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Effects of Teacher-mediated Repeated Viewings of Stories in American Sign Language on Classifier Production of Students who are Deaf or Hard of Hearing

Jennifer Beal-Alvarez

ACCEPTANCE

This dissertation, EFFECTS OF TEACHER-MEDIATED REPEATED VIEWINGS OF STORIES IN AMERICAN SIGN LANGUAGE ON CLASSIFIER PRODUCTION OF STUDENTS WHO ARE DEAF OR HARD OF HEARING, by JENNIFER S. BEAL-ALVAREZ, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Doctor of Philosophy in the College of Education, Georgia State University.

The Dissertation Advisory Committee and the student's Department Chair, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty. The Dean of the College of Education concurs.

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PROFESSIONAL SOCIETIES AND ORGANIZATIONS

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Council for the Education of the Deaf

Georgia Pathway to Language and Literacy

ABSTRACT

EFFECTS OF TEACHER-MEDIATED REPEATED VIEWINGS OF STORIES IN AMERICAN SIGN LANGUAGE ON CLASSIFIER PRODUCTION OF STUDENTS WHO ARE DEAF OR HARD OF HEARING
by
Jennifer S. Beal-Alvarez

Students who are deaf and use sign language frequently have language delays that affect their literacy skills. Students who use American Sign Language (ASL) often lack fluent language models in both the home and school settings, delaying both the development of a first language and the development of literacy in printed English. Mediated and scaffolded instruction presented by a More Knowledgeable Other (MKO; Vygotsky, 1978, 1994) may facilitate acquisition of a first foundational language. Repeated viewings of fluent ASL models on DVDs paired with adult mediation has resulted in increases in vocabulary skills for DHH students who used ASL (Cannon, Fredrick, & Easterbrooks, 2010; Golos, 2010; Mueller & Hurtig, 2010). Classifiers are a syntactic sub-category of ASL vocabulary that provides a critical link between ASL and the meaning of English phrases. Classifiers accounted for one-third of signs used by deaf adults in spontaneous narrative tasks (Morford & MacFarlane, 2003). Researchers have identified a preliminary sequence of classifier development in DHH children that spans from 3 to 12 years of age (deBeuzeville, 2006; Schick, 1990a; Slobin et al., 2003; Supalla, 1982). However, interventions to develop classifier production in children are scarce. The purpose of this study was to investigate the effects of teacher-mediated repeated viewings of ASL stories on DHH students' classifier production during narrative retells. This study included 10 student participants in second, third, and fourth grades and three teacher participants from an urban day school for students who are DHH. The

researcher used a multiple baseline across participants design followed by visual analysis and calculation of the percentage of non-overlapping data (PND; Scruggs, Mastropieri, & Casto, 1987) to examine the effects of the intervention. All students increased their classifier production during narrative retells following a combination of teacher mediation paired with repeated viewings of ASL models.

EFFECTS OF TEACHER-MEDIATED REPEATED VIEWINGS OF STORIES IN AMERICAN SIGN LANGUAGE ON CLASSIFIER PRODUCTION OF STUDENTS WHO ARE DEAF OR HARD OF HEARING

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ABBREVIATIONS

ASL	American Sign Language
CI	Cochlear implant
DHH	Deaf and Hard of Hearing
EOWPVT	Expressive One-Word Picture Vocabulary Test
DOD	Deaf of Deaf
DOH	Deaf of Hearing
MKO	More Knowledgeable Other
PPVT-IV	Peabody Picture Vocabulary Test, 4^{th} Ed.

CHAPTER 1

THE PROBLEM

Many students who are deaf lag significantly behind their typically hearing peers in language and literacy skills. An often cited statistic is that the average 17- to 18-year-old deaf student reads at a 3rd to 4th grade level upon high school graduation (Allen, 1986), although variation exists within the population (Geers, Tobey, Moog, & Brenner, 2008; Vernon, Raifman, Greenberg, & Monteiro, 2001). Vocabulary is directly related to reading for deaf students (LaSasso & Davey, 1987; Wilbur, 2000). These students frequently have severe vocabulary delays compared to their typically hearing peers (Kyle & Harris, 2010; Meadow, 2005; Sarant, Holt, Dowell, Rickards, & Blamey, 2009) and this gap in vocabulary increases with age (Kyle & Harris). For deaf children who use sign language, these delays are often the result of early communication challenges between deaf students and their hearing parents with limited signing skills (Kuntze, 1998; Mitchell & Karchmer, 2004; Moeller & Leutke-Stahlman, 1990; Moeller & Schick, 2006). Additionally, most teachers of deaf students are hearing, meaning that they are not native signers (Allen & Karchmer, 1990; Trybus & Karchmer, 1977) and the abilities of educational interpreters in the school setting also vary (Schick, Williams, & Kupermintz, 2006). Without fluent language models at home or school, deaf students may not be in an environment supportive of language acquisition and therefore they may continue to lag behind their hearing peers in language and literacy skills.

Limited research exists that identifies evidence-based instructional practices to increase the language and resulting literacy development of deaf students (Easterbrooks & Stephenson, 2006; Luckner, Sebold, Cooney, Young, & Muir, 2005/2006). An evidence-based practice is defined as systematic, instructional research that establishes a functional relation between teacher performance and student outcomes in experimental or quasi-experimental research settings (Odom et al., 2005). For example, across 40 years of research and 964 studies with deaf and hard of hearing students, only 22 studies met the criteria established by the What Works Clearinghouse (2003), and of these, no two studies investigated the same dimension of literacy within the population (Luckner et al.). Students who are deaf or hard of hearing represent a low-incidence population within special education with an occurrence rate of approximately 1 to 3 per 1,000 students (Task Force on Newborn and Infant Hearing, 1999). Single-subject research aligns well with the aims of special education because it functions at the individual level, permitting individual analysis of student outcomes and opportunities for change through an iterative process (Horner et al., 2005). Previous researchers have implemented single-subject research designs to investigate the effects of repeated viewings of stories presented in ASL by a fluent language model and reported an increase in students' vocabulary skills (Cannon, Fredrick, & Easterbrooks, 2010; Golos, 2010; Mueller & Hurtig, 2010).

Theoretical Basis

Previous researchers (Hoffmeister, de Villiers, Engen, & Topol, 1997; Padden & Ramsey, 1998; Strong & Prinz, 1997) have reported a positive correlation between ASL skills and printed English skills of deaf students who use sign language. Students' abilities to render printed English stories in ASL fluently were positively related to their reading comprehension skills (Easterbrooks & Huston, 2008) and sign language proficiency accounted for 68% of the variability in the reading comprehension of deaf students at the college level (Freel et al., 2011). In a semantic judgment task of paired

English words, Morford, Wilkinson, Villwock, Pinar, and Kroll (2011) reported that deaf adults who were proficient in both ASL and English activated ASL during the task, even though the task only required English knowledge. The authors proposed that deaf learners use co-activation when mediating between English and ASL. Because of their frequent language delays, deaf students may not have a fluent language foundation in ASL from which to transfer linguistic knowledge to the reading process (Chamberlain & Mayberry, 2008).

ASL is a language with its own syntax and grammar (Neidle, Kegl, MacLaughlin, Bahan, & Lee, 2000; Stokoe, Casterline, & Croneberg, 1965). In addition to signs presented on the hands, the use of nonmanual markers (i.e., facial expressions, head nod, body tilt, and eye gaze) are used to express semantic and syntactic information (Neidle et al.; Wilbur, 2000). Classifiers make up one prominent subsystem of ASL for which there is no equivalent in English (Schick, 2003). Classifiers are complex constructions that show the spatial arrangement, movement, and visual characteristics of figures (deBeuzeville, 2006; Schembri, 2001; Schembri et al., 2002; Schembri, Jones, & Burnham, 2005; Schick; Supalla, 1982, 1986). Classifiers accounted for a significant portion of signs used by deaf adults during spontaneous narrative storytelling (Morford & MacFarlane, 2003; Morgan & Woll, 2003). Classifiers consist of four parameters (i.e., handshape, location, movement, and orientation) that are produced simultaneously (Battison, 1978; Marentette & Mayberry, 2000; Stokoe et al., 1965) to show chunks of meaning. Deaf children of deaf parents (DOD), who have native sign language models in the home, tend to acquire and produce classifiers across the time period from 3 to 10 years of age (deBeuzeville, 2006; Schick, 1990a; Supalla, 1982), although they may not be mastered until 12 years (Slobin et al., 2003). Unlike their hearing peers, who master the grammatical systems of English prior to school entry, DHH students have not mastered the classifier system prior to learning to read or reading to learn. However, when provided with explicit, mediated instruction by a More Knowledgeable Other (MKO; Vygotsky, 1978, 1994), DHH students increased their vocabulary skills (Cannon et al., 2010; MacGregor & Thomas, 1988; Paatsch, Blamey, Sarant, & Bow, 2006). Explicit instruction may facilitate classifier development. When using explicit instruction, teachers model performance of the expected skill and provide students with opportunities for practice and feedback on their performance until students master the skill at the expected level (Hall, 2002).

Line of Inquiry

Without competent language models, deaf students are often exposed to impoverished and inconsistent linguistic environments that may “degrade learning” (Singleton & Newport, 2004, p. 399) and result in limited language skills (Coryell & Holcolmb, 1997). However, the provision of fluent language models, namely deaf adults who are native signers, has resulted in increases in vocabulary for DOH students (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010). Children are capable of achieving skills beyond their current levels when provided with mediated, scaffolded instruction (Gindis, 1999; Vygotsky, 1978, 1994; Wertsch & Sohmner, 1995), which may facilitate the emergence and development of language skills. Adults may benefit from mediation provided by an MKO as well. Komensaroff (2001) suggested that adults may benefit from mediation. In the current study, I hypothesized that fluent ASL models might provide explicit instruction in ASL for teachers who are not fluent signers and that the use of fluent ASL models combined with mediation scripts for adults might facilitate mediation and classifier acquisition at both the adult and child levels.

Overview of the Study

Because of the limited availability of deaf language models (Mueller & Hurtig, 2010), some researchers have used technology to provide repeated viewings of fluent ASL models through electronic formats such as electronic books paired with sign language narration (Mueller & Hurtig) and videos of stories presented in ASL (Cannon et al., 2010; Golos, 2010). Hearing parents and their deaf preschoolers increased their sign language vocabularies through repeated interaction with electronic books by clicking on the text on the computer screen to display the corresponding sign for a printed word (Mueller & Hurtig). Preschoolers who repeatedly watched a DVD with target vocabulary words presented in print, sign, and fingerspelling by an ASL model (Golos) and fifth graders who received pre-teaching of target vocabulary words prior to repeated viewings of stories presented in ASL (Cannon et al.) significantly increased their targeted vocabulary production. Based on the results of these studies, one might hypothesize repeated viewings of an ASL model paired with teacher mediation might lead to increases in production of a subcategory of ASL, namely classifiers.

To produce classifiers, DHH students need an authentic task, such as narrative retell, that provides opportunities in a “meaningful form of communication that is naturalistic” (Petersen, 2011, p. 208). Narrative retell, or the retelling of a true or fictional story with temporal sequence, appears to be an effective strategy for measuring students’ use of expressive language (Justice, Bowles, Pence, & Gosse, 2010; Kaderavek & Pakulski, 2007; Nikolopoulos, Lloyd, Starczewski, & Gallaway, 2003; Pankratz, Plante, Vance, & Insalaco, 2007), and, specifically, syntactic features in children with language impairments (Davies, Shanks, & Davies, 2004; Klecan-Aker, Flahive, & Fleming, 1997; Petersen, Gillam, Spencer, & Gillam, 2010). Students with language impairments increased their use of noun phrases, an element specific to classifiers in ASL, when provided with systematic, explicit instruction in narrative retell (Petersen). DHH students who used British Sign Language (BSL) decreased the number of ambiguous classifiers, or those for which no noun phrase was provided, across narrative retell opportunities and age (Morgan, 2006).

In addition to repeated opportunities for narrative retells, the pairing of mediated instruction with repeated viewings of ASL models and explicit instruction may further facilitate student production of classifiers. Because so few teachers are fluent signers, the provision of mediation scripts for teachers that are directly related to classifier production by ASL models may assist teachers in their explicit instruction of classifiers. In this study, I proposed that the provision of mediated instruction within the typical classroom setting by the students' regular teacher would lead to a socially valid, evidence-based practice to increase students' ASL skills. Because of the positive correlation between ASL and English skills (Hoffmeister et al., 1997; Padden & Ramsey, 1998; Strong & Prinz, 1997), increasing students' foundation in ASL through classifier production may assist in the development of their literacy skills.

Previous researchers (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) demonstrated increases in vocabulary for DHH students through repeated viewings of ASL models paired with explicit instruction. The purpose of the current study was to expand this research from targeted vocabulary words to a specific element of ASL vocabulary, classifiers. I sought to determine if a combination of repeated viewings of stories presented in ASL by a fluent model paired with teacher mediation would result in an increase in classifier production when DHH children engaged in narrative story retells. The research questions were (a) What are the effects of repeated viewings of ASL stories combined with teacher mediation on classifier production during narrative retells for children who are DHH? (b) What are the effects of fading teacher mediation on classifier production during narrative retells for these children? The term *effects* in the current study encompassed the number of overall classifier productions, the types of classifiers used, and the accuracy of classifier primes within a given parameter.

Research Design

This was a quantitative study using a multiple baselines across participants design. Participants included 10 students at a day school for the deaf (8 male, 2 female) in second, third, and fourth grades who had documented hearing losses. I chose this age range because it falls within the developmental period of classifiers in deaf children with deaf parents (i.e., 3-12 yrs of age; Kantor, 1980; Schick, 1987; Supalla, 1982) and the period of frequent language delays of deaf students, who may be up to 5 years behind their typically hearing peers (Kyle & Harris, 2010). Student and teacher participants were selected based on receipt of teacher consent to participate in this study and of parental permission and student assent from three students within a classroom.

A multiple baseline across participants research design and visual analysis of the data were used to examine the effects of a combination of repeated viewings of ASL stories paired with teacher mediation on student participants' classifier production during narrative retells. Student participant data were collected from the following assessments across the course of this study: (a) A background information form; (b) an audiogram for each student that documented his or her degree of hearing loss; (c) The *Peabody Picture Vocabulary Test* (PPVT-4; Dunn & Dunn, 2007), a measure of receptive vocabulary that provides a standard score for each child with a median reliability of .95; (d) the *Expressive One Word Picture Vocabulary Test* (EOWPVT; Brownell, 2000), a measure of expressive vocabulary that uses picture stimuli and provides a standard score for each child with a median reliability of .95; (e) *The ASL Receptive Skills Test* (Enns & Herman, 2011), a measure of ASL receptive skills in 8 grammatical categories (validity and reliability are not currently available); (f) the *Ozcaliskan Motion Stimuli* (Ozcaliskan, 2011), a set of 18 animated PowerPoint slides, were used as a measure of classifier production (validity and reliability are not currently available); (g) narrative retells of two picture books (*The Trunk* and *A Day in the Park*) as preintervention measures, one at the beginning of the study and one immediately prior to entry into the initial intervention phase, and as postintervention measures immediately after the intervention concluded, with prompts (*What happened?* and *Can you tell me more?*); (h) three narrative retells of each story presented by an ASL model on DVD using the same two prompts, if needed; and (i) narrative retell of *Goodnight Gorilla* as a maintenance measure 4 weeks after the conclusion of the study.

The current study included four intervention phases in the following order: In phase one, the teacher provided mediation during each of three viewings of the DVD using the corresponding mediated script; in phase two, the teacher provided mediation during the first and second viewings of the DVD; in phase three, the teacher provided mediation during the first viewing only; in phase four, the teacher provided no mediation during the repeated viewings. Following each viewing, each student engaged in a video-recorded narrative retell with the researcher. Each narrative retell was transcribed and coded with the calculation and graphing of each group's mean classifier production score. The multiple baseline graphs were analyzed using visual analysis to determine the presence of a functional relation between the introduction of the intervention and the students' performance on classifier production. Results from the visual analyses of the group classifier production graphs were confirmed by the calculation of the percentage of non-overlapping data (PND; Scruggs, Mastropieri, & Casto, 1987) for each group. PND is the percentage of data points in the intervention phases that represent an improvement over the most positive value obtained during baseline (Scruggs et al.). Using the established criterion of three data points in an increasing trend, each group moved among the intervention phases across an 8-week period, followed by the collection of maintenance data 4 weeks after completion of the intervention phases. Finally, the number of story events included in each student's retell was analyzed to check for the possibility of cognitive load interference with classifier production.

