th>Reading Related Outcomes</th>
<th>Limitations</th>
<th>Directions For Future Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching sessions at least 3 times per week for approximately 10-12 minutes each in a small group of two to four students. Total intervention time varied across participants from 3.5 hours to 5.5 hours, depending on the participant’s performance.</td>
<td>The data suggest post-intervention gains for each participant in almost all DIBELS assessment areas, with the exception of Al in nonsense word fluency and Ike in word use fluency. The trend for the lowest performing participants was clearly positive. Participants who received instruction in STS/VP responded correctly on more opportunities to identify letter/sounds taught with STS/VP than those that were taught via regular classroom instruction.</td>
<td>STS/VP intervention in the classroom may be appropriate for children who are falling behind with the regular reading curriculum. Preliminary evidence for the use of STS/VP to teach specific letter-sound relations with and without the written code.</td>
<td>These data did not suggest a difference within or across participant performance of the target skills, or in the rate of acquisition across the two variations of the independent variable. Before intervention, target participants did not correlate phonemes to printed text. There are also concerns related to interpretations of experimental control with the revised protocol and experimental design and implementation.</td>
<td>Future research can be constructed to address the methodological limitations of the current study from a research-based perspective (e.g., using a multiple baseline across behaviors or participants design).</td>
</tr>
<tr>
<td>The total intervention lasted approximately 5 months with maintenance measures given 1 week and/or 1 month after instruction was completed.</td>
<td>All participants improved their knowledge of letter sound relations in coded and uncoded conditions, with some participants learning as many as eight to nine sounds across conditions. Five participants made enough progress to change their risk status on these important subtests. Participants were able to learn the letter-sound relations in no more than two 10-min sessions.</td>
<td>The results from this study indicate that STS/VP can be an effective tool for teaching kindergarten students initial phonic skills.</td>
<td>It is not known what the effects of the STS/VP intervention would have been, if it had occurred within the general education reading instruction. Second, treatment integrity data were collected for only 19% of the sessions. Last, there were only six subjects who did not change.</td>
<td>Future research should seek to incorporate more students in a more rigorous experimental design to assess the effectiveness of STS/VP.</td>
</tr>
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</table>
Establishing Validity and Reliability

One of the significant concerns of qualitative studies is trustworthiness. Triangulation is the way to ensure validity in qualitative research, which involves different data sources (Paul et al., 2013). “Triangulation is accomplished by analyzing findings generated from multiple theories and methods. Thus, credibility has the potential to be enhanced when new translations are meta-synthesized from findings that have been generated from differing philosophical and methodological perspectives” (Finfgeld, 2003, p. 902). Therefore, to increase trustworthiness, data was collected from several different sources that used various methodological and philosophical perspectives.

Summary

Qualitative meta-analysis was chosen as a method of inquiry for the research questions of this study. Two search procedure steps were followed (electronic and manual searches) with the keywords of ‘visual phonics’ and ‘see the sound’. Rigorous selection criteria were established to identify all relevant studies. To be included, primary research studies had to be published in a refereed journal between 1982 and 2017, targeted PK-12 grade populations, and focused on reading related outcomes. Thirteen articles with fourteen studies were included in this comprehensive qualitative meta-analysis. Data analysis began with placing studies into one of four population categories. Then an excel file was created to report details about the studies.
Chapter 4: Results

This chapter synthesizes the results of the qualitative meta-analysis of fourteen studies focusing on Visual Phonics. The purpose of this study is to investigate what previous research tells about the effectiveness of Visual Phonics on reading related outcomes. A total of thirteen articles with fourteen studies were identified and included in the present analysis. All articles were published between 2005 and 2015. The sample size of the studies varies between 1 and 127, and it involves a total of 11 hearing kindergarteners who are at risk of reading failure and 211 d/Dhh students with various degrees of hearing loss in prekindergarten through high school settings. Seven studies were experimental designs, three studies were single case designs, and four studies were multiple case designs. The findings of this systematic and comprehensive analysis are reported by population category. Studies presented in Table 4 are grouped by population category in the table and discussed below in the same order. Quotations from the original studies are used as validation.
<table>
<thead>
<tr>
<th>Source</th>
<th>Methodology</th>
<th>Participants</th>
<th>Results</th>
<th>Future Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardner, Cihon, Morrison, and Paul (2013)</td>
<td>Experimental</td>
<td>6 hearing kindergarteners</td>
<td>All students enhanced their knowledge of letter-sound correspondence.</td>
<td>More students in a more rigorous experimental design</td>
</tr>
<tr>
<td>Trezek and Malmgren (2005)</td>
<td>Experimental</td>
<td>23 middle school d/Dhh students</td>
<td>Significant improvements in phonemic awareness and phonics skills</td>
<td>Investigation over a longer period of time with a link between other reading skills such as fluency, vocabulary, and comprehension</td>
</tr>
<tr>
<td>Trezek and Hancock (2013)</td>
<td>Experimental</td>
<td>127 d/Dhh students enrolled in 2nd grade through high school</td>
<td>Statistically significant growth in identifying phonemes in isolation, phoneme blending, and word reading</td>
<td>-Long range benefits of this type of intervention -Inclusion of specific measures such as morphology and syntax</td>
</tr>
<tr>
<td>Trezek and Wang (2006)</td>
<td>Experimental</td>
<td>13 d/Dhh students in kindergarten and first grade</td>
<td>Gains in word reading, pseudo-word reading, and reading comprehension</td>
<td>The effects of the amount and type of training provided to teachers</td>
</tr>
<tr>
<td>Trezek, Wang, Woods, Gampp, and Paul (2007)</td>
<td>Experimental</td>
<td>20 d/Dhh students in kindergarten and first grade</td>
<td>Statistically significant improvements in beginning reading skills</td>
<td>-Larger numbers of students with varying degrees of hearing loss -Control group</td>
</tr>
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Table 4. Summary of Selected Studies
Table 4 continued

