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Explicit instruction of reading comprehension strategies: Effect on d/Deaf adolescent students'  
strategy use and reading comprehension

by

Maryam Salehomoum

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Joint Doctor of Philosophy

in

in Special Education

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor David Pearson, Co-chair

Professor Philip Prinz, Co-chair

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Summer 2018



## Abstract

Explicit instruction of reading comprehension strategies: Effect on d/Deaf adolescent students'

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by

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Joint Doctor of Philosophy in Special Education

University of California Berkeley

Professor P. David Pearson and Philip Prinz, Co-Chairs

Studies of proficient readers have shown that the use of certain strategies (e.g., relating personal background knowledge to text, attending to headings and images, and summarizing) is important for comprehension of challenging texts (Afflerbach, Pearson, & Paris, 2017; Duke et al., 2011; Goldman et al., 2016; Shanahan, Shanahan, & Misischia, 2011). Despite advances in early identification of deafness, early intervention, and years of literacy research, on average, children who are Deaf or Hard of Hearing (DHH) continue to exhibit long-term language and literacy delays (Kyle & Harris, 2010; Ruffin et al., 2013). Many students, hearing and D/deaf, are limited in their use of comprehension and metacognitive strategies (Banner & Wang, 2011; Donne & Rugg, 2015; Morrison et al., 2013; Nickerson 2003, Schirmer, 2003). Although research has shown that explicit instruction can improve students' use of strategies (Johnson Howell & Luckner, 2003; Palincsar & Brown, 1984), there are few well-designed studies that examine the efficacy of this kind of intervention with adolescents who are DHH (Easterbrooks & Stephenson, 2006; Luckner et al., 2005/2006; Marschark et al., 2009).

A multiple baseline case study was therefore developed to examine the effect of 1:1 explicit instruction of targeted strategies for reading comprehension with four DHH high school students. A verbal protocol (think aloud) procedure (Ericsson & Simon, 1980; McGuinness & Ross, 2011) was used to better understand the students' cognitive processes as they engaged in reading aloud *and* to instruct students in the effective use of strategies. Data consisted of baseline vs. post-intervention analyses of: (a) type and frequency of strategies used, (b) students' success in deriving the meaning of unknown words, (c) students' response accuracy to short answer comprehension questions, and (d) coherence and accuracy of self-constructed written summaries. In addition to the student data, interviews and observations of four participating teachers were conducted to gain insight into existing classroom instructional practices.

Results indicate that all students began using new strategies following intervention. Students reported generalization of strategy use across contexts. However, even though some students used quite a variety of strategies, their application of a strategy did not always lead to improved text comprehension. The use of a think aloud procedure was highly valuable in shedding light on factors that challenged comprehension, such as limited vocabulary knowledge and skills. The

two non-standardized comprehension measures employed in the study (i.e., short answer comprehension questions and self-constructed written summaries) did not show a clear intervention effect, but results from the standardized *Gates McGinitie Reading Tests* (MacGinitie, MacGinitie, Maria, Dryer, & Hughes, 2007) indicated improved reading achievement for two students. Overall, findings suggest a promising effect of explicit instruction of strategies. To ensure more robust findings, future studies would need to implement explicit instruction over a longer period of time and/or via increased frequency of instruction.

This work is dedicated to the many d/Deaf or hard of hearing children and adults who continue to strive for equal opportunity and legitimacy in our society.

With many thanks to my instructors and my family for supporting me through this endeavor.

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## CHAPTER 1: INTRODUCTION AND REVIEW OF THE LITERATURE

Despite advances in early identification of hearing loss, early intervention, and an increase in the use of cochlear implants<sup>1</sup>, on average, children who are Deaf or Hard of Hearing (DHH) continue to exhibit language and literacy delays, as compared to their hearing peers (Benedict, Rivera, & Antia, 2015; Kyle & Harris, 2010; Paul & Whitelaw, 2011). Although there has been a long history of research dedicated to improving the literacy outcomes for deaf and hard of hearing children (Andrews, Byrne, & Clarke, 2015), we have yet to reliably identify efficacious instructional practices for this unique and diverse population of students. A review of the literacy literature indicates a few factors that appear to contribute to the delay in the development of improved instructional practices for deaf (and hearing) students: (a) disagreement about the best mode of communication for deaf students (i.e., the use of spoken vs. signed language; including a debate about the use of a natural vs. pedagogical signed language) (Edwards, 2001; Pittman & Huefner, 2001), (b) a division in ideology regarding the nature of reading development for deaf vs. hearing students (e.g., whether development is qualitatively similar to vs. different from that of hearing children) (Andrews et al., 2015; Easterbrooks et al., 2015; Mayberry, del Giudice, & Lieberman, 2011; Paul & Lee, 2010), (c) a lack of sufficient attention to the development of higher-level processes and strategies, such as analysis, synthesis, and critique (Goldman et al., 2016; Luckner et al., 2005-2006; Marschark et al., 2009), and (d) a lack of well-designed experimental studies regarding evidence-based literacy instruction (Luckner et al., 2005/2006). In addition, most past literacy studies of students who are DHH have focused on younger students through the elementary grades (Benedict, Rivera, & Antia, 2015; Easterbrooks et al., 2015; Schirmer, Bailey, & Schirmer Lockman, 2003) and/or discrete linguistic skills (e.g., phonology, vocabulary, and morphology) (Nielson, Luetke, McLean, & Stryker, 2016; Kyle & Harris, 2010; Mayberry et al., 2011). There have been few studies dedicated to understanding older DHH students' strategy use (Banner & Wang, 2011; Silvestri & Wang, 2018; Wang, Silvestri, & Jahromi, 2018) and practically no studies that have focused on examining the effect of explicit instruction on strategy use and comprehension. Years ago, I had researched alternative evidence-based tools for teaching early phonemic awareness skills to younger DHH children (e.g., Visual Phonics). During the last several years of clinical practice, my attention and interest shifted to the adolescent population and higher-level skills related to literacy development. Given my professional background as an interventionist, I was naturally drawn to completing a dissertation study of the effect of explicit instruction on DHH adolescent students' literacy skills.

While humans are born with a unique innate mechanism for acquiring language (Pinker, 1994, 2003), early exposure to advanced language *models* within naturally

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<sup>1</sup> A Cochlear Implant (CI) is a surgically implanted device, used to provide access to sound and spoken language through direct stimulation of the auditory nerve, for children with severe-to-profound hearing loss in both ears. For more information, visit:

<https://www.nidcd.nih.gov/health/cochlear-implants>

occurring *social interactions* is essential in triggering biological mechanisms that spur the development of one's first language (Tomasello, 2003; Vygotsky, 2012). Studies of feral children were the first to indicate that exposure and interaction must take place within an early *critical period* for children to achieve typical linguistic proficiency. Studies of late acquisition of a *second* language also indicate a critical or sensitive period for the development of certain aspects of language to near-native proficiency (Qureshi, 2016). Research with children who are Deaf or Hard of Hearing (DHH), born into oral communities and without exposure to adequate levels of comprehensible language, has provided further evidence of a critical period for language development (Mayberry, 2007); especially for certain aspects of language; for example, phonology and morphology are more sensitive to an early age of exposure than vocabulary (Geren & Snedeker, 2009; Senghas & Coppola, 2001). Although there is consensus among educators regarding the importance of an early age of exposure to language (Davidson, Lillo-Martin, & Pichler, 2013; Mayberry, 2007; Senghas & Coppola, 2001, Tomasello, 2003), professionals working with deaf children and their families are divided in their specific approach to intervention. For decades, a majority of educators in the US have promoted the use of an auditory-oral approach, while others have advocated the use of sign language (Edwards, 2001; Pittman & Huefner, 2001). Deprivation from meaningful early linguistic interaction has been shown to have lasting effects on language development, despite later intervention efforts and/or length of time that has lapsed since use of a comprehensible language (Mayberry, 2007; Ruffin, Kronenberger, Colson, Henning, & Pisoni, 2013).

In addition to effects on the development of discrete linguistic skills, children with a late age of acquisition of a first language have been shown to exhibit literacy and domain-general cognitive delays and deficits, e.g., Theory of Mind, Executive Functioning, and memory (Marschark, Sarchet, & Trani, 2016; Mellon, Ouellette, Greer, & Gates-Ulanet, 2009; Pisoni, Conway, Kronnenberger, Henning, & Anaya, 2010). The limitations or delay in metacognitive development and behavioral regulation in students who are DHH is attributed to the diminished access to auditory information in the environment, the early and ongoing impoverished language experiences, and less than ideal educational placement and programming (Marschark & Knoors, 2012). These limitations, in turn, have a negative impact on language and literacy development.

Congenital hearing loss, of any degree and type, puts children at risk for a delay in language, literacy, and certain cognitive skills development. Deafness is not inherently cause for delays. In fact, deaf children who are exposed to proficient linguistic models from birth (e.g., via parents who are proficient in sign language) develop language within normal limits (Davidson, Lillo-Martin, & Pichler, 2013). Most deaf children, however, are born to hearing parents who are proficient in a *spoken* language. The use of spoken language, even when children use a powerful assistive listening device such as a cochlear implant, results in a degraded linguistic input and increases the risk of delays (Hoffmeister & Caldwell Harris, 2014; Marschark et al., 2009).

Factors identified to improve language and literacy outcome include early access to a *comprehensible* language, including a natural sign language such as American Sign Language (Davidson, Lillo-Martin, & Pichler, 2013; Mayberry et al., 2011), support in developing associations between signed and spoken language, and early exposure to a print-rich environment (Emmory, McCullough, & Weisberg, 2016; Mounity, Pucci, &

Harmon, 2014; Wang, Andrew, Liu, & Liu, 2016). Although reading difficulties are related to delays in specific language skills, such as vocabulary and grammar (Nippold, 2017) and limitations in content knowledge (Kahmi & Catts, 2017), lack of use of metacognitive and comprehension strategies contribute as well (Duke, Pearson, Stratchen, & Billman, 2011).

Reading comprehension difficulties are not exclusive to DHH students. Hearing students are also reported to struggle in this area and to need explicit instruction of self-monitoring and comprehension strategies (Benedict, Rivera, & Antia, 2015; Chambers Cantrell, Almasi, & Rintamaa, 2017; Goldman et al. 2016; Snow, 1983). Hearing students whose home language is something other than English (i.e., English Language Learners) are especially at risk for reading delays and limitations; particularly, for comprehension of text beyond the single word level (Cannon & Guardino, 2012). Because reading has been recognized to be a difficult developmental task for some students (hearing and deaf, monolingual and multilingual), scholars have advocated for the need for explicit instruction and ongoing practice (Snow, 1983; Snow, 2016).

Limitations in literacy skills have significant consequences for children and adults, regardless of hearing status. Literacy skills not only affect children's success within the academic realm but continue to impact the quality of life of adults (e.g., with regards to employment opportunities and earning, sense of personal fulfillment, and daily living activities) (Garberoglio, Cawthon, & Bond, 2014; Luckner & Handley, 2008; Snow, 2016). Results from the Garberoglio, Cawthon, & Bond (2014) study, which show the long-term effect of literacy into adulthood, reflect outcome during a ten-year transition period from adolescence into adulthood for 550 deaf or hard of hearing individuals residing in the United States. The effect of literacy skills on earning, personal fulfillment (e.g., positive self-belief, and daily living skills (e.g., navigating the media to find residence and completing necessary paperwork) was significant even when controlling for factors such as family income and the presence of other disabilities.

Studies of instructional practices of hearing classrooms show a need for educators to go beyond using the text and self as authority to an instructional approach that facilitates authentic engagement of students and critical thinking skills (see Goldman et al., 2016). Educators of deaf *and* hearing students should be adept at recognizing when and how to use explicit instruction via modeling, think-aloud, and explanation. Discussions should follow a dialogic model of engaging students in free and open dialogue about a topic and inviting independent analysis, evaluation, and critique. Engaging students in *active* learning (i.e., getting involved with information and really thinking about it) is essential to optimizing learning outcomes (Chi & Wylie, 2014). In encouraging this kind of learning, it is important that students are supported in recruiting cognitive and behavioral processes *during* a learning activity (as opposed to, for example, interest or motivation, considered to be precursors to a learning activity) (Chi & Wylie, 2014). Several factors challenge a student's comprehension of text, including: (a) the student's knowledge of the content is low, (b) the text itself is challenging (e.g., with regards to decoding, vocabulary, or grammatical demands), or (c) the reading task is difficult. When the reading task is challenging, students need to employ strategies in improving comprehension. Explicit instruction of comprehension strategies that are deliberate and selective (e.g., use of strategies that are appropriate for the situation and used during meaningful interactions with challenging text) has potential for optimizing

reading comprehension outcome (Afflerbach, Pearson, & Paris, 2017). Given the ongoing metacognitive difficulties reported in the adolescent and young adult DHH populations, this population may especially benefit from explicit instruction and support.

In the early years of literacy development, single word reading (i.e., decoding) is strongly associated with phonemic awareness and vocabulary skills. The ability to construct meaning from text by *older* skilled readers, however, requires active engagement with text and the purposeful use of specific strategies (e.g., application of personal experience and world knowledge to text, understanding of the author's purpose, and one's ability to make logical conclusions) (Duke et al., 2011; Easterbrooks & Stephenson, 2006; IRA, 2012; Luckner, Sebald, Cooney, Young, & Goodwin Muir, 2005/2006; Shanahan, Shanahan & Misischia, 2011). The ability to recognize and acknowledge comprehension breakdowns improves with age (Blake & Brown, 1980). As compared to younger peers, older students are, therefore, in a better position to benefit from explicit instruction.

Although the development of phonemic awareness skills<sup>2</sup>, vocabulary, and English grammar are important foundations of literacy development for both hearing and students DHH (Easterbrooks et al., 2015; Easterbrooks & Stephenson, 2006; Luckner et al., 2005/2006; National Reading Panel; Paul & Whitelaw, 2011), an in-depth review of studies regarding these factors is outside the scope of the proposed study. An interest in exploring literacy development during middle and high school grades necessitates a focus instead on: (a) skills required for the construction of meaning and the implementation of higher-level standards of literacy (e.g., analysis, synthesis, and critique) (Goldman et al., 2016), (b) an examination of the literacy beliefs and practices of students and teachers (Frankel, 2016; Lewis & de Valle, 2009), and (c) effective literacy instruction across the content areas (Goldman et al., 2016; Shanahan, Shanahan, & Misisichia, 2011).

Extensive reviews of the literature conducted by Easterbrooks & Stephenson (2006), Luckner et al. (2005/2006), and Luckner & Handley (2008) indicate a need for inclusion of explicit instruction of meta-cognitive and reading comprehension strategies for students who are Deaf or Hard of Hearing. As reported by Banner & Wang (2011) and confirmed via a personal search for literature, there is a serious dearth of studies that examine the effect of explicit instruction of these important skills for DHH students.

Although the existing (though scant) research suggests explicit instruction of comprehension strategies and interventions targeting metacognitive skills are effective, there are few studies that examine the issue with a clear description of and control for the methods employed, evaluate outcome longitudinally, and/or include maintenance probes (Easterbrooks & Stephenson, 2006; Luckner et al., 2005/2006; and Luckner & Handley; 2008; Strassman, 1997). Furthermore, what we know about effective instruction of reading comprehension seems to have remained within the research and academic communities. Teachers of DHH students, in mainstream programs *and* schools for the deaf, are reported to lack training and knowledge regarding these student's unique learning and developmental needs (e.g., information processing) and effective

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<sup>2</sup> There is disagreement among scholars regarding the association of phonemic awareness skills and literacy development for deaf students. For a discussion, see: Andrews et al. (2015), Easterbrooks et al. (2015), and Mayberry et l. (2011).

instructional pedagogy (e.g., instruction of critical thinking via effective interactional dynamics) (Marshark & Knoors, 2012).

To address the scarcity of intervention studies evaluating the effectiveness of explicit instruction of strategies, particularly with *adolescent* DHH students, I implemented a mixed methods multiple baseline study at two high school settings to examine: (a) DHH students' use of specific reading comprehension strategies, (b) the effect of explicit instruction on strategy use, (c) the effect of explicit instruction on reading comprehension, and (d) the existing literacy instructional practices in the classroom.

Before describing the study, I present a review of relevant literature that aims to: (a) establish a rationale for the use of a social learning approach to instruction (Duke et al., 2011; Gavelek & Breshnehan, 2009; Vygotsky, 2012), (b) present evidence in support of explicit instruction of meta-cognitive skills and specific reading comprehension strategies with hearing *and* deaf students (Banner & Wang, 2011; Johnson Howell & Luckner, 2003; Palincsar & Brown, 1984), and (c) discuss the need for literacy instruction across the content areas (e.g., history, science, math) (Goldman et al., 2016; Shanahan et al., 2011).

### **Theoretical Framework: Social Learning Approach to Instruction**

Literacy not only requires the coordination of various cognitive, linguistic and perceptual processes (e.g., world knowledge, reasoning, and semantic skills), but is also believed to consist of a social-interactive-constructivist aspect (Andrews et al., 2015). In other words, reading and comprehension occur within a social milieu, where individuals interact with one another to construct (and reconstruct) meaning. Although literacy is applicable when discussing various mediums of representation of information (e.g., through the air or signed or spoken language, print, and/or digital technologies), the medium of interest for the purpose of this study is restricted to printed English. Comprehension of printed text necessitates skills that go beyond accessing the code or decoding to skills related to interpretation, evaluation, and synthesis, using one's background knowledge (McNamara & Kintsch, 1996).

The role of teacher as an important figure in facilitating reading *comprehension* skills may be explained using a sociocultural model of learning and development, or more specifically, Vygotsky's cultural-historical theory. Vygotsky's model proposes that development of the mind takes place in interaction with others. Each aspect of development is thought to first appear "on a social level" and then "on an individual level" (Gavelek & Breshnehan, 2009). In relation to reading comprehension skills, an adult (and more advanced) reader can support this development by mediating text-to-world relationships while in interaction with a student. As Gavelek & Breshnehan (2009) note, "recognition of the essential role played by the knowledgeable other" is associated with Vygotsky's concept of the Zone of Proximal Development (ZPD). Within this model, the teacher assesses the student's *actual* level (i.e., what the child does independently) and facilitates development to the next level by providing appropriate guidance, scaffolding, and instruction to encourage and support interaction and collaboration between peers. Proponents of Vygotsky's model of development believe awareness and use of the ZPD better index a student's learning potential (Bruner, 1996). The ZPD is used to determine "functions that have not yet matured but are in the process of maturing" (p. 86), and those with a higher level of capacity (e.g., teacher and more

developed peers) can facilitate development for younger or less advanced students (Vygotsky, 2012). Vygotsky's model places the teacher in a position of *leading* development, rather than *following* it (Gavelek & Bresnehan, 2009). The role of the teacher becomes even more significant in consideration of Vygotsky's distinction between everyday and "scientific" concepts, such as those that are associated with math, history, and science. Whereas a student may be expected to acquire everyday concepts through naturally occurring experiences, development of "scientific" concepts are believed to depend on explicit instruction (Gavelek & Bresnehan, 2009). It is important, however, that students be supported in developing a sense of agency and see themselves as active participants in the learning process (Alamsi & Hart, 2011). Educators can foster this sense of agency by asking students to verbalize their thoughts and take part in decisions about how to best engage in learning activities (e.g., decide which strategies to use when reading challenging text).

Following a sociocultural model, educators working with DHH students would assess a student's literacy skills, e.g., use of strategies and skills, identify areas of need, and develop an individualized program of instruction that advances the student to the next level of independence and expertise. Explicit instruction of strategies entails teaching students when and why to use strategies, what strategies to use, and how to implement strategies, and may be carried out through discussion, modeling, and guided practice (Luckner & Handley, 2008; Palincsar & Brown, 1984; Paris, Lipson, & Wixson, 1983). Duke et al. (2011) describe strategy instruction as "dynamic, adaptive, and responsive" (p. 67), and recommend that instruction continue as long as the student needs it. To provide effective instruction, teachers need to first understand the complex process of reading. To gain such an understanding, more recent teacher training programs have begun to engage teachers in reading difficult text and using think aloud to become aware of the processes and strategies by which they themselves can better understand these texts. "By thinking aloud during their own reading processes...teachers can better identify the supports needed to help their students develop thoughtful reading in difficult materials." (Ogle & Lang, 2011, p. 141) Because data indicate a need for improved instructional practices in supporting students' literacy development (Marschark & Knoors, 2012), it is critical that teachers continue to reflect on the complex reading comprehension task and the means by which they can best instruct students.

In assessing students from culturally and linguistically diverse backgrounds, hearing or deaf, educators are advised to exercise caution regarding selection and implementation of culturally and linguistically sensitive measures (Guardino & Cannon, 2016). This would entail, for example, assessing students in their dominant or preferred language. It is also important to individualize instruction in consideration of students' cultural and linguistic backgrounds; for example, using students' cultural knowledge and skills within the instructional content and approach (Guardino & Cannon, 2016).

Gavelek & Bresnehan (2009) note that problems or challenges of teaching to students of diverse cultural and linguistic backgrounds represent opportunities for "transformation and expansion" of a system, such as reading instruction pedagogy. The authors further note that challenges (e.g., tension between a student's interests, goals, and/or knowledge and curricular demands) "must be resolved in order to advance students' reading and comprehension" (Gavelek & Bresnehan, 2009, p. 150). Thus, the

challenges of teaching a diverse population of DHH students also present an opportunity to improve current practices and student outcomes.

### **Adolescence as a Critical Period**

Adolescence is a period of physical, neurobiological, cognitive, and social-affective change and development (Blakemore & Choudhury, 2006; Crone & Dahl, 2012; Vygotsky, 2012; Van Duijvenvoorde & Crone, 2013; Zarret & Eccles, 2006). Researchers note that developmental changes during adolescence can result in either positive behavioral responses, e.g., motivation to learn new material, or negative behavioral responses, e.g., attending to irrelevant distractions during instructional time (Van Duijvenvoorde & Crone, 2013). Adolescence is recognized as an important period for developing executive functioning skills, problem solving and moral reasoning skills, and identity (Crone & Dahl, 2012; Erikson, 1963, as cited in Most, Wiesel, & Blitzer, 2007; van Gent, Goedhart, Knoors, Westenberg, & Treffers, 2012).

Vygotsky argues that unless society (i.e., the social milieu) systematically and thoughtfully stimulates the intellectual growth and development of an adolescent, “his thinking fails to reach the highest stages, or reaches them with great delay” (2012, p. 115). It is important that educators recognize adolescence as a second “critical period”, and an opportunity for facilitating increased levels of engagement and learning and positive identity development. As Crone & Dahl (2012) state, adolescence is “an important period for developing cognitive control skills through training and experience.” (p. 645) Findings of behavioral and brain imaging studies indicate that when motivated, adolescents show heightened capacity for engaging in complex tasks and learning new skills (Crone & Dahl, 2012). Furthermore, a focus on positive *identity* development may support students in developing a positive *literacy* identity; i.e., a belief in one’s own capacity for developing proficient literacy skills (Frankel, 2016).

The question is *how* can educators best stimulate positive identity and cognitive development among adolescent students. This is especially important given the reportedly low level of motivation and engagement with text for some students who are DHH (Luckner & Handley, 2008) and certain existing classroom practices that may reinforce a negative literacy identity in students (e.g., enrolling students in remedial reading classes or perceiving students as limited in literacy capacity) (Frankel, 2016).

### **Reading Comprehension and Meta-Cognitive Strategies**

#### **Overview: Hearing Students**

A number of strategies, thought to be effective in facilitating reading comprehension, e.g., questioning, predicting, and requesting clarity, have been identified via experimental studies dating back to the 1960’s (Baker & Brown, 1980). It is essential that teachers *mediate* the acquisition of these strategies via explicit instruction, such as modeling, think-aloud<sup>3</sup>, and explanations (Gavelek & Bresnehan, 2009). Other important aspects of instruction include the use of a dialogic approach, whereby the student is encouraged to question and evaluate claims (Goldman et al., 2016; Nystrand, 1997) and the use of role reversal, as it is discussed, for example, in Reciprocal Teaching whereby students take on the role of the teacher in guiding a discussion and engaging their peers

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<sup>3</sup> Think aloud, as described by Ericsson (2006), is a process whereby an individual engaged in a task verbalizes their *spontaneous* thoughts (i.e., “inner speech”) as they complete the task.



(Palincsar & Brown, 1984). Our role as educators, “is not to produce ‘readings’ for our students but to give them tools for producing their own.” (Scholes, 1985, as cited in Gavelek & Bresnehan, 2009, p. 159)

Despite the evidence indicating efficacy of explicit instruction of strategies and an ongoing sociocultural rhetoric, the classroom space is often still shaped by a notion of teacher as expert and text as “authority” or truth (Goldman et al., 2016; Gavelek & Bresnehan, 2009). This phenomenon is explained as: (a) a conflict between the underlying (Marxist) principles in Vygotsky’s theory of learning as socially situated vs. American ideologies of “individualism, independence, and self-reliance” (Gavelek & Bresnehan, 2009; p. 166), and (b) certain educational policies, such as NO Child Left Behind, that prioritize instruction of discrete skills (e.g., vocabulary and/or phonics) over higher level skills of analysis, synthesis, and evaluation. Successful implementation of a sociocultural model therefore depends, in part, on changes to educational policies and dominant ideologies.

### **Overview: Deaf Adolescents and Young Adults**

Andrews et al. (2015) summarize the shifting historical trends in literacy research with DHH students via a review of literature from the 1970’s to contemporary time<sup>4</sup>. Most recently, meta-cognitive and meta-linguistic development and strategy instruction have been of primary interest in literacy research dealing with both deaf and hearing subjects. Several shortcomings with regards to the implementation, design, and replication of many of the past literacy studies related to deaf children, however, limit the studies’ reliability and usability (Luckner et al. (2005/2006). Notwithstanding these limitations, a meta-analysis from studies with large effect sizes indicated teacher discussion of comprehension strategies to be one of several instructional components that show promise in supporting literacy development (Luckner et al. 2005/2006). Following an extensive review of the literature, Easterbrooks & Stephenson (2006) also recommend explicit instruction of reading comprehension strategies for DHH students. Well-designed studies are needed to clearly establish the efficacy of recommended practices, such as explicit instruction of reading comprehension strategies with deaf and hard of hearing students.

### **Literacy Instruction Across Content Areas**

Per Gavelek & Bresnehan (2009), “Knowledgeable individuals must learn to read different texts in different ways for different purposes and should be taught accordingly.” (p. 152) Variations in text consist of differences in genres (e.g., narrative, procedural, expository, and descriptive) as well as differences across subject areas (e.g., history vs. biology). As will be discussed further, proficient readers respond to different kinds of text differentially. For example, adult expert readers evaluate the authors’ perspective when reading historical text as compared to evaluating the methods when reading scientific text. Although there is much overlap in the kinds of strategies expert readers use to evaluate various texts, it is important to teach students the unique characteristics of different texts and the kinds of strategies that are useful in improving comprehension of each.

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<sup>4</sup> Authors note advocacy for English language learning in the 1970’s, a focus on cognitive processes and cultural knowledge in the 1980’s, and an interest in bilingual development emerging in the 1990’s and continuing.

## Hearing “Expert” Readers

With increasing attention to and acknowledgement of the importance of teaching literacy across the content areas, some researchers have begun to investigate how information is organized across the areas (e.g., examining specific genre, vocabulary, and traditions of communication of ideas). In addition, researchers have begun to investigate how “expert” or skilled readers use discipline-specific strategies to read and process information (Shanahan et al., 2011). Many students are reported to begin secondary school without sufficient knowledge of expository texts and the strategies with which to successfully read and comprehend them. Although there are some similarities or overlap in the type of strategies employed across content areas, there are also important distinctions. So what exactly are the specific strategies we need to teach students across the disciplinary areas?

In their study, Shanahan et al. (2011) used interviews, a think-aloud procedure, and focus group meetings to investigate how adult experts, within the disciplines of history, mathematics, and chemistry, approach reading text in their own content area. Approaches used by the expert participants were coded and classified into the following three categories: (a) sourcing (e.g., a consideration of the source of information; the author’s credibility, political stance, and/or affiliation; type of document), (b) contextualization (e.g., consideration of the time period of a source with respect to the political, social, and economic influences), and (c) corroboration (e.g., the agreement or disagreement across sources of information).

Results showed that all the expert participants were aware of how information was structured in the text within their respective discipline. All experts used the strategies of sourcing, contextualization and corroboration, although to different degrees and for different purposes. All participants critiqued the information, and all used interest and familiarity to guide their reading (Shanahan et al., 2011).