Summary

DOH students frequently have language delays that affect their literacy skills. DOH students who use sign language often lack fluent language models in both the home and school settings, delaying both the development of a first language and the development of literacy in printed English. Mediated and scaffolded instruction presented by a More Knowledgeable Other (MKO; Vygotsky, 1978, 1994) may facilitate acquisition of this first language. Previous researchers (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) who combined repeated viewings of fluent ASL models on DVDs with adult mediation reported increases in vocabulary skills for DOD and DOH students who used ASL. Classifiers, comprising a subcategory of ASL, provide a critical link between ASL and the meaning of English phrases and are used frequently by deaf adults in spontaneous narrative tasks (Aarons & Morgan, 2003; Becker, 2009; Morford & MacFarlane, 2003). Researchers have identified a preliminary sequence of classifier development for children that spans from 3-12 years of age (deBeuzeville, 2006; Schick, 1990; Slobin et al., 2003). The purpose of the current study was to investigate the effects of teacher-mediated repeated viewings of stories presented in ASL on classifier production during narrative retells by deaf students.

CHAPTER 2

REVIEW OF THE LITERATURE

Many students who are deaf or hard of hearing (DHH) typically exhibit language delays that affect reading acquisition. One cause of a language delay is lack of exposure to appropriate language models (Goldstein & Bebko, 2003; Lederberg & Everhart, 1998). Typically, DOH students lack fluent language models in both the home (Kuntze, 1998; Mitchell & Karchmer, 2004; Moeller & Leutke-Stahlman, 1990; Moeller & Schick, 2006) and school environments (Allen & Karchmer, 1990; Schick et al., 2006). Many deaf students who use sign language begin their formal education without a solid foundation in American Sign Language and may not be exposed to fluent models when they reach school. As a result they lack skills in the language of instruction, printed English, which affects their literacy skills (Allen, 1986; Geers et al., 2008; Vernon et al., 2001). Students' proficiencies in ASL and English are positively correlated (Easterbrooks & Huston, 2008; Freel et al., 2011; Hoffmeister et al., 1997; Padden & Ramsey, 1998; Strong & Prinz, 1997). Therefore, increasing their ASL skills can provide a foundation for increasing their literacy skills. One particular ASL skill necessary for good communication is the use of classifiers, a sophisticated system of pronominalization that incorporates spatial arrangement, movement, and visual characteristics of figures (deBeuzeville, 2006; Schembri, 2001; Schick, 2003; Supalla, 1982, 1986) to represent phrases. Little is known about the relationship between classifiers and literacy. This chapter presents an overview of the literacy and language skills of DHH students, theoretical issues related to these acquisition processes, the specific acquisition of classifiers for deaf students who use ASL, the use of mediation during language instruction, repeated viewings of ASL models paired with mediation, evidence-based practices to develop language skills within this population, narrative retell as a tool for language production (including classifiers), and current assessments to measure these skills.

Language and Literacy Skills of DHH Students

DHH students frequently lag significantly behind their typically hearing peers in literacy skills. An often cited statistic is that the 3^{rd} to 4^{th} grade is the median reading level for DHH students upon high school graduation (Allen, 1986), although variation exists within the population. Some students with cochlear implants read within 1 standard deviation of their typically hearing peers (Geers et al., 2008) while one group of researchers reported that 30% of DHH students were functionally illiterate (Vernon et al., 2001).

Vocabulary knowledge is directly related to reading for DHH students (LaSasso & Davey, 1987; Wilbur, 2000). These students frequently have severe vocabulary delays compared to their typically hearing peers (Meadow, 2005; Sarant et al., 2009) and the gap in vocabulary increases with age (Kyle & Harris, 2010). For hearing students, vocabulary at the beginning of first grade predicted reading ability at the end of 1^{st} and 3^{rd} grades (Sénéchal & LeFevre, 1998; Sénéchal, LeFevre, Thomas, & Daley, 1998) and 11^{th} grade (Cunningham & Stanovich, 1997). At age 4, hearing children on average have a vocabulary of 2,000 to 3,000 words and know 6,000 root words by the end of second grade with an acquisition rate of about 1,000 words per year (Biemiller, 2005). In contrast, DHH students without native sign language models know around 10 words at 4 years of age (Meadow, 2005), have a vocabulary 1/3 the size of their hearing peers in second grade, and acquire vocabulary at only 50-60% the rate of their hearing peers (Sarant et al.). The typical 6-year-old DOH child has the English vocabulary of a 3-year-old hearing child (Mayne, Yoshinaga-Itano, Sedey, & Carey, 2000) and may be up to 5 years behind his or her grade level in English vocabulary skills in high school (Holt, Traxler, & Allen, 1997).

One reason so many DHH students lack sufficient vocabulary skills may be the communication mismatch with their parents. About 95% of these children have hearing parents (Mitchell & Karchmer, 2004) and 49% of these students use some form of sign language as their primary mode of communication (Gallaudet Research Institute, 2008). This percentage increases to 80% in adulthood, regardless of students' educational and communication backgrounds (Schlesinger & Meadow, 1972). Yet, only 10% of these students' parents learn sign language (Kuntze, 1998; Schein & Delk, 1974) and their skills in sign language vary (Moeller & Leutke-Stahlman, 1990; Moeller & Schick, 2006). Lederberg and Everhart (1998) reported that the number of signs parents used with their children was directly related to the number of words in their children's vocabulary. Because of this communication mismatch in the home, many deaf children lack a fluent foundation in ASL (Chamberlain & Mayberry, 2008; Singleton & Supalla, 2011), the primary language of deaf students. Late learners of ASL often lack the syntactic and morphological complexity used by native signers and have inconsistent ASL performance (Emmorey, 1991; Mayberry & Eichen, 1991; Newport, 1990), further affecting development of their language and literacy skills.

Teachers' and educational interpreters' sign language skills also affect the language development of their students. While the number of deaf or hard of hearing teachers who work in residential schools and programs for DHH students has ranged between from 16% and 30% across time (Andrews & Franklin, 1996; Rosen, 2005; U.S. Department of Education, 2009) and “most” of them worked in residential schools (La Bue, 1995), the majority of deaf students attend their local public schools. More than 30 years ago, only 1-2% of the teachers of the deaf in local schools were deaf themselves (Trybus & Karchmer, 1977). I learned from a query with the members of the Association of College Educators-Deaf and Hard of Hearing (ACE-DHH), an international organization of college professors who prepare future educators of deaf students, that current statistics following the implementation of No Child Left Behind (2001) and the Individuals with Disabilities Act (2004) are not available. According to D. F. Moores (personal communication, January 12, 2012), this information is not available “in the extant literature.”

Interpreter abilities also vary. Expert interpreters may present only 60-90% of the information within a classroom, while educational interpreters may present only 30-70% (Schick et al., 2006). Without competent language models, DHH students are often exposed to impoverished and inconsistent linguistic environments that may “degrade learning” (Singleton & Newport, 2004, p. 399) and result in limited language skills (Coryell & Holcolmb, 1997). To remedy the gaps in language and literacy acquisition, educators of DHH students need to know how to assess students’ current levels of ASL skills and how to provide instruction in these skills using evidence-based practices for ASL development. However, the field of deaf education has historically lacked sign language assessment tools (Singleton & Supalla, 2011) that lead to areas for instruction.

Further, after establishment of students' fluent ASL skills, educators need to know how to relate students' first language, ASL, to the language of literacy, printed English.

Reading and ASL skills are positively related. Students' proficiency in ASL is positively correlated with their proficiency in English (Hoffmeister , 2000; Hoffmeister et al., 1997; Padden & Ramsey, 1998; Strong & Prinz, 1997). Good readers tended to have good ASL skills (Easterbrooks & Huston, 2008; Hermans, Knoors, & Verhoeven, 2010) and those who were more proficient in ASL had higher reading comprehension skills (Chamberlain & Mayberry, 2008). For example, deaf college students' proficiency in sign language accounted for 68% of the variability in their reading comprehension (Freel et al., 2011). Younger children's receptive sign language vocabulary scores significantly correlated with their reading comprehension scores 1 and 2 years later for children who used Sign Language of the Netherlands (Ormel, 2008) and predicted their literacy development throughout the primary grades (Hermans et al.). Because DOH children who use sign language have highly variable levels of sign language proficiency (Maller, Singleton, Supalla, & Wix, 1999; Mann, 2007), their sign language skills should be assessed periodically to direct reading instruction (Anderson & Reilly, 2002; Haug, 2005; Herman, 1998). Two sign systems used for instruction are signed English and American Sign Language.

Signed English

In the United States, students who sign may receive instruction through various forms of signed English. Signed English is a process of signing printed text in spoken English word order (Musselman, 2000) while mouthing or speaking the corresponding words (Lucas & Valli, 1992; Lucas, Bayley, & Valli, 2001; Wilbur, 2000). The intention of signed English is not to eliminate supportive ASL features but to add morphological components, such as –ing and –ed (Bornstein, 1975; Gustason & Zawolkow, 2006; Gustason, Zawolkow, & Lopez, 1993) for the purpose of making ASL more English-like. ASL and signed English share about 90% of their vocabulary (Wilbur, 1987). Some English signs are formed by replacing the handshape of a sign with the handshape for the first letter in the word (Lucas et al.; Nakamura, 2011), "to make the relationship between a sign and a given English word more salient and more explicit" (Battison, 1978, p. 97), such as [T] for the sign TEAM to distinguish it from GROUP or FAMILY (Nakamura). This is referred to as "initialization" (Musselman, 2000, p. 16).

American Sign Language

In contrast to signed English, ASL is a language with its own syntax and grammar (Neidle et al., 2000; Stokoe et al., 1965). In addition to signs presented on the hands, the use of nonmanual markers (i.e., facial expressions, head nod, body tilt, and eye gaze) are used to express semantic and syntactic information (Neidle et al.; Wilbur, 2000). While all signs are made with four parameters (i.e., handshape, location, movement, orientation), ASL has two specific types of signs: lexical and productive (Johnston & Schembri, 1999; Napoli & Sutton-Spence, 2011). Lexical signs convey general information and establish the vocabulary found in a sign language dictionary, such as objects, actions, and states of being (Napoli & Sutton-Spence), such as BIRD, JUMP, COLD (lexical signs are transcribed using small capital letters; Morgan & Woll, 2007). Lexical signs provide no information about the type of bird, who jumps, or what is cold. In contrast, productive signs provide extensive information and "rely upon strong visual images" (Napoli & Sutton-Spence, p. 243), such as modeling a bird flying up into a tree.

Many lexical signs began as productive signs (e.g., classifiers) and changed over time (Napoli & Sutton-Spence), as is common in sign language (Lucas et al., 2001). One way we can investigate students' development in ASL is through the examination of classifiers, a syntactic and semantic component of ASL.

Classifiers

In English, the aspects of a motion/location event are frequently conveyed by a verb combined with adverbial and prepositional phrases (Singleton & Newport, 2004), such as "the car parked by the tree." In ASL and many other sign languages (Cogill-Koez, 2000; Morgan & Woll, 2007), motion events are rendered through the use of classifiers, a subcategory of vocabulary in ASL, for which there is no equivalent in English (Kantor, 1980; Schick, 2003). Classifiers are a system of sophisticated pronominalization that incorporates spatial arrangement, movement, and visual characteristics of figures (deBeuzeville, 2006; Schembri, 2001; Schick, 2003; Supalla, 1982, 1986) to demonstrate the connection between verb agreement and the pronominal system (Kantor). The utterances of hearing children are often quantified by counting the number of morphemes they use. A morpheme is the smallest meaningful unit in the grammar of a language (Payne, 1997). Classifiers may contain more than six morphemes in a single combination (Singleton, Morford, & Goldin-Meadow, 1993; Supalla, 1986) to represent details of an event, such as the figure, ground (or landscape), motion, location, orientation, direction, manner, aspect, extent, shape, and distribution in a described situation (Schembri, 2003).

Classifiers are frequently used in the narrative discourse of signers to model motion events (Morford & MacFarlane, 2003; Morgan & Woll, 2003). Bornstein (1975) noted that the elements of sign language that are frequently used are more likely to be learned than those that are infrequently used. Because of the frequent use of classifiers in ASL and specifically during narrative production (Morford & MacFarlane; Morgan & Woll), children need to master this component of their first language. Hearing children have mastered their syntactic system prior to entering school. In contrast, many DHH have not mastered the syntactic system of classifiers prior to learning to read or before reading to learn. Classifier production is complex and requires knowledge of sentence structure, visual representation of two or more objects, and two-handed coordination (Boudreault & Mayberry, 2006; Kantor, 1980; Schick, 2003; Slobin et al., 2003). Children who have native signing parents typically begin using classifiers by age 3 (Lindert, 2001) and do not master them until after 9 years of age or beyond (deBeuzeville, 2006; Schick, 1987, 2003; Slobin et al.). Deaf children with hearing parents, who frequently have language delays (Kyle & Harris, 2010; Meadow, 2005; Sarant et al., 2009), may not master this system until an even later age.

Classifier Structure

In addition to nonmanual markers (e.g., facial expression), signs in ASL consist of four parameters (i.e., handshape, ground, location, and movement) that are produced simultaneously (Battison, 1978; Stokoe et al., 1965; Valli & Lucas, 1992). Handshape is the configuration of the hand when representing an object (Marentette & Mayberry, 2000) and describes the extension of one or more fingers and the orientation of the hand relative to the body (Morgan & Woll, 2007). Handshape is frequently coded using the letters of the manual alphabet, such as [V] or [C] (Morgan & Woll). It is a convention in ASL notation to surround a letter with brackets (i.e., [ ]) when it represents an option (i.e., a *prime*) for a classifier parameter (Quizno-Pozos, 2007). Ground refers to the reference point (Tang & Yang, 2007), or the landscape against which a figure moves (Taub & Galvan, 2001), such as the tree by which the car parked in the previous example. The ground may be a stationary object anchored in space that serves as a source where the figure begins movement or as a goal where the movement ends (Gruber, 1976; Tang & Yang) or it may represent a second entity or physical object (Tang & Yang). Location refers to the place of articulation, such as to the right of the signer's body, while movement represents how the object moves, such as right to left for an animated figure that is walking (Marentette & Mayberry). When forming a classifier, the signer first identifies the figure, followed by the formation of a handshape that represents the figure paired with movement to model the figure's motion.

The parameter of movement has been divided into four morpheme types (Supalla, 1990): manner of locomotion (e.g., running, limping); path of motion (e.g., in a straight line, in a circle); direction of motion (e.g., uphill, downhill); and manner of motion along the established path (e.g., turning around). Manner encodes a secondary component of movement, such as *roll* in the movement *rolls down the hill* and requires a more detailed explanation than path or direction (Parrill, 2011). Along with movement, simple classifiers (Zucchi, 2011) may contain only a figure handshape, such as the car, while complex classifiers (deBeuzeville, 2006; Schick, 1987) may combine a figure handshape with a ground handshape, such as the car and the tree. In complex classifiers, both the figure and ground handshapes may engage in movement, such as *the boy chases the girl* (Tang & Yang, 2007), in which the ground (girl) moves while the figure (boy) chases.

Combined, these classifier parameters occur simultaneously to represent the equivalent of phrases in English (Tang & Yang).

Classifier Primes

The parameters of ASL signs are combined in specific ways during classifier productions. Each parameter (i.e., handshape, ground, location, and movement) of a classifier has a limited subset of members called primes (Battison, 1980; Valli & Lucas, 1992). Primes for each parameter are discrete, meaning that only one prime can be used at one point in time for each parameter (Marentette & Mayberry, 2000). The exact number of different primes for each parameter depends upon the level of analysis (Battison, 1978). Estimates for the number of primes per parameter have varied from 19 (Stokoe, 1960; Stokoe et al., 1965) to 45 (Battison, 1978) for handshape, 12 (Klima, 1975; Stokoe; Stokoe et al.) to 25 (Battison) for location, 12 (Battison) to 24 for movement (Stokoe; Stokoe et al.), and 12 (Battison) to 18 (Klima) for orientation. Primes are presented in brackets (Quinto-Pozos, 2007). For example, to represent a figure, one could sign [vertical index] or [V legs], but not both at the same time. In the previous phrase *the car parks by the tree* the figure handshape is [3 edge], the ground handshape is [tree], and the movement is [right to left].

Classifier Noun Phrase

In addition to specific primes for each classifier parameter, classifiers require identification of the noun phrase, or the figure and ground, to label the entities portrayed by the classifier (Aarons & Morgan, 2003; Morgan, 2006). For example, to show the phrase *the car parks by the tree* one would do the following: sign TREE (the ground) and establish or 'anchor' it (Tang & Yang, 2007) in space; sign CAR; and move its corresponding [3 edge] handshape toward the tree, stopping the sign in the space next to the tree. The figure and ground can be identified through lexical signs (e.g., CAT, HOUSE) or fingerspelling before or after the production of the corresponding classifier (Napoli & Sutton-Spence, 2011). Signers may also use constructed action, in which the signer imitates the actions of a character through movement of the upper body (Quinto-Pozos, 2010), the lower body (Quinto-Pozos & Mehta, 2010), and the hands and head (Perniss, 2007) to show detailed features that cannot be portrayed through classifiers alone.