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<thead>
<tr>
<th>Source</th>
<th>Methodology</th>
<th>Participants</th>
<th>Results</th>
<th>Future Directions</th>
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<tbody>
<tr>
<td>Syverud, Guardino, and Selznick (2009)</td>
<td>Single Case Study</td>
<td>A 7 year-old d/Dhh first grader</td>
<td>Improvements in phonological decoding skills and letter-sound associations</td>
<td>-Alternative research designs for generalizability purposes -Larger sample with different setting</td>
</tr>
<tr>
<td>Guardino, Syverud, Joyner, Nicols, and King (2011)</td>
<td>Multiple Case Study</td>
<td>6 d/Dhh students in kindergarten through fifth grade</td>
<td>Gains in phonological decoding skills and letter-sound associations</td>
<td></td>
</tr>
<tr>
<td>Beal-Alvarez, Lederberg, and Easterbrooks (2012) Study 1</td>
<td>Single Case Study</td>
<td>A 5 year-old d/Dhh preschooler</td>
<td>Learning of all taught grapheme-phoneme correspondences</td>
<td></td>
</tr>
<tr>
<td>Beal-Alvarez, Lederberg, and Easterbrooks (2012) Study 2</td>
<td>Multiple Case Study</td>
<td>3 d/Dhh preschoolers</td>
<td>Learning of all taught grapheme-phoneme correspondences</td>
<td>Comparison of Foundations alone and in conjunction with Visual Phonics</td>
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<tr>
<th>Source</th>
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<th>Participants</th>
<th>Results</th>
<th>Future Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang, Spychala, Harris, and Oetting (2013)</td>
<td>Multiple Case Study</td>
<td>3 d/Dhh preschoolers</td>
<td>Improvements in the early reading skills</td>
<td>Further research is recommended confirming the results of this study.</td>
</tr>
<tr>
<td>Tucci and Easterbrooks (2015)</td>
<td>Multiple Case Study</td>
<td>3 d/Dhh preschoolers</td>
<td>Improvements in letter-sound correspondence and initial sound identification</td>
<td>The hierarchy of phonemic and phonological skills with d/Dhh students without functional hearing</td>
</tr>
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</table>

At-risk Literacy Learners

Two studies provided evidence that Visual Phonics is a useful tool for hearing kindergarteners who are at risk for reading failure (Cihon et al., 2008; Gardner et al., 2013). Cihon et al. (2008) stated that students who are falling behind in the reading at the end of the first year continue to be behind during their most of formal educational years. Researchers conducted a preliminary study using Visual Phonics intervention with hearing kindergarteners in a general education classroom. Among twelve participants who returned parental permission five of the lowest performing ones were selected for a Visual Phonics intervention program. All twelve participants continued to receive general education lessons. For Visual Phonics intervention, teaching sessions were at least three times a week with a duration of 10-12 minutes in small groups. Students received 3.5
hours to 5.5 hours of total intervention based on their performance. During the intervention, letter-sound relations were taught with Visual Phonics hand cues or both hand cues and written symbols starting with the most common letter-sound relations that were not identified by students. Based on the finding of this preliminary study, participants showed gains in almost all DIBELS assessment areas. “In general, the trend for the lowest performing participants was clearly positive, rivaling the gains of the other seven, non-STS/VP participants in the class; participants who received STS/VP did not fall even further behind their non-STS/VP classmates” (p. 150). The researchers concluded that using Visual Phonics may be appropriate for students who are not on par with typical literacy learners. Additionally, further studies are needed to address methodological limitations of the study.

Gardner and collaborators (2013) investigated the effects of Visual Phonics intervention on phonemic awareness and letter-sound relations. Six hearing kindergarteners who were at risk for reading failure and required more than one Tier 2 intervention participated. Previously taught unlearned skills were introduced in the small groups (2-4 students) or one-on-one instructions during five months of intervention. The same generic Visual Phonics lesson plan from Cihon et al. (2008) study was instructed. The DIBELS subtests were administered for pre-test, post-test, and one week and one month after instruction measurements. The results of this study indicated that “all participants improved their knowledge of letter sound relations in coded and uncoded conditions, with some participants learning as many as eight to nine sounds across conditions” (p. 34). Participants easily learned letter-sound relations in no more than two
ten minutes sessions. Furthermore, after intervention checks demonstrated that students retained high level of gains. This study supported the findings of Cihon et al. (2008), and the NRP’s conclusion that explicit instruction can improve students’ reading achievement. This study provided persuasive evidence that Visual Phonics can be an efficient tool for hearing kindergarteners who are at risk for reading failure. However, authors recommended to add more students in more rigorous experimental design studies in future research.

d/Deaf and Hard of Hearing Learners

Twelve studies in the present synthesis focused on the population of d/Dhh students. This is not surprising because Visual Phonics was initially created for d/Dhh children to provide visual, kinesthetic, and tactile access to sounds. d/Dhh students are one of the most diverse population of students who are educated with different educational philosophies. The total sample of 211 d/Dhh students reflects the diversity of this population. The sample represented students with various degrees of hearing loss (slight to profound hearing loss, including cochlear implant users) in prekindergarten through high school settings. Additionally, all communication modes such as spoken language, simultaneous communication, and sign language were presented.