In addition, visual content, such as diagrams, graphs and artwork played a role in conveying critical information across disciplines (Shanahan et al., 2011), which indicates literacy is not limited to conventional text but includes a variety of symbolic forms of representation that are used to convey meaning.

Although Shanahan et al. (2011) expressed an interest in exploring whether the use of expert strategies would have any relevance to literacy instruction for adolescents, their study did not investigate this issue. It is important that researchers examine how and when to effectively teach specific strategies across the disciplinary content areas and evaluate the effects of strategy use on students’ academic and literacy performance.

A more recent study by Goldman et al. (2016) expands our understanding of the literacy skills and comprehension strategies of expert readers. An examination of the practices of a team of highly skilled adults in the reading, history, and science disciplines indicates advanced readers: (a) evaluate text (within a relevant context), (b) draw inter-textual links, (c) construct multiple interpretations, and (d) rely on constructs and theories in addition to the information in the text as evidence in support of individual claims. Goldman et al. (2016) note that although new educational standards (e.g., Common Core) identify desired targets or learning outcomes, they fail to illuminate effective *means* of teaching those targets. The authors propose a new model of instruction: Reading, Evidence and Argumentation in Disciplinary Instruction (READI). The READI model goes beyond: a) the traditional surface level (decoding), b) text level (understanding

explicit info), *and* c) the situation model (interpretation via activation of past knowledge and conscious application of comprehension strategies) to one which focuses on reading to learn “within authentic learning situations within a discipline” (p. 4); where readers are expected to evaluate and synthesize different and sometimes contradictory information from multiple texts.

### **Deaf Adolescents and Young Adults**

Although the research is scant, we do have some evidence of the benefits of explicit instruction of strategies within the content areas for older DHH students. Johnson Howell & Luckner (2003) conducted a case study with an 8<sup>th</sup> grade deaf student in a mainstream science class who had been struggling with text comprehension despite a high level of interest in and strong background knowledge of the content. This student had recently transferred from a self-contained School for the Deaf using American Sign Language to a mainstream middle school where she was participating in general education classes. She had been provided with support in a resource science class, but initially expressed uncertainty about her chances of success. Although the resource science class was the same as a general education class with regards to the curricular topics, instruction was reported to lack sufficient breadth and depth of information (Johnson Howell & Luckner, 2003).

The educational team, including the Deaf Education teacher, developed a plan for explicit instruction of a number of strategies specific to the content area. The plan was developed in consideration of the student (i.e., fair background knowledge of content and high interest level), the text (i.e., linguistic and visual features, and organization of content), and task (i.e., visualization and summarization). Explicit instruction consisted of the following three components:

- identification of text features, e.g., headings, bold and italic text, captions, and glossary, to promote the student’s understanding of how these features can support comprehension;
- mental imagery, e.g., images from the text, the corresponding sign, or a familiar personal schema;
- summarization (Johnson Howell & Luckner, 2003).

Instruction of strategies consisted of: (a) discussion of why, when, and where to use the strategy, (b) modeling, (c) practice and individual feedback, and (d) self-monitoring and generalization. By the end of the intervention, the student not only demonstrated improved performance on science tests but had also begun to generalize use of strategies to various classes (Johnson Howell & Luckner, 2003).

The effectiveness of the explicit instructional approach in the study (Johnson Howell & Luckner, 2003) was evident in several measures including: (a) positive changes in the student’s perception of her own literacy skills and performance within her science class, (b) generalization of skills to other content area classes, (c) a notable change in reading comprehension scores on standardized assessment (i.e., a score of 3.4 to 4.2 on The Woodcock Reading Mastery Test), and (d) a significant increase in percentile rank on the state science assessment (i.e., from 53<sup>rd</sup>-56<sup>th</sup> percentile in 6<sup>th</sup> and 7<sup>th</sup> grades to 62<sup>nd</sup> percentile at the end of 8<sup>th</sup> grade). Although the results of the Johnson Howell & Luckner (2003) study are limited to one student, the study provides modest evidence of a successful differentiated and adaptive approach to teaching content area strategies. The approach was differentiated with regards to meeting the specific needs of

this student (i.e., recognition of text structure and effective approach to vocabulary development). It was adaptive in its inclusion of an instructional component in response to the classroom teacher's feedback (i.e., its focus on summarization to improve test performance).

Although modeling and explicit instruction of language and literacy practices is important, students eventually need to learn to become self-reflective and independent in identifying their own literacy practices (e.g., time spent on reading and writing and variety of material used for reading). They also need to learn to identify their own strengths and weaknesses (e.g., with regards to English grammar, accuracy and organization of written compositions, and comprehension difficulties). Last but not least, students need to eventually become adept at identifying and using appropriate strategies when faced with challenging reading tasks, such as visualizing, looking up key vocabulary, and including personal experiences and perspectives (Marschark et al., 2009; Nickerson, 2003; Palincsar & Brown, 1984). These metacognitive strategies require active involvement by the student through the use of self-questioning and self-monitoring. Students who are DHH are reported to exhibit poor metacognitive skills, regardless of the language input (i.e., regardless of whether input is signed language or spoken English) (Marschark et al., 2009) or reading level (Kelly, Albertini & Shannon, 2001). Kelly et al. (2001), for example, found that both "high-level" and "low-level" deaf college students exhibited difficulties in identifying incongruities in text. DHH students who experience a language delay and also lack awareness of their language difficulties are reported to be in a position of "double burden" (Marschark et al., 2009). The question for many educators is how to best teach important metacognitive skills to those who lack it.

To address the lack of data about comprehension and metacognitive strategies, Banner and Wang (2011) completed a study of deaf adults and adolescent students with a range of reading proficiency. The authors were especially interested in assessing strategies used by more proficient readers. Participants in the study included five deaf adults between 27-36 years of age and six deaf students between 16-20 years of age. All participants had profound hearing loss of prelingual onset, and no diagnosis of physical or learning disabilities. The adult participants ranged in educational level, from status as a graduate student to one of high school dropout. Adult participants also differed in their exposure to language (e.g., type of school enrollment and age at which they were exposed to sign language). Student participants were all enrolled in a School for the Deaf that used a combination of signed and spoken English, and ranged in reading level from second to seventh grade. The authors completed interviews and a think-aloud procedure to collect data. Interviews were used to collect demographic information (e.g., participants' schooling history, first language, and preferred language) and information related to reading background (e.g., earliest memories of reading, process by which each learned to read, and comprehension strategies used). The think-aloud comments were elicited while participants were engaged in reading. All *adult* participants read the same three passages: one narrative, one periodical, and one expository text. The adolescents were given passages that matched their individual reading level, based on the most recent standardized assessment scores. The authors analyzed recordings using a list of 47 different strategies representative of the following categories: (a) constructing meaning (e.g., rereading, activating prior knowledge, predicting, visualizing, inferring,

summarizing), (b) monitoring and improving comprehension (e.g., identifying unknown words, developing alternative meanings, and generating questions), and (c) evaluating comprehension (e.g., awareness of the author's bias, expressing approval or disapproval of content, expressing affective reaction to text). To assess comprehension, participants were asked to summarize the passages and identify key elements.

Qualitative analysis of findings showed several patterns, most of them encouraging for this line of inquiry:

- Skilled readers in the study used multiple strategies;
- Regardless of reading level, all participants demonstrated use of several strategies;
- Adult readers were generally more aware of comprehension difficulties and more active in resolving those difficulties;
- Adults were more aware of the effectiveness of the strategies employed and used multiple strategies simultaneously when necessary;
- None of the adolescents in the study used evaluative strategies, whereas 3/5 adult participants did;
- More strategies were used when reading narratives;
- The most proficient reader (and most advanced in educational level) was the adult participant with earliest exposure to sign language through family and the educational system (Banner & Wang, 2011).

Although the adolescent students in this study used diverse strategies, analysis of the number and type of strategies employed showed notable differences from those of adult participants, (e.g., lack of use of evaluative strategies). The results suggest that the adolescent students would continue to benefit from modeling and instruction, particularly for strategies considered to be more advanced (i.e., evaluative strategies). Results of the Banner and Wang (2011) study are positive in showing that deaf skilled readers used a variety of comprehension strategies, thus suggesting that a difference in strategy use is not related to one's hearing status but rather is related to reading proficiency.

To investigate the effectiveness of explicit instruction on improving meta-cognitive skills, Nickerson (2003) evaluated the impact of deaf college students' use of literacy portfolios (described below). The author collected a variety of data using literacy portfolios and in-class observations. The nine students who participated in the study were all profoundly deaf, attended Gallaudet University, and were enrolled in a developmental English class. Students ranged in age from 18-22 years. All students were asked to keep a literacy portfolio for one academic year. Portfolios consisted of four core components, including: reading logs, writing assignments, surveys, and interviews. Reading logs consisted of student reports of reading material and time spent on reading. Writing assignments included students' reaction papers to assigned reading, such as letters, autobiographies, and opinion essays. Surveys were used to ask students to reflect on and describe their strengths as readers and writers. Interviews were used to document and analyze the students' awareness and use of self-assessment. Nickerson (2003) found that all students improved in their reading and writing practices and skills when using literacy portfolios. The author reports the following specific improvements:

- Students improved in their ability to identify their own strengths and weaknesses, e.g., the need to spend more time on reading, and the need to read more material of greater variety;

- Students improved in their use of specific comprehension strategies, such as looking up the meaning of unknown vocabulary and using context clues;
- Students reported an increase in their enthusiasm for reading and writing;
- Students demonstrated improved knowledge of specific topics (Nickerson, 2003).

Development of self-reflection and self-monitoring skills is certainly important in ensuring that students continue their literacy development long after they leave an educational institution and no longer have a mentor or educator to lean on. The results of the Nickerson (2003) study suggest that literacy portfolios have potential in promoting independence in self-monitoring and self-evaluation skills for deaf students. A limitation of this study, however, includes a lack of specific examples and/or assessment data that show changes in students' reading and writing skills.

In sum, the purposeful use of certain strategies is reported to support a reader's comprehension. Analyses of current classroom practices (Goldman et al. 2006) and the existing evidence related to the use of specific strategies to reading proficiency (Shanahan et al. 2011) indicate a need for implementation of *explicit* instruction in supporting students' literacy development (Cerra et al., 1997; Duke et al. 2011; Luckner & Handley, 2008; Palincsar & Brown, 1984). A sociocultural model of learning and development (Gavelek & Bresnehan, 2009) indicates that explicit instruction necessitates thoughtful facilitation by more advanced individuals, such as a teacher and/or advanced peers.

We have emerging evidence that older and more proficient DHH students do in fact use comprehension and meta-cognitive strategies of different types and levels of sophistication (e.g., strategies essential for constructing meaning and monitoring comprehension) (Banner & Wang, 2011; Silvestri & Wang, 2018). Results of the study by Nickerson (2003) indicate students' awareness of literacy practices and use of strategies can be improved through the use portfolios and explicit instruction. Finally, explicit instruction of specific strategies related to a content-area subject was also shown to be effective in increasing a deaf student's reading comprehension and independent use of strategies across contexts (Johnson Howell & Luckner, 2003). The existing evidence, however, is scant.

Additional studies regarding the efficacy of explicit instruction of strategies can address concerns that researchers and educators have been excessively focused on teaching and measuring discrete linguistic skills, such as vocabulary and phonemic awareness, and neglected development of higher-level reading and *cognitive* skills (Marschark et al., 2009). By carefully documenting important aspects of student characteristics and methodology, researchers can also address concerns regarding the quality of past research on literacy instruction of DHH students (Luckner et al., 2005/2006).

## CHAPTER 2: RESEARCH DESIGN AND METHODS

### An Overview

Despite improvements in early identification of hearing loss, early intervention, and years of research regarding literacy development and instruction, DHH students continue to lag behind hearing peers in reading and reading comprehension skills. A review of the literature (Luckner et al., 2005/2006; Marschark et al., 2009; Marschark & Knoors, 2012) indicates a need for controlled studies that examine the efficacy of explicit instruction of higher cognitive skills, e.g., comprehension and metacognitive strategies, in improving literacy outcomes for DHH students. This study was motivated by an interest in evaluating the effect of explicit instruction of reading comprehension strategies, using think aloud, on DHH adolescent students' strategy use and reading comprehension. To address the scarcity of intervention studies evaluating the effectiveness of explicit instruction of strategies with this population, I implemented a mixed methods multiple baseline study at two high school settings to examine: (a) students' awareness and use of specific reading comprehension strategies before the start of intervention, (b) the effect of explicit instruction on strategy use post-intervention, (c) the effect of explicit instruction on reading comprehension, as indexed by scores on short answer comprehension questions and self-constructed summaries, and (d) existing literacy instructional practices in the classroom. Baseline and intervention were both carried out using expository texts that are similar to the texts students encounter in their high school disciplinary classes (e.g., history, science). I chose a multiple baseline design as a best means of assessing an intervention effect when completing the study with a small number of diverse participants. The design is considered experimental and intended to document a functional relationship between an independent variable, in this case the strategy/think aloud intervention, and key dependent variables, in this case strategy use and comprehension of text (Horner et al., 2005).

The study was implemented at two high schools in Northern California, with participation by two students and two teachers at each site. Students completed an initial interview, standardized and informal reading assessments, and a series of ten weekly intervention sessions, employing verbal protocol or think aloud. The intervention followed a multiple baseline design in which each student participated in a different number of baseline assessment sessions to control for external variables as contributing factors to the effect of intervention. I used a combination of qualitative and quantitative data, which enabled me to complete an examination of complex behaviors (e.g., students' mental processes and approach to understanding challenging text) and to document behaviors in an objective and replicable fashion (Chi, 1997; Miles, Huberman, & Saldaña, 2014). Teachers completed an interview, designed to elicit information about their literacy instruction, training, philosophy, and practices. Each teacher also participated in a series of five observations of their instructional time, providing a secondary means of documenting literacy instructional practices.

To assess the feasibility of the proposed design, I piloted the student interview and the reading assessment with a deaf adolescent student, a few months before the start of the study. The student was a 17-year old with bilateral cochlear implants. She used a bimodal communication system (i.e., signed and spoken English) and was enrolled full-

time in mainstream classes on a high school campus with a deaf and hard of hearing program. The pilot consisted of a two-hour 1:1 meeting with the student. During the first hour, the student completed the proposed semi-structured interview, designed to obtain information about her language and educational history as well as literacy perceptions and practices. During the second hour, the student was engaged in reading and thinking aloud, using expository text. As was later implemented in the study, the student was allowed to choose a passage of interest from Readworks.org. Completing the pilot was helpful in revising certain aspects of the proposed literacy instruction, such as limiting the number of targeted strategies per session.

I began the study September 2017 and continued data collection through March 2018.

Several questions guided the design and implementation of the study, including three that related to the status quo for instruction and strategy use before the study began:

- What strategies do the participating students use when reading expository texts?
- How do participating teachers address reading comprehension development in their respective classes?
- What specific strategies do the teachers use to support students' comprehension of text?

And two related to the intervention:

- How does explicit instruction of strategies impact these students' use of strategies?
- How does instruction affect the students' reading comprehension?

### **The Setting**

**Sites.** I initially contacted three local schools (i.e., two mainstream campuses with a DHH program and a local school for the deaf) to seek approval for the study and begin participant recruitment. I completed an application for each site as part of the required review and approval process.

**Hayward.** The Hayward Unified School District (HUSD) Deaf and Hard of Hearing (DHH) program had been running for more than 20 years. At the time of the study, the district provided services to approximately 88 DHH students at the elementary through high school grades. The majority of DHH students, including all students at the middle and high school grades, received most or all of their instruction in mainstream classes. The program consisted of four DHH Special Day Classes, all at the elementary level, that were taught by a Teacher of the Deaf using signed and spoken English. Collaboration between the mainstream and DHH teachers and support staff was reported to vary widely by site and personnel. The DHH program had decreased in size over the years (e.g., used to include a preschool class and DHH Special Day Classes at the middle and high school levels) and increased its mainstreaming practices. According to the district liaison, the program lacked the adequate funding and resources needed to provide students with optimal support (e.g., in number of paraprofessionals proficient in sign language).

**Santa Clara.** The Santa Clara County Office of Education (SCCOE) DHH program was founded in the 1960's. It was initially an oral program and managed by the school district. The program changed to using a Simultaneous Communication (SimCom) approach to instruction (i.e., using signed and spoken English) in the 1970's and was



taken over by the county in 1983. Per program administrator and participating students, the program practiced a gradual shift in using Signed English to American Sign Language from the lower grades to the high school grades. The program had grown over the years, with regards to the age range of students served and total number of students enrolled. At the time of the study, the program served 119 students, from 3-22 years of age. The program consisted of self-contained classes, of 6-10 students per class, at every level (i.e., preschool through transition). The percentage of students who received instruction in mainstream classes vs. self-contained classes varied by grade level, with the largest percentage of students who were mainstreamed (i.e., 38%, in the high school). Administrative support was reported to vary widely (i.e., quite challenging at the elementary school and in contrast welcoming and “inclusive” and the middle and high school sites). Similar to the HUSD DHH program, the SCCOE program was also challenged by inadequate resources in providing equal access and optimal support to their students (e.g., limited in number of qualified interpreters and staff and the necessary transportation services for participation afterschool programs).

**Student recruitment.** Once the HUSD and SCCOE campuses approved the study, I initiated student (and teacher) recruitment. I shared information about student candidacy criteria<sup>5</sup> with liaisons (i.e., a case manager and a Teacher of the Deaf) who identified potential candidates. I also completed a review of student files to collect preliminary information about each student who was referred as a potential participant. Parents and students received a copy of consent forms, providing them with information about the study and asking for their participation. Consent forms were provided in Spanish to parents whose native (and preferred) language was Spanish. Once I had obtained signed consents from five parents and students, I stopped the recruitment process. Of the initial five consenting participants, only four were judged to be candidates for the study. The fifth participant was dismissed from the study following standardized and informal reading assessments because observations and analyses indicated a high percentage of decoding errors, even at several grade levels below the student’s enrollment level.

**Students.** Four adolescent students, all juniors aged 16 and 17, participated in the study. Two of the students were enrolled in the HUSD site and communicated using spoken language only and the other students were enrolled in the SCCOE site and communicated using a combination of signed and spoken language (i.e., signed and spoken English). These latter two students, Jill and Jason<sup>6</sup>, were enrolled in the DHH SimCom program, where they received most of their instruction in self-contained classrooms, led by a Teacher of the Deaf who used signed and/or spoken communication to provide *direct* instruction to a small group of students. When attending mainstream classes, these two students were always accompanied by a sign language interpreter. Students in the SimCom program had been exposed to American Sign Language through middle and high school grades but primarily used signed English when using manual communication. Students at HUSD campus, Leo and Kevin, received a majority of their

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<sup>5</sup> Candidacy criteria included: an active IEP, reading performance two or more grade levels below student’s current standing, absence of co-occurring conditions that complicate learning and development (e.g., Autism, developmental delay).

<sup>6</sup> All participant names are pseudonyms to better ensure confidentiality

instruction in mainstream classrooms, where a hearing teacher instructed a large group of students using spoken English. Neither of these two students had a sign language interpreter. Students on both campuses were frequently exposed to written English during instructional times.

All four students were the only deaf or hard of hearing (DHH) member<sup>7</sup> in their family. They represented the larger population of individuals who are DHH in the following ways: (a) they were born to hearing parents, and (b) attended a mainstream educational setting (Shaver et al., 2014).

Each student participant took part in a preliminary data collection procedure (described in detail under the student data section) that included three components:

- An interview to gather information about the student's language and educational history, literacy development, literacy identity, and current literacy practices;
- A reading assessment, using the Gates MacGinitie Reading Test (GMRT);
- Informal reading assessment to determine a Lexile level judged to represent an "intermediate difficulty" (Baker & Brown, 1980) or instructional level of text complexity.

Characteristics of the four participants are described in detail narratives and summarized in Table 2.1.

**Leo.** Leo was a 17-year-old male. He lived with his mother, father, and an older sister. He was also initially diagnosed with hearing loss at six years of age, one year after immigration to the United States. Reported information indicated Leo's hearing loss was progressive (e.g., student was talking, though limited, at age two). Leo received hearing aids shortly after initial diagnosis. Because his hearing thresholds declined over time, he eventually reached candidacy criteria for a Cochlear Implant (CI). Leo received one implant at age nine and a second implant at 11 years of age. Leo had been enrolled in a DHH program that used signed and spoken English through the elementary and middle school grades. Since entering high school however, he reported shifting to using auditory-verbal communication only. This change was in part due to lack of access to communication partners who used sign language. Leo used spoken English when communicating with me and displayed very good speech intelligibility. Leo's home (and first) language was Spanish. Family members were reported to communicate with one another (e.g., parent to parent, parent to child) mostly in Spanish. Although Leo reported limited Spanish *expressive* language skills, he used it to communicate with most family members, except his older sister with whom he used spoken English. Leo's mom had learned and occasionally used a very limited number of signs. Leo's sister had recently taken her first sign language class. In general, Leo reported his family was aware of his communication needs. Leo and family members used communication strategies (e.g., request for repetition of a message, paraphrasing and elaboration) to improve Leo's access to spoken language.

Initial GMRT assessment scores indicated performance to be at the 4<sup>th</sup> grade level. Leo identified the following as factors that had supported his literacy development over the years: access to closed captioning, access to books in the house, help in word pronunciation from sibling, support in learning letter-sound correspondence from speech

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<sup>7</sup> Deaf or hard of hearing identification in this study is differentiated from adult onset of hearing loss.

and language therapist, and use of video recorded media in better understanding academic content and lexical acquisition. When asked how he felt as a reader, Leo said “I’m ok.” Leo recalled becoming more motivated to read in middle school, as he began to pay more attention to peers reading.

**Kevin.** Kevin was a 16-year-old male. He had had a history of ear infections and ear surgery at a young age and was initially diagnosed with “significant” hearing loss at age six. A hearing assessment at the time of participation in the study indicated an unusual U-shaped hearing loss of a dipping mild to moderate-to-severe hearing threshold from 750 to 2000 Hz and a rising moderate-to-severe to mild hearing threshold from 2000-6000 Hz. Kevin had two hearing aids. Although he initially reported using them about 50% of the time while in classes, later observation and questioning revealed he rarely used hearing aids. The student’s decision for hearing aid non-use was despite recommendations by various professionals that aids would significantly improve his access to verbal language. Kevin communicated using spoken English and was highly intelligible. He reported himself to be an auditory-verbal communicator. Kevin’s home language included Tagalog and Bulgarian. Student reported understanding conversational Tagalog but speaking only in English. Kevin’s mother, stepdad and two younger siblings were reported to use English most of the time. Kevin had been exposed to sign language through the elementary grades but, per parent, had never attended to this mode of communication. Kevin reported his parents had never used sign language either. When asked how he perceived his family to feel about a difference in hearing, he said: “they do not really mind but...sometimes, I do not hear them and my mom would think I am ignoring them...” Kevin reported that his family members do not use any specific strategies when communicating with him (e.g., reducing background noise). Kevin recognized he needed to be in close proximity to a communication partner for better reception and comprehension of spoken language but reported he did not advocate for himself (e.g., ask a communication partner to face him while speaking).

Kevin had received instruction in self-contained classes in the past, but was enrolled full-time in mainstream classes at the onset of the study. Within a few months, the educational team determined Kevin would benefit from the support of a resource classroom specialist. Kevin was therefore advised to drop one of his elective classes and to enroll in a resource class. Kevin’s initial GMRT assessment score indicated reading performance at slightly more than two grade levels below actual grade level. During his interview, Kevin had accurately estimated his reading ability to be delayed by about two years. When asked about literacy development from a young age, Kevin identified access to closed captioning and encouragement from teachers (to read) as factors that contributed to his development. Kevin did not recall having had many books at home or joint reading time with parents at a young age. When asked how he felt as a reader, he said “I am kind of average...between like other students...”

**Jill.** Jill was a 16-year-old female who was born deaf and identified at birth. Jill and her family moved out of the United States shortly after her birth and returned when she was 15 months old. Jill received a cochlear implant (CI) at three years of age. At the time of the study, she had one CI and one hearing aid but reported using only her CI regularly. Jill’s home language was Spanish. Parents have limited English Proficiency, especially father. Jill reported her parents both know some sign language. According to Jill, neither have ever attended sign language classes but used a book to learn. Father’s

sign proficiency is quite limited and Jill has difficulty understanding her father's signed communication. Mom signs "clearly" and can sign simple sentences (e.g., I want milk). Jill has three siblings, two of whom also use sign language to a limited degree. Jill's youngest sister has learned sign language by watching and imitating Jill. Jill's family members communicate mostly in spoken Spanish with one another. Her siblings communicate mostly in spoken English with Jill. Jill reported understanding a little Spanish and using mostly English (and some sign language) to communicate with her family. Jill reported her family's acquisition and use of sign language to be indicative of their interest in deafness. Jill's speech was quite intelligible but very soft (low volume). Jill had always been enrolled in a SimCom program. GMRT assessment scores indicated an estimated four year reading delay. Jill identified sign language and strategy-based literacy instruction (e.g., rereading and relying on context clues to decipher word meaning) as factors that had supported her literacy development. Jill did not recall having had many books in the house or reading jointly with her parents as a child. She reported having *recently* discovered closed captioning and acknowledged that technology may be used to support an individual's reading development (e.g., via use of a dictionary and video media). When asked how she felt as a reader, she said "honestly, I do not like to read" but acknowledged reading to be important for communication and overall development.

**Jason.** Jason was a 16-year-old who was initially identified to have hearing loss at two years of age. He was enrolled in a SimCom program shortly after diagnosis. Jason's parents had pursued cochlear implantation when he was three years of age but were denied. Jason received his first implant at 11 years of age and a second implant at 12. Jason's home language was also Spanish but he reported having "little" proficiency. Jason reported both his parents to have limited sign language skills (mom better than dad). Mom had practiced sign language using a DVD when Jason was in second grade and had more recently attended sign language classes (Signed English) for a limited time. Jason described her signing (including finger spelling) as "slow". Mom was capable of signing simple utterances (e.g., Can you help me clean the bedroom?). If speaking English to one another, Jason felt he could understand his parents' communication; however, parents (and siblings) mostly used Spanish at home. Jason has three siblings, a 14-year old brother, a 4-year old brother, and a 1-year old sister. Jason's teenage brother does not know any sign language and his 4-year old brother knows a limited number of single- word signs (learned from mom). Jason communicated using signed and spoken English and reported recent increased awareness of American Sign Language. Jason's speech was very low in volume and of low to moderate intelligibility. Sign language was therefore essential in communicating effectively. GMRT scores indicated very low reading level, which differed significantly with the district standardized assessment scores obtained a few weeks prior. Informal assessment, using leveled passages, was therefore completed to better determine Jason's instructional reading level. When asked about literacy development, Jason identified early access to closed captioning and books and trips to the library as factors that supported early development. Technology (e.g., using a device to look for word meaning) and strategy-based literacy instruction (e.g., rereading) were reported to support recent and ongoing literacy development. When asked how he felt as a reader, Jason said he was "motivated".

**Table 2.1: Student Profiles**

<b>Data</b>	<b>Leo</b>	<b>Kevin</b>	<b>Jill</b>	<b>Jason</b>
<b>Age/Grade</b>	17 Junior	16 Junior	16 Junior	16 Junior
<b>Age of ID</b>	6	6	birth	2
<b>Communication Modality</b>	Oral Intelligible speech Exposed to sign language elementary grades through middle school Used spoken language since Freshman year	Oral Intelligible speech Exposed to sign language through elementary grades	Bimodal (signed and spoken English) Intelligible speech (low volume)	Bimodal Preferred signed modality Speech quite soft and not very intelligible
<b>Amplification (Hearing Aid, Cochlear Implant)</b>	2 CIs	2 HAs Rarely used	1 CI, 1 HA	2 CIs
<b>Educational Program</b>	Mainstream classes for all but one period	Mainstream classes for all but one period	SimCom program Self-contained classes for all but one period Enrolled in one mainstream class with interpreter	SimCom program Self-contained classes for all but one period Enrolled in one mainstream class with interpreter
<b>GMRT (Grade Equivalency)</b>	4.7	8.7	6.9	2.9**

\*\*Grade level equivalencies did not represent instructional reading level for all students. Informal assessment was therefore used to establish a more representative level.

**Teachers.** Four teachers, who were assigned to teach each of the participating students, took part in the study. Two mainstream teachers, referred to as Tracy and Julie, were recruited from the school where Kevin and Leo were enrolled. The other two teachers, referred to as Joy and Kathy, were recruited from the deaf and hard of hearing SimCom program where Jill and Jason were enrolled.