Quinto-Pozos (2010) investigated classifier and constructed action production in five deaf adults based on four animated clips that contained an animate referent (i.e., a person or animal) engaged in action, which the signers produced twice: in their first rendition, signers frequently combined classifiers with constructed action; in their second production, they were instructed to remove some element of the constructed action and frequently produced less detailed descriptions of the action presented within the clips. These results suggested that classifiers may be limited in the amount of detail they can portray and signers may choose to pair classifiers with constructed action or use constructed action in lieu of classifiers in certain descriptions of animate referents (Aarons & Morgan, 2003; Becker, 2009; Quinto-Pozos, 2008, 2011).

Classifier production is sometimes limited by the articulation abilities of the hands, such as modeling legs that plié when using the common semantic classifier of [V legs] to represent a person or representing the movement of *marching* through a classifier alone (Tang & Yang, 2007). Constructed action permits simultaneous embellishment or extension of details (Aaron & Morgan, 2003), such as sticking one’s tongue out to mimic a panting dog, that classifiers alone cannot incorporate because of three types of constraints. The first constraint is an inability to portray finer levels of detail. For example, Quinto-Pozos (2010) posited that the use of the common handshape [vertical index] to represent a person through a classifier is limited in that the handshape cannot represent the person's eye gaze, facial expression, or limb movements. A second constraint is a limitation in the available number and shape of articulators (i.e., the fingers, hands and arms) to portray an animate object, such as a lizard with four legs, a bobbing head, a swaying belly, and an oscillating tail. The signer is limited in showing the features of these combined body parts with only two hands and the available handshapes may not closely match the shape of the animate referent (Quinto-Pozos, 2010). Finally, motoric constraints may limit classifier production. While a [vertical index] finger can represent a person bending forward at a water fountain, it cannot adequately represent a person bending backward to look up at the sky.

In place of repeated identification of the figure and ground using lexical signs, signers may use nominal pointing to identify the figures within a noun phrase (i.e., signing DOG, pointing to the left of the body to establish the dog in space, and pointing to that specific space to repeatedly refer to the dog) to identify figures from narrative retells (Goldin-Meadow, 2003; Klima & Bellugi, 1979; Padden, 1988; Pfau, 2011; Supalla, 1982; Torigoe, 2000; Zimmer & Patschke, 1990). In a narrative context, prior to using classifiers, one deaf adult identified all figures through the use of lexical signs and/or fingerspelling followed by constructed action to pair a characteristic with each figure and establish each figure in sign space (e.g., DOG; tongue protrusion; pointing to the right side of his body while shifting his torso and eye gaze to that location; Aarons & Morgan, 2003). After introduction of figures, the deaf adult referred to the space through nominal pointing and presented motion events through the use of classifiers. Similar procedures were used by other deaf adults (Zimmer & Patschke).

Pfau (2011) reported that “within a noun phrase, pointing may also function as a definitive determiner (‘the house’) or a demonstrative pronoun (‘this/that’ house)” (p. 148) or even a personal pronoun (e.g., ‘she,’ ‘them’). Once the noun phrase is established through nominal pointing to a specific sign space by the signer, he or she may refrain from repeated identification of these elements if they do not change, such as in a narrative context (Morgan, 2005; Lucas et al., 2001). Identification of the noun phrase appears to vary across children. Deaf children of deaf parents (DOD) achieved the use of spatial reference during narrative production between 4 and 6 years of age (Becker, 2009; Morgan, 2002; Morgan & Woll, 2003). In contrast, deaf children of hearing parents (DOH; 11 to 17 years of age) frequently omitted identification of the figure upon its introduction in a picture story and introduced the second character (ground) through a lexical sign (e.g., MAN, PERSON; Becker). Additionally, they failed to identify people and objects prior to the use of constructed action to describe them, resulting in reduced cohesion in their narratives (Becker). However, after watching an adult sign a story and discussing it, DOD and DOH children identified the figure upon its introduction in their narrative retells but only 2 DOD children established the character in signing space for reference (Becker).

The DOD children also added a specific behavior to identify each character, similar to the deaf adult’s narration (Napoli & Sutton-Spence, 2011). In contrast, the three DOH signers began their narratives by listing the characters without further constructed action or use of space. To identify a change to another the figure, DOD children used role shift (i.e., turning the torso to correspond with the character's position in space), constructed action, and lexical signs (Becker). DOH children did not identify a change in figure reference 26% of the time, compared to only 4% of the time by DOD children. When they did, DOH preferred lexical signs (60%), while DOD (50%) and the deaf adult (85%) preferred spatial reference. Finally, once the children established a reference strategy, they continued to use it throughout their narrative retell, often relying on sign space and constructed action over varying lexical phrases (Becker, 2009). Form and function interact in narrative development (Berman & Slobin, 1994), so that students who have mastered a form of a language element (e.g., lexical signs or constructed action alone) that is successful for their function (e.g., showing motion events) tend to use this form in lieu of any other (e.g., classifiers).

Types of Classifiers

While most researchers disagree on the division of subtypes of classifiers (Cogill-Koez, 2000), some have focused on three different types: semantic, handling, and size-and-shape-specifiers (SASSes; deBeuzeville, 2006; Schembri et al., 2005; Schick, 2003; Supalla, 1986). Semantic classifiers contain classes of animate or inanimate objects (Quintos-Pozos, 2010; Tang & Yang, 2007) and the shape of the hand represents the shape of the referent class such as people ([index], [V legs]), animals ([bent V]), and transportation ([3 edge]; Morgan & Woll, 2007). Handling classifiers demonstrate how an object is handled or manipulated, such as showing a strainer by holding the imaginary handle in one hand while the other hand shows the contents moving through it. Finally, SASSes show the visual-geometrical characteristics of an object, such as a round [F] handshape for a button or a [B palm-down] handshape to represent a table (Perniss, 2007;

Schick, 1990c). The acquisition, use, and mastery of these classifier types appear to vary across DOD children based on limited data (Kantor, 1980; Schick, 1990a), such that one type of classifier is not dominant in children's development of classifier production.

Classifier Development in Deaf Children

Data on classifier production for children, including knowledge of parameters (Marentette & Mayberry, 2000; Morgan & Woll, 2007) and the development of classifiers across time (Morford & Mayberry, 2000) are also limited (see Kantor, 1980; Schick, 1990). Researchers to date have focused primarily on the initial stages of the language development (between 0 to 2 years of age) of DOD children (Anderson & Reilly, 2002; Goldstein & Bebko, 2003) or those children who have a fluent language model in the home, with an emphasis on handshape development. Boyes-Braem (1973, 1990) presented four developmental stages of handshape production in children based on motor control and proposed that children substituted earlier (easier) handshapes within signs when handshapes from a later stage the child had not yet mastered were required. Various researchers have confirmed the first two developmental stages (Kantor, 1980; McIntire, 1974, 1977). Expansion of handshape within semantic classifiers, such as expanding the vehicle handshape for car to trucks, boats, and vans, was reported for children around the age of 6 years (Kantor). However, Schick (1990a) investigated children's classifier production from all three categories (handling, semantic, SASS) and reported that the children in her sample, all over the age of 4.5 years, did not substitute handshapes, although children may acquire semantic handshapes earlier than other types of handshapes.

Handshape production had the most variance across studies and was affected by motor control, production within or outside of the child's visual field, a tendency for fingertip contact with the body, and proximity of production related to the center of the body (Cheek, Cormier, Repp, & Meier, 2001; Conlin, Mirus, Mauk, & Meier, 2000; McIntire, 1977; Meier, 2000). Meier proposed that the high degree of variation in handshape production results from the distance of the articulators, or the hands, from the center of the body. Kantor (1980) suggested that handshape errors, such as deletions and modifications of obligatory handshapes, may result from the complexity of the syntactic context in which a classifier is used. Children between the ages of 6 and 10 years produced an adult-like handshape during a classifier elicitation task with 69% accuracy (Singleton & Newport, 1993). Based on results of these studies, handshape production within classifiers seems to be a variable that may be affected by the age of the signer.

Less data exist regarding the development of other classifier parameters. Compared to handshape, location (Conlin et al., 2000; Marentette & Mayberry, 2000; Siedlecki & Bonvillian, 1993, 1997; Singleton & Newport, 1993) and movement (Siedlecki & Bonvillian; Marentette & Mayberry; Singleton & Newport) within classifier production have high agreement across children. These two parameters also appeared to be accurately acquired by children prior to handshape and orientation accuracy (Kantor, 1980). This may be due to the visual and iconic nature of movement, such that it is easy to see and reproduce (deBeuzeville, 2006; Singleton et al., 1993). In contrast, handshapes require knowledge of abstract categorization for objects in semantic and specific SASS classifiers (deBeuzeville). Finally, ground is frequently omitted by children because they either lack the required two-handed coordination (Boudreault & Mayberry, 2006; Slobin et al., 2003), the visual representation of more than one object at a time, or assume that the listener is already aware of the ground (Becker, 2009; deBeuzeville; Morgan, 2006).

Chronologically, children as young as 2;4 (years;months) in one study (Newport, 1981) produced classifiers, while a single participant in Ellenburger and Steyart's (1978) investigation began using classifiers between 3;9 and 4;6, with frequent use by 5;1 to 5;11. In a summary of European sign languages, Baker, van den Bogaerde, and Woll (2005) noted that classifier production first appears between 2;6 to 2;11. While young children (0-3 years of age) receptively understood most classifiers (Lindert, 2001; Kantor, 1980), they produced them only 30% of the time in obligatory contexts (Schick, 1990a) and used sequential parameters instead of the adult-like simultaneous production (deBeuzeville, 2006). Quinto-Pozos (2007) defined obligatory contexts as situations in which it "feels correct to a viewer" (p. 471) or those who use ASL for their daily communication.

Children's handshape production accuracy was around 30% at this age (deBeuzeville, 2006; Supalla, 1982) with higher accuracy for location and movement and a tendency to omit ground reference (deBeuzeville). They frequently substituted constructed action or lexicalized signs in lieu of classifiers. As children matured, they mastered receptive comprehension of classifiers and increased their use of classifiers in obligatory contexts to around 50% between 3-5 years of age (Schick, 2006). They continued to have difficulty with accurate handshape production, simultaneity, and continued to substitute constructed actions and lexicalized signs.

Difficulty in the selection of individual parameter primes seems to disappear around 5-6 years of age, but the complexity of the context in which classifiers appear (i.e., verbs of motion) may cause specific problems for children (Morgan & Woll, 2007). From 5-8 years of age, DOD children produced semantic and SASS classifiers with 80% accuracy (Schick, 1990a), increased their incorporation of a ground handshape, and decreased their use of substitutions (i.e., lexical signs, constructed action) for classifiers (deBeuzeville, 2006). From 9 years onward, children approached adult-like classifier production, although they may not master classifiers, defined as "appropriate and correct usage 90% of the time" (Kantor, 1980, p. 51) until 9-10 years of age (deBeuzeville; Kantor) or even 12 years of age (Slobin et al., 2003). Additionally, spatial reference, such as correctly establishing figures and motion events in space prior to the use of nominal pointing, may not be mastered until 11-13 years of age (Morgan, 2002; Morgan & Woll, 2003). Finally, similar to adults, who used specific parameters of sign for humorous purposes (Napoli & Sutton-Spence, 2011; Schick, 1990c), children may "manipulate forms for creative use or play" (deBeuzeville, p. 108) as they approach mastery, although specific examples were not available in deBeuzeville's results.

Based on the results of previous classifier studies, a preliminary developmental sequence for classifier production exists that may permit educators to assess children's current levels of classifier production and provide scaffolded instruction within the next developmental time frame. However, previous results for classifier production in deaf children are based on samples of deaf children with deaf parents who are assumed to have typical language development in ASL (Bailes, 2001; Boudreault & Mayberry, 2006; Wilbur, 2000). In contrast, the majority of deaf children have hearing parents (Mitchell & Karchmer, 2004) and their abilities to exploit the components of sign language at a native-like level are frequently related to their age of acquisition of sign language as opposed to their chronological age (Becker, 2009; Johnston & Schembri, 1999; Knoors, 1994; Mayberry & Lock, 2003). They may not follow the same sign language acquisition patterns as deaf children with deaf parents (Baker et al., 2005) and frequently come to school with severe language delays (Easterbrooks & Baker, 2002; Kyle & Harris, 2010; Meadow, 2005) that may require mediation to lead to successful mastery of ASL and its subcategories, such as classifiers.

Narrative Development

As children increase their language skills, they need an authentic task in which to use them. Narrative storytelling is one context in which deaf adults frequently use classifiers (Morford & McFarlane, 2003) and a "universal and basic form of everyday communication" (Becker, 2009, p. 114). Based on limited evidence, narrative retell appears to be an effective strategy for measuring students' use of expressive language. Narrative retell is an authentic storybook-related task in a natural discourse environment (Justice et al., 2010) that involves a student's retelling of a true or fictional story with temporal sequence. Narrative retell provides data on how a child uses language at two levels: macrostructure, or those common story grammar elements found within stories such as characters, setting, and plot; and microstructure, or how the language a child uses is broken down into smaller parts, such as elements of syntax (Justice et al.; Petersen, 2011).

Narrative retell provides opportunities for children to use and increase their literate language, such as elaborated noun phrases and specifically referenced pronouns (Petersen et al., 2010), which is directly related to their reading abilities across samples of children and time (Mehta, Foorman, Branum-Martin, & Taylor, 2005; Pankratz et al., 2007). Narrative ability at preschool predicted hearing students' language and reading comprehension scores in elementary school (Pankratz et al.). For a sample of over 1,300 students, Mehta et al. reported that language competence was highly correlated with reading ability at both the classroom and student levels. Following narrative interventions, children with language impairments increased their use of targeted syntactic features (Davies et al., 2004; Klecan-Aker et al., 1997; Petersen, Gillam, & Gillam, 2008), specifically noun phrases and pronominal reference cohesion (Petersen et al.), two factors that are related to ASL classifier production. During narrative production use of semantic classifiers increased across age for deaf children who were 4-13 years of age (Morgan & Woll, 2003): Students who were 4-6 years of age used semantic classifiers 12.5% of the time; students 7-10 years 20% of the time, and students 11-13 years 24% of the time in obligatory contexts. These students also decreased the number of ambiguous classifiers, or those for which no noun phrase was provided, with age (Morgan, 2006). Active engagement during narrative productions also increased students' inclusion of story macrostructure during narrative retells for DHH students who used oral communication (Pakulski & Kaderavek, 2001). Of 14 students, 12 had higher narrative retell scores for the books in which they engaged in role-playing compared to the books for which they only engaged in repeated readings.

When compared to an accumulation of factors (e.g., nonverbal IQ, hearing level, speech sound production, and short-term memory), students' ability to comprehend ASL narratives was the best predictor of their reading achievement (Chamberlain & Mayberry, 2000). However, there may be a gap between children's abilities to dramatize the motion events in narratives (e.g., using constructed action alone) and their abilities to coherently tell the story using narrative devices (e.g., classifiers; Becker, 2009). The accumulation of results from these studies with DHH students suggests that repeated interactions with storybooks may increase students' narrative retell abilities and accompanying literate language.

It is possible that memory recall of events within a story may affect students' ability to produce a narrative retell that includes classifiers. Researchers have investigated serial recall in deaf and hearing bilinguals who used ASL compared to hearing people who used English. Serial recall was consistently higher among those who used speech than those who signed (Cowan, 2001; Hall & Bavelier, 2011; Gozzi, Beraci, Cecchetto, Perugini, & Papagno, 2010), although this has been assessed in tasks such as digit and letter span, which represent unrelated items in serial order, or unconnected units of meaning (Gozzi et al.; Hall & Bavelier). A few reasons for higher recall for items presented in speech have been proposed. The visuospatial nature of signs means that signers must hold 4 units of meaning (sign parameters) that occur simultaneously in their memory, resulting in a limited number of stored signs (Gozzi et al.). Baddeley (2000) proposed that visual memory can hold up to four objects at one time, each of which has multiple features. This is similar to the multiple parameters embedded in signs. Signs may also take longer to produce than speech in recall tasks, which may further deplete memory span (Hall & Bavelier). In contrast, hearing participants, who stored speech auditorily, only had to maintain sequential syllables within words (Gozzi et al.), or fewer units of meaning at one time, than deaf participants. Another proposed reason is that auditory presentation of information requires temporal processing, while visual presentation permits simultaneous processing (Gozzi et al.). However, the finding of lower sign span may be specifically related to serial tasks (Gozzi et al.). In free recall tasks, without the constraint of seriality, deaf adults' recall span was similar in ASL and English (Bavelier, Newport, Hall, Supalla, & Boutla, 2008). Recall of repeatedly viewed familiar and sequential events, such as repeated viewings of a story, may highlight different recall effects for DHH students than previous tasks of unconnected serial recall.