Two studies were placed in the category of middle and high school d/Dhh students (Trezek & Hancock, 2013; Trezek & Malmgren, 2005). Even though Trezek and Hancock (2013) included students in second grade or higher, the study was placed in here because the majority of the population falls under this category. Furthermore, five studies were focused on d/Dhh primary school students (Guardino, Syverud, Joyner, Nicols, &

Middle and High School d/Dhh Students

One of the very first researchers who examined the effects of Visual Phonics was Trezek and Malmgren (2005). They conducted a quasi-experimental, pre-test/post-test design study in a large school district serving more than 100,000 students. The purpose of this study was to investigate the efficiency of a phonics treatment package supplemented with Visual Phonics. 23 students with various degrees of hearing loss were recruited from a self-contain d/Dhh program for middle school students (grade six through eight). Students were placed into two groups: 11 students were in the treatment group, and 12 students were in the comparison group. The students who were in the comparison group continued to receive the standard reading curriculum, whereas the treatment group experienced instructions from the phonics treatment package. The phonics treatment package included the first 20 lessons of The Corrective Reading-Decoding A Program (Engelmann, Carnine, et al., 1999) supplemented with Visual Phonics and Baldi technology (computer program). It is important to note that the teacher in the treatment group commented that Baldi technology was rarely used because Visual Phonics hand cues alone were sufficient.

During the 8 weeks of intervention, the phonics treatment package was instructed for 45 minutes a day. The researchers administered a pretest, posttest, and a
generalization test. Students in the treatment group had higher test scores on the posttest and generalization test. Hence, the findings of this study demonstrated statistically significant learning outcomes. Researchers highlighted that “instruction from the phonics treatment package was successful in developing knowledge of phonics for deaf and hard of hearing students in the treatment group regardless of the degree of hearing loss” (p. 267). Moreover, the authors suggested that further investigation over a longer period should examine the link between intervention and other reading skills such as fluency, vocabulary, and comprehension.

Trezek and Hancock (2013) examined d/Dh children in second grade or higher in a sign bilingual setting to explore the development of the alphabetic principle with remedial instruction supplemented by Visual Phonics. This study is important because it is the first large-scale investigation that was conducted over a three-year period. The study took place in a residential school with approximately 240 d/Dhh students. 127 students (28 elementary, 42 junior high, and 57 high school students) participated in the study. Almost forty percent of the students had an additional disability, and their degrees of hearing loss ranged from 20 to 120 dB. Also, 61% of the participants were male, and 39% were female.

*The Corrective Reading-Decoding A curriculum* (Engelmann, Carnine, & Johnson, 2008), which focuses on code-related skills, was utilized. Vocalization was not used because ASL was the primary language for instructions, and Visual Phonics provided access to phonemes during the instructions. Students received 40 minutes of daily instruction from *Decoding A* curriculum supplemented with Visual Phonics. The
authors employed a pre-test/post-test research design and reported statistically significant growth in identifying phonemes in isolation, phoneme blending, and word reading.

“Grade placement, presence of additional disabilities, and number of instructional days did not appear to be factors affecting participants’ overall performance on the measures” (p. 403), and findings were consisted with previous research. The authors also proposed directions for future research: investigation of long term benefits of this type of intervention and the inclusion of specific measures such as morphology, semantics, and syntax.

Primary School d/Dhh Students

Trezek and Wang (2006) evaluated the effectiveness of the Reading Mastery I program (Engelmann & Brunner, 1995) supplemented by Visual Phonics with kindergarten and first-grade d/Dhh students. Three teachers in a Total Communication program and 13 students participated in the study that lasted over 8 months. Students’ degree of hearing loss ranged from severe to profound, and two of the first graders wore cochlear implants. Students were divided into three groups for instructions.

The pre–posttest achievement of students was documented. A word reading test was administered to both kindergarteners and first graders, whereas pseudoword decoding and reading comprehension tests were only used for first graders. The results showed that the word reading subtest scores were statistically significant, and the effect size was large. Pseudoword decoding and reading comprehension subtests’ data were not appropriate for statistical analyses because of the limited availability. Nevertheless, the students improved from pretest to posttest. The gain on the word reading test was
equivalent to 4.33 months, and the gain on the pseudoword test was 9 months. The documented annual reading growth is 2-3 months for d/Dhh students. Indeed, students performed better in this study. Additionally, there was no effect of the degree of hearing loss because all d/Dhh students had benefitted from the treatment package. The researchers suggested future research examine a larger number of students with various degrees of hearing loss and grade placements. Additionally, they proposed the investigation of the effects of the amount and type of training provided to teachers.

Trezek et al. (2007) examined 20 kindergarten and first grade d/Dhh students during one school year. Students were recruited from two kindergarten classrooms and one first grade classroom where simultaneous communication was utilized, and another first grade classroom where oral communication was used. Ten students had cochlear implants, and the others’ degree of hearing loss ranged from mild to profound (30-112 dB). Trezek and collaborators’ purpose was to expand the findings of previously conducted studies with using LACES curriculum, a phonics based program developed by the school district, supplemented with Visual Phonics.

A pre-test/post-test experimental design was utilized. Sentence writing phoneme, sentence writing spelling, and phonemic awareness segmentation subtests were administered for both groups, and only first graders received phonemic awareness deletion, phonics onsets, and phonics rimes subtests. The researchers documented “a statistically significant difference between pre- and posttest scores for all six subtests evaluated and the effect size was considered large” (p. 383). Additionally, they noted that
future research should include more students with a wide range of hearing loss with the control group.