**Tracy.** Tracy was a mainstream English teacher with a total of 15 years of experience. She had left teaching for a few years to work in the gaming industry and had returned one year prior to the time of the study. She had a Social Science and an English Clear Credential and a Cross-cultural Language and Academic Development (CLAD) certification. Tracy spoke highly of her teacher training program but expressed that ongoing efforts at *self*-education is critical to professional growth and development. Tracy had completed four graduate classes, focused on the Common Core, urban education, literary analysis, and graphic novels, via an online program during the summer immediately before the onset of this study. She also mentioned a sense of pride in the teaching profession, a student-centered attitude, and early experiences of teaching at-risk students to have contributed to developing a creative and responsive approach to instruction. Tracy reported having had limited experience teaching students with a diagnosis of hearing loss (i.e., a total of 5-6 students through 3 or 4 years of teaching). She reported instructing primarily via speech, supplemented by visual supports – including objects.

Tracy said she had decided to reduce the time spent on reading content in order to increase time spent on instructing students on *how* to read effectively. Given this change, Tracy planned to assign thirty minutes of independent reading time as homework. When asked about her literacy instructional approaches, responses indicated a focus on: improving students' knowledge of standard American English grammar and punctuation conventions, vocabulary development, building students' knowledge of technological tools, and development of written composition skills via guided practice. Tracy also mentioned she is highly focused on encouraging students to think about assigned content and their own thinking, via modeling and verbal prompts (e.g., *Why do you think you made that mistake? Why do you think that is right? What do you think about this?*).

**Julie.** Julie was a mainstream English teacher as well. She had earned her bachelor's degree in English and was completing her supervised teaching experience, required for earning a clear credential. Although she did not have certification specific to reading instruction, she reported having had several training opportunities. Julie was starting her third year of instruction. She had had a few students who were deaf or hard of hearing the previous year and a few new students this year. Julie reported using power point slides often, to supplement oral instruction. Both Tracy and Julie taught classes with a range of 20-34 students.

Julie had not begun daily reading activities at the time of our interview but intended to assign thirty minutes of reading in class *or* at home once students had received some "introductory" instruction. Students would begin by reading a classic novel and be introduced to more expository text later in the academic year. When asked about her approach to supporting students' reading comprehension, Julie reported she models "annotating" or "talking to the text" and provided examples of identifying advanced words, using context clues to guess the meaning, and interacting with the text (e.g., using colored markers to indicate interesting, confusing, and important

information). Julie reported that observing and talking to her master teacher and other experienced teachers had played a more significant role in her professional development, as compared to the literacy classes completed through her teacher training program.

**Joy.** Joy had been a Teacher of the Deaf for 14 years and had begun her teaching career in the same SimCom program where she continued to practice at the time of the study. She instructed students in self-contained classes of an average of eight students per class. Joy had taught a variety of subjects, including algebra, US history, government, economics, and English. I observed Joy during her History class instruction. She described her mode of communication as Pidgin Signed English (PSE), and indicated shifting from signed to spoken language or from American Sign Language (ASL) to Signed English (SE) in response to situational demands (e.g., whether addressing a single student or whole class, student with auditory verbal skills or signing student). Joy had had training in both ASL and SE. She had completed a three-year ASL training at Gallaudet University and had had SE training at San Jose State University. Interview responses indicated Joy had given much thought to her literacy ideology and practice, the development of which had been influenced by her own experiences from childhood to present time:

You now maybe...I was a struggling learner...Parents were not educated. Mother did not graduate high school. Father blue collar worker...I had no help. So, learning how to read became so important to me because I felt it empowered me...I feel like literacy equates to power and more control over self so as I took that forward, in college, just...having to find strategies that worked for me...when learning to read; learning how to read complex stuff. And then...just doing my own research...And whatever strategy I was exposed to, needing to learn more about that. I really feel it was more self-initiated...

In addition to early and ongoing personal experiences (as a student, a parent, and a teacher), Joy reported several other means of further developing her literacy instructional practices, including: intuition, independent research, implementation and revision of approaches, and attention to student feedback.

Joy reported dedicating 20-30 minutes of class time to daily reading, and was knowledgeable of several different kinds of literacy strategies, such as: previewing vocabulary, using context to derive word meaning, attending to text structure, and visualizing. She also reported, and was observed to use, strategies that are uniquely helpful for students who are deaf; e.g., mapping signs onto words. Joy also believed in and regularly practiced pairing students for peer to peer support; something she referred to as working with “elbow partners”.

**Kathy.** Kathy had been a Teacher of the Deaf for 17 years. She began her career in a small private preschool for children 3 to 5 years of age and had then continued working at various public middle and high school campuses with a DHH program. At the current site, Kathy reported instructing students in self-contained classes of 5-10 students. She taught a variety of subjects, including: Math, Reading, Health, and Science. I observed Kathy during her Science instructional time. Kathy reported primarily using simultaneous signed and spoken English when instructing but also reported shifting to sign only or speech only in response to situational demands. Kathy had received two years of ASL training and 1-1.5 years of SE training at San Francisco State University when training as a deaf educator. A few years prior, Kathy had gone back to school to get her

Administrative credential. She reported this experience as essential to renewing her desire for improved teaching practices. When asked to identify a factor that had influenced the development of her literacy instructional practices, she stated, “Seeing how many students graduated that did not go on to college...” and thinking, “what are we doing wrong? What more can I do?”

Kathy reported dedicating about 30 minutes of a 90-minute class time to reading (i.e., when students are assigned to a silent or group reading activity and/or exposed to text during instructional time). Kathy was aware of and incorporated a variety of reading comprehension strategies, such as using morphological structure and context cues to derive word meaning, connecting content to personal experience, and building schema. She did report, however, that time spent on reading did not always guarantee comprehension.

**Table 2.2: Teacher profiles**

<b>Data</b>	<b>Tracy</b>	<b>Julie</b>	<b>Joy</b>	<b>Kathy</b>
<b>Years of teaching experience</b>	15	Completing supervised teaching experience	14	17
<b>Teaching setting</b>	Mainstream	mainstream	Self-contained DHH class	Self-contained DHH class
<b>Primary communication mode for instruction</b>	Speech, supplemented by visual supports	Speech, supplemented by visual supports	Spoken and signed English, American Sign Language	Simultaneous signed and spoken English
<b>Number of students in classes</b>	20-34	20-34	Average of 8	5-10

### **Data Collection and Analysis**

Given that my primary interest was an assessment of the effect of explicit instruction of reading comprehension and metacognitive strategies on *students’* literacy practices and performance, the majority of time (and data) was dedicated to individualized and 1:1 assessment and intervention with the four participating students. It was also important, however, to understand the classroom practices that were likely to contribute to literacy changes or outcome. I therefore collected data related to the participating teachers’ perspectives and literacy instructional practices as well. Student and teacher data consisted of a variety of qualitative and quantitative measures, including interviews, observations, and informal and standardized assessments. Data type and collection procedures are summarized in the following sections.

#### **Student Data**

Student data consisted of responses to a range of assessment/performance tasks: (a) responses to baseline and post-intervention interviews, (b) baseline and post-intervention performance on the Gates MacGinitie Test of Reading (GMRT), (c) baseline performance during informal reading assessment to determine each student’s instructional reading level (i.e., appropriate Lexile level), (d) baseline and post-



intervention analysis of reading strategies, and (e) baseline and post-intervention response accuracy to comprehension questions, (f) baseline and post-intervention scores on self-constructed written summaries, and (g) baseline and post-intervention performance on informal vocabulary probes. Each week, students were also asked to submit a weekly journal describing their reading activities, time spent on reading, challenges, and approach to overcoming the challenge.

**Interviews.** Semi-structured student interviews, using a list of predetermined interview questions as well as free-flowing conversation in response to spontaneously shared information, were conducted 1:1 in a private space and video recorded for later reference and accurate transcription. Initial (baseline) interviews were about one hour in length. Questions were designed to elicit information about students' language and educational history, literacy development, literacy identity, and current literacy practices. During this initial interview, students were also asked to complete a checklist (see Appendix B), to indicate the frequency with which they used a variety of 22 reading comprehension strategies. I completed two post-intervention interviews. The first was approximately 45 minutes in length. Questions for this interview were designed to assess the social validity of the intervention (e.g., student's satisfaction with the intervention, student's use of strategies across settings, and changes in student's reading habits). The second was about 30 minutes in length and designed to assess the students' continued use of strategies following withdrawal of intervention (i.e., to probe maintenance of strategy use about two months after the intervention had ended). I used simultaneous signed and spoken English when interviewing Jill and Jason and spoken English when interviewing Kevin and Leo, corresponding to the students' preferred expressive language modality. Baseline interview questions are presented as Appendix A and post-intervention questions are presented as Appendix I.

**GMRT.** The GMRT is a standardized reading assessment in which students are presented with a series of 11 passages at their grade level and asked to read each (silently) and to respond to a set of 4-6 multiple choice comprehension questions per passage; total of 48 questions. The test consists of both narrative (fiction) and expository (informational) passages. Students have 35 minutes to read as many passages and respond to as many questions as possible. Students may reread a passage if they wish. They are instructed to mark the answer they think is correct, even if uncertain (i.e., students are encouraged not to leave items blank). A student's raw score (i.e., total number of correct responses to questions) can be converted to various types of data, including: a grade level equivalency, national percentile rank, and national stanine. The raw score can also be converted to a Lexile score (i.e., a score that is used to calibrate passage difficulty<sup>8</sup>). The assessment was administered following standardized procedure, with the exception of the use of simultaneous signed and spoken English when presenting instructions to Jill and Jason. The GMRT was used as one means of assessing student performance at baseline and post-intervention. Although dynamic assessment, using non-standardized tools, present a highly valuable means of completing an examination of various aspects of a literacy activity and student performance (e.g., effect of student's topic familiarity or passage length on comprehension), standardized tools allow for

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<sup>8</sup> A Lexile score represents text complexity with respect to the complexity of vocabulary/concepts and sentence structure. Various formulas are used to calculate the score.

comparison of student performance to that of same-aged hearing peers. In addition, a change in standardized test scores (e.g., a change in the student's percentile rank as opposed a change in raw score) indicates growth beyond an expected degree within a given period of time; therefore, a change in percentile rank may serve as evidence in support of the efficacy of an intervention.

**Informal reading assessment.** The GMRT Lexile score conversions were used in the spirit of a screening tool to find an entry point to an informal assessment of each student's instructional reading level, using passages from Readworks.org, an online educational resource (described in more detail under Procedures). If a student demonstrated multiple dysfluencies and decoding errors or demonstrated very poor comprehension as measured by short answer questions when presented with a passage at the GMRT suggested Lexile, informal assessment continued until an appropriate level was determined. Using text that is representative of individual student's reading level was an important aspect of ensuring vocabulary and decoding demands were not too high. It was also a means of ensuring that students could allocate resources to learning comprehension strategies (Duke & Pearson, 2009).

**Reading strategies survey.** Following a review of literature that discussed and examined the use a wide variety of reading comprehension and metacognitive strategies (Banner & Wang, 2011; Mokhtari & Reichard, 2002), I adopted a list of sixteen strategies to target for assessment and instruction (presented in Tables 3 and 4). The list consisted of several strategies that were easy to identify and observable; I labeled these as "observable". By contrast, several others that were less transparent and difficult to identify, I labeled as "covert". Observable strategies consisted of overt behaviors I could document simply by watching a student read aloud. Covert strategies consisted of thoughts and processes that can only be detected when students provide commentary about their use. The list of targeted strategies (as well as those spontaneously used by students, reviewed under Results and Discussion) represent the three classes of strategies reported by Banner & Wang (2011): strategies used for constructing meaning, those used for monitoring and improving comprehension, and evaluative strategies.

**Comprehension questions.** To assess comprehension of each passage, I composed a series of five short answer questions using the 2015 National Assessment of Educational Progress (NAEP) guidelines. According to the NAEP guidelines, comprehension questions presented can/should encourage students to: (a) "locate and recall" important elements (e.g., main idea, or details of a text), (b) "integrate and interpret" information (e.g., by using background knowledge, comparing/contrasting, connecting information across text), and (c) "critique and evaluate" (e.g., addressing the accuracy, credibility, and/or function of some aspect of the text). Given my early observation of participating students and their performance on the initial reading assessments, I decided to limit the types of questions to the first two categories (i.e., locate and recall, integrate and interpret). Locate and recall questions include those that require students to identify a main idea or relevant detail, describe a sequence of event, and/or explain a causal relationship. Integrate and interpret questions consist of those that require students to describe a problem and a solution, infer mood or unstated assumptions, draw conclusions, and/or find evidence in support of an argument. I drafted most of the comprehension questions myself, using the NAEP guidelines. Occasionally

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**Table 2.3: Observable strategies**

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<b>Strategy</b>	<b>Description</b> <b>*Example from student transcripts</b>
<b>Previewed the text, pictures, or questions before reading</b>	Student was credited for preview of text (e.g., heading/subheading) or image Student was credited for previewing questions only when taking time to look over most/all of the questions
<b>Reread</b>	Rereading of words and/or phrases Rereading in either the oral or signed modality Rereading parts of a paragraph, silently or aloud, when pausing to verbalize strategies
<b>Used pictures, Tables, and Figures</b>	Attending to images Student was credited for this strategy if observed to attend to image or if he/she reported it
<b>Drew a picture</b>	Student's own depiction
<b>Took notes</b>	Student's own notes; including a summary, question, word definition, etc.
<b>Highlighted, underlined, or circled information</b>	Behaviors considered as one category and reported as "interaction with text"
<b>Identified unknown words</b>	<i>Student</i> identified a word as unknown *Student paused while reading, finger spelled and verbally produced <i>dozen</i> , and said she believes it means 12
<b>Slowed down</b>	Observed change in pace of reading and/or student's self-reported use of slowing down to better understand Including slowing down to decode difficult to pronounce words and/or to finger spell words *Many examples were of multisyllabic words, technical jargon, or proper names
<b>Use the Internet for more information (pictures, video, additional reading)</b>	Use personal phone or investigator's laptop to search for image, video, word definition, or other information supporting comprehension

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**Table 2.4: Covert strategies**

<b>Strategy</b>	<b>Description</b> <b>*Example from student transcripts</b>
<b>Thought about the main idea</b>	If student said they had thought about main idea when starting to read, I probed for information about <i>how and when</i> they did so. *Students often identified the title, key words, images, and/or first paragraph as important sources of information related to the main idea.
<b>Thought about what s/he already knew about the topic</b>	From personal experience, readings, videos, discussions, etc.
<b>Thought about whether the information relates to other readings</b>	From classes or student's self-selected or independent reading
<b>Imagined people, place, events</b>	Made a mental picture of certain things Students were asked to describe a few details *When reading about art and artists, one student described a mental image of a group of male and female architects in an office, busy designing
<b>Asked questions while reading</b>	Student generated a question(s) indicating curiosity and interest in learning more about the subject, a prediction, uncertainty about their own understanding, etc. *When reading about bacteria, student asked, <i>I wonder what would happen if we did not have the type of bacteria that help with digestion (of food)?</i> *When reading a about a boy who used a service dog, student asked, <i>What happened to Preston?</i>
<b>Predicted what may happen next or how the characters may feel, think or plan</b>	<i>*I can imagine how he would feel if he has to go to school without his dog</i>
<b>Recognized comprehension breakdown</b>	Students were asked if at any time while reading they stopped to think, <i>I do not think I understood that!</i> At times overlapped with recognition of unknown words If student was credited for identifying a specific unknown word, they were only credited for this strategy if during the probe they identified additional words
<b>Other</b>	Included students' use of strategies not listed *Recapitulation of a paragraph, evaluation or reaction to content, recognition that certain information about a familiar topic is new

however, I also found some of the questions presented on Readworks.org (described on page 35) useful and so copied and/or adapted them for use. An excerpt of a passage is presented in Figure 2.1 below. Corresponding comprehension questions follow.

## Books Through Bars

by ReadWorks



When people are sent to prison, they are deprived of many things: their freedom, the company of their friends and family, and many of the daily comforts they have enjoyed for most of their lives. In many cases, they are also deprived of something less obvious, but, for many people, just as dear: books. While some prisons have libraries, many do not. Those that do exist are generally poorly stocked and have many fewer titles than a typical public library. This means that an inmate may go many years with limited access to reading material. For a person who loves books or who wishes to learn about the world, this can be a harsh sentence indeed.

However, there is a group in Brooklyn that aims to help inmates receive some of the literature they want. As of 2013, the group, called Books Through Bars, gathers three times a week in the basement of a bookstore that overlooks the city's East River. The basement is small and dimly lit, but the walls are stacked high with wooden shelves, each packed to the brim with books. The books are arranged like a library, by sections. Novels are against one wall, history against another, and self-help and reference books against a third. All of the books are donated by people who believe that inmates, regardless of the crime they committed, should not be deprived of literature.

In the middle of the room is a table, piled high with letters. The letters come from prisons and jails all over the country. Books Through Bars advertises itself in magazines and pamphlets read by inmates. In the ads, they ask inmates to send them requests for books. So, the inmates write in, asking either for specific titles or books on a particular topic. The volunteers then try to match the requests to books in the Books Through Bars library. Each inmate receives two or three books. When the volunteer has selected the books, he or she wraps them in paper cut from old grocery bags, writes the address of the jail or prison the inmate lives in on the front in black pen, and adds the package to a stack of packages to be mailed. In one corner of the basement are milk crates filled with brown-paper packages, waiting to be taken to the post office.

Since the library is relatively small-it has only a couple thousand books-matching the inmates' requests can sometimes be difficult. One inmate writes in asking for a book about ancient civilizations, like the Mayans and Aztecs.

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*Figure 2.1.* Readworks expository text excerpt. This figure presents the first page of an assigned reading.

### **Questions: Books Through Bars**

1. Why did a group of people in Brooklyn start Books Through Bars?
2. What are *two* things that make it difficult for an inmate (prisoner) to get the exact book he/she wants?
3. Do you believe people involved in the Books Through Bars organization spend a large amount of money to keep it running? Why or why not? Use evidence from the text to support your answer.
4. Explain how Books Through Bars has affected the lives of inmates. Use evidence from the text to support your answer.
5. What is the author's purpose in writing this piece?

**Self-constructed summaries.** At each assessment session, students were asked to compose a written summary of their assigned reading within a ten-minute period of time. A summary not only served as a means of checking the students' comprehension of text but was also a targeted strategy, intended to teach students to effectively identify the main idea and important details, organize the content well, and express the content in their own words (Chi & Wiley, 2014; Fonseca & Chi, 2011; Palincsar & Brown, 1984). Because certain tasks (e.g., multiple-choice items that require recall of factual information) are deemed ineffective in differentiating between shallow vs. deep learning (Chi & Wiley, 2014), summarization may be used as a more meaningful assessment of comprehension (e.g., in checking whether student includes main idea, a majority of relevant details, and an evaluation of the content). Summarization is considered to be one type of formative progress monitoring; that is, an informal and ongoing measure of student performance that may be used to more effectively individualize instruction (Wixson, 2017).

I created a rubric, following the 2016 Literacy Design Collaborative Informational/Explanatory Task model, and used this rubric to score student summaries. The rubric consisted of the following three components of a well-written summary: an accurate and complete controlling (main) idea, relevant and accurate details, and content organization (see Appendix C).

**Vocabulary.** I also used the 2015 NAEP guidelines to identify three words from each passage to use in weekly vocabulary probes. The vocabulary probe was used to examine: (a) changes in students' awareness of unknown words, and (b) successful use of strategies in deriving the meaning of unknown words. The guidelines identify vocabulary selection criteria as: (a) "vocabulary of mature language users", (b) those that "label generally familiar and broadly understood concepts", (c) words that are "necessary for understanding at least a local part of the context", and (d) vocabulary that is "found in grade-level reading material." (p. 35) Two additional words were selected based on live (miscue) analysis of the students' read aloud. If a student's signed and/or spoken production of a word indicated lack of comprehension or dysfluency, the word was considered for a probe. Although students often misread more than two words per passage, I only selected two for the vocabulary probe in each session. The vocabulary probe was always limited to five words total.

### **Procedures**

Several procedures were involved in: (a) selecting the texts used in the study, (b) determining the verbal protocol or think aloud routine designed to elicit the students' thinking, (c) completing baseline data collection, and (d) implementing the intervention.

**Text selection.** Prior to the start of the study, I had considered using participating schools' curricular textbooks (e.g., language arts, history, biology) in selecting weekly passages for the study. I decided, however, to use an online resource instead, to better control for classroom instruction as a confounding variable (e.g., I did not want to risk assigning passages that had already been the focus of classroom instruction and could thus compromise my analyses of performance during assessment and intervention sessions). Readworks.org appeared, on first perusal, to be a good source for identifying expository passages of interest to students during all sessions (i.e., baseline and intervention). Readworks is a free online resource for educators and consists of both literary and expository texts at various Lexile levels. Lexile levels range from 0-2000 (roughly kindergarten to graduate school) in indexing text complexity; they are determined by collecting data from students' performance on comprehension measures and deriving formulas that examine text complexity. When all is said and done, Lexile levels reflect both a word and a syntax factor: (a) vocabulary (e.g., the proportion of commonly used words vs. advanced and low frequency words), and (b) grammatical complexity (e.g., the proportion of simple vs. complex sentences, operationalized as sentence length)<sup>9</sup>. Developers describe Readworks as an evidence-based resource and identify the 2000 Report of the National Reading Panel and the 2002 Rand Reading Study Group as two of the primary sources used in drafting Readworks content and instructional guides.

Allowing students to self-select the weekly reading material was determined to be more likely to result in higher motivation (Chambers Cantrell et al., 2016); therefore, each week, students were asked to browse the various subject categories or titles on Readworks.org and to choose a passage of interest. After several weeks, it became somewhat challenging to find articles of interest that (a) were within a student's Lexile level *and* (b) not too long to manage in a single intervention session. Thus, once a student identified a topic of interest, I sometimes used Newsela as a secondary source for finding the appropriate text. Newsela is similar to Readworks in its presentation of passages at various Lexile levels, enabling me to choose material linked to each student's instructional level and personal interests.

In addition to asking students to choose passages of interest, each week they were also asked whether the topic was "familiar" vs. "unfamiliar" (i.e., whether they had had background knowledge of the topic). Because background knowledge is a strong correlate of reading comprehension (McNamara & Kintsch, 1996), I wanted to document this aspect of the reading for later analysis.

Although a couple of the students had initially expressed an interest in reading fiction, I decided to use expository or informational text because it is reported to be the most commonly used genre of text at the secondary level (i.e., 70% of what students in 9-12 grade read) and it is also more representative of adult reading (Ehren, 2015). In addition, because students lack adequate exposure to this kind of text in the early grades, they are more likely to need instruction in effectively approaching reading and

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<sup>9</sup> For more information about Lexile level calculations, you can visit: <https://lexile.com/parents-students/understanding-your-lexile-measure/lexile-measures-reading/>.

comprehension of expository text across the subject area domains at higher grade levels (Elleman & Compton, 2017).

**Verbal protocol procedures.** Verbal protocol procedures (Ericsson & Simon, 1980; McGuiness & Ross, 2011) were used as the method of making a record of the students' thoughts and cognitive processes while they were engaged in reading aloud. Students were presented with specific instructions to think-aloud starting at the first baseline data collection session. Per reported guidelines (McGuiness & Ross, 2011), instructions were provided with minimal prompting and did *not* include a request for explanations or reasons for why students engaged in certain processes. Instructions for producing a running commentary while reading text corresponds to a "concurrent protocol" model, as contrasted with a "retrospective protocol". Students were instructed to verbalize their thoughts and strategies in *better* understanding text; in other words, in improving comprehension. This may be different than other investigators' approach to focusing on strategies that are used to *fix* comprehension breakdowns. In fact, as will be discussed, the students in this study were sometimes not even aware of a comprehension breakdown.

The following script was prepared before the first baseline session began and used to instruct students on the think aloud process:

*Ok. We are ready to start. Please read this story out loud. I would like to know what you think and what you say to yourself as you read. How is it you try to understand the passage? You can do anything you would normally do to help yourself better understand. Just remember that if you have a thought to share it by speaking it out loud. For example, if you see a word you do know and you pause to think: "Hmm, I think this means \_\_\_\_\_ because of the sentence." Or, if you start to imagine a part of story, like the person, the place, or whatever is happening, let me know by telling me: "I am picturing the boy on a hill...". If you are not sharing your thoughts with me yourself, I will stop you where the paper is marked orange to remind you. Do you understand what I am asking you to do?*

To better ensure comprehension of the think aloud procedure, a drawing activity was used to *demonstrate* think-aloud during the first session. Because student performance during the baseline phase should represent student's existing skills *pre*-intervention, I used a drawing activity to model think aloud (as opposed to a reading activity) to safeguard against affecting reading performance. The following script was used to model think aloud during the drawing activity:

*Every time we meet to read a story, I am going to ask you to think aloud. What I mean is, I am going to ask you to share your thoughts out loud as you are reading. I am asking you to share your thoughts with me so I can learn how you read to understand. I am going to show you what I mean by thinking aloud using a drawing activity. Suppose, I have to draw a fish. I can just draw a fish silently but I will share my thoughts with you so you understand how I draw an image. I Immediately imagine the fish in my mind. It is a goldfish. It is orange. I imagine its shape and draw that first. I then imagine the fins and add those to the drawing...That is what I will be asking you to do as you read; to think out loud.*



Although verbal protocol may be challenging for students who have language limitations and/or students engaged in highly complex tasks (McGuinness & Ross, 2011), previous research using the method with DHH students (Benedict, Rivera, & Antia, 2015; Schirmer, 2003; Schirmer, Bailey, & Schirmer Lockman, 2004) had shown it to be a promising means of better understanding metacognitive skills and reading comprehension strategies for a younger population of deaf or hard of hearing students. Reading and thinking aloud changes the reading experience, as compared to silent reading without pauses to explain one's thoughts and strategies, but the approach can be beneficial for both student and teacher and revealing to scholars studying student thinking. Thinking aloud can facilitate metacognitive processes for the student (e.g., facilitates recognition of comprehension breakdown). It also allows the listener (e.g., the teacher) to analyze the student's thought processes and comprehension difficulties and to thus provide individualized and appropriate instruction (Almasi & Hart, 2011). In fact, the verbal protocol procedure has been used in secondary teacher training as a means of increasing a teacher's awareness of the necessary cognitive processes in comprehension of complex text. As Ogle & Lang (2001) note, "By modeling and thinking aloud about their own reading processes...teachers can better identify the supports needed to help their students develop thoughtful reading in difficult materials." (p. 141)

At the beginning of each session, students in this study were presented with instructions to read aloud and to verbalize what they were thinking or doing to better understand their assigned text. They were also verbally and visually reminded to share their thoughts at the end of certain paragraphs, which were marked with a colored dot.

**Baseline data collection.** Once an appropriate instructional Lexile level was determined via standardized and informal reading assessment, baseline data collection began. Each baseline session was scheduled for 45-60 minutes. Baseline sessions always followed the same format: (a) student was presented with a printed series of five short answer comprehension questions and the corresponding printed expository passage; (b) I presented the instructions for student to read the passage aloud<sup>10</sup> and to verbalize their strategies; (c) student read the passage within a 15-minute period of time, and I noted any observable strategies, such as rereading of a word or phrase (d) student was asked to compose a written summary of the passage in ten minutes, (e) student was then provided another ten minutes to respond to short answer comprehension questions; (f) I probed the student's use of each of the targeted covert strategies, by asking the student whether they used each strategy and if so to provide an explanation or example of it; and (g) I probed the student on their knowledge of five vocabulary words by asking student to identify whether a certain word was known or unknown, to define the word, and to describe how the student derived the meaning of an unknown word. Supplementing the student's own verbal account of strategies with documentation of observable behaviors, a request for information about targeted covert strategies, and the vocabulary probe were used to ensure the most detailed or comprehensive means of data collection. Although occasionally students spontaneously shared their thoughts about covert strategies, I often had to elicit information about them. If a student said they had used any of these strategies, I asked for an example or explanation. The "Other" strategy category was used

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<sup>10</sup> Kevin and Leo read aloud verbally. Jill and Jason read aloud using simultaneous signed and spoken language.

to capture students' use of a strategy *not* included in the pre-determined list (e.g., recapitulation or verbal summary or personal evaluation of or reaction to content).

The number of baseline sessions completed differed for each student. This study followed a concurrent multiple baseline design in which: (a) the participating students all began baseline data collection at the same time, and (b) literacy instruction followed a staggered start time, implemented in the following manner:

- Instruction began for the first participant while the other three continued in the baseline phase for an additional two sessions;
- A second participant began while the third and fourth continued in baseline
- Then the third and fourth began the intervention in a similar manner.