Deaf students with hearing parents may lack experience with videotaped narratives in sign language and may require repeated viewings and support from a signing adult to increase their narrative development (Becker, 2009). Of five DOH children between 11 and 14 years of age, only one generated a personal narrative without adult intervention and none were able to generate a narrative based on fantasy (Becker). Student performance improved when an adult asked comprehension questions, clarified student utterances with yes-no questions and elaborative responses, and provided interaction via head nods, facial expressions, and lexical responses (e.g., GOOD). Additionally, the adult interlocutor provided student assistance through expansions and recasts (i.e., new structural displays of the student's utterance; Nelson, 1998) of student-generated information. While students increased their classifier production through retells, Morgan's (2006) study did not include adult mediated viewings of the story or repeated viewings. One might speculate that greater increases in students' retell ability might follow repeated viewings combined with adult-mediated storybook experiences.

Mediated Learning

Children with language delays may benefit from mediated, scaffolded instruction on classifier production (Gindis, 1999; Vygotsky, 1978, 1994; Wertsch & Sohmner, 1995). Mediation by a More Knowledgeable Other (Vygotsky, 1978, 1994), or anyone who has a better understanding or higher ability level than the learner (Wertsch & Sohmer), may quicken the emergence and development of language abilities and reveal the hidden potential of the child (Gindis). Children are capable of far more when they have scaffolded assistance from adults (Gindis) in their Zone of Proximal Development (Vygotsky, 1978, 1994), or the area between what a learner can do independently and what he can do with the assistance of an MKO. Learning occurs through these differences between the mediator and the learner (Werstch & Sohmer). In addition to mediated instruction for children, Komensaroff (2001) suggested mediation at the adult level. In the context of the current study, deaf adults who are fluent models in ASL provide models of instruction for teachers who are not fluent signers. This mediated instruction may increase non-native adults' signing abilities and provide a model for them to use during instruction with deaf students. Therefore, through application of Vygotsky's mediation model at both the adult and student levels and the proposed sequence of classifier development, students may increase their production of classifiers.

Shared Reading

Mediation during shared storybook reading is one evidence-based strategy that researchers have used to increase the language skills of DHH students (DesJardin & Eisenberg, 2007; Fung, Chow, & McBride-Chang, 2005). Reading aloud with students is considered a best practice by the National Reading Panel (2000). The practice of Shared Reading, as specifically defined by Schleper (1995; 1998), is supported by the Laurent Clerc Center at Gallaudet for increasing the reading abilities of DHH students. Shared reading is based on 15 principles that deaf parents use when reading to their deaf children. The Shared Reading Program is an in-home intervention in which a deaf tutor models reading a storybook for the parent(s), the parent(s) read the storybook using sign language and receive feedback from the tutor, and the storybook and a corresponding DVD that presents the book in ASL is left in the home for repeated shared reading opportunities between the parent and child. Parents reported an increase in repeated reading opportunities and their sign skills from before instruction in Shared Reading and after the intervention began (Delk & Weidekamp, 2001). Shared Reading is also used within schools (Schleper, 1998). During the first reading of a book, the teacher reads the entire book. In the second reading, she invites the students to participate and addresses their interests through discussion and language support. After the third reading, the students and teacher engage in an activity related to the story, such as role-playing the story or creating a classroom version of the story. Repeated readings allow students to delve deeper into the content of the story, beyond just the surface information (Martinez & Roser, 1985), and expose children to new words in an interesting, context-based format (Justice et al., 2010). When a shared book is read in sign language, the experience serves as an early bridge to English print (Erting & Pfau, 1997), as the teacher mediates visible text from a big book to a signed rendition.

Dialogic reading is an interactive process that expands shared reading through the addition of specific prompts and dialogue about a book (Whitehurst et al., 1988; DesJardin, Ambrose, & Eisenberg, 2007). After participation in Dialogic Reading with picture support, DHH children who used oral communication made significant increases in their receptive (DesJardin et al.; Fung et al., 2005) and expressive vocabulary (DesJardin et al.). Additionally, children’s expressive vocabulary directly after the intervention was positively associated with their reading passage comprehension three years later (DesJardin & Eisenberg, 2008). However, a limited evidence base exists for the direct effects of shared reading on children's productive sign language skills and specifically, classifier production. Additionally, few teachers are fluent signers and the use of specific prompts and discussion questions is left up to the teacher.

Use of Repeated Viewings and Mediation

While mediation during storybook reading and the use of specific language prompts have been effective in increasing oral DHH students' language skills (DesJardin & Eisenberg, 2007; Fung et al., 2005), not all DHH students experience much shared reading in the home (Marschark & Harris, 1996; Schleper, 1995) and their opportunities to interact with storybook language and fluent language models may be limited (Becker, 2009; Mueller & Hurtig, 2010). Repeated viewings of educational DVDs increased students' attention and participation across viewings and increased their comprehension of the presented material for typically hearing preschoolers (Anderson et al., 2000; Crawley, Anderson, Wilder, Williams, & Santomero, 1999) and elementary students (Mares, 1997).

Recently researchers have investigated repeated viewings of fluent ASL models on video paired with explicit instruction (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig). Researchers who combined mediation of vocabulary with repeated viewings of stories presented by a fluent ASL model reported increases in signed vocabulary production for elementary students (Cannon et al.) and DHH preschoolers (Golos; Mueller & Hurtig). For example, the teacher in Cannon et al.'s study used preteaching of vocabulary immediately prior to repeated viewings. Signed narration was accompanied by interactive sign language dictionaries that parents and children used in Mueller and

Hurtig's study. Explicit instruction was embedded in the video used in Golos's study with multiple provisions of target vocabulary words presented in print, fingerspelling, and sign. Participants in all studies, from preschool to fifth grade, increased their vocabulary as a result of the interventions. While repeated viewings of ASL models on video paired with explicit instruction increased students' content vocabulary (i.e., story-related words), researchers have not investigated the effects of this intervention combination on the specific construct of ASL classifiers, which include information about characters and actions in a narrative context. Additionally, previous interventions did not provide mediation of the students' signed responses. Therefore, students could potentially produce the wrong vocabulary responses even when given a fluent language model. When using video for instruction, O'Doherty and colleagues (2011) reported that toddlers with typical hearing required modeling of or participation in reciprocal interactions in video to receive the greatest word learning benefit. Toddlers were also more likely to imitate the behaviors of a live person when compared to a model on video (Nielsen, Simcock, & Jenkins, 2008). These findings are similar to DHH students' increased narrative retell with the inclusion of role-playing (Kaderavek & Pakulski, 2001) and their increased vocabulary production with repeated viewings (Golos). These combined results may suggest that an interactive element of teacher modeling and student imitation paired with repeated viewings of video may provide the optimum environment for student learning of classifiers from ASL models on video.

Because teachers of DHH students frequently lack fluent signing skills, scripted mediation that is provided for the teacher to use during the video viewings may alleviate a potential communication mismatch. The provision of fluent ASL models through repeated video viewings paired with scripted teacher mediation may result in increases in DHH students' classifier production during narrative retell. However, teachers should not view classifier instruction as 'once-and-done' proposition (Lienemann, Graham, Leader-Janssen, & Reid, 2006). Intensity of mediation is an additional factor. For example, during the mediation phase of their intervention, Cannon et al. (2010) provided 30 total minutes of preteaching vocabulary and 30 total minutes of repeated viewings (three viewings per story) across three stories and two weeks that resulted in DHH students' increased target vocabulary production. In comparison, six hours of intervention per week across four weeks resulted in significant increases in use of narrative macro- and microstructure for students with language impairments (Petersen et al., 2008), while three 50-minute sessions per week for six weeks was "too short to capture gains in syntax" for other students with specific language impairment (Swanson, Fey, Mills, & Hood, 2005, p. 138). Use of a mediation script with repeated viewings may allow a teacher to provide individualized levels of support for students with various language skills. To determine the necessary amount of mediation and the outcomes of narrative intervention, educators need effective assessment of students' ASL skills.

Assessments

A paucity of available assessments with reliability and validity measures to assess DHH students' expressive and receptive ASL abilities exists (see Singleton & Supalla, 2011, for a review; Goldstein & Bebko, 2003; Paludneviciene & Hauser, 2007). The following review of ASL assessments is divided into combined, receptive, and expressive measures. The *Test Battery for ASL Morphology and Syntax* (Supalla, Newport, Singleton, Supalla, Metlay, & Coultier, n.d.) is a combined measure of ASL for signers 3 years of age through adulthood. It requires 2 hours to administer and 15 hours to score. Previous researchers who investigated classifier production (deBeuzeville, 2006; Schembri, 2001; Singleton et al., 1993; Singleton & Newport, 1993, 2004) have used Supalla's *Verbs of Motion Production* test (VMP), a subtest of the *Test Battery for American Sign Language Morphology and Syntax* (Supalla et al.). The VMP consists of video clips that show one or two objects in some sort of movement and participants must model the action of the video clip using classifiers. However, this assessment is not currently published or available. The *Test of ASL* (TASL; Prinz & Strong, 1994) contains subtests for classifier production and comprehension, but the measure is currently unavailable. The *American Sign Language Assessment Instrument* (ASL-AI; Hoffmeister, 1999) is a combined measure for children 4-16 years of age that requires 1 hour for administration and 20 hours to score. It is currently not available. The *American Sign Language Sentence Reproduction Test* (ASL-SRT; Hauser, Paludneviciene, Supalla, & Bavelier, 2006) is a combined measure that takes about 15 minutes to administer and 20-30 minutes to score, but it is currently not available. The *Sign Language Proficiency Interview* (SLPI; Newell, Caccamise, Boardman, & Holcolmb, 1983) is a combined assessment currently used with hearing adults learning ASL as a second language, which requires administration and scoring by trained assessors.

The *American Sign Language Proficiency Assessment* (ASL-PA; Maller et al., 1999) is an expressive measure for children 6-12 years of age that requires 1-2 hours to score. It is currently unavailable for purchase. The *Signed Language Development Checklist* (Mounty, 1994) also lacks evidence of validity and reliability and yields one overall language ability score based on general descriptors obtained through child observation. Based on the lack of availability, and lack of measures of reliability and validity of the above assessments, I used the *Ozcaliskan Motion Stimuli*. Ozcaliskan's (2011) task is currently used as a measure of gesture production of hearing adults. Participants watch animated clips of a figure moving in reference to a secondary figure (such as a man crawling across a rug) and produce a representation of the scene using gesture. Because these clips were developed for gesture elicitation, each clip provides the opportunity to encode the relevant parameters of signs (i.e., figure, ground, path, and manner; Parrill, 2011). For the current study, participants responded to the animated clips in ASL. This assessment was chosen because of the unavailability of other classifier production measures, the availability of the stimuli, and the efficiency of scoring (i.e., approximately 10-15 minutes per assessment). While measures of reliability and validity were currently unavailable, the *Ozcaliskan Motion Stimuli* was readily applicable to classifier production as each clip contains the opportunity for production of the four parameters within classifiers. Additionally, children's performance was compared to that of two native-signing deaf adults from within the language community.

The *American Sign Language Vocabulary Test* (ASLVT; Schick, 1997a) is a receptive measure modeled after the *Peabody Picture Vocabulary Test* (PPVT; Brownell, 2000) for children ages 3-8 years that currently lacks availability and measures of validity and reliability. The *Receptive Test of ASL Classifiers* (Schick, 1997b) is a receptive measure of classifiers in which the assessor and child look at identical plates that contain 3 to 4 pictures. The assessor signs a classifier construction that represents one of the items and the child points to the matching picture on his plate. However, this assessment is not currently available. The *Receptive Test of British Sign Language* (Herman, Holmes,

& Woll, 1999) assesses receptive sign abilities of children ages 3 to 13 years who use British Sign Language. Enns and Herman (2011) adapted this assessment and created the *ASL Receptive Skills Test*, a measure of ASL receptive skills in 8 grammatical categories: number/distribution, negation, noun-verb distinction, spatial verbs (location and action), size and shape classifiers, handling classifiers, role shift, and conditionals. While it is not currently published, the authors have collected data on 34 deaf children of deaf parents and permitted use of this assessment for the current study. After a 20-item pretest to ensure participants are familiar with the vocabulary used within the assessment, participants watched 42 video clips presented in ASL and identified their response for each item by pointing to one of four pictures displayed on the computer screen. Items are shown one time each.

Because DHH children frequently experience a mismatch with the communicators in their environment, they may benefit from the provision of mediated, explicit instruction in ASL (Gindis, 1999; Vygotsky, 1978, 1994; Werscht & Sohmer, 1995) by a language model who is fluent in both ASL and English (Bailes, 2001; Easterbrooks, 2008; Komensaroff, 2001). Therefore, through application of Vygotsky's mediation model at both the adult and student levels and knowledge of and instruction in the classifier developmental sequence, teachers and students may increase their use of classifiers in a systematic way to develop students' vocabulary.

Previous researchers (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) demonstrated increases in vocabulary for DHH students through mediated repeated ASL viewings. The purpose of this study was to expand this research from target vocabulary words to a specific element of ASL vocabulary, classifiers. In the current study, I investigated the effects of repeated viewings of stories presented in ASL paired with teacher mediation on students' classifier production during narrative retell. The research questions were (a) What are the effects of repeated viewings of ASL stories combined with teacher mediation on classifier production for children who are DHH? (b) What are the effects of fading teacher mediation on classifier production for these children? The term *effects* in the current study encompassed the number of overall classifier productions, the types of classifiers used, and the accuracy of classifier primes within parameter productions.

Summary

The preceding paragraphs provided a review of the literacy and language delays of DHH students, theoretical issues related to acquisition processes, and the specific acquisition of classifiers for DHH students who use ASL. Further, I reviewed the evidence base for mediation paired with repeated viewings of ASL models for increasing DHH students' vocabulary skills. Finally, I reviewed assessments to measure vocabulary skills in this population. Results of previous research suggest that DHH students can acquire vocabulary through mediated repeated viewings. However, researchers have not investigated the acquisition and production of classifiers using this intervention. In the current study, I investigated the effects of teacher-mediated repeated viewings of ASL stories on the classifier production of DHH students during narrative retell.

CHAPTER 3

METHODOLOGY

In this single-subject methodological study, I examined deaf children's classifier production after mediated repeated viewings of storybooks on DVD presented in American Sign Language (ASL). I used a multiple baseline across participants design with multiple probes (Kazdin, 1982).

Student Participants

This study included 10 student participants (eight boys and two girls), ages 7;8 to 10;7 (years;months), from second, third, and fourth grade classrooms (see Table 1). Six of the students among third and fourth grades were similar in age. Students across these grades met the developmental age spectrum in which classifier ability is emerging but not yet mastered (i.e., 9-10 years of age; Schick, 1990a; Kantor, 1980). Results of a parental background information form (see Appendix A) identified that six students were Black, two were Hispanic, one was biracial (Black and White), and one was White. All students received free or reduced-price lunch. One student had a deaf mother (B3), one student had two deaf parents (A1), and the other eight students had hearing parents. While the criteria for inclusion in this study specified no additional disabilities beyond hearing loss, the parental background form for C3 indicated the presence of Charge Syndrome and the form was returned after the student began the intervention. None of the other student participants had identified disabilities besides hearing loss. However, the parents of A2 noted that they had "behavior, communication, and motor concerns" for their child. These factors may have contributed to his inability to recall events of the story without visual support. All students used sign language, and student age upon learning it ranged from 11 months to 4 years, with an average of 3;1.

Table 1

Students' Background Information Based on Parental Report

Student	Mother's Highest Level of Educ.	Father's Highest Level of Educ.	Spoken Language at Home	Spoken and Signed Language at Home	ASL at Home	Signed English at Home	Age Student Started Signing
C1	HS	HS	English	Yes	Yes	Yes	2;6
C2	College	-	English	No	No	No	1;0
C3	HS	HS	English/ Spanish	Yes	No	No	3;0
A1	-	-	ASL	No	Yes	No	2;0
A2	HS	HS	English	No	No	No	2;5
A3	College	College	English	No	Yes	No	3;0
A4	8th	College	Swahili	No	No	No	9;0
B1	MA	MA	English	Yes	Yes	Yes	3;5
B2	HS	-	English	No	No	Yes	4;0
B3	HS	College	English	No	Yes	No	0;11

(-) Indicates no response. HS=high school. MA=Master's degree. Note: Student groups are listed by age with Group C, the youngest, listed first.