Narr (2008) studied ten d/Dhh students’ phonological awareness, decoding, and reading comprehension skills. Students were in kindergarten through third grade and received instructions in a mode of sign language or sign supported English. Their degree of hearing loss ranged from 68 to 120 dB. Phonemic awareness and phonics aspects of the reading curriculum were supported with Visual Phonics. Students and teachers were familiar with Visual Phonics that had been used for at least one and a half years. At the beginning of the study, the author hypothesized that there would be a positive correlation between Visual Phonics and phonological awareness and decoding tasks. All students, who participated in this study, completed post-tests with greater than chance performance scores, and their reading scores were above the average of norms for this population. “Findings indicate that these students were able to use phonological information to make rhyme judgments and to decode; however, no relationship between performance on reading ability and length of time in literacy instruction with visual phonics was found” (p. 405). Moreover, Narr highlighted that larger sample size and more experimental research is needed.

Syverud et al. (2009) conducted a case study to analyze the effectiveness of teaching phonological skills. The participant was a 7 year-old first-grader with moderate-to-severe mixed bilateral progressive hearing loss. The curriculum *Teach Your Child to Read in 100 Easy Lessons* (Engelmann, Haddox, & Bruner, 1983) supplemented with Visual Phonics was utilized. The study took place in a self-contained classroom where
oral philosophy was used, and the intervention (30 minute sessions three times a week) continued for eight weeks. Both qualitative and quantitative data were collected. The results showed “improvements in the participant's phonological decoding skills and letter-sound associations” (p. 385). Because all case studies have generalization problems, researchers recommended alternative research designs with different educational settings.

Because of significant results from the previous study, Guardino et al. (2011) conducted a follow-up study and investigated the benefits of phonological instruction with six d/Dhh students (two kindergarten, two first grade, and two fifth grade students) in an oral-deaf education program. Participants’ degree of hearing loss ranged from mild to profound. Students were grouped based on their grade level, and data were collected by using a multiple case study design. The intervention lasted for ten weeks, three times a week with 30 minutes sessions. “Results from the intervention showed that all students made gradual gains in pseudoword reading accuracy” (p. 566). Moreover, the results demonstrated that all six participants had increased knowledge of phonological decoding skills.

Preschoolers who are d/Dhh

Several studies investigated Visual Phonics with preschoolers and revealed significant improvements of early reading skills during these fundamental years. First, Smith and Wang (2010) investigated a four-year old child with a cochlear implant to determine the effectiveness of Visual Phonics on phonological awareness and speech production skills. The subject received a cochlear implant when he was two years old,
and his language development was equal to that of typically developing 18-month old.
The investigators implemented an intervention program that was six weeks long, at least four times a week for 15-20 minutes daily. During the intervention, the modified version of *The Fountas and Pinnell Kindergarten Phonics Curriculum* (Fountas & Pinnell, 2002) was used. It was noted that phonological awareness was a necessary skill for reading and speech production. Even a short period of time such as 6 weeks, the child showed significant increases in phonological awareness and speech production. “The main implication of the present study is that the use of Visual Phonics cues with a phonics curriculum can support phonological awareness and provide an alternative source of information about spoken and written language” (p. 130).

Beal-Alvarez et al. (2012) conducted two studies to examine the acquisition of grapheme–phoneme correspondences. The studies were a part of 4-year project to develop *Foundations for Literacy* curriculum (Foundations; Lederberg, Miller, Easterbrooks, & Connor, 2011). Foundations is an emergent literacy curriculum specifically developed for d/Dhh population. The participants were four d/Dhh preschoolers who used sign language. The researchers carefully analyzed students’ grapheme-phoneme correspondence by using Foundations curriculum supplemented with Visual Phonics. Study 1 included a five year old with an unaided 90dB hearing loss. The participant had minimal speech perception skills who had no usage of vocalized speech at the beginning of the study. This study was conducted over a 10-week period in the spring, and 30 minutes one-on-one intervention sessions occurred four times a week. “She met criterion and continued to respond correctly on maintenance probes for all eight
taught GPCs during the 10-week intervention” (p. 45). Also, she began to use her vocalization.

Study 2 was conducted the following fall, and three preschoolers with various levels of speech perception participated in. Their degree of hearing loss ranged from severe to profound. One participant only used sign language for communication, whereas the other two used a combination of speech and sign. Teaching sessions occurred an hour per day, 4 days a week for 23 weeks. “Results suggest that instruction was very effective for these children, with preschoolers learning GPCs after only one or two instructional sessions” (p. 50). All three preschoolers mastered targeted grapheme-phoneme correspondence, and they learned to use Visual Phonics with voice. The researchers concluded that Visual Phonics was an effective mnemonic tool for d/Dhh preschoolers, even for those who had limited speech perception and who used sign language for communication. Because the researchers could not determine the significant results due to Visual Phonics or Foundations curriculum, they recommended that future research should investigate the effects of Foundations alone and in conjunction with Visual Phonics.

Wang et al. (2013) explored the effects of a phonics-based early intervention package with Visual Phonics on the early reading skills. The philosophy of education was Total Communication. Three preschoolers who had different degrees of hearing loss participated. The 40-weeks of intervention (50-week in one case), approximately an hour a week, was delivered. During the interventions, the Reading Mastery I (2008) curriculum supplemented with Visual Phonics and smart board technology was used.
“The results showed that all participants demonstrated at least some use of phonemic awareness and phonics skills when they were explicitly trained, and that these skills were sustained in early elementary school. Furthermore, all participants exhibited overall reading levels at or above age level when measured in early elementary school” (p. 107). Because of the limitations with generalization, the researchers recommended further research to confirm outstanding results of this study.