Staggered start time is a recommended practice and intended to control for potentially confounding external variables, such as classroom instructional effect (Horner et al., 2005).

Following multiple baseline design guidelines (Horner et al., 2005), pre- and post-intervention data were analyzed for:

- Immediacy of effect (i.e., how quickly a change was observed);
- Variability (i.e., stability vs. change in score in baseline and intervention phases);
- Level (i.e., average scores in the baseline vs. intervention phases).

Leo completed four baseline sessions and was the first student to begin intervention. Jill, the second student, completed two additional baseline sessions (i.e., a total of six baseline sessions). Jason, the third student to begin intervention, completed a total of eight baseline sessions. Kevin was absent two weeks during the baseline data collection phase so even though he was last to begin intervention, he only completed a total of six baseline sessions. Once intervention began, students participated in one hour of instruction and one hour of assessment every week. Each week, I planned the intervention session based on an analysis of the student's performance from the last session (e.g., I used my assessment of Leo's performance from his last baseline session to plan instruction for our first intervention meeting). The inclusion of ongoing assessment was considered an important part of the instructional design (Duke et al., 2011).

**Intervention.** The intervention used in this study was designed in consideration of the three essential aspects of strategy instruction, as proposed by Almasi & Hart (2011): context, agency and metacognition, and scaffolding. The *context* of intervention was the "safe" environment in which students were encouraged to identify comprehension difficulties and explore helpful strategies. Students were always considered active participants in the intervention session; thus, facilitating their sense of *agency* and development of *metacognitive* or self-monitoring skills. The use of verbal protocols and weekly journals were meant as additional means of building student agency and metacognition. To support student learning, I discussed and modeled specific strategies. Although two strategies - identification of unknown vocabulary and summarization - were more consistently targeted throughout the intervention, instruction and scaffolding was flexible and implemented in consideration of weekly analyses of students' independent reading and strategy use. The goal was always to "gradually release the responsibility" of identifying and using effective strategies (i.e., to reduce the frequency of modeling and instruction) (Duke et al., 2011).

Once intervention began for a given student, they participated in alternating hourly instruction and assessment sessions for ten weeks (i.e., students and I met twice a

week, the first time to provide instruction on a student's use of reading strategies and comprehension of assigned text from the previous session and a second time for the student to complete an independent reading of a new text, using think aloud). During each independent reading, I documented the student's reading difficulties (e.g., word decoding errors), strategy use, and response to vocabulary probes. Following each independent reading, I scored the student's responses to comprehension questions and written summaries and noted particular concepts and/or paragraphs that had been challenging. The inclusion of this kind of ongoing formative assessment was considered an important part of effective instruction (Duke & Pearson, 2008/2009) since analyses were always used to plan the following intervention session.

During each instructional session, a student was supplied once more with a paper copy of the same passage used in the previous session's assessment. I began the session with a review of the strategies the student had used and discussed their importance (e.g., slowing down helps a reader think about content more carefully; allows for more processing time). I provided feedback about the student's written summary; identifying important details as well as missing information and evaluating the clarity and organization of the content. I reviewed 2-3 words student had defined correctly and/or incorrectly to reinforce a student's effective use of vocabulary strategies and to provide appropriate instruction in revising incorrect guesses. Because a vocabulary probe and review was completed at every session, students consistently received instruction regarding various strategies for deriving word meaning. These strategies consisted of: (a) using context (e.g., using related words and/or the content within adjacent sentences to make an educated guess about word meaning), (b) relying on morphological knowledge (e.g., to derive the meaning of a word such as *impossibility*), and/or (c) using a dictionary. I also discussed and modeled 1-3 additional strategies, from the list of 16 observable and covert strategies, that could have been helpful in supporting the student's comprehension of the text. Although some strategies were emphasized more often, having a large number to choose from meant students and I could be more selective about the type of strategy thought to support comprehension in different situations (e.g., when reading different kinds of texts) (Duke & Pearson, 2008/2009). The specific targeted strategies were always selected based on my analysis of a student's performance during the reading and think aloud activities and their performance on the two comprehension measures. A summary of an assessment session, my analysis of the student's performance, and a description of the subsequent intervention session is presented in Appendix F to clarify the adaptive and individualized aspect of the intervention. The various components of the intervention model correspond to those reported to be essential in strategy-based interventions (Duke et al., 2011; Pearson, Cervetti, & Tilson, 2008). To ensure consistency in the implementation of various essential components of intervention, I developed a checklist prior to beginning the intervention phase (see Appendix G). This checklist was used to complete the fidelity assessments (to be discussed on pages 69-71).

Through the first few intervention sessions, I emphasized the importance of previewing comprehension questions as I had noted none of the students had ever done so during baseline data collection. I discussed the importance of previewing questions as a means of identifying the kinds of information they were expected to attend to. The questions were also used to set a purpose for the reading (from the teacher's perspective). In addition to previewing questions, I recommended students either interact with the text

(e.g., highlight or underline words and phrases, write their own questions) or stop to summarize information in their own words. Intervention sessions ended with a rereading of a portion of the passage to provide an opportunity for student to implement various kinds of strategies. Each student was asked to reread 1-2 paragraphs and stop to share his thoughts/strategies. Each time the student stopped to verbalize a thought or strategy, I would also verbalize my thoughts or a strategy (e.g., student summarized a paragraph in their own words and I would share a question or prediction to model an alternative strategy). Through the first half of the intervention phase (i.e., first 4-5 intervention sessions), the student and I would reread the first few paragraphs of the assigned passage to practice strategy use. As the intervention progressed, I realized it might be more effective to target passages that had been particularly difficult for students to understand. I therefore started to ask students to reread these specific passages in thinking aloud and implementing various strategies. This change in the intervention approach may represent a more effective means of increasing students' awareness of comprehension breakdowns. An effect on students' awareness would need to be systematically examined in future studies.

Although much of the analysis was completed live, all sessions were video recorded to facilitate re-examination of the sessions. Recordings were used to complete fidelity and inter-rater reliability checks for 20% of the sessions. In completing the weekly fidelity and reliability checks with my external collaborator, I realized that in addition to strategy instruction I was often also providing students with relevant background information even though that was not a predetermined goal of the intervention. For example, when reviewing a passage about the function of the muscles of the body and injury prevention, the conversation with Leo naturally turned into a discussion of the brain as a control center, the left and right hemispheres, stroke and heart attack, etc. I questioned whether these discussions were interfering with the focus of the study on *strategy* instruction but on further reflection, I decided that sharing relevant background information was essential to making the instruction meaningful and motivating. Having watched the session with me, my external collaborator agreed and commented that the quality of interaction seemed to engage the student's desire and curiosity. Having rich discussions of text is an important aspect of effective reading comprehension instruction (Duke & Pearson, 2009 and is reported by d/Deaf adults as one component of "effective" reading (Silvestri & Wang, 2018).



Figure 2.2. Student in 1:1 session with me.

## **Teacher Data**

Teacher data consisted of an initial interview and a series of five observations (per teacher), scheduled within a six-month period of time. In addition, I sent occasional emails to teachers with clarification questions for which I sought a response (e.g., if observing an experiment in a biology class, I emailed the teacher to ask if there were any discussions or writing and reading assignments before or after the hands-on experiment to get a better sense of the literacy practices associated with the activity). I also shared a summary of my observations of a student's or a teacher's use of strategies on a few occasions. None of the teachers ever observed me in practice with the participating students. The teachers and I communicated about strategies and strategy instruction a few times during the entire length of the study. I do not believe these few instances of communication to have had any effect on the teachers' instructional approach. The only teacher who reported changing the quality and frequency of her strategy-based instructional approach was Joy, who had indicated an interest in researching and implementing such an approach during the initial interview. Changes in her approach were therefore believed to be attributed to her own interest (and history of independent research into classroom pedagogy).

Teacher interviews were completed at the beginning of the academic year. Interview questions were developed following a review of the literature (especially, Frankel, 2016) and were designed to elicit information about the teachers' literacy philosophy and classrooms practices as well as the training they had received in developing their practice (see Appendix E). Each interview was conducted in a private space and video recorded for detailed transcription and analysis. Interviews lasted between 60-90 minutes.

Each teacher was observed during five classroom instructional sessions, each of which was also video recorded for later reference. Although teachers were asked to implement their instruction as they would in the absence of an observer, there is no guarantee that aspects of instruction, such as selected activity, materials, or approach were not affected by the mere presence of me as an observer and the teachers' knowledge of the objective of the study. At each observation, I documented the instructional activity, material used, the teacher's prompts, the teacher-student interaction, and the teacher's use of literacy strategies.

## **Summary**

A total of four students and four teachers, at two public high schools, participated in the study. Students were diverse with regards to: age and degree of hearing loss, type of assistive listening device used, educational setting, preferred communication modality, and standardized reading achievement scores. Teachers were also diverse with regards to years of teaching experience, the communication mode used for instruction, and total number of students per class.

The proposed intervention study was implemented using a multiple baseline design. The intervention consisted of the use of think aloud as a means of assessing students' approach to reading expository text as well as a means of instructing the students in the use of certain targeted strategies to improve comprehension. Specific strategies were selected weekly in response to a student's performance and the content and/or demands of the assigned text. The dependent variables of interest included: (a) type and frequency of strategies used, (b) vocabulary skills (i.e., identifying and defining

unknown words), and (c) improved text comprehension, as measured by two informal tasks (i.e., response to short answer comprehension question and written summaries) and the Gates MacGinitie Reading Tests.

I collected a variety of data to ensure accurate representation of students' reading skills. For example, to examine the students' strategy use and change, I used interview questions (conducted prior to the start of intervention and following intervention), a strategy checklist, weekly analysis of students' reading behaviors, and journal entries.

## CHAPTER 3: RESULTS

The primary purpose of this chapter is to analyze the results in relation to the overall goal of the study and key research questions:

- What strategies do the participating students use when reading expository texts?
- How do participating teachers address reading comprehension development in their respective classes?
- What specific strategies do the teachers use to support students' comprehension of text?
- How does explicit instruction of strategies impact these students' use of strategies?
- How does instruction affect the students' reading comprehension?

I therefore examined: (a) the students' use of comprehension strategies before the start of the intervention as compared to their strategy use following instruction, (b) changes in reading comprehension as indicated by response accuracy to short answer questions, and (c) changes in comprehension as indicated in students' self-constructed written summaries. In addition, I completed a more detailed examination of the student's vocabulary skills and the strategies they used to derive word meaning. Throughout the study, I monitored the literacy instructional approach(es) the participating teachers were using so I could better determine whether intervention effects were attributable to the intervention vs. related to classroom instruction.

Before addressing each of the goals systematically, it will be useful to understand the specific challenges that students faced as they engaged in assigned reading and the corresponding activities. These challenges not only emerged during my weekly analyses of student behaviors but were also expressed in the student interviews and weekly journals. Following this discussion, I turn to the main analyses of growth from baseline vs. post-instruction stages, including a close analysis of the key outcome measures of strategy use, response to comprehension questions, students' self-constructed written summaries, and performance during vocabulary probes.

### Reading Challenges

Interview data and weekly analyses during assessment sessions, including miscue analysis, vocabulary probes, and analysis of students' comprehension of short answer question indicated the following to contribute to reading comprehension difficulties: (a) decoding and/or word recognition errors, (b) lack of comprehension of word meaning, (c) and lack of knowledge of certain print conventions. All four students had indicated vocabulary as a challenge to reading and comprehension during the initial interview and continued to report vocabulary as a challenge to reading comprehension in their weekly journal reports. Although baseline assessment had been used to determine each student's instructional text complexity level, decoding and vocabulary demands were still notably high in the students' weekly assigned reading. In fact, on a few occasions informal assessment revealed the students' lack of comprehension of words essential to the main idea or important details of assigned reading (e.g., lack of comprehension of *juvenile*, *offender*, and *curfew* when reading about one juvenile's offense and sentencing). These difficulties may have dwarfed any effect of strategy instruction and use (e.g., reducing the degree of effect or the pace at which students showed change in their deployment of strategies they had been taught).

Decoding errors for Leo and Kevin were indicated in their oral reading of words. Decoding errors for Jill and Jason were indicated via use of inaccurate signs. Two typical patterns of errors were: (a) orthographic similarity errors<sup>11</sup> (e.g., though → through), and (b) morphological errors (e.g., harmless → harmful). Often, orthographic similarity errors were not corrected even when student was probed for their comprehension of the words. In other words, at times orthographic similarity seemed to take precedence over consideration of context for deciphering word meaning. In addition, Jason and Jill's use of Signed English, as compared to the use of a conceptually appropriate sign, seemed to occasionally challenge comprehension. Examples include student's sign for *lasts*, meaning *continues* or *endures*, as *the last one*; student's sign for *recover*, meaning to heal or recuperate, as *re + cover*). From time to time, Jill and Jason revised their signs to demonstrate a change to accurate comprehension of meaning. They were also both noted to occasionally use conceptually appropriate and/or American Sign Language signs (e.g., *to line up*, *to store...water*) through their first reading. The use of conceptually appropriate signs was expected since both students has been increasingly exposed to ASL since middle school and were receiving explicit instruction regarding this practice in their self-contained History class.

These sorts of difficulties also affected students' performance on short answer comprehension questions. In fact, Kevin had noted during his initial interview, "Some of the questions might have like certain words...I do not have an example, but they will have words I do not know." Although students were not asked to read the questions aloud, careful analysis of their responses revealed difficulty with several necessary components of skilled reading – word recognition miscues, failure to access the relevant word meaning, and even lack of knowledge of certain conventions such as the use of italic font for emphasis. For example, when reading the question *Some kinds of art can be useful in everyday life. What evidence from the text supports this idea?*, a student wrote, *Because art can be found anywhere in the world*. In discussing the question during the following intervention session, it became evident that student did not know the meaning of *useful*. At times, errors revealed confusion about the specific question (e.g., why vs. how), as in this example:

Question: How do scientists interested in different animals, for example spiders and humpback whales, try to keep them from dying out? Draw evidence from all three readings.

Response: *The scientists want to protect the spiders because spiders can benefit our lives.*

Not only is the student's response in this example incomplete (i.e., student does not identify how spiders benefit humans) but is actually related to a *why* question that was not even asked.

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<sup>11</sup> Orthographic similarity was also reported by students as a strategy (i.e., *ineffective* strategy) for guessing the meaning of unknown words.



## Strategies

### General Patterns

Students used a variety of strategies during baseline reading assessments. They were allowed to use any strategies, deemed appropriate in supporting comprehension, with the exception of asking me questions (i.e., students were not allowed to use me as a resource). Because my interest was in examining what students would do if/when reading *independently*, I did not interact with them (i.e., did not provide any clarifications or instructions) during their assessment sessions. Hence, the strategy repertoire that students brought to and employed during the baseline phase of the study could have developed either in response to the variety of tasks given to them over the years or from specific instruction provided by earlier teachers.

Analysis across baseline sessions and students indicated that all students came to the study with two common strategies - rereading and slowing down - prior to the start of intervention. Rereading and slowing down were characterized somewhat differently by Jill and Jason, both of whom used bimodal communication (i.e., signed and spoken reading of text). Rereading and slowing down for them included repetitions and/or revision of *signs* and slowing down when fingerspelling words. Jill and Jason also stopped to identify unknown words during the baseline data collection phase, whereas Kevin and Leo did not. Perhaps this awareness of words and meaning was related to the consistent focus on this aspect of comprehension in self-contained DHH classes attended by these two students.

Although students received credit for reporting a covert strategy as long as they provided an explanation or an example, analysis of responses indicated superficial, or at least unelaborated, use of some of these strategies. For example, when students reported having background knowledge of a topic, they did not always provide rich details of their knowledge or an indication of how those details mapped onto ideas from the text. Instead, a student would, for example, recall reading and/or discussing material of relevance in a previous class but would have difficulty recalling and sharing details. This difficulty in connecting personal experience and knowledge with content via literacy activities was also reported by Kathy, one of the participating teachers. Activating “passage specific and topic specific knowledge in constructing meaning” is important in supporting reading comprehension, as reported by high achieving deaf college students (Silvestri & Wang, 2018). Having superficial or little background knowledge of a topic (or perhaps, difficulty tapping into such knowledge when reading) is especially problematic when students read low coherence texts (i.e., a text that consists of fewer explicitly stated main ideas or connections between ideas). When reading a low coherence text, a student is required to fill in missing information via inferencing and to rely more on their own background knowledge (McNamara & Kintsch, 1996). During my limited experience of browsing high vs. low Lexile texts (i.e., a text written on the exact same topic but at high, mid, and low Lexile levels), I noticed a reduction in text coherence in several of the low Lexile level texts. Even as a proficient reader, I found myself relying on relevant background knowledge to make sense of the texts. Although I did not complete a systematic analysis of text coherence and its relation to Lexile level, I wonder whether this factor affected reading comprehension performance, especially for Jason whose instructional reading level was determined to be several grades below that of his actual grade level.

Similarly, although students received credit for identifying an unknown word or asking a question while reading, consideration of these behaviors as “strategies” was at times questionable given observations that students did not consistently stop to find a word meaning or information in response to their own question.

Not only were strategies used superficially at times but the use of certain strategies, such as a verbal summary, visualization, and questioning, revealed the student’s *misunderstanding* of content. In these situations, it was apparent a student was unaware of a comprehension breakdown. The use of a strategy was therefore ineffective at resolving comprehension barriers (although they, quite incidentally, proved to be useful diagnostic probes). For example, when reading about service animals (i.e., dogs that provide various kinds of service to individuals with differences and/or disabilities), Jill asked an important question about one of the main characters in the reading (i.e., *What happened to Preston?*) Preston’s condition was explicitly stated in the text as an Asperger diagnosis, characterized by feeling of anxiety in crowds and difficulties with attention. Although Jill stopped to summarize the text several times throughout the reading, she concluded that Preston must have been a boy who used a wheelchair. Her verbal summary illustrated her misunderstanding of text, lack of awareness of this misunderstanding, and absence of strategy use at a critical moment (i.e., when reading Preston’s diagnosis of Asperger, Jill could have quickly used the Internet to get more information). Jill’s description of her mental imagery (i.e., use of visualization as a strategy) further illustrated her misunderstanding of the text and lack of awareness of this misunderstanding; she imagined a boy in a wheelchair, moving through a crowd of people with his dog. Students’ occasional lack of awareness of comprehension breakdowns was also reported by Joy, one of the participating teachers, during our interview, “I do not think that they (students) even realize that they do not get it. I think that is a huge struggle for a lot of kids.”

Through the baseline data collection phase, none of the students ever demonstrated previewing comprehension questions, interacting with the text (e.g., highlight or underline information, take notes), or using technology (e.g., using the Internet for photo, video, or dictionary). Interaction with text and use of technology remained quite low in frequency of use through the intervention phase.

Jill was noted to use a greater variety of strategies, including summarizing and paraphrasing parts of the text, and expressing personal evaluations, but, as just discussed, the use of more strategies did not necessarily lead to better comprehension. In fact, using a higher number of strategies seemed to be related to the difficulty level of the passage. For example, when presented with a passage at a higher Lexile level, Leo used more strategies but earned a lower score on his self-constructed summary and response to comprehension questions.

During the initial interview, Jill and Jason had both mentioned they had received classroom instruction regarding certain types of strategies, such as using context clues to decipher the meaning of unknown words. Informal feedback from one of the teachers and data from pre- vs. post-intervention indicated students had not mastered *how* to use strategies effectively. The use of strategies in deriving the meaning of words will be further discussed in a later section.

### Examining Strategy Use Across Students

Student’s use of the sixteen observable and covert strategies through the baseline vs. intervention data collection sessions is depicted in the series of bar graphs labeled as Figures 3.1-3.4. During each session, students received a point if they demonstrated use of a certain type of strategy even once during their independent reading of text. Data represent the *percentage* of sessions students used each strategy. For example, Kevin’s use of rereading as a strategy during all six baseline sessions is plotted as 100%. Kevin also used rereading during all ten intervention sessions; therefore, rereading strategy is once again plotted as 100%. Because I used a staggered intervention start time, each student had a different number of baseline session as indicated in the legend of each graph. All students received ten weeks of intervention.

### Individual Student Patterns

Overall, the data indicate an increase in the use of several strategies post-intervention. A summary of changes in each student’s strategy use, in response to explicit instruction, is presented in the following few paragraphs, following a visual representation of each student’s performance.

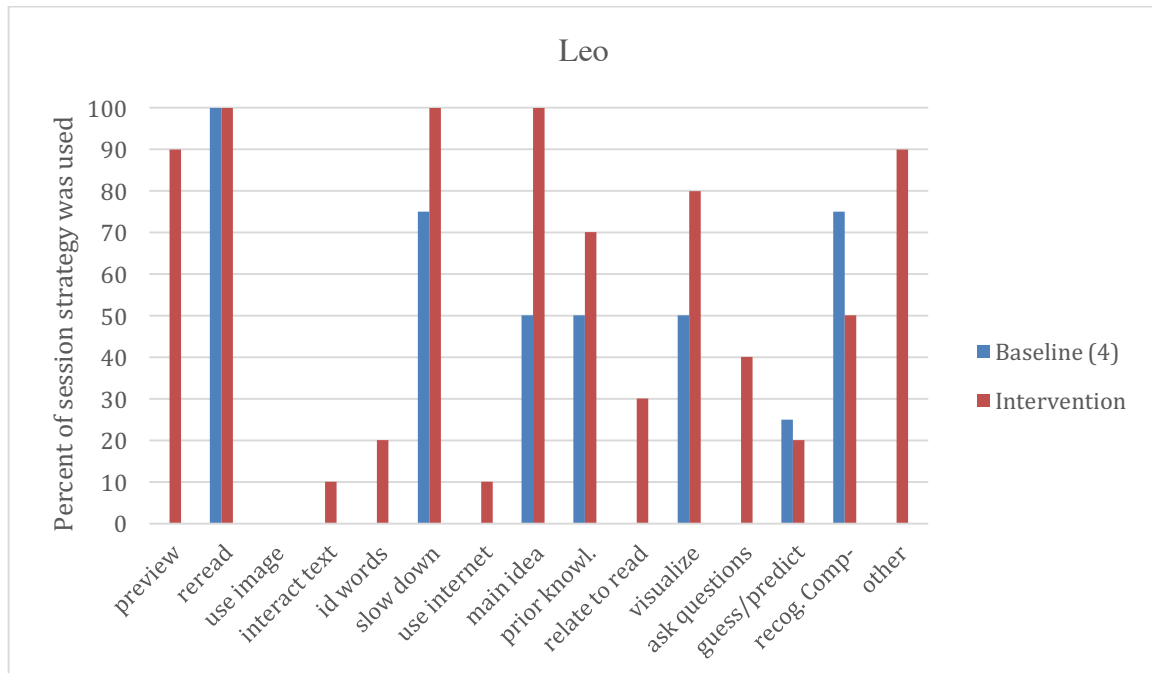


Figure 3.1. Leo’s baseline vs. intervention strategy use. This figure depicts changes in the frequency of use for each targeted strategy from baseline to intervention phase.

**Leo.** A visual inspection of baseline vs. intervention bar graphs clearly shows an increase in Leo’s use of strategies following intervention. Once instruction started, Leo demonstrated use of a new strategy at nearly all meetings. Following the first intervention session, Leo previewed the comprehension questions and reported relating information from the assigned passage to prior reading (i.e., background knowledge) for the first time. Following the second intervention, he also began to demonstrate verbal summarization while reading. This change indicated a more careful approach to understanding content. After the third session, Leo continued to produce verbal summaries and, for the first time,

used images and reported that he was asking himself questions while reading. Leo began to highlight challenging and important words within the text after the fourth intervention session. He also demonstrated new behaviors when slowing down his pace of reading. Whereas, slowing down had been primarily used to decode difficult to pronounce words, Leo began to slow down in order to think about the proposed comprehension questions and/or highlight important words and phrases. By the fourth intervention session, Leo also reported he had begun using previewing questions as a strategy when reading assigned text in his History class. This was the first sign of transfer or generalization of a targeted strategy. Leo used the Internet, as a tool, to look up word meaning for the first time during his fifth intervention session. Altogether, the data indicated that following instruction Leo was more flexible in his use of various kinds of strategies in response to challenging text.

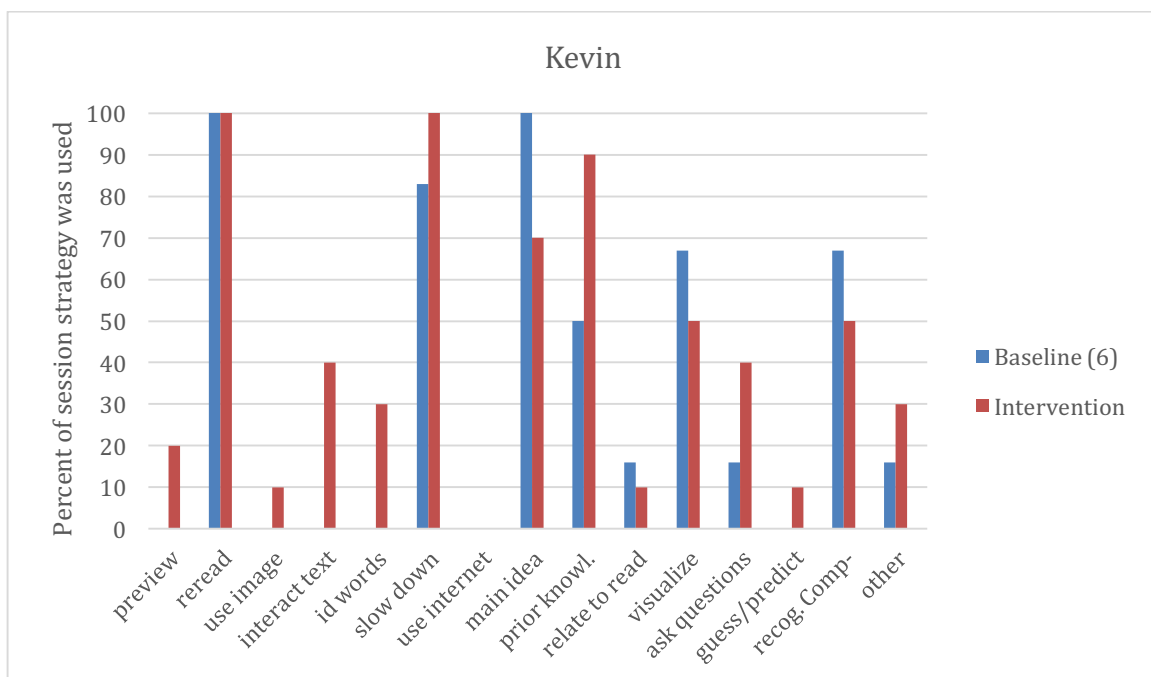


Figure 3.2. Kevin’s baseline vs. intervention strategy use. This figure depicts changes in the frequency of use for each targeted strategy from baseline to intervention phase.

**Kevin.** Kevin did not use any *new* strategies following the first three intervention sessions. He did, however, begin to write a summary in his own words (also discussed under Self-constructed summaries section). This was seen as a notable change because the summaries he had produced during baseline sessions had been constructed entirely via ‘cut and paste’ from the original text. Kevin and I talked about plagiarism, which was apparently an unfamiliar concept to student, and the importance of paraphrasing in truly understanding content. Following the fourth intervention session, Kevin began to identify unknown words for the first time. Although Kevin recognized words that were unknown to him, he did not initially use any strategies to derive the meaning of the words. Kevin began to slow down and reread to figure out the meaning of a few unknown words following the fifth intervention session (and thereafter). He also reported attending to an image for the first time. Kevin demonstrated use of two additional new strategies

following the sixth intervention session. For the first time, he briefly attended to the comprehension questions before beginning the reading and once while reading. He also highlighted a sentence that represented unknown content, reported as the labeled ‘interact with text’. Kevin reported generalization of highlighting or underlining words and phrases when reading assigned text in various classes. In addition, visual inspection of the data shows an increase in Kevin’s awareness of the relationship between his prior knowledge and content in assigned reading. In sum, Kevin demonstrated use of five new strategies following intervention: previewing comprehension questions and headings to predict key ideas, using imagery to better understand text, interacting with text to locate important details, identifying unknown words, and making a prediction or guess. Kevin consistently demonstrated a slow pace of reading, judged to be important in supporting comprehension. The ‘Other’ strategy category for Kevin represents use of a few different kinds of strategies, such as pausing to recognize information as new vs. known or prior knowledge.