Student A4 had one year of experience with a sign language not used in American education but closely related to ASL prior to moving to the United States, and A4 began using ASL at 9;0. Three students had cochlear implants (CIs), receiving them after 3 years of age, although one discontinued use of his CI at least 6 months prior to this study and another student used it sporadically during this study. The third student with a CI used it daily. Three students communicated with a combination of sign and speech, and the remaining nine used only sign language. In other research, age of exposure to language was a greater predictor of children's language use than their chronological age (Bernardino, 2007; Goldstein & Bebko, 2003). Parental report of ASL use predicted 15%

to 20% of the variance in their children's language skills (Schick & Hoffmeister, 2001). Age of exposure may be a factor that influences classifier development in the current study. Length of exposure to ASL may be a predictor for a child's initial classifier production ability (Chamberlain & Mayberry, 2008; Mayberry & Lock, 2003). Deaf children of deaf parents, who had longer exposure to sign language, produced more classifier handshapes than deaf children of hearing parents (Bernardino). Students who use spoken language or signed English, which does not include classifiers (Schick, 2003; Wilbur, 2000) may vary in their classifier production ability. Therefore, information on students' age of exposure to sign language and the specific types of languages and modes used in the home was included on the background form (see Appendix A).

Additionally, an audiogram for each student was obtained that documented his or her degree of hearing loss with and without listening devices (i.e., hearing aids or CIs). Students' degrees of aided and unaided hearing loss and their use of listening devices may affect their sign language skills, the degree to which they use sign language, and their corresponding knowledge and use of classifiers. Therefore, the background form also included questions regarding the types of amplification that students used and the frequency of use. Teachers provided copies of students' current audiograms and audio-logical records.

Participant Selection

Teacher participants. Teachers of students in grades two through five were invited to attend an informational meeting and volunteer to participate in this study. Three teachers with typical hearing returned signed consent to participate and distributed parental permission forms to their students. All teachers were certified in deaf education and employed as classroom teachers at the research site. The three teachers had ratings of Advanced, Intermediate Plus, and Intermediate on the *Sign Language Proficiency Interview* (Newell et al., 1983). All teachers completed the 1-hour teacher training session and met the 80% criterion for fidelity of the intervention during the training session. Years of teaching experience was not a criterion condition in this study because of the amount of mediation provided to the teacher during the intervention and the fidelity requirements that permitted additional teacher training if necessary.

Student participants. The first three students within each teacher's class who returned parental permission were selected to receive the intervention. This resulted in three groups of three students each in second (Group C), third (Group A), and fourth grade (Group B) classrooms. Because four students returned parental permission in the third grade classroom, all four students participated in the intervention. However, one participant, A2, could not recall events of the DVD stories without visual support from the book, so he was treated as a separate, modified case of one. Three groups met the minimum requirement across which to replicate a functional relation in a multiple baseline design.

Setting

This study occurred in three typical classrooms with the students' regular class-room teacher at an urban day school for DHH students located in a major metropolitan area. The school enrolls approximately 200 students from preschool through 12th grade from 28 counties in and around the metropolitan area. Each classroom consists of small group instruction with class sizes ranging from four to eight students. Because the inter-vention occurred in the students' typical small group educational setting, it provided evidence of the social validity of the intervention. Pre-assessments and post-assessments occurred in a separate classroom one-on-one with a student and researcher.

Independent and Dependent Variables

The independent variable for this study was teacher-mediated repeated viewings of ASL stories on DVD for three consecutive days (approximately 5-10 minutes per day). The dependent variable was student classifier production during narrative retell, defined by a group mean percentage score derived from each student's correct classifier production across parameters (i.e., figure and ground handshapes and movement) during each retell following every viewing of a story. The target primes within each classifier were determined by the fluent signer's renditions during the ASL stories on DVD. This score was calculated from the number of classifier parameters correctly produced by each student divided by the number of opportunities for parameter production based on the narrator's production in each story. Because the number of classifiers presented by the ASL models in each story varied within and across story levels (i.e., 4-8 opportunities per story), percentage scores were used across the phases of this study (Becker, 2009).

Research Design

Previous studies of narrative interventions exhibited limited experimental control (Petersen et al., 2010) with only pre-/post- test designs. To demonstrate more robust experimental control in the current study, I used a multiple baseline across participants design with multiple probes (Kazdin, 1982) to investigate the effects of repeated viewings of stories presented in ASL paired with teacher mediation on students' classifier production during narrative retell of those stories. Multiple baseline designs permit demonstration of a functional relation between an independent variable (i.e., repeated viewings and teacher mediation) and a dependent variable (i.e., classifier production). A functional relation is established if the target behavior, classifier production, increased only after the repeated viewings and teacher mediation and if the non-instructed participants' performance stayed at or near preintervention levels across baseline (Kazdin).

Instruments

Baseline assessments were administered to students prior to their entry into the initial intervention phase of this study in one-on-one sessions between the researcher and individual students in a separate classroom using the instruments listed below.

Peabody Picture Vocabulary Test. The *Peabody Picture Vocabulary Test* (PPVT-4; Dunn & Dunn, 2007) is a measure of receptive English vocabulary that provides a standard score for each child with a median reliability of .95. The established norms are based on children with typical hearing; therefore it was adapted and used within a different context than intended with the accompaniment of signs. This assessment was administered only prior to the intervention as a measure to determine students' receptive vocabulary at the onset of the study. Receptive vocabulary abilities might affect students' abilities to comprehend the stories presented on DVDs. Target items were presented in simultaneous voice and sign. In some instances, iconic features of a sign that is presented receptively may permit test takers to guess the meaning of the sign correctly and therefore identify the appropriate picture on a receptive task (Hermans et al., 2010). To address this possibility, I met with the reading specialist and the literacy instruction coordinator at the research setting to determine adequate and acceptable signs on the *PPVT* based on conceptual accuracy and signs used within the research setting by deaf students and adults. In our decisions for individual test items, we remained faithful to ASL and attempted to limit iconicity and visual cues. However, we did not alter signs or use fingerspelling when a conceptually accurate sign is commonly used in ASL that also appears to provide a clue to the correct response, such as *farm* for *agriculture* and *small horse* for *colt*. In some items, this may have reduced the complexity of the label for the concept in ASL when compared to English, such as in the previous example. Some words for which there are no ASL signs (e.g., *fungus, grain*) were presented in fingerspelling, as a native signing adult would likely use fingerspelling in these contexts. These adaptations may have resulted in elevated receptive English vocabulary scores for some students; however, because the same signs were used throughout this task across students, students in this study had an equal chance of elevated receptive scores. The scores obtained for students on the *PPVT* in this study are only valid with the group of students tested and were used as a threshold for receptive vocabulary to see if a certain size of lexicon was required to comprehend the stories presented in ASL and therefore participate in an expressive retell task.

Expressive One Word Picture Vocabulary Test. The *Expressive One Word Picture Vocabulary Test* (*EOWPVT*; Brownell, 2000) is a measure of expressive English vocabulary that uses picture stimuli and provides a standard score for each child with a median reliability of .95. The established norms are based on children with typical hearing; therefore it was adapted and used within a different context than intended with the accompaniment of signs. Students responded in sign language, with speech, or using a combination of both. This measure was also given only as a preintervention measure to ensure students had sufficient expressive vocabulary to engage in a narrative retell.

Students' expressive vocabulary might affect their abilities to use more complex expressive constructs such as classifiers. Bergeron, Lederberg, Easterbrooks, Miller, and Connor (2009) collected a consistent set of acceptable sign choices for the *EOWPVT* and I used this set in the current study.

ASL Receptive Skills Test. The *ASL Receptive Skills Test* (Enns & Herman, 2011) is a measure of ASL receptive skills in 8 grammatical categories: number/-distribution, negation, noun-verb distinction, spatial verbs (location and action), size and shape classifiers, handling classifiers, role shift, and conditionals. This assessment was given before and after the intervention to determine if the intervention resulted in increased receptive identification of classifiers. Students' receptive ASL abilities were assessed prior to implementation of the intervention and immediately following the conclusion of the intervention in the same one-on-one setting as above. During this task, participants watched 42 short clips (approximately 3 seconds each) presented in ASL, one at a time, and pointed to one of four pictures presented for about 5 seconds on a computer screen that corresponded with the signed stimulus immediately following each clip. Neither stimuli nor answer clips were repeated.

Narrative retell tasks. In this study, narrative retell involved having children retell a story from a wordless picture book, from a repeated viewing of a story presented in ASL, or from brief animated video clips. Because of noted limitations using only one genre for narrative elicitation (Becker, 2009) and limited results with use of picture books and student-generated narratives (Baker, van den Bogaerde, & Woll, 2005; Becker; Morgan, 2002), I used two measures of classifier production to assess students' skills both before and after the intervention, as described below.

Wordless picture books. Two wordless picture books (*The Trunk* and *A Day in the Park*) were presented to students, one at a time, and students were asked to tell the story while looking at the pictures with the following prompts: "Tell me what happened in the story" and "Can you tell me more?" This task took about 5 minutes per story and was video recorded for later transcription and analysis. Student storytelling transcriptions were coded for the inclusion of classifiers and the specific primes used for each classifier parameter (see Appendix B). If students did not use classifiers during their narrative retells, their productions were coded for the mechanism that they used (i.e., lexical signs, constructed action, nominal pointing) to show the action depicted in the story. As a basis for comparison, these two storybooks were piloted with two deaf adults (Beal-Alvarez & Easterbrooks, submitted) as a measure of target-like productions from within the students' language community, similar to previous research (Becker). The adults' total classifier productions were averaged, coded by parameter, and established as target-like productions to which the children's productions were compared. Student narratives of these two storybooks were coded in two ways: (a) A percentage was calculated based on the total number of correct parameters produced by students divided by the adult average for each story; (b) A total count of correctly produced classifiers and a total count of different classifiers produced were calculated for each student. Because the number of classifier opportunities varied across each intervention story, the students' percentage scores served as baseline classifier production scores for later comparison across intervention stories. For groups B and C, *A Day in the Park* was used as a baseline probe immediately prior to entry into phase one of the intervention to increase the confidence of a causal relation between the intervention and classifier production (Petersen et al., 2010). Narrative retell was also used in the intervention, as described below in the intervention procedures.

Ozcaliskan Motion Stimuli. The *Ozcaliskan Motion Stimuli* (Ozcaliskan, 2011), 18 animated PowerPoint clips, elicit gesture production by hearing adults. For the current study, these stimuli were used to elicit classifiers. Participants watched animated clips of a figure moving in reference to a secondary figure (such as a man crawling across a rug) and produced a representation of the scene using signs and/or classifiers. Given a paucity of available measures of classifier production (Goldstein & Bebko, 2003; Paludneviciene & Hauser, 2007), I chose this assessment because it is readily applicable to classifier production as each clip contains the opportunity for production of the parameters within classifiers (i.e., figure and ground handshapes and movement). While no measures of reliability and validity were available, the measure was readily available and it was efficient to administer and score. Participants were given the following directions: "I will show you some pictures on the computer. Then you show me how to sign them." They were not given feedback on any test items in order to prevent modeling of the dependent variable, classifier production. All student responses were video recorded and transcribed in the same method as the wordless picture books. The *Ozcaliskan Motion Stimuli* were piloted on the same two deaf adults mentioned above (Beal-Alvarez & Easterbrooks, 2012) and analyzed for the generation of classifier production. The adults produced classifiers for 17 (94%) and 18 (100%) of the clips, respectively, demonstrating the potential of this assessment to elicit classifier productions.

Interrater reliability was calculated for each of the preintervention and postinter-vention classifier production measures by randomly selecting two students and having a second rater recode each assessment for each student (i.e., 20%). The author, who has an Advanced Plus rating on the *Sign Language Proficiency Interview* (SLPI; Newell et al., 1983) and 7 years of teaching experience with DHH students, was the first rater. The second rater had an Intermediate *SLPI* rating and 6 years of teaching experience with DHH students.

Procedures

Baseline assessment data were collected as described above to determine the students' current receptive and expressive vocabulary scores and their current receptive ASL skills. Their classifier production skills were assessed during narrative retells of two wordless picture books and an animated task. These measures documented students' current language skills and predicted their performance without introduction of the intervention (Kazdin, 2011). Additionally, teachers who consented to participate in the current study completed the one-hour teacher training session.

Intervention Instruments and Procedures

Intervention materials for classroom teachers included (a) a computer paired with a projector in each teacher's classroom to play and display the ASL story; (b) a copy of each ASL story on DVD for each teacher; and (c) a mediation script for each ASL story used during intervention phases one through three (see Appendix C). Sundance/-Newbridge Educational Publishing (1999; Northborough, Massachusetts) publishes a collection of leveled emergent literacy books called *Alphakids*. The Accessible Materials Project at the Atlanta Area School for the Deaf (AASD.AMP@doe.k12.ga.us) has created ASL renditions in DVD format of more than 300 of these titles. The stories for this study were selected from a larger set of *Alphakids* leveled stories because they included multiple examples of classifiers and multiple levels of stories.

Teacher and student behaviors were identical across all mediation scripts, with the exception of the specific parameters of classifiers that the teacher modeled and the number of classifiers that appeared in each ASL story. The teacher modeled each classifier as directed in the corresponding mediation script, the students imitated each classifier, and the teacher provided feedback as needed on student productions. These materials provided fluent ASL models, scripted teacher mediation, and the fading of teacher mediation across time. For each intervention session, the classroom teacher started the ASL DVD in the "Read Aloud" version using her classroom computer and projection screen. Students watched the ASL DVD from their desks. During intervention phases with teacher mediation, the teacher followed the directions on the accompanying mediation script (see Figure 3). At indicated points in time, the teacher stopped the DVD, prompted students to produce the classifier modeled on the screen; modeled the classifier herself and prompted students to imitate her production; provided feedback to students as needed; and continued the DVD. During phases without teacher mediation, the students watched the story from start to finish without interruption.

The current study had four intervention phases across groups. In each intervention phase, the students watched an ASL story narrated by an ASL model three times. The amount of mediation provided by the teacher during the repeated viewings of each story faded across the four phases. In phase, one the teacher provided mediation during each of three viewings of the DVD using the corresponding teacher mediation script (see Appendix C). In phase two, the teacher provided mediation during the first and second viewings of the DVD and not for the third viewing. In phase three, the teacher provided mediation only during the first viewing. In phase four, the teacher provided no mediation during the three repeated viewings.

To move to the next phase of the intervention, the daily mean score for classifier production for each group had to exhibit an increasing trend across the three days of the intervention phase. The students' scores within each group for each narrative retell were averaged and graphed to determine if the group's performance increased across viewings within the phase (e.g., across three viewings of *Sleeping Animals*). In the event that a group's mean score did not increase for three consecutive data points, the teacher continued in the current intervention phase (i.e., the same level of mediation) with a different ASL story of the same level on DVD until this criterion was met. The intervention occurred across a 6-week time frame for each group (see Table 2).

Table 2

Intervention Schedule

	Group A		Group C		Group B	
Week	Story	Med.	Story	Med.	Story	Med.
1	*Sleeping Animals*	3	*Monsters*	3	*Video Game*	3
2	*Looking for Fang*	2	*Butterfly*	2	*Snake's Dinner*	3
3	*I Can't Find My Roller Skates*	1	*What's That Noise?*	2	*Thomas Had a Temper*	2
4	*Tadpoles and Frogs*	1	*Making Butter*	1*	*A Pet for Me*	1
5	*Taking Pictures*	1*	*I Can't Find My Roller Skates*	1*	*Shadow Puppets*	1
6	*Video Game*	0*	*Looking for Fang*	0*	*Sebastian*	0

Med. = no. of times teacher provided mediation for each story.
* indicates provision of pictures during students' narrative retell.

Because this study occurred in the students' typical classrooms, teacher schedules determined the order in which groups entered into the intervention phases (i.e., third grade, second grade, fourth grade). Following a stable trend in baseline classifier production performance (i.e., 20% either side of the mean; Repp, 1983), the first group of students (Group A) began the intervention with three repeated viewings of *Sleeping Animals* and three sessions of teacher mediation during the viewings. This pattern proceeded across the three groups and across phrases. Details of the intervention phases are presented in the Results section. Materials used by the researcher to collect students' classifier production during narrative retell included (a) copies of the books that corresponded with the ASL stories on DVD; (b) a video camera to record individual student retells; and (c) coding sheets for each ASL story and each student (see Appendix D).