Finally, there is a recent study conducted by Tucci and Easterbrooks (2015). They investigated three aspects of the Foundations of Literacy curriculum for d/Dhh prekindergarteners: syllable segmentation, identification of letter-sound correspondences, and initial sound identification. Visual Phonics was used for two of the above skills but not for syllable segmentation. Three prekindergarteners in a self-contained classroom where the Total Communication approach was used participated in this study. Two of them had functional hearing, but the third one did not. More than 25 weeks of intervention occurred four times a week for an hour long sessions. The results showed that “all three participants mastered all taught letter-sound correspondences” (p. 287). Two of the participants mastered initial sounds. Although one participant made remarkable improvements, he did not master initial sounds. Consequently, the participants demonstrated improvements in all three skills within various degrees, and Visual Phonics supported these gains.

The authors hypothesized that skill development moved from syllable segmentation to letter-sound correspondence then initial sound identification. Participants with functional hearing supported this hypothesis, but the participant who had no
functional hearing had the most difficulty with syllable segmentation. Therefore, the authors suggested that future research might examine the hierarchy of phonemic and phonological skills with d/Dhh students without functional hearing.
Chapter 5: Discussion and Conclusion

The purpose of this investigation is to synthesize existing research about the effects of Visual Phonics on reading related outcomes. Three research questions guide this investigation.

1. How has Visual Phonics been investigated in primary research on reading related outcomes?

2. What are the general findings?

3. What are the recommendations for future research?

Research Question #1

A well-known body of research concludes that the systematic and explicit phonics and phonemic awareness instructions improve early reading and spelling skills and prevent reading difficulties (NRP, 2000; Snow et al., 1998). For reading difficulties, code related skills such as phonemic awareness, letter names, grapheme-phoneme correspondence, and phonics could be underlying reasons (Mayer & Trezek, 2015). The NRP concludes when phonemic awareness and phonics taught early, they yield the best results. Additionally, systematic and explicit phonics instruction is effective for all students in early grades and older students with disabilities. All fourteen studies investigated the same or different dimensions of code-related skills and effects of Visual Phonics intervention, and all of them found strong evidence that students showed
improvements in their phonological awareness, phonological decoding, and letter-sound correspondence skills.

The balanced reading curriculum involves five elements: phonemic awareness, phonics, fluency, vocabulary, and comprehension. During the early grades, phonemic awareness and phonics instruction require the most attention, and phonemic awareness and letter knowledge are the most important predictors of later reading success. During the interventions, Visual Phonics was used to supplement phonemic awareness and phonics aspects of reading curriculums, and the majority of the studies (n = 12) focuses on students in primary grades or younger.

For younger children, emergent literacy is critical because literacy development begins earlier than formal schooling. Phonological awareness, letter names, and letter-sound knowledge are essential for beginning reading instruction. Phonemic awareness is a strong predictor of reading success in the first two years of schooling. Additionally, letter knowledge is the first step to learn the alphabetic principle and one of the most important early reading skills. Five studies investigated Visual Phonics with preschoolers and revealed significant improvements in early reading skills during these fundamental years (Beal-Alvarez et al., 2012; Smith & Wang, 2010; Tucci & Easterbrooks, 2015; Wang et al., 2013). All preschoolers improved their early reading skills of phonological awareness and letter-sound knowledge.

Seven studies investigate Visual Phonics with students in primary grades. Reading instructions in primary grades are critical because success or failure during these years is a strong predictor of later success. For example, Cunningham and Stanovich
(1997) examined reading skills of first graders, and ten years later, they reexamined the reading abilities of half of the same students. They discovered that the first grade reading skill had a significant influence on (i.e., was related to) 11th grade reading ability. Therefore, reading problems should be solved during the early years. Phonemic awareness and letter-sound relationships have to be mastered at the beginning of reading instructions, and Visual Phonics can be used to teach these skills. Several studies provide evidence that Visual Phonics is an effective teaching strategy to teach beginning reading skills (Cihon et al., 2008; Gardner et al., 2013; Guardino et al., 2011; Narr, 2008; Syverud et al., 2009; Trezek & Wang, 2006; Trezek et al., 2007).

Two of the seven studies that focus on primary grades targeted specifically hearing kindergarteners who are at risk of reading failure (Cihon et al., 2008; Gardner et al., 2013). Reading is an essential academic skill, and several students have reading difficulties. 80% of students with learning disabilities have deficits in reading; similarly, minority students and English language learners are mostly at risk of reading failure (Smith et al., 2015). Many students who are at risk for reading difficulties enter school with little or no phonological awareness (Snow et al., 1998). Early literacy intervention for students who have reading difficulties is vital because the gap between good readers and poor readers becomes larger with advancing age. Based on two interventional studies, students demonstrate significant gains in almost all DIBELS assessment areas, and researchers conclude that Visual Phonics may be an appropriate intervention for students who are behind.
There is also another unpublished action study that was in the reference lists of two selected studies with at risk hearing kindergarteners supported the findings of above studies. Slauson and Carrier (1992) utilized Visual Phonics as an early reading program for kindergarteners. Two kindergarten classes were assigned to either a treatment or control group. All students received standard reading instruction, but Visual Phonics hand signals were only used for the treatment group. When the researchers compared the pretest-posttest scores, they found that students in the treatment group were more successful (i.e., higher scores) than the ones in the control group. Slower and resource room students benefitted the most, and advanced students did not show any difference. Average students in the treatment group were two times more advanced than students in the control group.

Two studies that focused on primary grades (Narr, 2008; Trezek & Wang, 2006) tried to relate phonological awareness and decoding improvements with reading comprehension, but they found mixed results. Narr (2008) found significant gains in phonological awareness and decoding measurements, but there was no relationship with reading comprehension. Additionally, in a study by Trezek and Wang (2006), there was a limited data available on reading comprehension. Even though there was an improvement from pre-test to post test, it was not possible to calculate statistical test or grade equivalent gains on reading comprehension test.