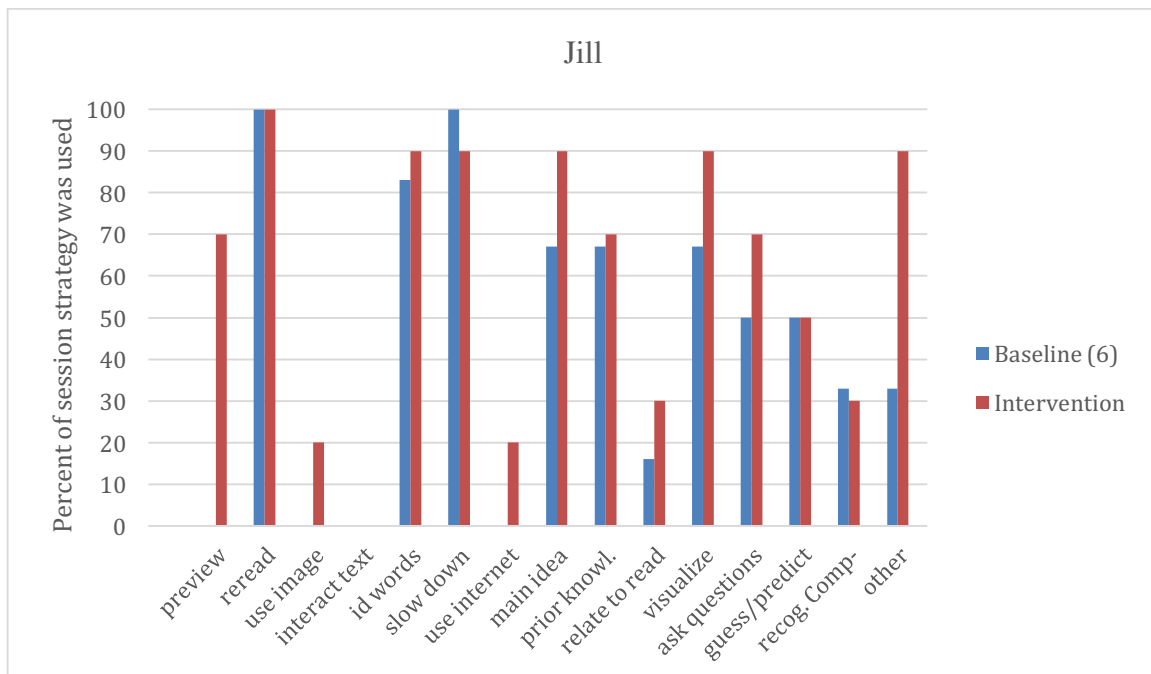


Figure 3.3. Jill’s baseline vs. intervention strategy use. This figure depicts changes in the frequency of use for each targeted strategy from baseline to intervention phase.

**Jill.** Although Jill used quite a variety of strategies prior to intervention, data indicates she became even more strategic following intervention. The notable change in strategy use following the first intervention session for Jill was a more careful use of context to decipher the meaning of unknown words. In fact, by the 9<sup>th</sup> intervention session, Jill began to use the Internet to derive word meaning, as compared to relying on context clues alone. This change may seem slight but is actually significant considering the well-accepted correlation of vocabulary knowledge and reading comprehension (scores are reported under the Vocabulary Skills section). An important realization, however, was that Jill did not always identify words that were essential to understanding important ideas in text (e.g., a key word in a heading).

Following the second intervention session, Jill previewed the comprehension questions for the first time. Although the student reported the preview to be helpful, her comprehension scores and self-constructed summary scores remained unchanged post-intervention (data reported in later sections). Emphasizing the importance of previewing comprehension questions presented an opportunity for me to complete a more careful evaluation of students' language and literacy skills, as will be further discussed (e.g., to assess whether a certain word, grammatical structures, and/or writing conventions contributed to comprehension performance scores). Jill consistently used a variety of strategies during each session. Following the fourth intervention session and a few times thereafter, she used her notes about summarization. She was the only student to reference handouts or notes from intervention sessions. Visual inspection of the data shows a notable increase in the frequency of verbal summaries post intervention, reported as Other strategy. Jill also began to use the Internet to look for word meaning and referenced printed images to better understand the text during the last few intervention sessions.

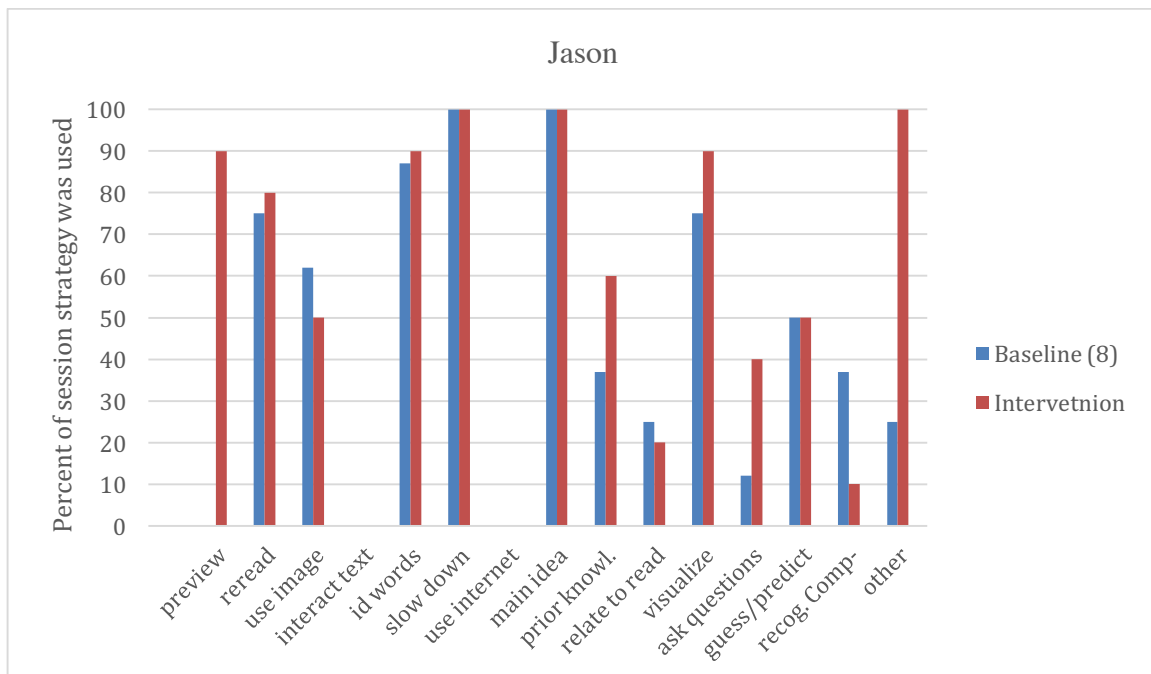


Figure 3.4. Jason's baseline vs. intervention strategy use. This figure depicts changes in the frequency of use for each targeted strategy from baseline to intervention phase.

**Jason.** Following the first intervention session and thereafter, Jason began to pay closer attention to the title, headings, and images in assigned text before he began reading the passage. Although this was seen as an improvement, observations indicated that the preview would be more effective if Jason had used key words and/or the subscript corresponding to images to make predictions about the main idea and key concepts. Following the second intervention session, Jason reported he had begun to slow down, think about, and summarize content from paragraphs as he read outside our sessions (e.g., while reading for subject area classes). This report was accompanied by a change in behavior during independent reading following the third intervention session and thereafter. Data shows a steady increase in Jason's use of a variety of strategies through

the first three sessions (i.e., an increase to 9, 10, and 11 different kinds of strategies). But more importantly, Jason approached the reading more thoughtfully, stopping more often to summarize information (verbal summaries reported as Other strategy). By the 7<sup>th</sup> intervention session Jason reported using a new strategy (i.e., asking questions) when reading assigned text for class and when reading for pleasure. This data indicates generalization of a strategy use across contexts. Jason attributed this particular change to the strategy-based instruction in his English class, taught by Joy (one of the participating teachers). Data from Joy's interview responses and classroom observations indeed indicate a focus on and value for strategy-based instruction.

A comparison of baseline vs. intervention data indicates the most notable improvement emerged in Jason's preview, connection of text to prior knowledge, and verbal summaries.

### **Growth in Vocabulary Skills and Strategies**

At the end of each reading, students were probed for their knowledge of five targeted words; three words that were preselected on the basis of their characteristics as: words that are representative of grade level or more advanced vocabulary, *not* specific to a subject area, and *not* defined within the body of the text, and two words that were added following on-the-spot analysis of words that proved problematic as students read the text aloud. I did not verbalize the words during the probes because doing so could have provided an auditory cue. Rather, I pointed to each word in the text and asked the student to identify whether the word was known or unknown. If student identified the word as known, I asked student to define it. If student identified the word as unknown, I asked student to figure out the meaning and to identify the strategy used for doing so. On occasion, students reported a word as familiar and provided an approximate definition; for example, student defined *convince* as "to beg", but a definition had to be fairly exact to be scored as accurate.

It is important to note that although the vocabulary probe was limited to five words for each session, students often encountered more than five unknown words, as was apparent by their oral reading performance and discussion of the reading during the intervention session. Unless a student stopped to identify a word as unknown himself, which was rare, observations indicated students regularly skipped unknown words (i.e., did not stop to think about and decipher meaning). Of course, we have all experienced skipping words as we read challenging texts, but when a reader skips a word that is critical to understanding an important idea in the text or when the student skips a large number of the words in a text, the behavior becomes problematic.

The vocabulary probe was used to track changes in: (a) the accuracy with which a student identified a word as "known", (b) the accuracy with which a student inferred the meaning of an unknown words, and (c) frequency with which a student's incorrect guess (for meaning) was within the same lexical category (e.g., noun, verb, adjective) as the target word. Each kind of data was important in shedding light on a certain aspect of the students' linguistic and metacognitive skills.

Incorrect identification of a word as "known" may indicate a student's lack of awareness of a comprehension breakdown. For example, when reading "She had to stay in bed to recover from her injuries.", a student identified the word *recover* as "known" but incorrectly defined it as "to cover" or "to hide". Incorrect identification of a word as "known" may also indicate a student's knowledge of one meaning of a word that has

multiple meaning. This was the case, for example, when Kevin identified *dissect* as known but incorrectly defined it as *to cut apart* (and related his knowledge to a previous Biology class) when the author's use of the word was meant to express *to analyze*.

The second kind of data, the accuracy with which students guessed the meaning of an unknown word, presented information about the frequency with which they effectively used a strategy in deciphering meaning. Close analysis of the type and success of a strategy employed by Leo was useful in planning intervention. For example, when reading:

*In newly released photographs by Henryk Ross, one photo shows a group of smiling children at a banquet table. In another, a couple looks happily at a newborn infant. In a third photograph, a young boy holds a furry teddy bear. Everyone looks content*

Leo initially used rereading and context to guess the meaning of *content* to be "a feeling" "tired". His use of context was helpful in making a guess within the right lexical and conceptual categories but not adequate in deriving the exact meaning. He and I reviewed and discussed vocabulary strategies during the following intervention session. He was then asked to reread the passage and to guess the meaning of *content* once more. This time, Leo identified the words *smiling* and *happily*, in the passage, to be important in leading to a correct definition and guessed the meaning of *content* as "happy".

Noting the type of strategies students employed was also helpful in identifying ineffective or misleading ones (and helping student in replacing it with a more reliable strategy). This was especially true in reducing a students' reliance on orthographic similarity (e.g., defining *abscess* as "missing" due to similarity to *absence*). Analysis of students' strategies was also helpful in increasing students' awareness of the multiple meanings of some words and a need to carefully consider whether a "known" definition was appropriate within a specific context (e.g., student defined *trade* as "when you give someone something and they give you something back" when *trade* meant *profession*).

The third kind of data, choosing a meaning within the correct lexical category, provided information about whether students used their knowledge of grammar (i.e., semantic bootstrapping) when thinking about unknown words. A few examples are presented to illustrate:

Sentence: "*Rely on your neighborhood and maybe one or two parents to get a local park where there is ample space*" says Clements.

Response: Jill defined *ample* as "park", "trees and grass".

In the example above, Jill not only derives an incorrect meaning but substitutes a noun for an adjective.

Sentence: *Sometimes doctors have to operate to open up blocked tubes....*

Response: Student defined *operate* as "replace".

In this second example, although Jill did not present the correct meaning, she presented a word within the correct lexical category (i.e., she substituted a verb with a verb).

I looked closely at the data on the use of strategies to unlock word meaning during baseline and post-intervention phases. In the tables for each student, it is important to note that percentages may have been affected by the difference in the number of words targeted during the baseline vs. intervention phases. For example, Leo's percentages reflect a total of 20 words included in the baseline probe (four baseline sessions, five words each time) vs. 50 words included in the intervention probe.



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**Table 3.1: Leo’s Use of Vocabulary Strategies**

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<b>Skill</b>	<b>Baseline</b>	<b>Post-intervention</b>
Correctly identify word as “known”	83%	65%
Correctly define unknown word	14%	21%
Choose a meaning within correct lexical category	90%	66%

---

Leo’s scores indicate a decrease in successfully identifying a word as *known* and in choosing the meaning of unknown words within the correct lexical category. As stated previously, the decline in scores, particularly for Leo who only completed four baseline sessions, may reflect a difference in the total number of words used in the baseline vs. intervention probes. It may also be worthwhile to note that classroom observations of Leo’s English teacher, Julie, indicated minimal inclusion of vocabulary instruction. This was in contrast to the regular focus on vocabulary (i.e., identifying and defining key words) by the other three participating teachers. Data indicate a modest increase in Leo’s success at deriving the meaning of unknown words.

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**Table 3.2: Kevin’s Use of Vocabulary Strategies**

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<b>Skill</b>	<b>Baseline</b>	<b>Post-intervention</b>
Correctly identify word as “known”	65%	52%
Correctly define unknown word	23%	41%
Choose a meaning within correct lexical category	80%	88%

---

Kevin’s scores show an increase in the accuracy with which he derived the meaning of unknown words (i.e., from 23-41%). The slight improvement in Kevin’s use of syntactic knowledge, as indicated by improvement in choosing a meaning from a correct lexical category, may have been a contributing factor. In addition, an increase in the frequency with which Kevin independently identified unknown words, as was depicted discussed in the previous section, may have also contributed to improved skills at deriving word meaning.

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**Table 3.3: Jill’s Use of Vocabulary Strategies**

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<b>Skill</b>	<b>Baseline</b>	<b>Post-intervention</b>
Correctly identify word as “known”	50%	72%
Correctly define unknown word	6%	23%
Choose a meaning within correct lexical category	42%	61%

---

Jill’s scores indicate an improvement in all three measures related to vocabulary skills. Although Jill was identifying unknown words prior to the start of intervention, as indicated by data related to strategy use, she began to use the Internet in deriving word meaning only after intervention had begun. Classroom observations of Jill’s participating history teacher clearly indicated a focus on vocabulary strategies instruction, such as identifying advanced, key, and/or unknown words, using the dictionary to look up word meaning, and using a sign language dictionary and peer consultation to assign a conceptually appropriate sign to a word.

**Table 3.4: Jason’s Use of Vocabulary Strategies**

<b>Skill</b>	<b>Baseline</b>	<b>Post-intervention</b>
Correctly identify word as “known”	54%	57%
Correctly define unknown word	32%	30%
Choose a meaning within correct lexical category	62%	82%

Jason’s scores for the third vocabulary measure (i.e., a change from 62-82%) indicate an improvement in his use of English grammar in deriving the meaning of unknown words. Unlike Jill, data related to baseline vs. intervention strategy use (i.e., identification of unknown words and use of Internet) do not show much change. Jason was enrolled in the same History class as Jill but scores indicate less benefit from classroom (and 1:1) vocabulary strategies instruction.

### **Response to Comprehension Questions**

Each time a student read a newly assigned passage, they were asked to respond to a series of five short answer questions. As noted in the Data and Analysis section, questions required students to either demonstrate comprehension of details (the locate and recall target from the NAEP framework) or to integrate and/or interpret information.

Overall, average scores indicate modest improvements post-intervention for all students except Jill. Each student’s scores are plotted and discussed, following a discussion of a few factors that challenged students’ response accuracy to questions.

Weekly analysis of students’ performance on the comprehension questions task indicated that a few things contributed to lower scores. One important observation was that students sometimes misunderstood the question itself; or rather a key word or concept in the question. A few examples are presented below to illustrate:

Question: Identify *two* positive uses of fungus.

Jill: *Fungus can cause allergies and asthma complications.*

In this example, Jill misunderstood, or perhaps did not attend to, a request for *positive* uses and responded with accurate information about the associated problems of fungi discussed in the passage. In effect, she answered a different question (i.e., what are some of the consequences of fungi being present in our everyday environments?)

Question: Some kinds of art can be *useful* in everyday life. What evidence from the text support this idea?

Jason: *Because art can be found anywhere in the world.*

Jason's response above shows a lack of comprehension of the key words *useful*.

Question: Is the idea of a farmer's market still popular in New York? Use evidence from the text to support your answer.

Jill: "*On the first day most of the farmer sold everything they had.*" *A lot of people buying their sale food.*

In case, Jill provided evidence of the initial popularity of a farmer's market and missed a key word (i.e., the word *still*) in providing evidence in support of continued popularity.

Another behavior that contributed to lower comprehension scores was carelessness (i.e., student not attending to a specific request). An example of this is evidenced in the following question and response, when Kevin provided only one difficulty when asked to present two examples:

Question: What are *two* things that make it difficult for an inmate (prisoner) to get the exact book he/she wants?

Kevin: *The library is small and does not have as many options to choose from. So this makes it difficult for giving the inmate the books they requested.*

Students were also noted to struggle with questions that required inferencing, a distinction between cause and effect, and/or a comparison between two key concepts - almost always examples of the NAEP integrate and interpret target. Questions that required students to compare and contrast necessitated that they distill important attributes and identify similarities and/or differences between two phenomena represented in the text. These questions not only hinge on an accurate understanding of information that is explicitly stated in the text but also on one's skill to synthesize and compare information. An example of a question and Kevin's response is provided below:

Question: Compare and contrast Buddhism to Confucianism. Identify two similarities and/or differences.

Kevin: *They are both religions. They were both made by artists. differences are is that buddha is 3D and the portrait is just a painting.*

In the example above, Kevin has misunderstood representation of the two religious ideologies in art as an important attribute of each. He has also reported a distinction that is not significant in differentiating the two ideologies.

An example of confusion between cause and effect is exemplified in the following question and response from Jason:

Question: How does lack of sleep (little to no sleep) negatively affect a student's performance at school?

Jill: *Because they are watching TV, staying late at party, use the internet, or playing games on the computer.*

This is another example of providing a sensible answer to a question not asked, in this case something like, why do students often fail to get adequate sleep? Jill provided an example of a shaky response to a question that required a student to both synthesize and assess the significance of information within the text:

Question: In the 1950's and 1960's, Rosa Parks and many other black people started to show their unhappiness with the unfair treatment in US society. What was the significance (important result) of their actions?

Jill: No response.

Jill did not respond to this question at all. I decided to probe for her comprehension at the end of the session, to confirm she had not simply run out of time to respond<sup>12</sup>. Despite additional verbal prompts, Jill could not provide a correct response.

Question: Buying food from local farms at a farmer’s market helps reduce pollution. Why? Use evidence from the text to respond.

Jill: No response.

Jill initially expressed she did not know the answer and was ready to hand in her paper. She was encouraged to write something and responded with: *I think they clean the vegetables and fruits for safety*. Her response indicated a lack of comprehension regarding the significance of in-text information related to the transport of many foods from foreign countries as a problem or contribution to environmental pollution and the connection to one man’s clever idea of starting a local farmers’ market in New York city. To understand the significance of the in-text information, Jill would have benefited from background knowledge regarding the global topic of environmental pollution and preservation.

**Qualitative analyses of comprehension probes.** Baseline and post-intervention comprehension scores are presented in Figure 3.5. Following a staggered multiple baseline design, each student completed a different number of baseline sessions. All students completed 10 intervention sessions. The highest possible score on short answer comprehension questions was always 10.

Given the variability of data during both the baseline and intervention phases as well as the proportion of overlapping data (evident via visual inspection of Figure 3.5), there is no clear evidence of an intervention effect for any of the students on the text-related indices of comprehension. The only sign of an effect is a change in the mean score from baseline to intervention for three of the students (i.e., Leo, Kevin, and Jason), portrayed in tabular format in Table 3.5. Again, these numbers do not permit the inference that the intervention influenced this proximal (close to the intervention) index of text comprehension.

**Table 3.5: Mean scores for comprehension questions**

<b>Student</b>	<b>Baseline Mean Score</b>	<b>Intervention Mean Score</b>
Leo	5	5.8
Kevin	4.4	5.8
Jill	4.2	4.2
Jason	3.3	4.8

Since background knowledge or familiarity of a topic is believed to affect students’ reading comprehension (McNamara & Kintsch, 1996), I had asked students to indicate whether they judged an assigned passage to be of a familiar vs. unfamiliar topic. I was interested in examining whether topic familiarity had had an effect on comprehension scores; therefore, I calculated the mean score for passages that were identified as familiar vs. unfamiliar for each student. Topic familiarity, as judged by the students themselves, seemed to be correlated with higher comprehension scores for Leo

<sup>12</sup> Students were always asked to respond to questions within a ten-minute period of time

only. However, the other three students' mean scores were slightly lower for the passages they had judged to be of a familiar topic.

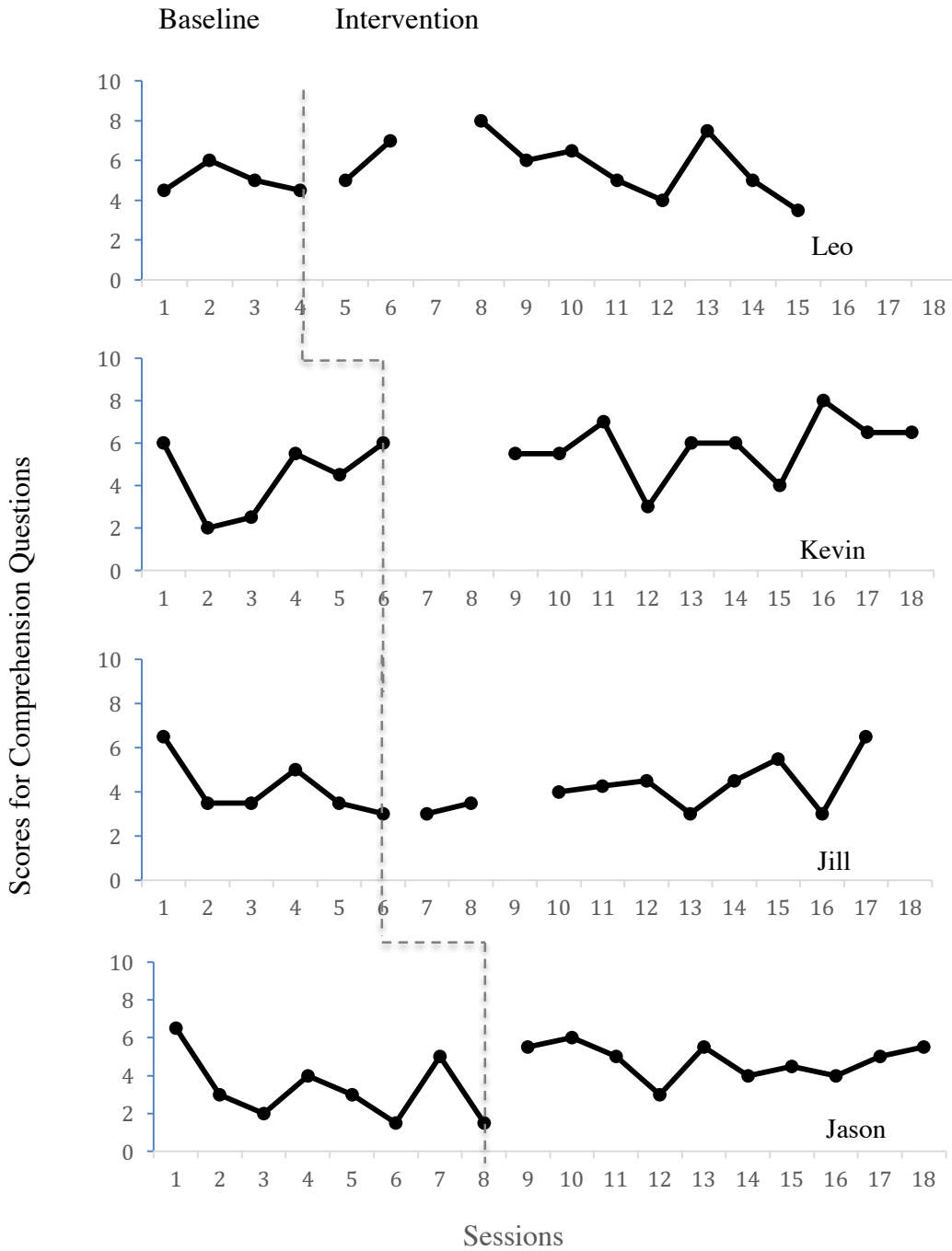


Figure 3.5. Participating students' baseline and intervention comprehension question scores.

**Self-constructed Summaries**

As noted before, at each assessment session, students were asked to compose a written summary of their assigned reading within a ten-minute period of time. The written summaries were always composed first, before students responded to short

answer comprehension questions. Using a rubric (Appendix C), each summary was scored for: (a) accurate and complete identification of the main (or “controlling”) idea, (b) inclusion of accurate and important details, and (c) presentation of content in a clear and coherent manner.

An interesting observation during baseline data collection was that students wrote their summaries with little reference to the passage, as compared to their consistent reference when responding to comprehension questions. A comparison of the numerical scores, between short answer comprehension questions and written summaries, is not possible since the scoring rubrics or numerical scales used for the two activities are different. Observations, however, indicated that responding to comprehension questions proved to be a more challenging task for students (see Comprehension Questions section for a few explanations). For example, following a reading about immigration (i.e., in US, historical overview, reasons for immigration, and hardships post-immigration), Jill was asked:

Question: *What struggles do immigrants or refugees face in their home country that causes them to move to a new country? Use evidence from the text to support your answer.*

Jill: No response.

Jill did not have time to respond this question or the following two (i.e., questions 3, 4, and 5 were left blank). Jill did not receive credit for her comprehension of this aspect of immigration when responding to questions even though she had included accurate information in her summary:

Jill: *Some people come to the United State because they want a better life in United State from country. Many different reason why they move here. Also getting away from the war or danger...*

There were, however, also occasions when a student’s response to a comprehension question was consistent with information presented in their self-constructed summary. For example, following a reading about a man who was an ice cream truck driver, Jill was asked:

Question: *The weather affects how much money an ice cream truck driver makes. According to Gus, “...one year though, when the weather was cooperative, he started driving in February and did not stop until Thanksgiving!” Explain what cooperative means in this context.*

Jill: *I think it mean to keep going and not stop.*

When reading this passage, Jill had stopped at the end of a paragraph to explain that she understood Gus continued working even during bad weather. This was a misunderstanding which was not corrected as she continued to read. When producing her written summary, Jill wrote:

Jill: *He been working hard to get money while bad weather like rain, hot day, and cold.*

Altogether, a comparison of the data between comprehension questions vs. self-constructed summaries indicated the importance of using different means of assessing comprehension; i.e., when we change the task, we may get different results.

Following baseline data collection, students were presented with a simple template that indicated the expected components of a summary (i.e., main idea, details, ending). As was intended, instruction for constructing accurate and detailed summaries

consisted of a weekly discussion of the students' summaries with regards to whether a student clearly identified the main idea, included important and relevant details, and presented the information in an organized fashion. Occasionally, students were asked to use the templates to write suggested revisions, such as a more complete controlling idea or additional details.

The students' scores at baseline vs. intervention are shown in Figure 3.6. Visual inspection of the data reveals a high degree of variability at both baseline and interventions phases and a high proportion of overlapping data points between the two phases. Once again, analysis fails to show a clear intervention effect.

A comparison of baseline vs. intervention mean scores, presented in Table 3.6, shows a slight gain in Jason's self-constructed summary performance.

**Table 3.6: Mean scores for self-constructed summaries**

Student	Mean baseline	Mean intervention
Leo	5.8	6
Kevin	----	5.2
Jill	4.9	4.8
Jason	5	5.8

**Leo.** Although Leo's score showed an immediate change following the first intervention session (as depicted in Figure 3.6), data during remaining sessions clearly highlight a lack of intervention effect.

**Kevin.** As stated in the Strategies section, Kevin began to compose summaries using his own words immediately following the first intervention phase. This was in contrast to his approach of selecting and copying a series of phrases and sentences from the assigned passage throughout the baseline data collection phase and was a significant change in his approach to making sense of assigned reading. Because he had copied the text verbatim during all six baseline sessions, scores were treated as missing data.