Data Collection

Immediately after watching the DVD, students individually retold the story to the researcher with student order determined by the group's rotating line leader for the school day within each class. The students told the story to a different researcher on each of three days to control for the assumption on the student's part that the researcher already knew the story (Becker, 2009). Students were shown only the cover of the corresponding story to encourage students to retell the story based on their previous experiences with the corresponding ASL story instead of the influence of surface-level features (Baker et al., 2005; Becker; Morgan, 2002). The researcher prompted students with "Tell me what happened in this story" or "Can you tell me more?" until the student indicated that s/he was finished with the retell. Each student's narrative retell was video-recorded with an

Insignia 720 pixel digital camcorder on a 4” tripod with the screen of the camera visible to the student (i.e., the student could tell the story to the camera or the researcher). The narrative retell task took about 5 minutes per student. Students told each story to one of three researchers directly following each viewing for a total of three retells across each of six stories.

Students were required to tell the intervention stories from memory during the three successive retells. All of the participants, except A2, were able to retell at least a third of the story events on any given day across the intervention. A2’s recall of story events was only 14% and 17% across the first 2 weeks of the intervention. Because he was the fourth participant for Group A, I modified the intervention and studied him as an individual case. First, each of his retells was recorded using only the cover of the book as a visual prompt, followed by a second retell during which the researcher flipped through the individual pages of the book as A2 told the story.

During the third phase of the intervention, in which Group A received only one occurrence of mediation, their classifier production decreased as a group and they did not meet the established criterion (i.e., an increasing trend line of three data points) to proceed to the next phase. The phase was repeated with a different story and Group A again failed to meet the established criterion. Picture support was added to assist students in their recall of the story for Groups A and C. Because Group B’s recalled events remained above 50% across retells during the same time period, they did not receive picture support throughout the intervention. For each narrative retell, students in Groups A and C first told the story with only the cover of the book as a prompt, followed immediately by a second retell in which the researcher or student flipped through the pages of the story. All text within the books was covered using two layers of white paper.

Data Coding

The following materials and procedures were used to code students' narrative story retells to collect data for classifier production and recalled events during the intervention phase. I transcribed each narrative retell and coded classifier productions using a coding sheet similar to the one in Appendix D.

Each coding sheet contained each phrase represented by a classifier in the ASL narrator's rendition of the story (e.g., *Thomas falls off his swing*); the figure and ground identified by the student (i.e., noun phrase); the primes used by the student to represent each classifier parameter; and the time on the video during which the student produced each classifier. Parameters were described using the ASL manual alphabet for handshape (Conlin et al., 2000) and descriptive movement primes encased in brackets (i.e., [B]; Quinto-Pozos, 2010). In contrast to the detailed classification provided by Supalla (1990), I analyzed movement only at the surface level to identify the presence of movement within a classifier production with a focus on path and direction (e.g., forward, under). Each coding sheet also included a designated space for calculation of the total use, by percentage, of the above components. These coding procedures were similar to the coding procedures used by Singleton and Newport (2004) for the VMP task.

Student scores for each element (i.e., figure and ground identification) and parameter (i.e., figure handshape, ground handshape, movement) were calculated by adding the total correct primes and dividing that sum by the total opportunities for the parameter. An overall percentage score for classifier production was calculated by dividing the sum of correct primes by the total prime opportunities. This served as each student's overall classifier production score for each retell. Finally, the sum of students' overall classifier production scores for each retell were averaged within each group to determine the group's mean classifier production score, which was graphed for each retell. When students did not use classifier productions for the phrases that were represented by a classifier by the ASL narrator, their substitutions (e.g., constructed action, lexical signs) or omissions were recorded on the data sheet.

In addition to analyzing the classifier production, student retells were analyzed for the number and percentage of events that students recalled during each retell (see Appendix D). Inclusion of story events controlled for the possibility that cognitive load interference (memory recall inhibits language production; Hall & Bavelier, 2011; Gozzi et al., 2010) during story retell might affect student classifier production. The percentage score for recalled events was calculated from the total number of story events a student recalled divided by the total number of events in the story as determined by the ASL narrator's rendition. Finally, the third narrative retell of each story by each student was analyzed for the specific type of classifiers the student used (i.e., semantic, SASS, handling).

Maintenance Instruments and Procedures

In Petersen's (2011) meta-analysis, only one narrative study included information on maintenance of narrative skills. Maintenance of the intervention effects in the current study was measured in two ways. First, after 5 weeks of intervention for each group, the final intervention phase included student retell after repeated viewings of the ASL story with no teacher mediation to investigate the effects of no mediation on students' classifier production during their narrative retells. Second, maintenance was measured by postintervention retell of *The Trunk* and *A Day in the Park* for comparison of classifier production between students' preintervention and postintervention assessments. Maintenance data were collected 4 weeks after the conclusion of the intervention.

Generalization Instrument and Procedures

Of the narrative studies reviewed by Petersen (2011), only Petersen et al. (2010) provided information for generalization of narrative skills. In the current study, I measured generalization of classifier production by student retell of *Goodnight Gorilla,* a wordless picture book, 4 weeks after the intervention ended. Students' narrative retell transcriptions were coded for the total number of classifiers produced, the number of different classifiers produced, and the specific primes used for each parameter, similar to procedures described above for the two pretest-posttest picture books (i.e., *The Trunk* and *A Day in the Park)*. The total number of classifiers produced and the percentage of accurate classifier parameters served as generalization scores.

Social Validity

Social validity is a measure of the extent to which the effects of an intervention have applied value for the participants and are beneficial in their everyday lives (Kazdin, 1980). Social validity was collected from teacher participants one week after the intervention ended using an anonymous printed survey that contained statements regarding the effectiveness of the intervention and a 5-point Likert scale for teachers' responses. Teachers returned their surveys to a central location by a given time for the researcher to collect all surveys at once and evaluate teachers' perceptions of the effectiveness of repeated viewings paired with teacher mediation on their students' classifier production and the feasibility of this intervention in the typical classroom setting (Horner et al., 2005). Social validity was collected from student participants one week after the intervention was completed using a second 5-point Likert scale questionnaire. I presented the questions on the questionnaire to the students in sign language. These questionnaires served as an informal and subjective evaluation (Wolf, 1978) to examine student perceptions of the effectiveness of teacher mediation and repeated viewings of ASL stories on their classifier production.

Expectations

I expected that the current study would identify and replicate a functional relation between teacher-mediated repeated viewings of ASL stories on DVD and student classifier production across three groups of students, such that each time the intervention was introduced across four intervention phases, student classifier production would demonstrate an increasing trend. Additionally, I expected that student classifier production would increase across time despite a decrease in the level of teacher mediation provided. Based on students' increases in vocabulary following 6 weeks of preteaching and repeated viewings (Cannon et al., 2010), I hypothesized that 6 weeks comprised a sufficient intervention period to realize positive results from implementation of the current intervention. However, a multiple baseline design also permitted flexibility in the amount of intervention that students received based on student performance on classifier production within each group.

Finally, I expected that students would maintain high levels of classifier production after teacher mediation was removed, as measured by narrative retells of the ASL stories and picture books. Based on these expected results, the combination of teacher mediation and repeated viewings may be an effective intervention to increase the classifier production of students who are DHH. These expected results will provide additional support for previous findings of increases in vocabulary following mediated, repeated viewings of ASL models (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) and extend previous findings to the specific ASL subsystem of classifier production. The implications of these results will provide an evidence base for the use of repeated viewings of ASL models and fading teacher mediation to increase classifier production and increase reading skills based on the identified correlation between ASL comprehension and reading of English (Chamberlain & Mayberry, 2000; Easterbrooks & Huston, 2008).

CHAPTER 4

RESULTS

In this study, I investigated deaf children's ability to learn classifiers through mediated instruction using repeated viewings of ASL stories. The research questions for this study were (a) What are the effects of repeated viewings of ASL stories combined with teacher mediation on classifier production during narrative retells for children who are DHH? (b) What are the effects of fading teacher mediation on classifier production during narrative retells for these children? Results are presented in three sections. First, I present students' demographic information and vocabulary scores on multiple measures to establish their current levels of performance at the beginning of the study. Then I examine data that pertain to overall classifier production, followed by data regarding the specific types of classifiers and the accuracy of classifier parameters. Next, I present data on students' recall of story events followed by an analysis of the type and amount of mediation and the effect on students' classifier production. Finally, I report the results of social validity measures. All assessment results are presented starting with the youngest group of students (i.e., Group C) and ending with oldest group (i.e., Group B) to show developmental or age-related patterns.

Vocabulary

Receptive Vocabulary

Based on the *PPVT*, all students in Groups C and A had receptive English vocabulary age equivalent scores below their chronological ages (see Table 3). Students in Group C ranged from 1;6 to 4;0 (years;months) behind their typically hearing peers based on the *PPVT*. Students in Group A ranged from 1;10 to 4;9 behind. All students in Group B scored above their age equivalent score with a range of 0;9 to 2;1.

Table 3

Demographics by student at the beginning of the study.

Student	Age[a]	Grade	Unaided (L/R) (dB)	PPVT SS	PPVT AE	EOWPVT SS	EOWPVT AE
C1	8;1	2	85/75	86	6;7	83	6;1
C2	8;7	2	75/80	78	6;1	67	4;6
C3	7;8	2	100/100	60	3;8	56	3;0
A1	9;3	3	75/80	72	6;0	69	5;1
A2	9;5	3	80/70	72	6;2	81	6;8
A3	10;7	3	70/100	89	8;9	58	4;3
A4	9;8	3	90/100	57	4;11	68	5;3
B1	9;10	4	-/115	108	11;1	87	7;11
B2	9;1	4	105/70	106	9;10	82	6;7
B3	9;2	4	85/85	116	11;3	92	8;0

(-) indicates no data; [a]years;months; (L/R)=left ear/right ear; (dB)= decibels; PPVT=*Peabody Picture Vocabulary Test*; SS=standard score; AE=age equivalent score; EOWPVT=*Expressive One-Word Picture Vocabulary Test*.

Expressive Vocabulary

Based on the *EOWPVT*, all students had expressive English vocabulary age equivalent scores 1-6 years below their chronological ages (see Table 3). Although not a research question in the current study, an examination of the *PPVT* and *EOWPVT* demonstrated a positive relation between receptive and expressive scores for these students with receptive vocabulary consistently higher than expressive vocabulary based on these two measures (see Figure 1).

Students in Group C demonstrated individual and group similarities in the relation between their receptive and expressive vocabulary scores. Students in Group A were more variable in comparison to each other in receptive and expressive vocabulary scores.

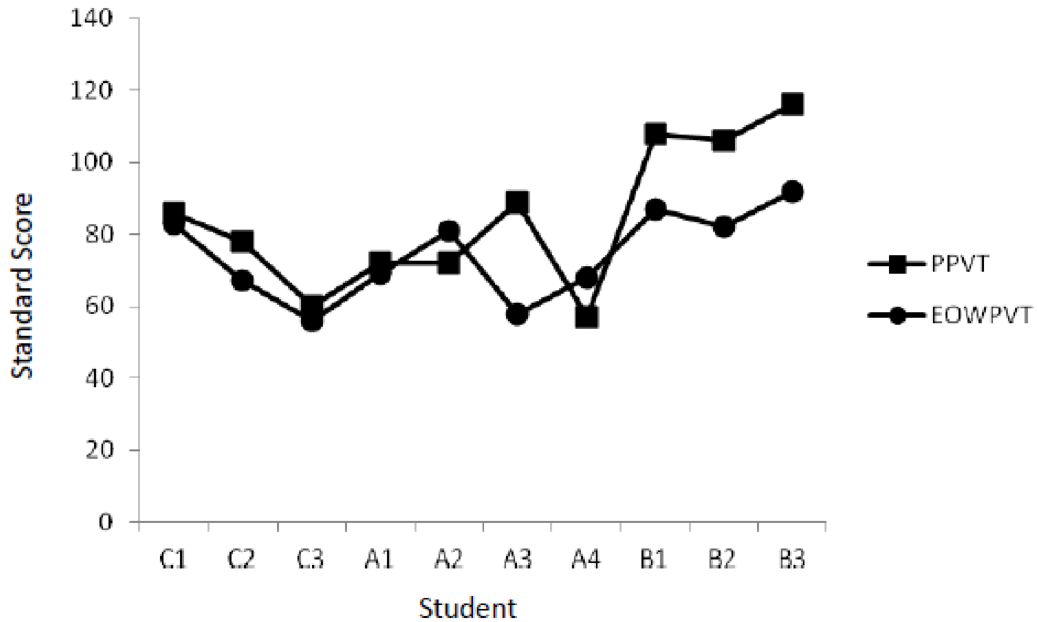

Figure 1. PPVT and *EOWPVT* standard scores across students.

Group B had the highest scores overall and had a larger gap between their expressive and receptive scores than the other students (except A3).

Next, I address the first research question, What are the effects of repeated viewings of ASL stories combined with teacher mediation on classifier production during narrative retells for children who are DHH? I present students' overall classifier production performance during preintervention narrative retells followed by their overall classifier production performance for intervention narrative retells. Then I present students' accuracy for the specific parameters of classifier production for preintervention and intervention measures.

Overall Classifier Production

To document the accuracy of classifier production, I transcribed all video recordings across each preintervention and postintervention classifier production task (i.e., *The Trunk*, *A Day in the Park,* and *Ozcaliskan Stimuli*) and coded for the following elements and parameters: figure and ground identification, figure and ground handshapes, and movement.

Figure and ground identification (i.e., noun phrase). If the student identified the figure (e.g., MAN, CAT) and/or the ground (i.e., TREE, BOAT) by signing an appropriate label, it was noted on the coding sheet (see Appendix D). While some researchers (Pfau, 2011; Supalla, 1990; Zimmer & Patschke, 1990) reported that pointing may be acceptable in certain instances for noun phrase identification, for the current study I coded pointing as an incorrect response because multiple items were within each picture or animate frame in the elicitation materials.

Figure and ground handshapes. While more complex coding systems are in development for handshapes (i.e., coding of selected fingers and joint specifications; Eccarius & Brentari, 2008), for the current study the manual alphabet (Conlin et al., 2000) and number system were sufficient to code student production of figure and ground handshapes.

Movement. I coded student production of movement to describe the salient features of the production, namely manner and path (e.g., [forward], [turn-over]).

Preintervention Results

Each group exhibited a stable baseline trend, defined as 20% either side of the mean (Repp, 1983) for classifier production during preintervention narrative retells of the two wordless picture books. Group C’s mean baseline classifier production scores for *The Trunk* and *A Day in the Park* were 23% and 4%. Group A’s baseline scores were 34% and 51%. Group B’s baseline scores were 53% and 67%. For the *Ozcaliskan Stimuli*, pretest scores for classifier production (out of 18 items) ranged from 9% to 89% with a mean of 44% across students.

Baseline Reliability

Interobserver agreement was collected for 20% of the students' preintervention assessments by randomly selecting 2 of the 10 students and coding each of their baseline assessments for overall classifier production and the accuracy of classifier parameters. The second rater used a coding sheet that documented the time on each student's video-recorded retell and corresponding phrase during which a student produced a classifier. The second rater coded the same elements and parameters as the first coder (i.e., figure and ground identification, figure handshape, ground handshape, and movement). Agreement on classifier production and classifier parameters was calculated using the point-by-point formula (Total Agreement = agreements divided by the sum of agreements and disagreements x 100%) for each parameter across retells of both wordless picture books and the *Ozcaliskan Stimuli*. Mean agreement for overall classifier production was as follows for each measure: *The Trunk:* 90%; *A Day in the Park:* 95%; and the *Ozcaliskan Stimuli:* 96%. Mean agreement for each parameter at pre-intervention across measures was as follows: Figure identification: 89%; Ground identification: 83%; Figure handshape: 99%; Ground handshape: 93%; and Movement: 96%.

Intervention Results

This multiple baseline intervention included three groups of three students, across grades 2, 3, and 4. (All intervention scores for Group A do not include A2's performance. His performance is discussed as an individual case study). The schedule of intervention for the groups is displayed in Table 2. Following transcription and coding of students' classifier productions and number of recalled story events, the group mean for classifier production for each intervention group was graphed using the multiple baseline across participants design (see Figure 2). In the event that a student was absent, the group mean was calculated using two scores instead of three. Across the intervention sessions, B2 was absent three times, C3 was absent twice, and B3 and C1 were absent once each.