The last two studies included older d/Dhh students in middle or high school settings (Trezek & Hancock, 2013; Trezek & Malmgren, 2005). These students in later grades still benefitted from phonemic awareness and phonics instructions because their
skill development in those areas is slower than that of typically developing learners. The fourth grade reading level among the high school d/Dhh students could be due to the lack of attention to code-related skills (Paul, 2009; Paul et al., 2009; Trezek et al., 2010; Wang, Trezek, Luckner, & Paul, 2008).

Research Question #2

The second research question asks about the general findings of Visual Phonics. According to the official website for Visual Phonics, (where the information is available, these are retrieved from http://seethesound.org/visual_phonics.html) Visual Phonics is beneficial for:

- Students that read below grade level in regular education settings, or in special service programs.
- Children in early education programs, also "at risk readers."
- Special education students and students with disabilities.
- Deaf and Hard of Hearing students (DHH), students with hearing loss at all levels.
- English Language Learners (ELL), students learning English as a second language.
- Adults who are not literate or read below an 8th grade level (p. n.d.).

However, it has been difficult to conclude that Visual Phonics is effective for all of the target groups that are mentioned above due to the limited number or no studies about some target groups. For instance, illiterate adults have not been examined in any research.
Although there is no research specifically targeted students learning English as a second language, Cihon et al. (2013) investigated undergraduate students who were learning Italian. They found that Visual Phonics helped students to acquire the letter-sound relations in Italian. Because Italian is a transparent language (one to one relations between letters and sounds), the results may be different for languages that are less transparent or more opaque such as English.

Cihon et al. (2013) discussed similarities between second language learners and d/Dhh learners; this is in line with the QSH. The QSH argues that reading development of English Language Learners is similar to that of typically developing monolingual learners. About 22% of the d/Dhh population (some overlap with the use of English) uses spoken Spanish (Paul et al., 2013). Some of the selected studies reported participants, who were coming from Spanish speaking homes, equally benefited from the Visual Phonics intervention (Beal-Alvarez et al., 2012; Guardino et al., 2011; Smith & Wang, 2010; Trezek & Wang, 2006; Trezek et al., 2007; Tucci & Easterbrooks, 2015).

Another important finding is that there is no relationship between degrees of hearing loss and the effectiveness of Visual Phonics intervention. Students with different degrees of hearing loss, including cochlear implant users equally benefited from the intervention and demonstrated gains in code-related skills (Beal-Alvarez et al., 2012; Narr, 2008; Trezek & Hancock, 2013; Trezek & Malmgren, 2005; Trezek & Wang, 2006; Trezek et al., 2007; Tucci & Easterbrooks, 2015; Wang et al., 2013).

In the field of d/Dhh education, reading wars still continue. Some scholars claim that phonological skills are unnecessary and unrealistic for d/Deaf readers with no
functional hearing (Allen et al., 2009). The results of the present synthesis provide further evidence for the benefits of phonological skills for d/Dhh students, regardless of their degree of hearing loss. Beal-Alvarez et al. (2012) and Tucci and Easterbrooks (2015) conclude that Visual Phonics intervention is effective for students with and without functional hearing.

Furthermore, there is another disagreement among scholars about the necessity of sound-based phonology for d/Dhh students whose primary mode of communication is sign language. Even though the majority of studies were conducted in self-contained classrooms where oral or simultaneous communication (sign and speak at the same time) are utilized, one study (Trezek & Hancock, 2013) investigated students who use sign language as a primary mode of communication. Trezek and Hancock (2013) conducted the first large scale study (n = 127) over a three-year period in a sign bilingual educational setting. During the intervention, vocalizations were never used, and instructions were delivered via sign language. Students demonstrated favorable gains in sound-based phonological skills. Additionally, Beal-Alvarez et al. (2012) examined preschoolers using sign language in their two studies, and students learned all taught grapheme-phoneme correspondences. Furthermore, Tucci and Easterbrooks (2015) concluded that the intervention is effective for signing d/Dhh students. Thus, it can be concluded that Visual Phonics intervention is effective for all communication modes such as spoken language, total communication, and sign language.

Moreover, the presence of an additional disability does not appear to be a factor that affects the benefits of Visual Phonics intervention (Trezek & Hancock, 2013; Wang
et al., 2013). In a study by Trezek and Hancock (2013), approximately 40% of the participants had an additional disability. “The categories of documented disabilities included attention deficit/hyperactivity (n = 14), autism (n = 3), emotional disturbance (n = 6), mental retardation (n = 9), other health impairments (n = 10), specific learning disability (n = 20), and visual impairment (n = 1)” (p. 394). The results showed that there is no statistically significant difference related to the existence of an additional disability.

Similarly, the preschooler with a language processing disorder in a study by Wang et al. (2013) had improved her print awareness, phonological awareness, and definitional vocabulary during the intervention, but these scores were still below average. The researchers reported significant improvements during the follow-up assessment. At the time of follow-up, the participant was in first grade. She communicated with sign language and did not use any amplification. The reading curriculum that she received was not a phonics-based, and her most recent exposure to Visual Phonics was seven months ago. Consequently, because of her severe language processing disorder, it took her longer to benefit from Visual Phonics intervention.