**Jill.** A comparison of Jill's scores at baseline vs. intervention indicates no change in the quality and/or accuracy of her self-constructed summaries.

**Jason.** An important change immediately following the first intervention session with Jason was his understanding that when assigned a series of related texts or paired passages (e.g., an introduction to art and artists via two pieces about Frida Kahlo and Gabriel Garcia Marquez), a well-written summary should integrate content from *all* assigned pieces. During baseline data collection, Jason had produced a few summaries that only presented information about one of a series of paired passages. Following intervention, he began to produce written summaries that integrated information across texts.

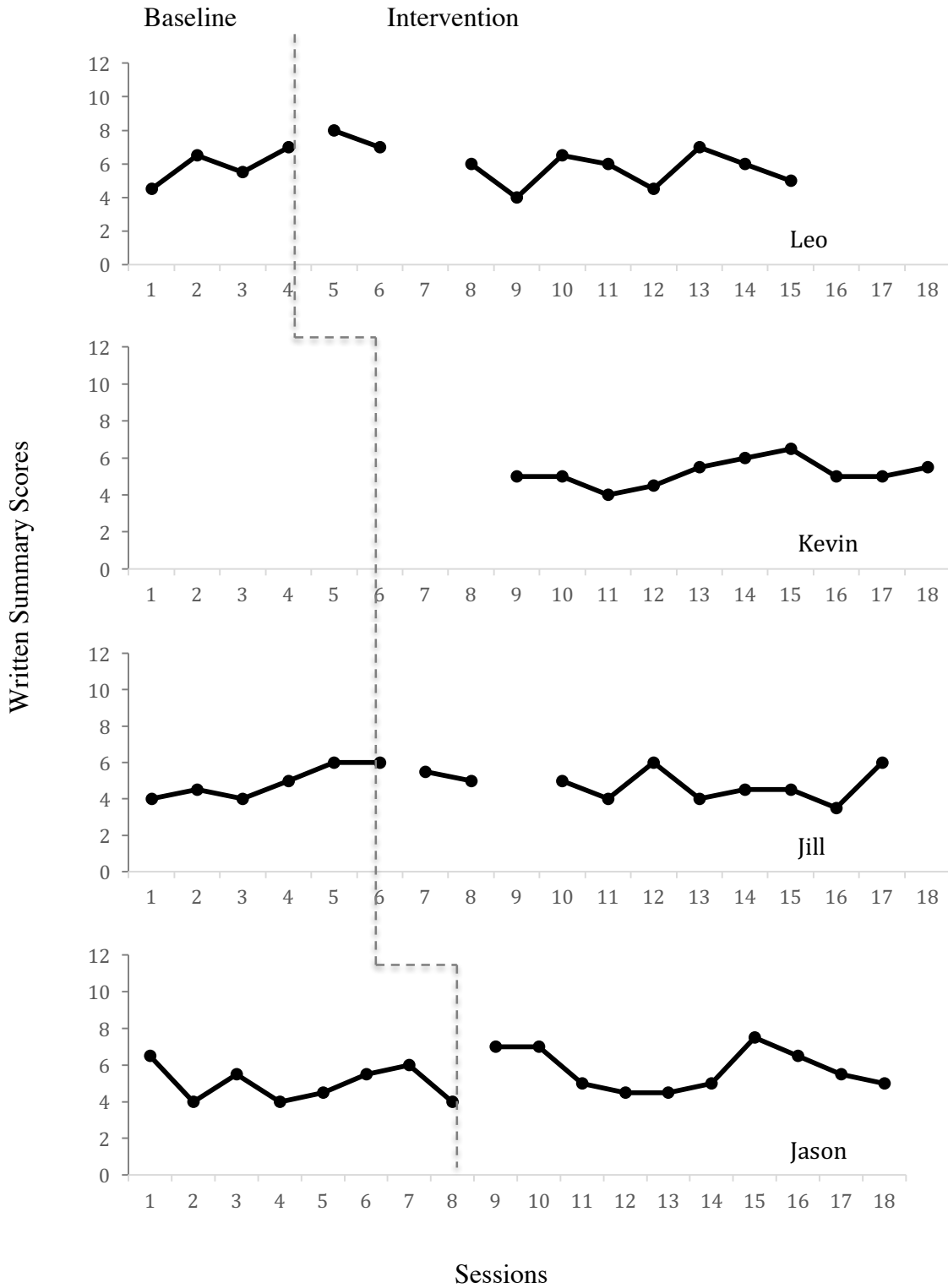


Figure 3.6. Participating students' baseline and intervention written summary scores.



### Standardized Reading Test

Students completed the Gates MacGinitie Reading Tests (GMRT) twice, once at the beginning of the study and second time, one to two weeks following the last intervention session. The GMRT was used as a standardized means of measuring changes in reading comprehension. To better control for any learning effect that might occur from retaking the exact same test, I changed from Form S at baseline to Form T at post-intervention. As was the case during the initial assessment, there were no changes to administration procedures, except the presentation of instructions in signed and spoken English to Jill and Jason. Testing was completed 1:1 and in a private room. Baseline and post-intervention results, using Grade Equivalent (GE) and Normal Curve Equivalent (NCE) scores, are reported in Table 3.7.

**Table 3.7: GMRT scores**

Student	Baseline GE	Baseline NCE	Intervention GE	Intervention NCE
Leo	4.7	10	7.9	34
Kevin	8.7	40	8.2	36
Jill	6.9	28	7.6	32
Jason	2.9	1	8.9	40

Although both the GE and NCE scores seem to indicate an improvement in reading comprehension for 3/4 students, NCE is a more reliable means of examining change since it represents student *achievement* relative to students in the same grade. A GE score that is far below a student's actual grade level, as was the case with Leo and Jason at baseline, is reportedly meaningless and "likely to be misleading" (MacGinitie et al., 2007, p. 42). When comparing test-retest scores, if a student's NCE scores differ by 4 or less, "there is at least a 15% chance that the student's relative achievement has not actually changed." (MacGinitie et al., 2007, p. 43). If the difference in scores is less than 11, "there is still at least a 5% chance that the student's relative achievement has not changed." (MacGinitie et al., 2007, p. 43). The change in NCE scores for Leo and Jason is quite large (i.e., a change of 24 and 39 respectively); therefore, it is likely these two students experienced an actual improvement in reading comprehension achievement.

The degree of change in NCE scores is an indication of improvement in reading achievement; nevertheless, it is important to consider other factors that may contribute to differences in test-retest performance, such as: (a) differences in student characteristics (e.g., level of anxiety or reading motivation at baseline vs. post-intervention assessment), (b) test familiarity at second assessment, or (c) an overall improvement in test taking skills. Because students practiced completing timed activities (i.e., reading passages, writing summaries, and responding to short-answer questions) every week for 14-18 weeks, it is possible that they learned how to more quickly and accurately complete reading and comprehension tasks when under a time constraint. In addition, differences in the students' scores from baseline to post-intervention assessment may be partly attributed to a difference in the number of passages and questions that each student completed within the allotted 35 minutes. Because non-attempted items are treated as incorrect, they can potentially "confound conclusions and inferences made regarding students' comprehension scores." (Clemens et al., 2015) Kyle was the only student who

completed all items at both assessments. Leo had completed 28 items during baseline assessment but responded to 33 items during the post-intervention assessment. Jennifer had only completed 37/48 items during the initial assessment but completed all items during the second assessment. Jason had completed 24/48 items during the initial assessment but completed all items as well during the second assessment. The finding correlates with reported information about an increase in the percentage of non-attempted items on the GMRT as reading proficiency skills decline (Clemens et al., 2015). None of the students who had non-attempted items on their test had skipped any items, which indicates they likely ran out of time (as opposed to skipped items that were difficult, with intention to return to them at a later time). Clemens and colleagues (2015) recommend considering percent of items correct as an additional measure of comprehension skills. Following this recommendation, I calculated the percent correct a baseline vs. post-intervention assessment for Leo, Jill, and Jason, who had had non-attempted items during one or both assessments. Calculations indicated:

- An increase in percent of correct items for Leo (i.e., from 32% to 51%);
- A slight decrease in percent of correct items for Jill (i.e., from 40% to 33%);
- An increase in percent of correct items for Jason (i.e., from 16% to 44%).

The NCE and percent correct data for Leo and Jason are consistent in showing improved reading comprehension.

### **Summary**

In sum, analyses of students' performance across tasks indicate several difficulties that challenge reading and comprehension: decoding or word recognition errors, limited vocabulary skills, limited knowledge of English grammar, lack of awareness of certain print conventions, and limited background knowledge of a variety of topics. In addition, the students' effective application of comprehension strategies was occasionally challenged by a lack of awareness of comprehension breakdowns.

All participating students used the strategies of slowing down and rereading prior to the start of intervention and all showed an increase in the frequency and type of several strategies following intervention. All four participants exhibited increases in identifying unknown words and improvements in deriving word meaning. All four students, however, would benefit from continued support in further developing lexical skills. All four also demonstrated increases in their use of summarization, as a meaning-making strategy while reading. A few strategies (i.e., preview of questions, interaction with text, and use of technology) were only observed (emerged) following intervention.

When using a multiple baseline design, an intervention effect is judged by visual inspection of the data with regards to: (a) stability of data during the baseline phase, (b) immediacy of change in performance following the introduction of the proposed intervention, and (c) the proportion of non-overlapping data between the baseline and intervention phases (Horner et al., 2005). Analyses of baseline and intervention performance, using the two informal measures of comprehension (i.e., response to short answer comprehension questions and self-constructed summaries) do not show an intervention effect. Scores from the GMRT assessment, however, indicate improved reading achievement for Leo and Jason.

## CHAPTER 4: SUMMARY, DISCUSSION, AND IMPLICATIONS

Although it is important to acknowledge the correlation between delayed exposure to comprehensible language and to address development of discrete linguistic skills (e.g., vocabulary and grammar), it is also essential to assess and teach meta-cognitive and reading comprehension strategies when working with adolescents. The purposeful use of meta-cognitive and comprehension strategies supports one's understanding of challenging text (Afflerbach, Pearson, & Paris, 2017; Duke et al., 2011; Goldman et al., 2016; Shanahan, Shanahan, & Mischia, 2011). Many students are limited in their use of these strategies (Banner & Wang, 2011; Donne & Rugg, 2015; Morrison et al., 2013; Nickerson 2003, Schirmer, 2003); therefore, it is important to continue a quest for efficacious interventions that support students in further developing a strategic approach to reading and comprehension.

We have few well-designed studies that examine the efficacy of strategy-based intervention with adolescents who are DHH (Easterbrooks & Stephenson, 2006; Luckner et al., 2005/2006; Marschark et al., 2009); therefore, I designed a multiple baseline case study to examine the effect of 1:1 explicit instruction of targeted strategies with a small number of students. I used a think aloud procedure to better understand the students' thinking and approach to reading and comprehension as they engaged in reading aloud and to instruct students in the effective use of strategies. I collected a variety of data before, throughout, and at the end of intervention. Data consisted of baseline vs. post-intervention analyses of: (a) type of strategies used, (b) students' identification and definition of unknown words, (c) students' response accuracy to short answer comprehension questions, (d) coherence and accuracy of self-constructed written summaries, and (e) standardized assessment score, using the Gates McGinitie Reading Tests. I also interviewed the students to examine their satisfaction with the intervention and generalization of newly learned skills across situation, as a measure of social validity. I returned to each of the two school sites about two months after intervention had ended to examine the students' continued use of strategies via a 1:1 interview and observation of students during a read and think aloud activity. To better control for external variables, such as the influence of classroom instruction on changes to targeted reading behaviors, I completed a series of 20 observations of the four participating teachers during classroom instruction.

I anticipated that students would show an increase in their use of strategies following intervention. Given my knowledge of the multiple baseline design guidelines in evaluating intervention effect (i.e., stability in performance pattern at baseline, immediacy of change, high proportion of non-overlapping data) I was not certain I would capture any significant changes to comprehension of text. This challenge prompted me to use a few different means of assessing text comprehension – response to short answer questions, written summaries, and the Gates MacGinitie Reading Tests (GMRT).

As predicted, results indicated all students began using new strategies following intervention. Students reported generalization of strategy use across contexts. However, even though some students used quite a variety of strategies, their application of a strategy did not always lead to improved text comprehension. The use of a think aloud procedure was highly valuable in shedding light on factors that challenged

comprehension and the students' uptake of strategy instruction. The two non-standardized comprehension measures, employed in the study, did not show a clear intervention effect, but results from the GMRT indicated changes in comprehension achievement for Leo and Jason. Overall, findings suggest a promising effect of explicit instruction of strategies.

## **Intervention Effects**

### **Strategy Use**

Following a review of the literature, I had chosen sixteen strategies to monitor for this study. As I began to analyze and classify students' strategies during the reading and think aloud time, I realized that a few of the categories and uses of strategies overlapped in various ways, including: (a) students' identification of an unknown word also indicated recognition of a comprehension breakdown, (b) students' reported background knowledge was at times related to prior reading, and (c) students' identification of the main idea emerged from a preview of title, headings, and/or the comprehension questions.

Overall, all students demonstrated use of new strategies following intervention. Leo and Kevin both began to preview the title and headings, to interact with text, and to identify unknown words only after intervention had begun. Jill, who had demonstrated quite a variety of strategies during the baseline phase, nevertheless exhibited new strategies as well (i.e., preview, use of images, and use of Internet). Jason, who had also shown independent use of quite a variety of strategies at baseline, demonstrated a significant increase in his use of preview and verbal summarization following intervention.

Classroom observations of students, weekly journals, and responses during student interviews indicated differences in the students' use of certain strategies during the 1:1 intervention as compared to when reading (and writing) in a classroom or at home. For example, students were observed to and reported using the Internet in class and/or at home but rarely used this strategy during the 1:1 intervention sessions with me. Kevin reported he intentionally avoided using a device during our sessions, as he often found device use to be distracting. Leo reported he did not use the Internet due to the time limitation within which students were expected to complete activities during their 1:1 meeting with me (i.e., 15 minutes for completing the reading aloud, 10 minutes to complete the written summary, and 10 minutes to respond to comprehension questions). An observation of differences in strategy use indicates a need to collect a variety of data in truly recognizing a student's strategy repertoire.

As was mentioned in the Results section, strategy use was not necessarily accompanied by improved comprehension. In fact, a student's verbalization of a strategy, such as visualization, at times indicated that they had misunderstood key content. The finding correlates with the distinction that Wang, Silvestri, & Jahromi (2018) also made with regards to deaf individuals' strategy use vs. effective application in completing standardized reading comprehension assessments. It is therefore important that educators not only teach strategies but monitor how effectively they are employed by students. The relatively low frequency with which Jill and Jason indicated recognition of a comprehension breakdown, spontaneously and/or during weekly inquiries into the use of covert strategies, is consistent with reported delays in meta-cognitive skills in some deaf

students (Marschark et al., 2009) and suggests a need for continued *guided* instruction in developing this skill. Guided instruction designed to improve a student's awareness of their own comprehension breakdowns may require the use of additional (and unique) strategies. It is important to systematically assess the efficacy of various approaches in increasing students' awareness of comprehension difficulties.

### **Vocabulary Skills**

Vocabulary (skills and instruction) is widely reported to have a strong correlation with reading skills for both hearing *and* deaf students (Emmory, McCullough, & Weisberg, 2016; Kyle & Harris, 2010; Silvestri & Wang, 2018). Vocabulary is emphasized by the National Assessment of Educational Progress (2009) and the Common Core State Standards (Wixson, 2017), and identified as a target for strategy instruction (i.e., identification and definition of unknown words) in a few efficacy studies with DHH students (Banner & Wang, 2011; Johnson Howell & Luckner, 2003). Identifying and clarifying unknown vocabulary is an important aspect of monitoring one's own comprehension (a metacognitive skill) and characterized as a constructive strategy (Chi & Wylie, 2014). Vocabulary strategies targeted in this study included: using context to infer meaning, looking for morphemic cues (Elleman & Compton, 2017), and using a dictionary, including on-line, to confirm meaning.

Studies show DHH students not only have a more limited lexical inventory but exhibit weaker or more idiosyncratic connections between similar words. The atypical connections between words may indicate differences in the way knowledge is stored in deaf students' long-term memory and may even explain the difficulty some deaf children have in applying background knowledge during various academic tasks, including reading (Marschark & Knoors, 2012).

Findings of this study reflect the well-documented findings regarding vocabulary development for DHH students. Vocabulary difficulties were consistently evident via observation of students' decoding errors, dysfluencies (e.g., pause before reading a word), slow rate in decoding multisyllabic words, and revisions of single words, and errors in defining words during vocabulary probes. As indicated by Marschark & Knoors (2012), the students' limited vocabulary skills may be related to the finding that they also often had difficulty relating background knowledge to assigned text, even when they identified the topic as "familiar".

Identification of key unknown words and the selection and use of an effective strategy in deriving word meaning were targeted for instruction every week. Findings across participating students indicated improvements in at least one of the three measures related to vocabulary skills (i.e., correctly identifying a word as known vs. unknown), correctly defining an unknown word, and choosing a meaning (for an unknown) word within the correct lexical category. Leo and Kevin's scores showed improvements in correctly defining unknown words. Jill's scores showed an improvement in all three measures, and Jason's scores showed an improvement in choosing a meaning within the correct lexical category.

Overall, data also indicated a need for *continued* attention to vocabulary development for all participating students.

### **Reading Comprehension**

The evidence, especially the qualitative data from the think-aloud protocols, indicate that a number of factors affect the participating students' comprehension,

including: (a) limited vocabulary, (b) limited knowledge of English grammar, (c) lack of awareness of print conventions, (d) ineffective application of a strategy, and (e) lack of awareness of comprehension breakdowns. If replicating the current study, students can be *directed* in identifying specific sections/paragraphs that were challenging (e.g., as indicated by response to comprehension questions, verbal summaries while reading, and/or written summaries) to increase their awareness of comprehension breakdowns. Most of the time, when students acknowledged comprehension difficulty, they attributed the problem to an unknown *word* and not the main idea or key details in a section/paragraph. Challenging sections can be systematically and consistently targeted during instruction when modeling strategies.

I used two non-standardized and one standardized measure for examining changes in students' reading comprehension (i.e., response to a series of short-answer comprehension questions, self-constructed written summaries, and the Gates-MacGinitie Reading Tests).

**Comprehension questions.** Short answer questions were used as one measure of comprehension, following each assigned reading. As stated previously, I drafted a series of five locate and recall or integrate and interpret questions for each assigned text, following the 2015 NAEP guidelines.

Observations, student reports, and informal evaluations indicated that vocabulary, the question type, and English grammar challenged the students' comprehension of the question itself. Overall, students seemed to be more challenged by this task, as compared to self-constructed written summaries. This interpretation, however, conflicts with the students' *judgment* of comprehension questions as an easier task. During the post-intervention interview, a few students reported they believed summarizing information to be more challenging because it requires independent identification of the main idea and relevant (vs. irrelevant) information.

Overall, the variability in baseline vs. intervention data, an absence of immediacy of intervention effect, and a high number of overlapping baseline vs. intervention data indicated a lack of intervention effect. The only sign of intervention effect was the change in mean baseline vs. intervention scores for 3/4 students. Topic familiarity, as judged by the students themselves, was not correlated with higher comprehension scores for anyone but Leo.

**Summarization.** By asking students to summarize, educators are in fact asking that students attend to relevant and important content and monitor their own comprehension (Palincsar & Brown, 1984). If effectively instructed to summarize important content using their own words and to add to what is stated in the text (e.g., via analysis, critique, and synthesis), students are guided to become active and constructive (Chi & Wiley, 2014; Fonseca & Chi, 2011). Targeting summarization, in this study, presented an opportunity for teaching students strategies for identifying the relevant vs. irrelevant details in text. It was also an opportunity for modeling analysis and synthesis, which are important in developing more advanced skills in constructing meaning from text. As mentioned previously, I had revised a scoring rubric from the 2016 Literacy Design Collaborative Informational/Explanatory Task model in scoring the written summaries. To guide students in drafting a good summary during instructional meetings, I used a graphic organizer. A graphic organizer is a means of explicitly displaying the relationship between important concepts within various genres (e.g., causal, sequential,

biographical) and a recommended tool in supporting students who struggle with reading comprehension (Elleman & Compton, 2017).

As compared to the time spent on reviewing students' strategy use and vocabulary performance, the time spent on reviewing the students' summaries was limited and inconsistent (i.e., did not occur every week). Overall, the students' scores (i.e., baseline average vs. post-intervention average) did not indicate an improvement in summarization skills. The absence of change was further indicated via the inconsistent pattern of performance at baseline and intervention, absence of an immediacy of effect following intervention, and the high proportion of overlapping data points between the baseline and intervention phases. A couple of the students exhibited *qualitative* changes in their summarization skills. Kevin began to compose summaries in his own words as opposed to copying excerpts of the readings verbatim, following intervention. Jason began to compose summaries that integrated information across the 2-3 related readings, which was often assigned to him, as opposed to summarizing content from only one of the readings. Jason's success at integrating information across related text was especially evident in his use of an accurate main idea statement when beginning a summary.

Factors that may have contributed to limited progress on the students' summarization scores include the limited time spent on instruction and the limitation in time when students were actually composing their summaries. Students reported that had they had more than the ten minutes of allotted time in drafting a summary, they believe they would have included more content in some of their summaries. Even though inclusion of more content would not necessarily mean a more coherent and/or accurate summary, it is important to note the time constraint as a possible limitation.

**GMRT.** In contrast to what I expected at the onset of the study, which was to see changes in the students' comprehension within the non-standardized measures and no changes in the standardized assessment measure, the GMRT scores revealed notable improvement in 2/4 students' reading achievement. As a more distal measure of reading achievement, changes in the GMRT scores represent an important indication of change in reading achievement.

There are a few possible explanations why there were notable changes on the GMRT assessment scores for two students but an absence of reliable change on either of the two non-standardized measures of comprehension. One possibility is that the short answer questions, which were constructed by me, had some design issues (e.g., the grammatical complexity of some questions may have rendered them difficult to interpret). A second possibility is that short answer questions are more difficult as compared to multiple choice questions. The GMRT, which uses multiple choice questions as a measure of comprehension, may be a more sensitive tool for measuring subtle changes in comprehension. A third possibility is related to the differences in the type of passages used in the study vs. the GMRT. The GMRT presents the reader with a combination of narrative and expository passages. Narrative text may be easier than expository text. In fact, deaf students have been reported to use a greater number and variety of strategies when reading narrative text, as compared to their use of strategies when reading expository text. Once again, this could mean that the GMRT is a more sensitive tool for measuring changes in comprehension.

### **Fidelity and Reliability**

In the present study, reliability, validity, and objectivity were established through the use of triangulation and inter-rater agreement. Triangulation was implemented through the use of multiple sources of data, including: student interviews (at baseline and post-intervention), observation and analysis of reading performance during 1:1 meetings, and observation of the students (and their teachers) in classroom settings. Inter-rater agreement was used to evaluate: (a) the procedural fidelity of assessment and intervention sessions and (b) the reliability of evaluations of target behaviors (i.e., students' strategy use and comprehension scores on self-constructed summaries and response to short answer questions). Fidelity is the degree to which a plan is implemented as intended. Reliability represents the degree to which two or more people agree on an assessment of a target behavior. In-rater reliability is defined as "the level of agreement between multiple raters using a particular instrument on the same cohort of participants." (p. 489, Lim, Palethorpe, & Rodger, 2012)

Per multiple baseline design guidelines, I completed a fidelity check for 20% of assessment and 20% of intervention sessions and a reliability check for 20% of the data for the three dependent variables: (a) strategy use, (b) comprehension as measured via written summaries, and (c) comprehension as measured via response to short answer questions. I chose the sessions used for fidelity and reliability checks randomly, alternating between students to ensure all students were represented equally. I worked with two external collaborators in completing the fidelity and reliability checks.

Because two of the participating students used a bimodal communication system (i.e., signed and spoken language), I recruited an external collaborator who was proficient in sign language to complete all fidelity checks and the reliability check for the students' strategy use. Victoria (pseudonym) was a sign language interpreter, who was employed at a public middle school with a deaf and hard of hearing program at the time of the study. To communicate the expectations of completing the fidelity and reliability assessments, I presented Victoria with a series of checklists, including: a fidelity checklist for assessment sessions, a fidelity checklist for intervention sessions, and a list of the observable and covert strategies for completing the reliability checks (see Appendix G for the intervention fidelity checklist). The fidelity checklists outlined the behaviors expected of the interventionist (me) during an assessment or intervention session (e.g., teacher begins with the think-aloud instructions, teacher models a strategy while rereading an excerpt from the assigned passage). As Victoria watched a selected assessment or intervention session, she was asked to rate the fidelity with which I demonstrated each expected behavior, on a scale of 0-2; a score of 0 was assigned if a behavior was absent, a score of 1 was assigned for a behavior that was demonstrated but lacked in expected quality, and a score of 2 was assigned for a behavior that was demonstrated as expected. The sum of Victoria's numerical assessment of behaviors across all sessions were then divided by the total points possible to get a fidelity estimate.

To complete a reliability check of the students' strategy use during selected assessment sessions, Victoria was asked to document the *type* of strategy a student used, each time a strategy was observed. Victoria's assessment of strategy use was then compared to my own assessment of strategy use to determine inter-rater agreement of the type of strategies observed throughout a session. An inter-rater reliability was determined using a binary scoring system of 0-1; 0 indicating disagreement in type of strategy



observed and 1 indicating agreement. The reliability score was calculated by dividing the agreement score by the total possible score; e.g., if there were a total of 100 observations of student strategy use and the external collaborator and I agreed on the type of strategy used 90/100 times, the reliability score would be 90%. This procedure corresponds to guidelines for calculating percentage of agreement as a measure of consensus estimate when using nominal data (Lim, Palethorpe, & Rodger, 2012).

Victoria and I always viewed selected sessions jointly in completing fidelity and reliability checks; however, my role steadily changed in the following manner:

- During the first few sessions, I explicitly identified the behavioral expectations that were outlined in the fidelity checklists. I also explicitly identified student strategies each time one occurred. This kind of training was deemed essential since Victoria had had no prior research experience or knowledge of reading comprehension strategies.
- As Victoria's consistency and accuracy in identifying targeted behaviors improved, I became less involved (e.g., in discussing targeted behaviors) and simply watched the recorded sessions with Victoria as she completed the evaluations.

The second external collaborator, Gerry (pseudonym), was a doctoral student and a former teacher and as such was an ideal candidate for completing the reliability checks for the two comprehension measures: (a) written summaries, and (b) response to comprehension questions. There was no need for Gerry to watch recorded sessions. To complete a reliability check of the two comprehension measures, I presented Gerry with:

- The scoring rubric I had used to score the written summaries;
- Printed copies of selected assigned passages, from the same randomly chosen sessions that had been used in completing fidelity checks;
- Photocopies of the students' corresponding written summaries and responses to comprehension question;
- A series of printed guidelines to further clarify scoring procedures (e.g., that each question was weighted equally and worth 2 points).

Gerry and I met to discuss the scoring procedures and to practice scoring, using two sample passages and the corresponding comprehension measures. Gerry then completed all reliability checks independently. Because the data under examination can be considered ordinal (i.e., quality and accuracy of written summaries was assessed using a scoring rubric), I calculated a percentage of agreement by:

- adding the total number of cases for which both raters assigned the same score or a score of +/-1 point;
- dividing this number by the total number of cases (Lim, Palethorpe, & Rodger, 2012).

### **Fidelity Results**

The procedural fidelity of assessment and intervention sessions, as judged by the external collaborator, was 94% and 96% respectively. Degree of intervention fidelity is correlated with student achievement or outcome (Chambers Cantrell et al., 2016); Vaughn et al. 2011). The high degree of fidelity for both the assessment and intervention sessions in this study indicate that the procedures used for obtaining data were consistent and students received intervention as was intended. Absence of more robust outcomes,

particularly with regards to performance on the two reading comprehension tasks, was therefore likely related other variables, such as limited length of time of intervention implementation.

### **Reliability Results**

Inter-rater reliability was 93.6% for classification of type of strategies observed, 66% for the assessment of written summaries and 85% for assessment of response accuracy to comprehension questions. A reliability score of 70% or higher is considered an indication of good inter-rater agreement. A low inter-rater agreement percentage, as was the case with the assessment of students' written summaries, may indicate a need for revising the measurement tool and/or further measurement training for the raters.