I used visual analysis to determine the presence of a functional relation between the introduction of the intervention and the students' classifier production during narrative retells. Using the established criterion of three data points in an increasing trend, I determined if and when each intervention group proceeded to the next intervention phase. This criterion was met across groups, demonstrating a functional relation between the intervention of repeated viewings of ASL stories paired with teacher mediation and students' classifier production during narrative retells. At the individual level, each student's retell score was graphed to monitor recall of story events. Analysis of data at the group and individual levels permitted exploration of additional factors that may affect students' classifier production.

Results from the visual analyses of the group classifier production graphs were confirmed by the calculation of the percentage of non-overlapping data (PND; Scruggs et al., 1987) for each group. PND is the percentage of data points in the intervention phases that represent an improvement over the most positive value obtained during baseline (Scruggs et al.). For multiple baseline designs, 50% or more of data points during intervention should exceed the highest baseline score for visual analysis (Rogers & Graham, 2008). To determine the PND the total number of intervention data points that were higher than the highest baseline data point were divided by the total number of

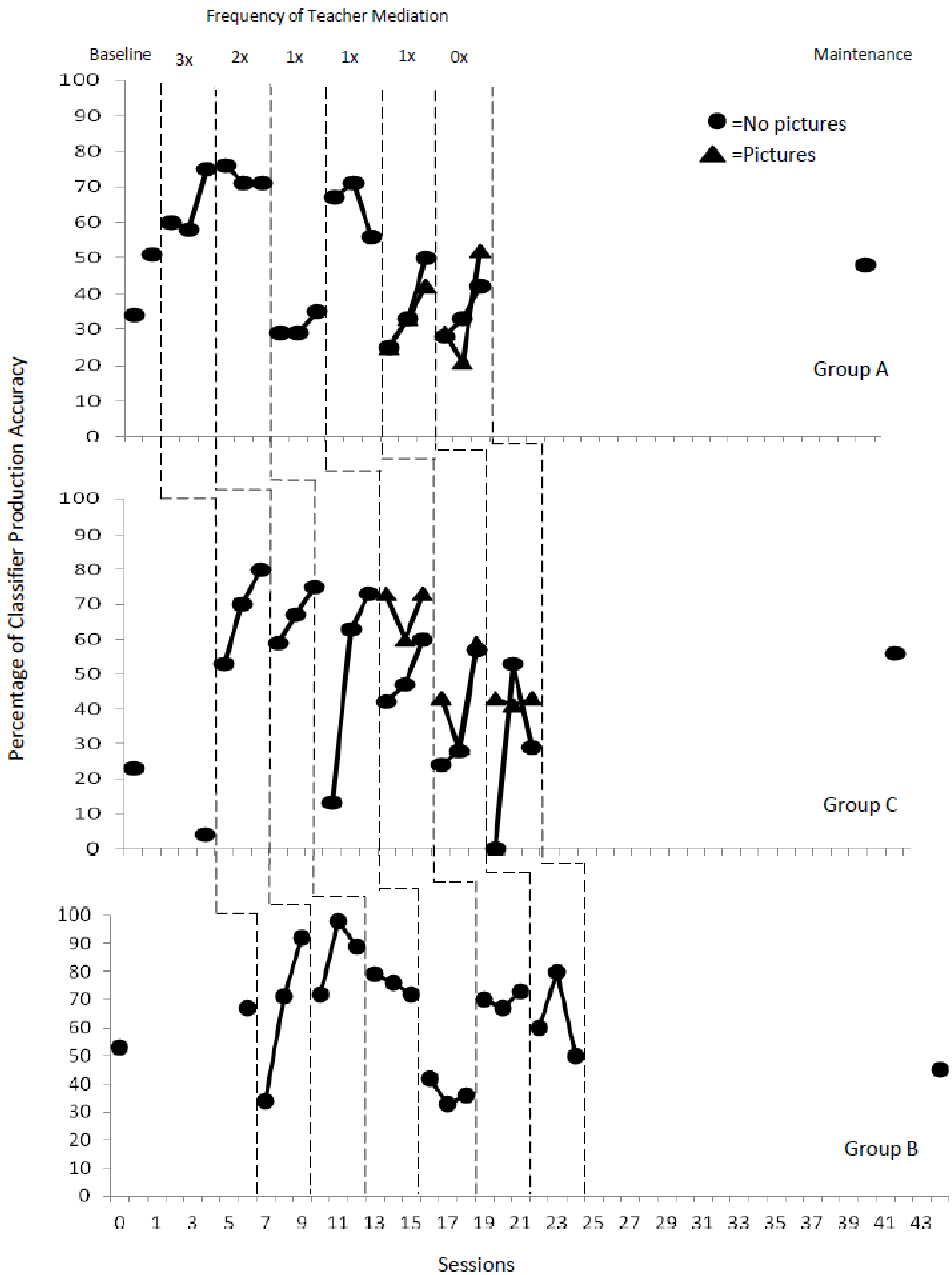

Figure 2. Mean classifier production by student group.

intervention data points and multiplied by 100. Group performance was compared to each baseline data point for each group's mean classifier production (i.e., *The Trunk* and *A Day in the Park*). Group A's PND when compared to *The Trunk* was 67%, showing a small effect using criteria established by Scruggs, Mastropieri, Cook, and Escobar (1986). Their PND when compared to *A Day in the Park* was 50%, showed no effect of the intervention.

During the third phase of the intervention, Group A's mean across each of the three retell sessions fell below their baseline score for *Trunk*. If their intervention data points for *I Can't Find My Roller Skates* are removed, the intervention had a moderate effect for the group (PND=80%). Compared to *The Trunk* Group C's PND was 83% and their PND for *A Day in the Park* was 94%, showing moderate and large effects of the intervention. Finally, Group B exhibited a moderate effect (PND = 72%) for *The Trunk* and a small effect compared to *A Day in the Park* (PND = 61%). With removal of their intervention data points for *I Can't Find My Pet* in phase four of the intervention, which fell below their group mean for *The Trunk*, the intervention had a PND of 88%. The effects of the 6-week intervention ranged from small to large across groups.

Groups A and C received picture support halfway through the intervention to address possible effects of recall embedded within the narrative retell task (see Figure 2). When provided with picture support in intervention phases 5 and 6 with one or zero sessions of mediation, Group A showed no effect of the intervention compared to *The Trunk* (PND = 33%) or *A Day in the Park* (PND = 0%). When Group C received picture support with one or zero mediation sessions, they showed a large effect of the interven-tion (PND=100%) when compared to both baselines. Individual students' performances

Table 4

Mean number of classifiers produced by student without and with picture support.

Student	Mean Classifiers	Mean Classifiers Picture Support
A1	6.0	4.0
A2	2.0	5.0
A3	4.0	0.8
A4	5.0	4.5
C1	5.0	10.0
C2	4.0	3.8
C3	2.5	3.7
B1	4.8	--
B2	5.9	--
B3	6.8	--

varied when provided with picture support during their retells. Three students appeared to benefit from the provision of picture support compared to no picture support based on their mean number of classifiers produced: A2, C1, and C3 (see Table 4).

Picture support resulted in little difference in the mean number of classifiers produced by A4 and C2. Finally, A1 and A3 produced fewer classifiers when provided with picture support immediately after their first retelling without picture support. In comparison, students in Group B had varied performance across days, stories, and levels of teacher mediation without picture support during their retells. From the first to second and second to third retellings, half of the time their classifier production increased and half of the time it decreased.

Types of Classifier Productions

In addition to overall classifier production, I coded students' narrative retell transcripts for classifier type (i.e., semantic, SASS, handling) using the third retell for each story, supported by pictures when available for students in Groups C and A, in order to analyze their retells generated during the highest level of support. All groups produced semantic and SASS classifiers (see Table 5). Only Group C produced handling classifiers, generated specifically by the story *Making Butter*, and this group also produced more SASS classifiers than the other two groups. Semantic classifiers were prevalent across groups.

Dependent Variable Reliability

Interobserver agreement was collected for 17% of the students' narrative retells during the intervention by randomly selecting 3 of the 12 student retells for each intervention group across phases 1, 3, and 5. Procedures for calculating inter-observer agreement were the same as described above for pre-intervention narrative retell inter-rater reliability. Mean agreement for overall classifier production was 93.6%. Mean agreement for each element and parameter was as follows: Figure identification: 85%; Ground identification: 88%; Figure handshape: 92%; Ground handshape: 90%; and Movement: 83%. Additionally, both raters agreed that no classifiers were exhibited for six narrative retells.

Intervention Fidelity

I collected fidelity of the intervention using a fidelity checklist that corresponded with the teachers' mediation scripts for each story (see Appendix E) for 37% of the sessions during which teachers provided mediation with a mean of 99% across teachers

Table 5

Types of classifiers produced by each group.

	Semantic		SASS		Handling	
Group	Total	%	Total	%	Total	%
C	20	48	16	45	4	7
A	25	86	4	14	0	0
B	18	82	4	18	0	0

(see Table 6). Mean fidelity of the intervention was 100% across teachers for 11% of the sessions in which they did not provide mediation.

Maintenance

Maintenance data for classifier production were collected using the wordless picture book *Goodnight Gorilla,* which was the only student narrative retell of this particular book, 4 weeks after the end of the intervention. Students were video-recorded during their narrative retells following the same procedures used for the pre- and post-intervention measures of *The Trunk* and *A Day in the Park.* Adult retell data for *Goodnight Gorilla* were not available. Therefore, to estimate adult-like classifier production, I calculated the mean of the total classifiers used across the three highest student scores as an estimate of classifier opportunities for *Goodnight Gorilla.* These three students (C1, A1, B3) performed similarly to each other and two of the students were DOD with a mean total classifier opportunities of 13 (range 12 to 14). All student classifier productions were divided by 13 opportunities to calculate the overall classifier production score for each student (see Figure 3). The total number of classifiers produced by students ranged from 0 to 13 (mean = 7) and the number of different classifiers ranged from 0 to 11 (mean = 5) across students (see Figure 4). Again, C1, A1, and B3 used the

Table 6

Fidelity of intervention results.

Teacher	Phase	Story	Mediation	No Mediation	Score
A	2.3	*Fang*		X	100.0%
A	4.1	*Tadpoles*	X		100.0%
A	5.1	*Taking Pictures*	X		100.0%
C	1.3	*Monsters*	X		100.0%
C	2.1	*Butterfly*	X		100.0%
C	3.1	*What's That Noise*	X		100.0%
C	4.1	*Making Butter*	X		100.0%
C	5.2	*Looking for My Skates*		X	100.0%
B	1.1	*Roller skates*	X		100.0%
B	2.1	*Snake's Dinner*	X		98.5%
B	3.1	*Thomas Had a Temper*	X		96.2%
B	4.2	*A Pet For Me*		X	100.0%
B	5.1	*Shadow Puppets*	X		95.6%

greatest number of different classifiers (9 to 11). Figure identification ranged from 0% to 100% (mean=35%) with only B1 identifying the figure for every classifier production. Identification of the ground ranged from 0% to 100% (mean=17%) with B3 scoring 100%. Eight students scored 100% for figure handshape accuracy (mean=87%; range=0% to 100%) and seven students scored 100% accuracy for ground handshape (mean=77%; range=0 to 100%). All students who produced classifiers scored 100% for movement accuracy.

Generalization

I analyzed generalization of classifier production by comparing students' total number and different number of classifiers produced during pre-intervention and post-intervention for *Ozcaliskan Stimuli, The Trunk, A Day in the Park,* and *Goodnight Gorilla*.

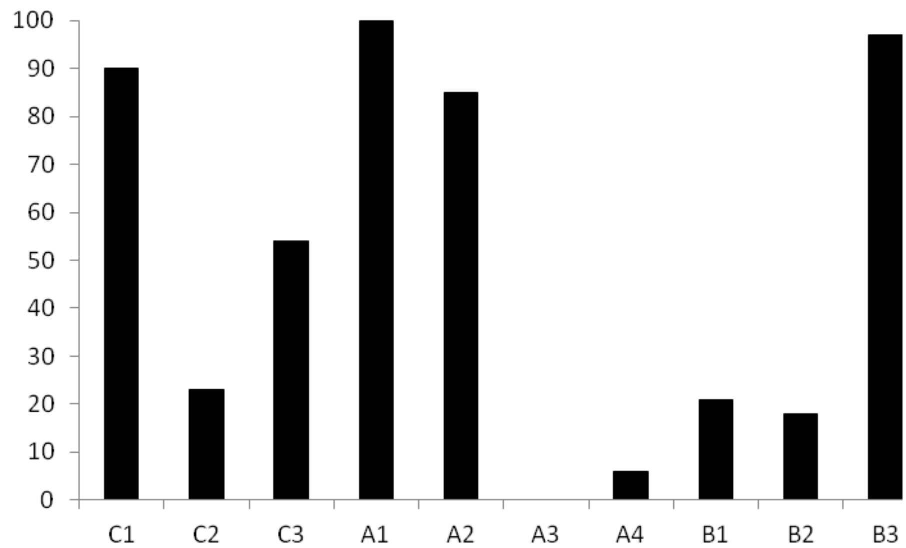

Figure 3. Percentage of overall classifier production by students for *Goodnight Gorilla*.

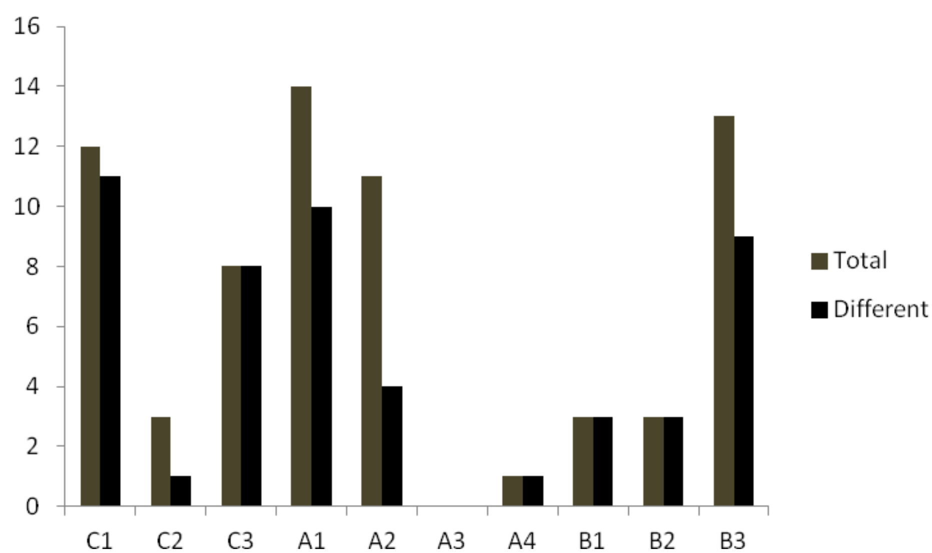

Figure 4. Total and different number of classifiers produced across students for *Goodnight Gorilla*.

Ozcaliskan Stimuli. Nine students increased their classifier production from pretest to posttest on the *Ozcaliskan Stimuli* (see Figure 5). Posttest scores ranged from 4% to 91% (mean=69%). A3 performed significantly lower than the other students on both the pretest (9%) and posttest (4%). Because the *Ozcaliskan Stimuli* is a pilot assessment in this study, the stimuli were analyzed by individual item (see Figure 6) to investigate their ability to elicit classifiers.

Each animated stimulus (i.e., items 1 through 18) elicited a classifier from a minimum of two students for the pretest and a minimum of five students for the posttest. All items elicited more classifiers on the posttest than the pretest with the exception of stimulus 17, *runout*. The movement in stimulus 17 was similar for stimuli 4 and 13, which exhibited increases in classifier elicitation from pretest to posttest. The mean elicitation rate across items for the pretest was 43% and 70% across the posttest with a mean increase of 28% between the two measures.