Moreover, Visual Phonics is a useful tool for speech-language pathologists. Montgomery (2008) had an inclusive dialogue on Visual Phonics with Dave Krupke, who had served children with communication and language disabilities for 37 years and was a licensed Visual Phonics trainer. He stated that, in 1982, a parent who had deaf children created the system of Visual Phonics to link the hand cues and the sounds. Visual Phonics is a system that helps students to associate the hand cue with the sound without hearing it. He claimed that Visual Phonics contributes to the building of literacy skills while using
multisensory inputs, and it can be adapted to different instructional situations. Visual Phonics can be used for children who have hearing loss, communication disorders, and reading difficulties. Moreover, he noted that Visual Phonics is suitable for any typical child as an early literary skill improvement tool. Several studies reported improvements in speech perception skills (Beal-Alvarez et al., 2012; Smith & Wang, 2010; Trezek & Malmgren, 2005; Tucci & Easterbrooks, 2015; Waddy-Smith & Wilson, 2003).

According to Waddy-Smith & Wilson (2003), Visual Phonics can easily be incorporated into any phonics based curriculum. The results of the present synthesis support this argument. In many studies, several different phonics based reading curriculum supplemented with Visual Phonics were used, and all studies yield significantly positive outcomes. The reading programs that are instructed: Corrective Reading-Decoding A curriculum, Foundations for Literacy, Teach Your Child to Read in 100 Easy Lessons, Fountas and Pinnell Kindergarten Phonics Curriculum, The Reading Mastery I program, and LACES. These programs are explicit and systematic phonics-based reading programs. Any phonics-based curriculum supplemented with Visual Phonics yields positive outcomes. This is also in line with the NRP’s recommendations because the NRP found that any systematic and explicit phonics program is better than non-systematic ones. Additionally, there is a support for the QSH’s argument about fundamentals should be the same for all children, but the instructions should be differentiated. Therefore, Visual Phonics is an effective way to differentiate instructions.

Effective teaching strategies lead to tremendous increases in students’ learning. According to Snow et al. (1998), “quality classroom instruction in kindergarten and the
primary grades is the single best weapon against reading failure” (p. 343). Therefore, teachers’ knowledge and perceptions about instructions affect the quality of reading instructions. Donne and Zigmond (2008) conducted a study that took place in the tri-states: Ohio, Pennsylvania, and West Virginia. Seventeen teachers and twenty four d/Dhh students who were in grades one through four participated in different educational settings (general education only (n = 5), general education/resource room (n = 6), and self-contained classroom (n = 13)).

Based on the observational data, reading activities (including reading aloud, reading silently, and comprehension) made up 46.4% of observed time in reading instruction, language activities (including vocabulary, grammar, and creative writing) made up 22.6% of observations, spelling activities made up 13.8% of observations, and phonic/phonemic awareness activities made up 1.6% of observations. This translates to a mean of 35.9 minutes/day spent in reading, 17.5 minutes/day spent in language, 10.7 minutes/day spent in spelling, and 1.2 minutes/day spent in phonic/phonemic awareness activities. The remaining time (12 minutes/day spent in reading instruction) was spent in activities other than reading (Donne & Zigmond, 2008, p. 226).

Only two first grade and two second grade d/Dhh students, who were reading on grade level, were observed during phonemic awareness and phonics instruction. All students had hearing loss from unilateral severe to bilateral moderate to severe, and they used speech as a primary mode of communication. Students were observed in a total of 59 minutes ranging from 2 minutes a day to 24 minutes a day during phonemic awareness
and phonics instruction. Teachers who incorporated phonemic awareness and phonics instructions into the reading lesson took twice more reading courses than other teachers. Even though phonemic awareness and phonics instructions were parts of the reading curriculum, only 4 out of 24 d/Dhh students were observed during these instructions.

Phonemic awareness and phonics instructions were only 1.6% of all instructional time for d/Dhh students. That is alarmingly poor compared to their typical hearing peers’ instructional time. Donne and Zigmond (2008) cited two similar studies that showed the proportion of instructional time. First, Edmonds and Briggs (2003) found that 56% of reading instructional time was spent on alphabetics (e.g., phonemic awareness and phonics instruction) in kindergarten, and 39% of the time was spent in first grade. Second, the Florida State University Center for Reading Research (2004) found that increase in grade level leads to decrease in instructional time in phonics and word study activities. In kindergarten these activities occurred 33% of the total instructional time; in first grade was 26.1%; in second grade was 12.9%, and in third grade was 11.8%.

Moreover, Easterbrooks, Stephenson, and Mertens (2006) surveyed 37 master teachers about ten literacy and ten math/science practices. “Master teachers are current pre-K-12 teachers who are established (i.e., not in their first years of teaching) and considered particularly innovative and effective in their instruction of students who are deaf/hard of hearing” (Easterbrooks et al., 2006, p. 402). For literacy practice of ‘teaching phonemic awareness and phonics’, 46% of the master teachers rated them beneficial to most beneficial for d/Dhh students, and 45% of the master teachers indicated that they were very likely to highly likely to engage in these activities. This result demonstrated
the most mixed views among all identified practices. This can be explained by a fact that half of the master teachers were working in an environment that sign language was used. Furthermore, participants expressed that they did not have adequate training on phonemic awareness and phonics. Additionally, they did not believe that these activities would be appropriate for students with hearing loss.

Some educators do not believe the importance and benefits of phonemic awareness and phonics instructions for d/Dhh students. Hence, without the addition of teachers’ perception about the Visual Phonics, this study would be incomplete. Teachers’ opinions are valuable for future practices and policy makers. The only study that investigated teachers’ use of Visual Phonics in their everyday reading instruction was conducted by Narr and Cawthon (2011). They conducted a national mix-method survey study with over 200 participants, many of whom were mainly teachers of the deaf (n=113). Half of the teachers had more than 10 years of teaching experience; however, Visual Phonics was a new tool for most of them. Half of the teachers (n=102) reported that they had 1 or 2 years of experience with Visual Phonics. The participating teachers commonly practiced Visual Phonics for d/Dhh students or students with disabilities other than hearing impairments.