Because the inter-rater reliability was low for self-constructed written summaries, Gerry and I met once more to review our scoring approach/procedures for two assigned passages that had produced the largest difference in scoring. For these two passages, the difference in scores were evident in both the written summaries and the short answer comprehension questions. My goal was to better understand reasons for the discrepancy in scoring. Gerry and I reviewed each assigned passage and our own scoring procedures (i.e., we reviewed our written notes, detailing the strengths and shortcomings in the students' work). We then discussed our procedures with one another. This process was productive in resolving disagreements and further clarifying the scoring rubrics and resulted in revised scores on all four comprehension measures. I completed an analysis of whether the change in scores would affect the overall results and interpretation (e.g., with regards to a change in mean scores for the summaries and response to comprehension questions) and concluded that it did not. I therefore decided to leave the scores unchanged; in other words, to report the scores as they were originally derived without a follow-up meeting with my external collaborator. The follow-up meeting was a good exercise in understanding the importance of completing a more thorough discussion and practice (e.g., using a larger number of data sets) in preparation for completing an interrater reliability check.

### **Social Validity**

Social validity is a measure of the *functional* impact of an intervention (i.e., impact on an individual's life) and considered to be an important component of single subject case design. Social validity measures may also examine the practicality or acceptability of the goals, procedures, and/or outcome of an intervention. Social validity may be examined via: (a) subjective evaluations or people's perceptions of the various components of an intervention, (b) a comparison of the participants' behavioral outcome(s) with that of a reference group, and/or (c) a maintenance probe (i.e., a measure of sustainability of target behaviors when participants are no longer receiving the intervention) (Snodgrass, Chung, Meadan, & Halle, 2018). To address the need for inclusion of a social validity measure, I completed semi-structured interviews with participating students.

### **Participants' Perceptions and Behavioral Outcome**

One to two weeks following the last intervention session, I met with each student for an interview to discuss the student's perceptions and experiences of the intervention. Interview questions were designed to elicit information about various components of the intervention related to goals and procedures (e.g., the targeted strategies, comprehension

measures, 1:1 meeting, limited time in completing activities). I also asked questions designed to elicit information about the impact of the intervention on the students' literacy practices, such as the effect on *what* the students were reading, how much time they spent on reading, and generalization of strategy use across contexts, and reading interest and motivation (see Appendix H for a list of questions). Students were presented with a printed list of questions one week prior to the interview to give them time to think about each of the items. Two students reported reviewing the questions before the interview day.

Each interview lasted approximately 45 minutes and was video recorded for transcription and analysis. I used spoken English when interviewing Kevin and Leo and signed and spoken English when interviewing Jill and Jason. I often presented an elaborated version of the question to better ensure comprehension (at times, this was per a student's request). In addition, I regularly paraphrased a student's response to confirm that I had understood the student's intended meaning.

Students' responses indicated an overall increase in interest level and motivation in reading. This was reported to be due, in part, to a student's perception of having acquired some tools (i.e., strategies) to better understand text. For example, Leo reported that the chance to self-select the text for our weekly meetings had piqued his interest in reading informational text (e.g., sports-related articles), and that strategies, such as using the Internet to research a key idea and/or look for word meaning, contributed to better comprehension during independent reading. Leo and Jason reported spending more time per week on independent reading. Leo and Jill reported an increased level of interest in reading informational text.

Interview responses and classroom observations indicated generalization of strategy use across contexts for all four participating students. All students reported using preview (e.g., of tiles, headings, questions, images) and word identification as strategies used in classes and/or when engaged in independent reading. Kevin also reported using interaction with text (e.g., highlighting information) as a means of better identifying key information when completing assigned curricular reading. In addition, Kevin reported rereading excerpts of assigned text more often to better understand; indicative of an improvement in checking one's own understanding of text. Leo also reported using a few strategies (i.e., previewing, summarizing, using the Internet) when completing reading assignments in history class and/or when reading self-selected articles. Jill reported changes to her awareness of unknown and/or advanced vocabulary (e.g., awareness of multiple meaning words) and said she has begun to recognize the contribution of vocabulary to comprehension breakdowns. Although Jill reported using the Internet to derive word meaning, an observation of Jill during a class presentation (and her performance during weekly assessments) indicated a need for continued support in recognizing words that are key for understanding and an appropriate strategy in deriving the meaning. Jason reported using multiple strategies when completing class assignments, including summarizing and taking notes, in better supporting his comprehension of text.

There were some differences in the students' strategy use during 1:1 sessions with me, as compared to their reported and observed strategy use when completing assigned curricular reading. The most notable difference was the frequency with which students used the Internet (e.g., for the dictionary, supplemental reading, or images) and interacted with the text (e.g., took notes).

When asked to consider whether 1:1 literacy-based instruction differs from classroom instruction, students were split in their belief. Kevin reported an advantage to 1:1 instruction and stated:

*In a classroom, the teacher is teaching multiple students, not focusing on one and some of the students might not understand or they might have missed what he or she said. And if it was 1:1, like the student and the teacher, then the student can...confirm or ask questions again...To understand it better.*

When asked to further elaborate on his own experiences, Kevin said, “The teachers do not really check up on you to see if you are doing it or not, but like with me and you, we are actually doing something.” For the first few months of the year, Kevin was enrolled in a English class with a teacher who actually incorporated quite a few strategies in her literacy-based instruction. Observations of Kevin’s English teacher, Tracy, revealed a focus on: (a) identifying and defining advanced and key words, (b) note taking (i.e., summarizing key information), (c) previewing title and headings, and (d) predicting. Tracy’s strategy instruction was embedded in her discussion of the text genre and content. Just as I did, Tracy modeled the use of various strategies. Differences in instruction, however, included absence of think aloud as a specific means of modeling, inconsistencies in the frequency or time spent on strategy instruction, and delivery within a large-group format. As Kevin reported, whole class instruction was not always effective in eliciting intended behaviors from students. During one of the classroom observations (of Tracy), I noted that Kevin did not copy any of the notes that were projected for all students to see/read and write, as teacher and students engaged in a verbal discussion.

Leo believed that 1:1 and classroom instruction were quite similar, with a few exceptions (e.g., a focus on previewing comprehension questions within the 1:1 intervention). Jill believed 1:1 and classroom instruction to be the same.

In contrast to Kevin’s preference for 1:1 instruction, Jason identified *classroom* instruction as more beneficial. Jason said he values peer feedback (e.g., requests for clarifications and elaborations and the exchange of ideas when working within small groups).

*Jason: I prefer group because the people in the group may have different ideas or opinions about reading strategies...*

Overall, all four participating students believed the additional 1:1 intervention had been helpful. A few students emphasized the importance of using self-selected text, and Jill and Jason said they appreciated the systematic or step-by-step approach, such as the encouragement and prompt for students to use a strategy at the end of each paragraph.

Students’ consensus regarding the helpfulness of the intervention, generalization of strategy use across contexts, as well as the few changes noted in literacy practices all support the social validity of the intervention.

### **Maintenance**

An examination of whether participants continue using newly learned skills when an intervention has been withdrawn (i.e., maintenance) is one indication of an intervention’s efficacy (Snodgrass, Chung, Meadan, & Halle, 2018). I therefore scheduled a maintenance probe with the participating students eight weeks after the last intervention session. I met each student 1:1 for one hour to:

- conduct an interview about changes in reading habits and continued use of strategies (see Appendix I);

- probe students' recollection of the strategies that had been targeted during the intervention;
- observe students reading and thinking aloud and document their strategy use.

The expository text I used for each student's maintenance probe was judged to be at the same Lexile level and length as had been used throughout the study. During the last 10-15 minutes of the hour, I shared my impressions of the students' reading performance and strategy use and offered recommendations (e.g., strategies a student could add to their repertoire). As always, meetings were video recorded to enable detailed and accurate analysis of the interview, students' reading and think aloud, and my discussion of students' performance and recommended strategies.

**Leo.** Leo reported no change in time spent on reading or type of reading material. As before, Leo continued to read articles about current events and sports, on the Internet. Leo also felt there has been no change in the degree of success with reading and comprehension. Leo had continued using some strategies, including: using context to derive word meaning or looking up word meaning in the dictionary, previewing questions when reading certain curricular text, and (occasionally) summarizing. When asked to recall a few strategies that had been targeted through the intervention, Leo listed only two: focusing on the main idea and summarizing. He did not remember any others.

When reading and thinking aloud, Leo used a few observable strategies, including: rereading, slowing down, asking a question, and summarizing. Some of Leo's verbal summaries indicated shallow understanding of content. Leo's interview responses indicated a need for continued support in improving summarization skills (i.e., when and how to summarize content and what to include in a summary). When asked about his use of covert strategies, Leo also reported: having thought about a Netflix program that related to the assigned topic and visualizing. Leo reported that he had not tried to figure out the main idea (of the assigned passage or specific paragraphs). When asked about unknown words, Leo said he believes he had understood all (key) words. A review of key vocabulary, however, quickly proved his judgment to be false. Overall, Leo did not acknowledge any comprehension breakdowns. A discussion about the text and potentially helpful strategies (e.g., visualizing, using technology, attending to images within the text) led to two primary recommendations as the most helpful strategies: (a) focusing on the main idea, and (d) identifying and defining key unknown words.

Although Leo initially indicated he had maintained the same level of strategy use, interview responses and observation during the reading and think aloud activity indicated a decrease in his attention to and independent use of strategies. In fact, Leo reported turning to his sister as a resource when reading something difficult to understand. Relying on others may be considered a "strategy" but differs from strategies which seek to promote *independent* reading and comprehension of text; as was the case of targeted strategies in the proposed intervention.

When asked whether he believes he would benefit from continued reading intervention, Leo said, "I think so." He identified two specific desired components of a reading intervention program to be: (a) systematic encouragement to read more often, and (b) direct instruction for correct pronunciation of words.

**Kevin.** Kevin reported an increase in time spent on reading. He specifically reported that whereas he used to avoid reading assignments he thought to be uninteresting, he now often begins the assignment and finds himself engaged with the

material shortly thereafter. He also reported a recent change in his perception of reading as a means of gaining knowledge and learning new words. Overall, he felt more successful when reading, especially when reading assigned curricular material. Kevin had continued using several strategies, including: thinking about the main idea, using the dictionary to look for the meaning of unknown words, and using the Internet to look for supplemental information about assigned readings (e.g., video and text). Kevin remembered additional strategies that had been targeted during the intervention (e.g., attending to images and headings and generating questions). Kevin did not recall why attending to headings may be a helpful strategy. He also could not explain why/how generating a question may be helpful.

When reading and thinking aloud, Kevin used a variety of strategies, including: summarizing, predicting, rereading, slowing down, and asking a question. When asked about his use of covert strategies, he also reported: thinking about the main idea, relating information to background knowledge, and imagining events. Similar to Leo, Kevin did not identify any unknown words or comprehension breakdowns. A discussion of the text, however, revealed that unknown key vocabulary had hindered comprehension of a large portion of the assigned reading. The lack of comprehension was exacerbated by a lack of attention to headings and subheadings. Kevin had not acknowledged this comprehension breakdown, nor used a strategy to resolve it. The discussion about the text and potentially helpful strategies led to two primary recommendations: (a) attention to headings, which often present a clue to key/main ideas in a passage, and (b) acknowledgement of comprehension breakdowns.

When asked whether he believed he would benefit from continued reading intervention, Kevin said he would benefit and identified generating questions and summarizing as two strategies for which he would like more direct instruction.

**Jill.** Per student report, there had been no changes in the kinds of reading material or time spent on reading at home. Time spent on reading at school, however, had changed. Jill had recently been assigned to an additional 20-minute independent reading time in two of her classes, taught by the two participating teachers (of the DHH program). Jill has begun to approach reading academic text more strategically, and stated she has been more “focused” on meaning and content organization. Jill reported she has been slowing down and rereading more often to better understand text since the end of the reading intervention. She had also been identifying more unknown words and using strategies to derive word meaning (e.g., using context, substituting the word with a known word, and/or using Google). Jill reported using strategies when reading school-related text but not when reading for personal enjoyment. When asked about strategies that had been targeted during the intervention, Jill listed visualization and a focus on vocabulary as the only two she recalled.

When reading and thinking aloud, Jill demonstrated use of several strategies, including the ones she had reported; (a) predicting the main idea by attending to the title of the passage, (b) identifying *several* unknown words and used various strategies in deriving the meaning (including fingerspelling and sounding out a word in successfully figuring out the word itself), (c) slowing down, and (d) rereading words and entire paragraphs to better understand the text and to correct a few misunderstandings. When asked about covert strategies, Jill also reported having used visualization and prediction (of consequences). Overall, interview responses and observation of Jill indicated she had

been using the few strategies I had emphasized at the end of the intervention (e.g., increased attention to key vocabulary and slowing down to monitor comprehension). It is important to note that despite the changes in strategy use, Jill continued to struggle with comprehension. She acknowledged the challenge of reading and reported joint/group reading activities and peer (and teacher) input to be essential in supporting her comprehension of text and in feeling successful. When reading independently, Jill reported relying more on technology to support her own comprehension. I praised Jill for her continued use of strategies and recommended the following additions: (a) check predictions of a main idea(s) by paying closer attention to headings, and (b) focus on morphology as an additional strategy for figuring out word meaning (e.g., *thoughtless* = without thought (about), or not thinking (about)).

Jill reported that additional reading instruction would be beneficial and expressed an interest in receiving direct instruction on the meaning of idioms and metaphors.

**Jason.** Jason reported no changes in time spent since the end of intervention but expressed he feels his reading comprehension has improved over the past year. He attributed this improvement to strategy use. Jason reported continued use of several strategies, including: (a) slowing down when reading something challenging, (b) rereading, (c) identifying unknown words and deriving the meaning through the use of context or a dictionary, (d) using the Internet to look for supplemental information on a topic, (e) highlighting information he determines to be important, and (e) summarizing text. When asked to recall additional strategies that had been targeted through the intervention, he identified using technology to find videos that support comprehension. Jason did not recall any other strategies from the intervention.

When reading the assigned passage and thinking aloud, Jason demonstrated use of several strategies, including: (a) attending to the title and headings to figure out the main idea, (b) rereading (including rereading words and phrases to self-correct a misunderstanding, (c) slowing down, and (d) summarizing. The first verbal summary indicated a shallow and concrete understanding of content. Two subsequent summaries indicated a correct understanding of the main idea. Jason's final verbal summary revealed a misunderstanding of an important concept in the reading (i.e., whereas Jason interpreted the reading to indicate that people with phobias can learn to *avoid* their fears, the author had repeatedly emphasized the importance of *overcoming*, *taming*, and/or *conquering* one's fear). This misunderstanding was related to vocabulary limitations. Although Jason's use of fingerspelling (and on a few occasions, Signed English) indicated lack of familiarity with many words, he identified only one word as unknown during the entire reading. Our discussion of the text and Jason's strategy use led to a recommendation that Jason identify more unknown words and that he use a strategy to define the word. In addition, I discussed the importance of changing an English sign to a conceptually appropriate sign. I emphasized the importance of attending to vocabulary in titles and headings, especially because Jason's understanding of the main idea had been limited by a lack of comprehension of a word in *all* four headings in the assigned reading.

Jason said he would benefit from continued reading instruction but when asked to elaborate on the components of a helpful instructional approach, he reported an interest in direct instruction/explanation of main ideas and key vocabulary in assigned reading. I responded by explaining that while direct instruction of content is helpful in improving

one's understanding of a specific passage, instruction related to strategies has better potential for enabling a student to *independently* approach challenging reading material.

Overall, the maintenance probes revealed that 3/4 students have maintained strategy use since the end of this study's intervention. Leo was the only student who seemed to show a decrease in attention to and use of strategies. Kevin reported an increase in time spent on reading and Jason said he feels his reading comprehension has improved. Taken together, these findings indicate some positive changes in students' reading habits and perceptions. The data also show that limitations in language skills (e.g., vocabulary) and students' lack of awareness of comprehension breakdowns continue to hinder comprehension and would need to be addressed to optimize reading comprehension outcomes.

### **Limitations**

This study was limited in a variety of ways with regards to participants and the proposed intervention. One limitation was the study's inclusion of a small number of participants, including participants whose primary mode of communication is American Sign Language. The small number of participants precludes any statements regarding generalizability to what is generally a very diverse population of students who are Deaf or Hard of Hearing (DHH). The study was also limited in its use of a relatively short period of intervention time. Although there were changes to all participating students' strategy use, the variability in comprehension data during the baseline and intervention phases indicated limited evidence in support of intervention efficacy. A longer period of intervention may yield more robust findings in support of the impact of explicit instruction of strategies on students' comprehension of text. Another limitation was related to the need for weekly data collection, using multiple measures. This resulted in allocation of a tremendous amount of time to assessment, as opposed to instruction. Future studies should, therefore, consider an alternative design in which students receive more instruction and spend less time on assessment (e.g., 3 instructional sessions followed by one assessment session).

Observations of students during weekly meetings and the students' responses during the post-intervention interview indicated additional limitations. The time limitation in completing all assessment activities (i.e., read and think aloud, written summary, and response to comprehension questions) challenged strategy use and may have impacted students' performance on the two comprehension tasks. Leo and Kevin reported more time would have been helpful in constructing summaries, and Jason reported he would have used more strategies (e.g., used the Internet as a resource while reading assigned passages) if he had had more time more time.

The requirement that students read aloud was also a potential limitation. This is especially true given the findings that some deaf individuals may approach reading in a non-linear fashion (i.e., look at text holistically, from top to bottom) to get an idea and reread to construct meaning (Silvestri & Wang, 2018). This approach to reading may be especially true for individuals whose preferred and dominant language is American Sign Language (ASL). A need to translate printed English text into the visual-spatial language of sign may necessitate the use of unique strategies.

Deaf and hard of hearing (DHH) students comprise a heterogeneous group, many of whom are from culturally diverse families and exposed to multiple languages and



modalities of communication (Gerner de Garcia, 1995; Grosjean, 1992). Such was certainly the case with the four participating students in the current study, all of whom were exposed to a spoken language other than English at home. Three of the students had also had different degrees of exposure to Signed English and American Sign Language at school. As is characteristic of bi- and multilingual individuals, 3/4 students in the current study shifted between their use of English vs. another spoken language and/or signed vs. spoken language modality in response to various situational demands (e.g., Leo often used spoken Spanish when communicating with parents and spoken English when communicating with hearing peers in mainstream classrooms). A student's receptive and expressive competency in more than one language (or language modality) is cause for consideration in the design and implementation of effective educational programming. Deaf education scholars (Gerner de Garcia, 1995; Grosjean, 1992; Parasnis, 1997) offer several recommendations in optimizing the linguistic and educational outcome for DHH students from diverse linguistic and cultural backgrounds, including:

- assessing a student's skills in all languages of exposure (i.e., the home and school languages) and/or modalities (e.g., signed, spoken, and written);
- informing parents and students of language options;
- supporting students in recognizing themselves as multilingual;
- exposing families and children to culturally and linguistically diverse models (e.g., Deaf adults who use American Sign Language).

Gerner de Garcia (1995) emphasizes the need for improved teacher training in the theories and practices of English as a Second Language (ESL) and culturally responsive pedagogy (e.g., use of visual media to support language comprehension, inclusion of culturally relevant themes, maintaining a focus on critical thinking) for the growing population of culturally and linguistically diverse DHH children in the US. Parasnis (1997) further emphasizes the importance of capitalizing on visual media for DHH students by highlighting the advantages of (what has become highly accessible) digital media; i.e., access to information via images, videos, and text on the Internet. Access to and use of digital media has become ubiquitous in classroom spaces of hearing and deaf students and is available to most individuals at home and the community. Use of digital media was recognized as an important strategy in the current study's intervention. As has been discussed, digital media was often used by all participating teachers as a means of improving access to and comprehension of information as well.

In returning to a discussion of how deaf individuals approach reading, it is important to recognize that it may also be the case the *regardless* of communication modality, deaf individuals approach text differently than hearing individuals (Mehravari, Emmory, Prat, Klarman, & Osterhout, 2017). In their assessment of the neurological response to text using event-related potentials (ERPs), Mehravari et al. (2017) report a clear distinction in attention to the semantic accuracy of text by deaf participants vs. attention to the grammatical accuracy by hearing participants. The authors report the deaf participants' bias to semantic content to be evident even when controlling for mode of communication and reading proficiency level. Mehravari et al. (2017) suggest that their results indicate deaf individuals may benefit more from vocabulary instruction (as compared to a focus on English grammar). I find this conclusion to be problematic on several grounds: (a) the participants in this study did not include any deaf individuals with access to auditory-spoken language (i.e., all were severely to profoundly deaf; none

used a cochlear implant), (b) ERPs are not necessarily indicative of an individual's *strategic* approach to reading (and understanding) text, and (c) a task that requires the reader to recognize errors in text may elicit different cognitive responses and processes than a task that is focused on *comprehension* of text. Further studies that examine the issue of strategy use and neurological processes via a systematic comparison between different types of participants and reading tasks are needed before we can make any conclusions regarding whether the reading process is the same vs. different between deaf and hearing individuals.

Analysis of the students' strategy use revealed certain limitations with regards to how the strategies were defined (i.e., which behaviors constituted a certain kind of strategy). In completing similar research, I would either revise definitions of several of the strategies or create hierarchies for some of the strategies. A few examples include:

- Identify *specific* types of questions that would be considered strategic (e.g., questions that serve to fix a comprehension breakdown or prompt the student to look for more information, as opposed to questions that indicate a general sense of curiosity or relate to explicitly stated details in the text);
- Create a hierarchy of word identification as a strategy (e.g., self-identification of an unknown word without an attempt to define it as level 1, self-identification of an unknown word and an unsuccessful application of a strategy in deriving meaning as level 2, and self-identification of an unknown word and successful application of a strategy in deriving meaning as level 3);
- Document whether or not a student attempts to revise inaccurate predictions of the main idea.

### **Implications**

Notwithstanding the several limitations noted, findings from this study have potential for contributing to the development of more efficacious literacy intervention. The results present a modest level of evidence in support of explicit instruction of strategies and the think aloud approach in effectuating change in student's strategy use and comprehension of text. The think aloud procedure was also a highly valuable a means of *assessing* students' skills and areas of need, which is an important component of individualizing instruction. Most importantly, students' verbalizations revealed that strategy use does not necessarily lead to improved comprehension of text. Educators, therefore, need to not only examine strategy use but whether the use is effective and leads to better *comprehension*.

### **The Research and Practice Gap**

In addition to an interest in exploring effective means of supporting *student* development, literacy intervention studies have potential for addressing the gap between research and classroom practice. Teacher interviews and observations allow for an exploration of teachers' perspectives of literacy and effective instructional approaches and perceptions of students' literacy skills and potential. Interview and observation data analysis can be used in planning teacher-researcher workshops in which the two parties engage in constructive conversations about evidence-based practice and devise a plan for improving existing practices. This is an important component of any proposed literacy study given the reportedly ineffective and incoherent teaching practices in both hearing and DHH classrooms (Marschark & Knoors, 2012).

It is critical to understand how to embed strategy instruction within the daily classroom curriculum and important to recognize that instruction consisting of identifying strategies (i.e., labeling a strategy and providing a definition and examples) is different than *modeling* use within joint reading activities. Students in this study were aware of various kinds of strategies and even used the strategies while reading independently but did so ineffectively. It is essential to not only assess whether a student uses a strategy but whether the use of a strategy is *effective*. Modeling strategies, such as *how* to identify words that are critical to an understanding of the main idea and important details, *which* strategy to use to derive meaning, and *how* to implement the strategy, is essential to ensuring the efficacy of strategy instruction. Classroom observations completed in this study revealed that 3/4 teachers never used a think aloud approach to explicitly teach various strategies. Joy was the only teacher who began to use the think aloud approach in supporting literacy development across subject areas (i.e., history and English). Joy had expressed an interest in this approach at the beginning of the study and independently researched the approach through the few months during which I was meeting with participating students. Observations also showed that specific reading comprehension strategies (e.g., identifying and defining unknown words and summarizing to check comprehension) were targeted inconsistently and with a high degree of variability between teachers. While Tracy and Joy were observed to include vocabulary identification and decoding strategies during all five observations, Julie and Kathy were only observed to do so during 2/5 observed classes. Joy was the only teacher who consistently demonstrated and encouraged the use of summarization, in writing and/or verbally.

Participating teachers used a few similar *instructional* strategies, such as: (a) encouraging students to use technology to access notes, research assigned topics, and submit assignments, (b) asking students to work in pairs or small groups, and (c) eliciting and/or allowing student contributions to discussions. Each of these strategies, however, was seen to have potential for improvement (or change in implementation that would better support comprehension of text). Students' use of technology can be improved via explicit instruction (e.g., with regards to accurate and effective use of a dictionary vs. Google images to derive the meaning of an unknown word). Time allotted for small group or peer-to-peer activities can (and perhaps should) be balanced with direct and explicit instruction from a teacher. Observations of peer-to-peer work indicated problematic behaviors (e.g., one peer taking the lead while others copied or passively watched). Student contributions to a discussion can be used to identify and model a strategy. Students in Kathy's class, for example, were observed to identify comprehension breakdowns, ask questions, and relate their personal experiences to a topic of discussion. These were seen as opportunities for modeling many different strategies. While Kathy often responded to her students' comments and questions, she was not observed to explicitly teach them strategies they could begin using in reading future texts.

### **Feasibility**

In discussing the findings and reflecting on whether explicit instruction of strategies can be efficacious, we must also address issues regarding feasibility; e.g., reflecting on the appeal and practicality of the proposed intervention and the likelihood that a similar intervention would be used in a classroom setting. A few components of the

intervention, as were implemented in this study, would challenge implementation within a classroom setting. These include: (a) the amount of time spent on *1:1* assessment and instruction per week, (b) the use of reading material at an *individualized* Lexile level, and (c) the time spent *planning* instruction per student each week (e.g., finding passages of interest, analyzing student performance, and rehearsing instruction). I found myself consistently spending more time in finding individually tailored passages that met the full range of important selection criteria, such as difficulty, interest, and overall length. This issue was especially salient for Jason whose reading level was assessed to be significantly below his actual grade level. The Readworks (and Newsela) passages at lower Lexile levels were often quite short and presented very little content about a topic. On the Newsela website, a lower Lexile score also resulted in passages with compromised clarity and coherence.

Do the limitations noted indicate strategy-based instruction cannot be implemented in a classroom setting? Do they indicate that implementation would be especially difficult in classrooms where the teacher works with a diverse array of students, ranging from several students in a self-contained special needs class to 30 highly diverse students in a mainstream class? Do the limitations indicate challenges even when service providers, such as a speech and language pathologist, work 1:1 with students? While there will certainly be some differences in implementation, data in the current study indicate teachers do in fact use strategy-based instruction. There is, however, room for improvement. So what can be done? Based on the insights emerging from the current analysis, several possibilities present themselves:

- **Finding time for relevant assessment.** The GMRT assessment may take a few hours to administer, but provides valuable information regarding reading level. Quarterly informal assessment of comprehension of assigned curricular reading is another possibility.
- **Considering alternative curricula:** Newsela is one possible resource for assigning the same content to all students but at more individualized Lexile levels.
- **Using student-selected reading:** I gave students some choice, but an even more individualized model is available, which as was the case in Joy's class where students presented on a self-selected article each week
- **Instruction:** We should consider going beyond discussion of strategies to modeling via think-aloud and collaborating with service providers who can provide individualized instruction, even if limited to 20-30 minutes a week.

#### **Future Studies**

The current study was limited in a number of ways, including inclusion of a small number and type of participants and a short period of intervention. To ensure better generalization potential and more robust findings, future studies should consider recruiting a larger number of students and extending the intervention time. In addition, due to certain pragmatic constraints (e.g., limited time in completing a dissertation study and the need to begin baseline measurement at the same time for all participants), participant recruitment ceased before a school for the deaf had reached a decision about participating in the study. It is important that future studies consider inclusion of students whose primary and/or preferred language is a natural sign language.

Past studies—both those that survey existing strategy use ((Banner & Wang, 2011) or implemented interventions (Johnson Howell & Luckner, 2003) —have assumed

that DHH students need the same strategy portfolio as hearing students. This assumption was also the case in the current study. Although there are many similarities in the cognitive and perceptual skills of hearing and DHH individuals, a careful consideration of certain differences indicates a need for a re-evaluation of an assumption that learning and development (and thus the use of specific strategies) is exactly the same for hearing and deaf students. There is evidence, for example, that DHH individuals who are auditory-verbal and have stronger phonological and speech skills use more temporal or sequential coding strategies, while those who rely on sign language use more visuospatial strategies (e.g., have better memory of complex visual stimuli and locations in space and use non-linguistic mental imagery to conceptualize text) (Marschark & Knoors; 2012; Silvestri & Wang, 2018; Wang, Silvestri, & Jahromi, 2018).