The reasons that these teachers preferred to use Visual Phonics include the effectiveness of phonics instructions, spelling, phonemic awareness, vocabulary, and improvement of articulation. All teachers used the hand cues, but only 40% of the teachers used written symbols because teachers found that written symbols were complicated to implement in the lessons. This tendency can be seen in the research
because only a few studies incorporated written symbols (Cihon et al., 2008; Gardner et al., 2013; Narr, 2008).

Ninety-five percent of the teachers agreed strongly or somewhat strongly that Visual Phonics improves students’ phonemic awareness; 93% agreed that Visual Phonics increases decoding skills; 64% agreed that Visual Phonics boosts reading comprehension skills; and 72% agreed that Visual Phonics enhances students’ success in other subject areas. Ninety-four percent of teachers found Visual Phonics to be most appropriate for elementary students. Furthermore, more than 80% of the teacher-participants stated that Visual Phonics was easy to use and engaged students (Narr & Cawthon, 2011).

Research Question #3

The last research question asked about the recommendations for future research. All included studies highlight the necessity of further research because limited research is available on the effectiveness of Visual Phonics. The studies indicate similar limitations such as small sample size, difficulty with randomized sample, lack of a control group, and generalization of findings. Because hearing impairments is a low incidence disability, these limitations are common throughout all the research in the field of d/Dhh education. Selected studies recommended that future research needs to incorporate more students with different degrees of hearing loss in more rigorous experimental designs over a longer period. Additionally, long-term benefits of this type of intervention should be investigated with a link to other reading related skills such as fluency, vocabulary, and reading comprehension. Moreover, the addition of more specific measurement areas of
English language, such as morphology, syntax, and semantics could be beneficial for better understanding on the effects of the intervention.

Limitations

The study is limited to the published primary studies on Visual Phonics. Despite the exhaustive literature search, only fourteen studies met the inclusion criteria because of limited research on the topic. According to Sandelowski, Docherty, and Emden (1997), “synthesists locating more than 10 topically similar studies will have to use a clearly defined purposeful sampling strategy in order to set tighter boundaries for the synthesis” (p. 368). Even though there were a limited number of studies, these studies were selected by using rigorous criteria that allowed the researcher to draw conclusion.

There could be a publication bias. Wang and Williams (2014) remarked that “a meta-analysis can only be as good as the studies it includes” (p. 343). Some researchers believe that the inclusion of unpublished research reports helps to avoid publication bias. However, unpublished reports excluded from this synthesis due to difficulties of locating all relevant unpublished master theses. These difficulties led Finfgeld (2003) to assert that using these sources may be restricted in the future.

Conclusion

After the NPR’s findings on the elements of a balanced reading curriculum, Schirmer and McGough (2005) conducted a synthetic literature review on d/Dhh students and found that there is a lack of intervention research on phonemic awareness and phonics with d/Dhh students. Similarly, Luckner et al. (2005/2006) conducted a meta-analysis, but found no studies on these two aspects of a balanced reading instruction.
Any of the Visual Phonics intervention studies was not included these two reviews because there was no research available at that time. Since 2005, there has been a growing and promising body of research about Visual Phonics as an intervention tool for teaching phonemic awareness and phonics to d/Dhh students. Research findings show that Visual Phonics has statistically significant positive outcomes on phonemic awareness and phonics instructions for d/Dhh students (Beal-Alvarez et al., 2012; Guardino et al., 2011; Narr, 2008; Smith & Wang, 2010; Syverud et al., 2009; Trezek & Hancock, 2013; Trezek & Malmgren, 2005; Trezek & Wang, 2006; Trezek et al., 2007; Tucci & Easterbrooks, 2015; Wang et al., 2013).

Visual Phonics can be easily incorporated with any phonics-based curriculum, and Visual Phonics is an effective intervention tool to teach code-related skills for at risk hearing kindergarteners (Cihon et al., 2008; Gardner et al., 2013) and d/Dhh students, regardless of degree of hearing loss, grade placement, communication method, home language, and prevalence of an additional disability (Beal-Alvarez et al., 2012; Guardino et al., 2011; Narr, 2008; Smith & Wang, 2010; Syverud et al., 2009; Trezek & Hancock, 2013; Trezek & Malmgren, 2005; Trezek & Wang, 2006; Trezek et al., 2007; Tucci & Easterbrooks, 2015; Wang et al., 2013).

It is evident that Visual Phonics is getting attention around the World. For example, researchers from Malaysia introduced Visual Phonics to enhance d/Dhh students’ learning in Malaysia (Abdulghafoor, Ahmad, & Huang, 2015). Visual Phonics is effectively used for English phonemes, and clearly, there are adaptations for Spanish and Italian phonemes (Cihon et al., 2013).
As a researcher from Turkey, I believe that using Visual Phonics will increase the educational opportunities and provide differentiated teaching techniques for d/Dhh students in Turkey. I think Visual Phonics is highly effective and easy to use teaching tool for all younger students and d/Dhh students in all grade placements. Because d/Dhh students may not have fully access to speech sounds via the auditory channel, Visual Phonics provides additional visual and tactile access to phonemes, which is fundamental to learning to read in any alphabetic language. Similar to d/Dhh students in the US, Turkish d/Dhh students’ reading achievement level is alarmingly poor compared to that of typically developing peers. Visual Phonics may be the key to improve the reading achievement of d/Dhh students. Therefore, Turkish adaptation of Visual Phonics may enhance learning opportunities for d/Dhh students.
References


where, when, and why. *Journal of Deaf Studies and Deaf Education, 16*(1), 66–78.