Marschark & Knoors (2012) summarize several additional differences that are worthy of consideration in determining *what* and *how* to teach deaf students in classroom settings (i.e., when instruction is directed at a group and not 1:1). On average, DHH students have more difficulty with visual attention (i.e., maintaining attention on a signing interpreter or deaf peer). Deaf students also have an added burden of often having to shift attention between verbal and visual stimuli (e.g., the signed message and a corresponding image). These differences indicate a need to modify the instructional pace and interactional style (e.g., stop signing when students need to attend to a visual stimulus and gain the student's attention when initiating a conversational turn). The need to shift attention so frequently is reported to have a negative impact on short-term memory of information and relational processing (e.g., relating similar content, drawing from one's own background knowledge when processing new content, and synthesizing content across sources). Relational processing skills are associated with advanced reading and comprehension so limitations in this area into adolescence and young adulthood indicate a need for continued support and instruction for older DHH students. Studies that seek to extend explicit instruction of comprehension and meta-cognitive strategies to the classroom setting, as compared to the 1:1 and highly individualized approach used in the current study, need to therefore consider the additional cognitive and linguistic demands on the student.

There are a number of other areas of study that would contribute to the existing scant body of literature related to literacy development in older DHH students (e.g., literacy identity, home literacy practices, and digital literacy practices). The future is ripe with need and potential for studies that further our understanding of theories of literacy development in older DHH students and the best means of intervention.

### **Conclusion**

Despite improvements in the early identification of hearing loss and the interventions provided, many Deaf or Hard of Hearing students continue to exhibit language and literacy delays into adolescence and adulthood (Ruffin et al., 2013). Research has also indicated delays and limitations in domain-general skills, such as Theory of Mind, Executive Functioning, and memory (Marschark et al., 2009; Marschark, Sarchet, & Trani, 2016; Pisoni et al., 2010). Lack of early access to comprehensible language has significant and long-term consequences for neurophysiological development (Sharma & Glick, 2016) and affects DHH children's cognitive, language, and literacy development, regardless of the intensity and length of intervention provided thereafter (Mayberry, 2007). Although continued improvements in

policies and practices related to ensuring early and continuing access to comprehensible language is critical to advancing the field of Deaf Education, such a discussion was beyond the scope of this study. My interest was to examine whether explicit instruction would be effective in improving DHH adolescent students' approach to reading and comprehension of text; regardless of the students' educational and linguistic backgrounds.

Most literacy studies of students who are DHH to date have focused on younger students (Benedict, Rivera, & Antia, 2015; Easterbrooks et al., 2015; Schirmer, Bailey, & Schirmer Lockman, 2003) and/or discrete linguistic skills (e.g., phonology, vocabulary, and morphology) (Nielson, Luetke, McLean, & Stryker, 2016; Kyle & Harris, 2010; Mayberry et al., 2011). There have been few studies of older DHH students' strategy use (Banner & Wang, 2011; Silvestri & Wang, 2018; Wang, Silvestri, & Jahromi, 2018) and practically no studies that have focused on examining the effect of explicit instruction on strategy use and comprehension.

I therefore undertook this study to examine the metacognitive and reading comprehension strategies of a small group of adolescent students following an intervention using explicit instruction of reading strategies and the think aloud procedure. The proposed intervention was developed based on our current understanding of reading as a sociocultural phenomenon (Andrews, Byrne, & Clark, 2015) and reliance on a sociocultural framework of teaching via modeling and systematic guidance (Gavelek & Bresnehan, 2009). The intervention also reflected an understanding of the importance of student as a motivated and active participant in the learning process (Chi & Wylie, 2014).

I implemented a multiple baseline design in which each participating student completed a different number of baseline assessments to better control for the effect of external variables. All students completed ten weeks of an intervention phase, during which they engaged in alternating assessment and intervention hourly sessions twice a week. The purpose of ongoing assessment was to individualize the weekly intervention (i.e., specific strategies targeted for intervention changed in response to a student's performance and the demands of the assigned text). Each week, I analyzed student performance on several measures, to examine strategy use and comprehension of text.

Analyses of students' performance across tasks (i.e., reading aloud, strategy use, response to vocabulary probes, response to comprehension questions, and self-constructed summaries) indicated a few factors that challenged reading comprehension for these adolescent students, including: (a) limited/delayed vocabulary, (b) limitations in receptive and expressive English grammar, (c) limited background knowledge, and (d) lack of awareness of comprehension breakdowns. Limitations with vocabulary and grammar interfere with a student's text-based comprehension, while limitations in background knowledge challenge the student's successful integration of text into existing knowledge (stored in long-term memory) and the re-construction or expansion of that knowledge (Mac Namara & Kintsch, 1996). Lack of awareness of comprehension breakdowns reflect reports of delays and limitations of domain-general development in DHH students (Marschark et al., 2009). The current study's findings suggest a need for continued support in building DHH students': (a) discrete linguistic skills (i.e., vocabulary and English grammar), (b) adequate background knowledge of global topics, and (c) meta-cognitive skills (i.e., self-monitoring). Development of adequate background knowledge (McNamara & Kintsch, 1996) and meta-cognitive skills requires

explicit instruction and support over a long period of time, using multiple texts and activities.

Despite all of these challenges, findings revealed an increase in the type and frequency of strategy use by all four participants. Students did not, however, always use strategies effectively. In fact, students' verbalization, via the think aloud procedure, revealed misunderstandings of content and lack of awareness of these comprehension breakdowns; findings which were also recently reported by Wang, Silvestri, & Jahromi (2018). A positive finding was that all four participants began to identify unknown words more frequently and to show improvements in their approach to deriving the meaning of these words. Students reported generalization of strategies across contexts. This study was limited in its use of a time constraint for all tasks, including students' reading of assigned passages. Classroom observations and participating students' journal entries revealed strategy use to differ in the classroom, home, and 1:1 instructional setting. Although some of the variation may be attributed to differences in activities and/or expectations of students (e.g., students often assigned to work in peer groups and explicitly asked to use the Internet to retrieve and organize information about a specified topic), difference also seemed to be a result of the time constraint under which students worked when meeting 1:1 with me. As Leo noted during the post-intervention interview, he had avoided using the Internet as a resource because he simply did not have enough time. The limitation in time may have also hindered students from employing higher level strategies, such as synthesis. Weekly journal entries and post-intervention interviews by Leo and Jason indicated use of technology and synthesis as strategies when reading topics of interest at home.

Analyses of informal comprehension measures failed to show an intervention effect (i.e., absence of immediate improved comprehension scores following the introduction of the intervention). Standardized assessment scores, however, show notable change in the reading achievement for two students (Leo and Jason).

Although the students' language and literacy history was not systematically examined (e.g., via lengthy questionnaires and/or formal language assessments), responses from informal interviews indicate a few noteworthy patterns. All students were the only DHH member in the family. All had had exposure to sign language at some point in their education but only two had continued to receive and use a bimodal communication system (i.e., signed and spoken English). All but Kevin reported at least one family member to have limited sign language proficiency; often the student's mother. Three of the students reported families often used spoken Spanish despite the student's preference for and higher proficiency of English. None of students reported frequent joint reading with parents at an early age. As expected the participating students were quite diverse in age of identification of deafness, assistive listening device use, educational programming, and preferred mode of communication. Altogether, because the participants were quite small in number and highly diverse in hearing, language, and educational history, the data cannot be generalized to the larger population of DHH students. More studies are needed to establish reliable evidence of efficacy of explicit instruction of strategies.

The current study produced modest evidence in support of using think aloud as a specific approach to explicit instruction of reading comprehension strategies. Additional studies, using a larger number of students and implemented over a longer period of time

are needed to more clearly show the efficacy of the proposed intervention approach. Because observations of the participating teachers revealed that 3/4 of the teachers never implemented think aloud and rarely directly addressed reading comprehension strategies, it is worthwhile to pursue studies that seek to train classroom teachers in implementing think aloud as a more systematic approach to addressing reading comprehension development.

As McNamara and Kintsch (1996) highlight, “texts are crucial for conveying and for acquiring new information.” (p. 247) Our reliance on text as a primary source of information and communication is likely to continue into the distant future, even with the many exciting and multimedia technological advances. Because of the long-lasting effects of reading skills across the life (Garberoglio Cawthon, & Bond, 2014) and the ongoing statistics of a language and literacy gap between deaf and hearing adolescents, it is critical that we continue our quest for better means of supporting these students’ development.



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## Appendix A: Student Initial Interview

### Demographic information (via interview and review of student files)

Name

Age (How old are you?)

Grade

Degree of hearing loss (What is your hearing level?)

Age of onset/diagnosis of hearing loss (How old were you when you had your first hearing test? When you first became deaf?)

Type of amplification(s) used

If implanted, age of implantation

Communication modality

Language(s) (What is your preferred language?)

Language history (first language student was exposed to, age of exposure, changes in language exposure in school and home)

Reported reading level (and test used)

Reported "oral" language level (e.g., vocabulary, grammar)

Current IEP services (type, frequency, and model)

Educational history (age at initial enrollment, type of program kindergarten through present time) (Tell me about your schooling; from kindergarten to now.)

Parent's name and contact information

Home language

### Literacy Interview Questions

*I would like to ask you some questions about reading. There is no right or wrong answer. These questions are about you and your reading development, skills, interests, and challenges.*

1. How did you learn to read?
2. What helps you improve your reading skills?
3. How do you feel about yourself as a reader? Do you believe you are skilled? Tell me more (Why or why not).
4. Thinking back to your childhood, what kinds of things helped you become a reader? (books in the house, older sibling, parent reading to you, closed captioning used while watching TV, others)
5. What is challenging about reading?
6. When reading something difficult, what do you do to help yourself?
7. How does your teacher support you in developing your reading skills?
8. Has anyone else helped you develop your reading skills?



9. Describe the reading and writing activities in your class.
10. When you have difficulty understanding (text), what does your teacher do to help?
11. Does technology (computer, Internet) help you as a reader? How?
12. What do you read outside school?  
(Internet, comics, newspaper, novel, email, magazine, closed captioning, etc.)
13. How much time do you spend reading outside school?
14. What do you *enjoy* reading?
15. What are some topics of interest to you (e.g., sports, travel, cooking, science)?
16. If you do not enjoy reading, what do you think would help you enjoy reading more?
17. What is the purpose of reading?
18. Why is reading important?
19. What kinds of writing do you do (e.g., text messaging, participation in social media – such as FB, journal writing, school assignments, making lists, when communicating with other deaf individuals, when communicating with hearing people, communicating with family members and relatives, etc.)?

## Appendix B: Strategy Checklist

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Below is a list of things different people may do when reading something difficult. What do *you* do when reading something difficult?**

Let me know if you have questions or something is unclear.

When reading something hard, I	Always	Sometimes	Never
_____			
_____.			
look at the text, pictures, and questions before I start reading, to better understand what is expected of me			
reread some parts			
pay attention to the title and headings			
think about the main idea			
think about what I already know about the topic			
think about whether the information relates to other readings			
imagine the people, place, and/or events (I make a picture in my mind)			
use pictures, Tables, and Figures to help me understand			
draw pictures			
take notes			
highlight, underline, or circle information			
guess the meaning of difficult words			
summarize the information in writing			

ask myself questions as I read			
guess what may happen next			
guess the characters' thoughts, feelings, and/or plans			
check to see if my guesses are right or wrong			
recognize when I do not understand something			
read aloud or sign			
slow down			
talk to others about the reading			
use the Internet for more information (pictures, video, more reading)			

**Can you think of anything else you do when the reading is difficult?**

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Thank you!

### Appendix C: Self-Constructed Summaries: Scoring Rubric

Scoring Elements	1 Emerging	1.5	2 Approaches Expectation	2.5	3 Meets Expectations	3.5	4 Advanced
<b>Controlling idea</b>	Presents a general or unclear controlling idea.		Presents a clear but incomplete idea (e.g., identifies topic but not the focus or main idea).		Presents a clear and specific controlling idea (s).		Presents a clear and specific idea from a critical position (e.g., acknowledging a gap in evidence or information).
<b>Use of details to support the controlling idea</b>	Includes minimal details from sources. Details consist of inaccuracies and lack explanations or connection to one another.		Includes a few details, examples, and/or quotations that are relevant to the controlling idea, but may lack an explanation or a clear connection to one another. May be missing an important detail.		Includes most or all details that are relevant and accurate in supporting the controlling idea.		Presents details that are relevant and accurate and from a position of personal evaluation and/or interpretation.
<b>Organization</b>	Lacks structure. Makes unclear connections between ideas, concepts and information.		Groups ideas and uses transitions to develop controlling idea, but demonstrate some lapses in coherence or organization.		Groups and sequences ideas to develop a cohesive explanation. Uses transitions to clarify the relationship between ideas. Includes an ending.		Groups and sequences ideas in a logical progression. Creates a unified whole. Uses varied transitions to clarify the precise relationships among complex ideas.

## Appendix D: Written Summary Template

What to do when *writing* your summary:

What to do	Example
Begin with a sentence that introduces the main idea. Think about what, who, when, and where.	
Include 3-4 important details from the passage that support the main idea.	
Write the summary using your own words.	
Include an ending.	
(other)	

## Appendix E: Teacher Interview

### Demographic information

Degree

Certification specific to reading

Teacher's primary subject area

Number of years of teaching experience

Number of years of teaching Students who are Deaf or Hard of Hearing (SDHH)

History of employment with regard to educational setting (e.g., mainstream campus, Deaf and Hard of Hearing Program, public vs. private school setting)

Current mode of communication and instruction with students

Number of students in current class

### Perspective and practice

1. How do you define literacy?

2. What do you see as the purpose(s) of reading?

3. How much time do your students spend on reading (in the classroom) per day/week?

4. What kinds of literacy activities do you incorporate into the classroom curriculum?

5. What do you believe contributes to successful literacy development (through the primary school grades; through middle and high school grades)?

6. What contributes to difficulties in literacy development?

7. How do you support literacy development for student in your class?

8. What do you teach students to do when they encounter difficult texts?

9. Do you teach reading comprehension strategies? If so, how?

10. Do you teach metacognitive skills? If so, how?

11. Please describe any other components of your literacy instructional approach we have not yet discussed.

12. Describe the training you have received in supporting students develop literacy skills.

14. Who or what has influenced your approach to teaching literacy?

15. What kinds of support and training (related to literacy instruction) are currently available to you?

16. Do deaf students develop literacy skills in the same way as hearing students?

17. What contributes to successful literacy development in SDHH?

18. What challenges the literacy development of SDHH?

19. How important is it for a student to develop proficiency in literacy skills?

20. If you could change or adapt current literacy practices, what changes or adaptations would you recommend?

21. I'd like to talk briefly about the following student(s) in your class: \_\_\_\_\_

What are some of his/her strengths? What are some of his/her challenges?

22. Do you have any specific approach to working with this student in supporting their literacy development?

23. What, if anything, do you know about your student's literacy practices outside school?

24. What, if anything do you know about your student's family and the kind of influence they have on his/her literacy development?

## Appendix F: Sample Assessment, Analysis, and Subsequent Intervention Session Leo's 6<sup>th</sup> Intervention Session

### Assessment and Analysis

Leo was assigned paired passages about WWII. As was common practice in this study, Leo had selected WWII as a topic of interest a week in advance. The first passage provided background information about the atomic bomb and the second passage presented specific information about the Hiroshima bombing (screenshots of the first page of each passage is presented below). The paired passages represent a historical genre. The first passage was retrieved from Readworks and reported as 800 Lexile level. The second passage was retrieved from Newsela and reported as 850 Lexile level. The two passages were a total of 937 words. Although Leo had expressed an interest in reading about WWII, he identified the content in the two readings as unfamiliar. I had read both passages ahead of time to: (a) document my own comprehension and metacognitive strategies, (b) select three words for the vocabulary probe, and (c) prepare the series of five short answer questions.

Leo and I met 1:1 in a private space. As always, I presented Leo with verbal instructions regarding reading and thinking aloud. Leo received a paper copy of the paired passages, which were marked at the end of each 1-2 paragraphs as a reminder to stop and verbalize his thoughts. I also presented Leo with the printed series of short answer comprehension questions. Leo immediately began to preview the questions and the title and subheadings of the assigned passages. He took more than one minute to do so and I documented this behavior as an observable strategy (i.e., noted the behavior on the strategy checklist as *previewed the text, pictures, or questions before reading*). Leo then began to read the first passage aloud. As I listened, I documented reading errors, such as mispronounced words. These reading errors were used to choose two additional words for the vocabulary probe (for a total of five). Each time Leo stopped to think aloud, I documented the verbalization as one type of strategy. For example, at the end for the first paragraph, Leo stopped to say: "They are talking about how they created the bomb." This behavior was documented as a verbal summary. Throughout the reading, Leo demonstrated use of several strategies, including: (a) previewing questions and headings, (b) summarizing, (c) rereading (of single words and paragraphs), (d) slowing down (e) relating information to background knowledge, (f) asking a question, and (g) making an evaluation (e.g., of the severity of the impact of the bombing).

Following the reading and think aloud, Leo was asked to compose a written summary of the passages and to respond to the series of five short answer questions (presented below the screenshots of the paired reading). Leo had ten minutes to complete each activity. He was then asked about his use of additional covert strategies and reported: (a) thinking about the main idea by previewing the titles and attending to images, (b) visualizing (e.g., the explosion in mid-air), (c) predicting (e.g., President Obama's motivation for visiting Hiroshima), and (d) recognizing a comprehension breakdown (i.e., content in paragraph related to how an atomic bomb is made). Although Leo identified content related to the creation of the atomic bomb to be challenging, he had not used a strategy to resolve this comprehension difficulty. Leo's verbalizations had also indicated a lack of attention to the difference in time periods between the Hiroshima bombing and President Obama's visit. As usual, I also completed a vocabulary probe.

The probe revealed difficulty with a few *key* words in the reading (e.g., *perished*), but Leo had not identified any vocabulary as unknown.

In addition to the live analyses completed during our 1:1 meeting, I completed analyses of Leo's self-constructed written summary and response accuracy to short answer comprehension questions. Students' performance on these two informal measures of comprehension often served as a means of confirming impressions of areas of need or difficulty. For example, Leo's lack of response to question number 3, *Compare and contrast an atomic bomb with a traditional bomb...*, was judged to be related to his own reported comprehension difficulty. Each week, I relied on the live analyses as well as analyses of performance on the informal measures to identify content that had been challenging and potentially useful strategies in improving comprehension.

### **Intervention**

Leo and I met for one hour of intervention, to discuss my analysis of his performance and to discuss and practice strategies that would be useful in improving comprehension. Before providing any feedback, I asked Leo to review the passage and refresh his memory of the content. I then reviewed a few strategies Leo had used effectively in the previous session and discussed the importance of each (e.g., rereading paragraphs silently is important in better understanding challenging content). I also reviewed the evidence that Leo had misunderstood certain content (e.g., asking the question, *Will Obama help the Japanese rebuild (their city)?* had indicated a lack of comprehension of the difference in time between the two events). I provided Leo with a blank template of the 16 targeted strategies and explained that when generating a question as a *strategy*, the reader should often attempt to find the response as they read. I further explained that in doing so, the reader may need to use additional strategies, such as relating one's background knowledge to the reading (e.g., Obama had recently served as President). As was often the case when reading historical pieces with students, I recommended that Leo attend to and analyze the timing of various events (e.g., recent presidency vs. past Hiroshima bombing). Although I sometimes helped students create timelines for such readings, during this session, I pointed out the printed dates in the reading and recommended that Leo look for such information in the body of the reading and printed images. Leo needed direct instruction to correctly infer that in the 50-60 years that had passed, Hiroshima had already been rebuilt; Obama was not concerned about rebuilding. The misunderstanding of this content exemplifies a few difficulties, commonly reported in deaf students: (a) limited background knowledge, (b) limited skill in relating existing knowledge to text, (c) difficulty inferring correct information that is not explicitly stated in the text, and (c) lack of awareness of comprehension breakdowns.

I reviewed a few unknown words and the strategies that Leo had used (effectively and ineffectively) to derive the meaning. I recommended alternative strategies to deriving the correct meaning of a word that Leo had incorrectly defined and guided him in using the strategy to revise his definition. For example, when reading *They could also end the war and save the lives of soldiers; however, the great loss would be in civilian life*, Leo had guessed the meaning of *civilian* as "people and soldiers". I asked that Leo *reread* the sentence and attend to the word *however* as a clue to the correct meaning of *civilian*. Leo knew the meaning of *however* but had not used this knowledge effectively to derive the correct meaning of *civilian*. A review of the few unknown words (i.e., *civilian*, *agony*, and *accompanied*) prompted a discussion and implementation of all the targeted



vocabulary strategies (i.e., rereading, using semantic and syntactic clues, using the dictionary, and using morphological knowledge).

All through our discussion of strategies, I also provided quite a bit of supplemental (and background) information about key ideas (e.g., war, casualties, Hiroshima, atomic bomb, etc.).

I reviewed Leo's written summary and pointed out a few strengths, such as his inclusion of several accurate details of the Hiroshima bombing. I also recommended changes or additions that would have improved the accuracy or completeness of the summary (e.g., specifying which "scientific discovery" led to the creation of the atomic bomb). A review of Leo's written summary also led to a recommended strategy for supporting comprehension (e.g., using the Internet to find a video or image that supports comprehension of the concept of *splitting an atom*). Our discussion about the strategy consisted of *what* it is, *when* to use it, *why* it would be helpful, and *how* to implement it. Once again, while implementing a strategy, I also found myself presenting supplemental background information.

Next, Leo and I took turns reading a few selected paragraphs from the text and verbalizing our thoughts. For example, when reading a paragraph about Obama's visit to Hiroshima, I modeled relating my background knowledge to content in the text and inferring information (about Obama's motivation/impetus in making the trip). I also verbalized my intention to continue reading to check my prediction. I provided immediate feedback and instruction when Leo took a turn reading and thinking aloud; the instruction was essential in addressing gaps in background knowledge and/or in pushing a student beyond shallow implementation of a strategy. Leo was engaged during our discussion and strategy use and asked additional questions (e.g., related to why past presidents had not made a trip to Japan to make amends). When we had reread the few selected passages and discussed and practiced strategies, I also pointed out a short answer question that had been difficult for Leo and discussed the correct response.

Students were always encouraged to keep paper copies of assigned passages and the strategy templates that we used during the intervention session. My hope was that students would use these (and other) handouts to review and implement strategies when reading independently, but students rarely reported doing so.

Leo had already identified a topic of interest for the next series of assessment and intervention sessions. During the last few minutes of our reading, I asked him to browse the Readworks website and choose another passage of interest so I could begin planning for the following series of meetings.

### **In Sum**

This excerpt is highly representative of the adaptive and individualized nature of the intervention implemented in this study. Students were always engaged in a discussion of the content in assigned readings, in addition to the strategy-related discussion and practice. Although I would use my analyses of a student's performance during the previous assessment session to identify 2-3 strategies to target during the intervention session, additional strategies would often emerge during my interaction with the student.

## World War Two - The Atomic Bomb

by ReadWorks



*mushroom cloud from atomic bomb dropped on Nagasaki*

Before World War II, scientists around the world were discovering many new things about the smallest unit of matter: the **atom**. When World War II started, countries wanted to use these discoveries to build new weapons. They especially wanted to make an atomic bomb. This type of bomb is made by splitting the atom into two parts. The explosion of this bomb would be more destructive than anything the world had ever seen.

The United States was not the only country trying to make an atomic bomb. Japan and Germany also had scientists busily working on a bomb. It was a race. Whoever developed the bomb first would win World War II. They could also end the war and save the lives of soldiers. However, the great loss would be in civilian life. The bomb could not pick and choose to kill only soldiers. Innocent men, women, and children would die.

Scientists in the United States were the first to learn the secret of splitting the atom. On August 6, 1945, the U.S. dropped an atomic bomb with the code name of "Little Boy." The bomb was dropped on Hiroshima, Japan.

## The Hiroshima bombing: What you need to know about the nuclear attack

By Los Angeles Times, adapted by Newsela staff on 06.01.16

Word Count 655



In this Sept. 8, 1945, file photo, a correspondent stands in the rubble in front of the shell of a building that once was a movie theater in Hiroshima, Japan, a month after the first atomic bomb ever used in warfare was dropped by the U.S. on Aug. 6, 1945. AP Photo/Stanley Troutman, File

**HIROSHIMA, Japan** — President Barack Obama plans to go to Hiroshima, Japan, on Friday. He will become the only current U.S. president to visit the first city targeted for a nuclear attack.

The president plans to visit the Hiroshima Peace Memorial to lay a wreath. He also will tour the memorial grounds and give a statement reflecting his thoughts. Obama will be accompanied by Japanese leader Shinzo Abe.

Many people in Hiroshima hope President Obama's visit will rekindle global interest in giving up nuclear weapons. Obama addressed this topic in a 2009 speech in Prague, the capital of the Czech Republic.

More than 70 years have passed since a U.S. B-29 plane dropped the nuclear bomb known as Little Boy on the city. It was on Aug. 6, 1945, in the closing days of World War II. Another nuclear bomb was dropped on the city of Nagasaki on Aug. 9.

**The atomic bomb**  
**Questions**

1. How did President Truman justify (explain) dropping an atomic bomb in Japan?

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2. Why was President Obama's 2016 visit to Hiroshima important?

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3. Compare and contrast an atomic bomb with a traditional bomb. Identify *two* similarities and/or differences.

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4. Other than the destruction to buildings and immediate death, how does an atomic bomb affect people?

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5. What is the purpose of the two readings?

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## Appendix G: Intervention Fidelity Checklist

Date: \_\_\_\_\_ Student: \_\_\_\_\_

Please use a 0, 1, 2 to indicate whether student investigator (referred to as “teacher”) demonstrates each of the following:

**0 = student investigator does not demonstrate the skill**

**1 = student investigator demonstrates skill, but there is room for improvement; please provide comment re improvement**

**2 = student investigator demonstrates skill**

Behavior	Observation
Teacher began with <b>summary of observed strategies</b> during last assessment session, using the printed list of strategies.	
Teacher provides <b>feedback regarding student’s written summary</b> (i.e., reviews handout, identifies a strength and, when possible, a missing element).	
Teacher reviews student’s use of a successful <b>vocabulary strategy</b> and, if applicable, one ineffective strategy.	
Teacher <b>explicitly labeled 2-3 strategies</b> student could have used to better understand passage.	
Teacher <b>modeled use</b> of each labeled strategy and/or provided an example, in reference to passage.	
Teacher <b>explained why/how</b> each strategy could have been helpful.	
Teacher engages student <b>implementation</b> of strategies (i.e., students is encouraged to think about pre-reading strategies, reads aloud, stops at the end of each paragraph, verbalizes thoughts about strategies, teacher models a strategy <i>if necessary</i> ).	

## **Appendix H: Student Post-Intervention Interview: A Measure of Social Validity**

1. Are you reading different or new kinds of things, as compared to before your reading instruction time with me? Newspaper, books, magazines, the Internet, closed captioning, etc.
2. Are you spending more time on reading (outside school)?
3. Has your approach to reading changed? Are you using new strategies to better understand when reading?
4. Are you using strategies you and I have reviewed in your classes?
5. Which of the strategies we have reviewed do you think are helpful?
6. Which of the strategies we have reviewed do you think are NOT helpful?
7. How important is reading? Has your opinion about the importance of reading changed?
8. Are you more motivated to read? If so, what has influenced this change?
9. How do you feel about yourself as a reader?
10. Do think the reading instruction has been helpful? If yes, how has it been helpful?
11. What did you not like or appreciate about the weekly instructions with me?
12. What do you think about meeting 1:1 (you and a teacher alone) for reading support as compared to getting instruction in class?
13. Did you find the handouts (for example, the list of strategies) helpful? If yes, how were they helpful?
14. Did you find writing a weekly journal helpful? If yes, how was it helpful?
15. What do you think about writing a summary as compared to answering questions?
16. What do you think about the time limitation (i.e., you only had ten minutes to write a summary and ten minutes to answer the questions)?
17. If you were the reading teacher, what would you do differently?
18. Do you have any advice for me in working with other students in the future?

### **Appendix I: Maintenance Probe**

1. Have there been any changes to the kinds of things you read since we last met in March?
2. Have there been any changes to your reading habits since we last met?
3. Are you spending more time on reading (outside school)?
4. Have you continued to use strategies to better understand when reading? If so, which ones?
5. As compared to last year, do you feel more successful when reading in class or for enjoyment?
6. If so, what makes you feel successful?
7. If it were possible to get more reading instruction next year, do you think you would benefit?
8. If yes, what kind of instruction would you like to have?