The Trunk. Six students produced more classifiers on the posttest for *The Trunk* than the pretest (see Figure 7) with a mean of 4.5 more classifiers on the posttest (range 1-10). Three students produced 1 to 3 fewer classifiers on the posttest (B3 produced the same number on each test). Students produced a range of 1 to 13 total classifiers (mean=6.5) on the pretest and 2 to 16 (mean=8.6) on the posttest. Seven students increased the number of different classifiers produced (range 1 to 7; mean=2.7) from pretest to posttest for *The Trunk* (see Figure 8). Two students increased from a baseline of 0 classifiers produced on the pretest to 8 and 3, respectively, on the posttest. Three students decreased in the total number of classifiers produced: A2 by 8, A4 by 2, and B1 by 4. Six students increased in the number of different classifiers they produced from

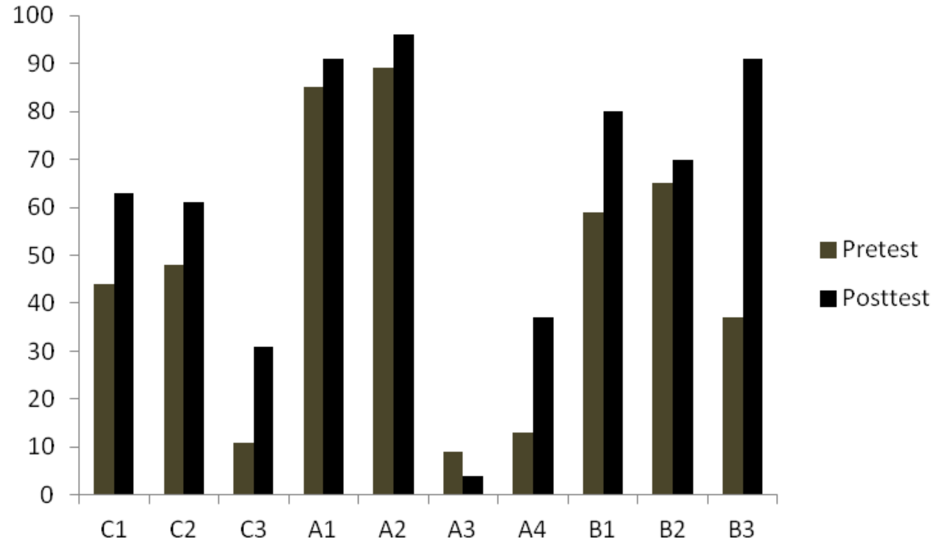

Figure 5. Total percentage of classifiers produced for *Ozcaliskan Stimuli* pretest and posttest by student.

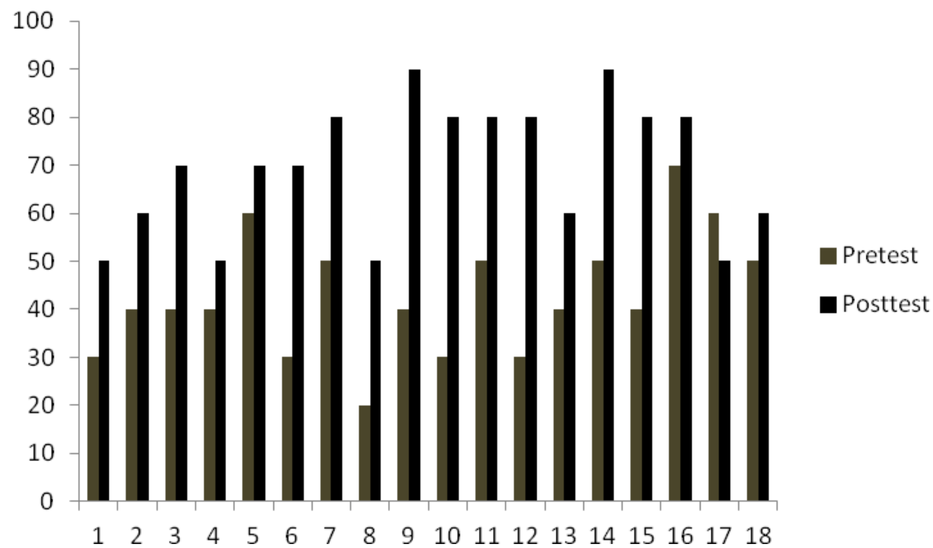

Figure 6. Total percentage of classifier production across items for *Ozcaliskan Stimuli* pretest and posttest.

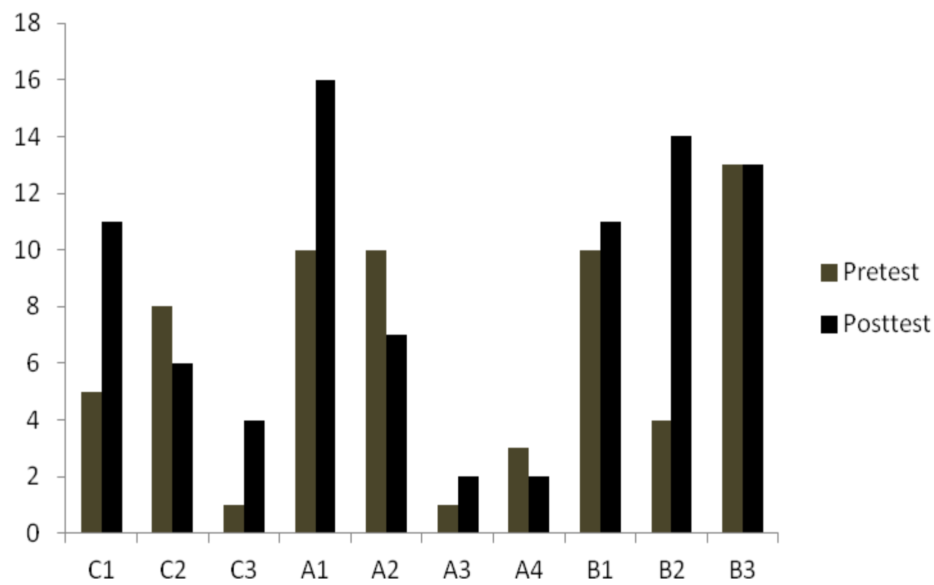

Figure 7. Total number of classifiers produced in *The Trunk* pretest and posttest across students.

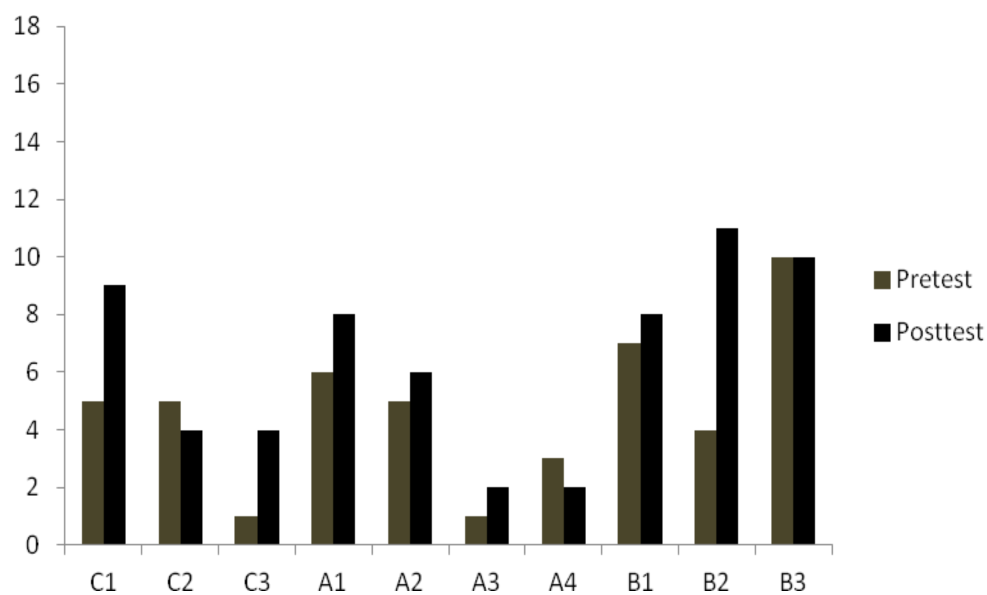

Figure 8. Number of different classifiers for *The Trunk* by student.

pretest to posttest (see Figure 9) while one performed the same between measures and three students decreased in their number of different classifiers produced.

A Day in the Park. Student classifier production for *A Day in the Park* ranged from 0% to 100% (mean=49%) on the pretest and 8% to 100% (mean=60%) on the posttest. Students produced a range of 1 to 21 total classifiers (mean=7) on the pretest and 1 to 19 (mean=8.3) on the posttest. Six students increased their total classifiers (mean=5; range 3 to 9) from pretest to posttest and six students increased the number of different classifiers used (mean=4.8; range 2 to 9).

Inter-observer agreement was collected for 20% of the students' postintervention measures using the same procedures and the same students' assessments as prentervention interrater reliability for *The Trunk*, *A Day in the Park*, and *The Ozcaliskan Stimuli.* Mean agreement for overall classifier production was as follows: *The Trunk:* 92%; *A Day in the Park:* 91%; and *The Ozcaliskan Stimuli:* 95%. Mean agreement for each parameter post-intervention across measures was as follows: Figure identification: 89%; Ground identification: 91%; Figure handshape: 98%; Ground handshape: 93%; and Movement: 94%.

To ensure that all measures of classifier production elicited classifiers and to investigate patterns in classifier elicitation across students and measures, I compared students' pretest and posttest classifier production scores across three measures. All measures elicited classifiers for all students except the pretest of *A Day in the Park*. This story appeared to be more difficult for some students because of the length and complexity of the story. For example, while *The Trunk* was coded for 7 events, *A Day in the Park* was coded for 17 events. All students produced at least one classifier for all posttest measures, even though their performance varied among tasks, supporting the use of multiple measures for classifier production.

Specific Parameters of Classifier Production

Because classifiers are composed of individual parameters, I further investigated the effects of repeated viewings paired with teacher mediation on the individual elements (i.e., figure and ground identification) and parameters (i.e., figure and ground handshapes

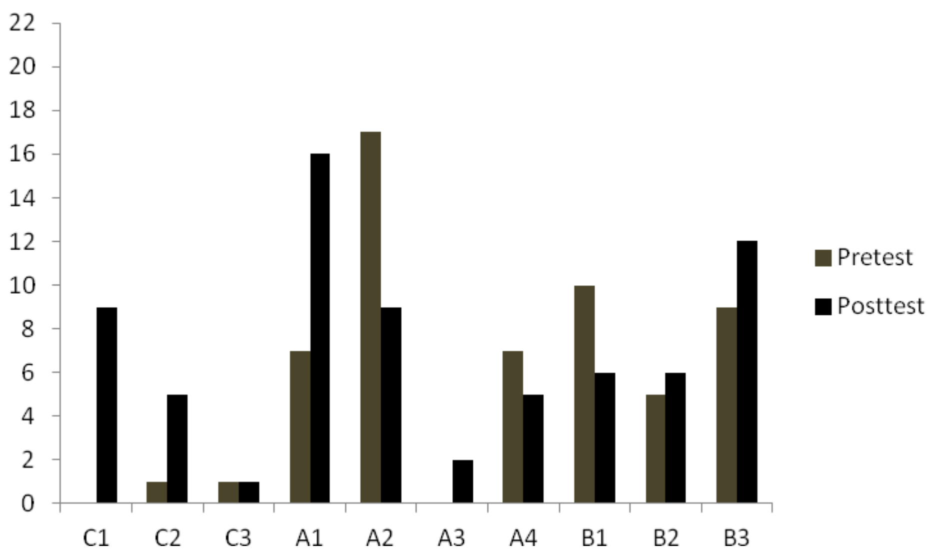

Figure 9. Number of different classifiers for *A Day in the Park* by student.

and movement) of classifiers during students' productions. I analyzed students' inclusion and accuracy of these classifier components during intervention narrative retells and between pretest and posttest measures. Noun phrase is presented first, followed by figure handshape, ground handshape, and movement.

Figure Identification and Accuracy

Intervention. Overall, students identified the figure less than half of the time but accurately used figure handshapes to represent the figure. Across all stories without picture support Group C's mean was 39% for figure identification. For stories in which they received picture support, Group C performed similarly with a mean figure identification of 21% across stories. However, individual variation was evident. C1 frequently identified the figure in his retells (mode = 100%) while students C2 and C3 frequently did not (mode = 0%). Overall, Group C had a figure handshape accuracy of 88% without picture support. Across the three stories for which they received picture support, their accuracy was 80% without pictures and 88% with picture support. Group A identified the figure 34% of the time across intervention stories without picture support. Across the two stories for which they received picture support, they identified the figure 20% of the time without picture support and 27% of the time with picture support. They had a mean figure handshape accuracy of 89% across retells without picture support and 69% with picture support. Omissions of classifiers by A1 and A3 during retells with picture support reduced the group's accuracy for figure handshape and other parameters. Individually, the mode for handshape accuracy was 100% across both conditions. Group B identified the figure about 65% of the time during their narrative retells with a figure handshape accuracy of 98% across retells.

Preintervention and postintervention measures. Five students increased their figure identification from preintervention to postintervention for the *Ozcaliskan Stimuli*, although students frequently did not identify the unchanging figure across the 18 animated clips. With the exception of B3, who scored 100% for figure identification on the pretest and 94% on the posttest, the group mean for figure identification was 28% on the pretest and 41% on the posttest. The group mean for figure identification did not change across time for *The Trunk* (mean=64%) or *A Day in the Park* (mean=32%). While some students increased their identification of the figure from pretest to posttest for these measures, some students never identified the figure. Students' accuracy for figure handshape increased from pretest (mean=53%) to posttest (mean=64%) for the *Ozcaliskan Stimuli.* All students scored 100% for figure handshape accuracy on the pretest and posttest retells of *The Trunk*. Finally, most students scored at ceiling for figure handshape accuracy on the pretest (mean = 79%) and posttest (mean = 98%) for *A Day in the Park*. C1 and A3 produced no classifiers for the pretest but both students scored 100% for figure handshape accuracy on the posttest.

Ground Identification and Accuracy

Intervention. It appears that ground identification and ground handshape accuracy increased with age in this study. Across all stories and conditions, Group C frequently did not identify the ground. They performed at floor levels 55% of the time without picture support (mean = 9%) and 67% of the time with picture support (mean = 5%). However, they frequently used accurate ground handshapes, with a mean acccuracy of 82% across all intervention narrative retells. For the three stories for which they received picture support, their mean ground handshape accuracy was 76% without pictures and 88% with picture support. Overall, Group A had a mean ground identification of 18% for retells without picture support. Picture support made no difference for ground identification, with a mean of 25% during retells with and without pictures. Group A had a mean ground handshape acccuracy of 86% across retells without picture support. For the two stories for which they received picture support, their ground handshape accuracy mean was 86% without pictures and 70% with picture support. (Two students did not produce classifiers on a few occassions with picture support.) Group B identified the ground about 41% of the time across all stories with a mean ground handshape acccuracy of 96% across retells. Finally, all students in Groups C and A and student B1 had a mode of 0% for ground identification during their narrative retells. While Group B had the highest identification of ground overall during the intervention phases, they performed at floor levels 28% of the time.

Preintervention and postintervention measures. Group means for ground identification increased across all preintervention and postintervention measures. Seven students increased their identification of the ground for the *Ozcaliskan Stimuli* from pretest (mean = 28%) to posttest (mean = 41%) and the group mean for ground handshape accuracy increased from pretest (mean = 39%) to posttest (mean = 57%). Six students increased their ground identification for *The Trunk* from pretest (mean = 54%) to posttest (mean = 74%) but ground handshape accuracy remained similar across time (pretest mean = 68%; posttest mean = 65%). The group mean for ground identification for *A Day in the Park* increased from pretest (mean = 12%) to posttest (mean = 23%). While five students (C1, C2, C3, A1, and A3) never identified the ground for either measure of *A Day in the Park*, they all used ground handshapes and students' accuracy for ground handshape increased from pretest (mean = 56%) to posttest (mean = 90%).

Movement Accuracy

Intervention. Movement accuracy also appeared to increase with age across students in the current study. Most students performed near ceiling levels for movement. Group C had a mean movement acccuracy of 86% across retells. For the three stories for which they received picture support, their mean was the same across retells (89%) with and without pictures. Group A's mean movement acccuracy was 93% across narrative retells without picture support. For the two stories for which they received picture support, their mean was 89% without pictures and 72% with picture support. Group B had a mean movement acccuracy of 98% across retells.

Preintervention and postintervention measures. The group mean for movement accuracy increased from pretest (mean = 46%) to posttest (mean = 63%) for the *Ozcaliskan Stimuli.* All students scored 100% for movement accuracy on the pretest and posttest of *The Trunk* with the exception of C2, who scored at 75% accuracy for the pretest. All students scored 100% for movement accuracy on the pretest and posttest of *A Day in the Park* with the exceptions of C1 and A3, who produced no classifiers on the pretest.

Type of Classifier Identification

I also measured students' receptive classifier ability for handling and SASS classifiers before and after intervention using the *ASL Receptive Test.* Eight students increased their identification of handling classifiers from pretest to posttest. A3 and B2 performed the same from pretest to posttest (see Figure 10).

Four students increased their identification of SASS classifiers from pretest to posttest while three students performed the same between measures and two students decreased in their accurate identification on SASS classifiers (see Figure 11). To answer the second research question, What are the effects of fading teacher mediation on classifier production, I present an analysis of the events recalled by each group across intervention phases and conditions. In order to produce classifiers to represent story events, they needed to first recall the events. Then I present the relation between the number of recalled events and the number of classifiers produced by students. Finally, I report on the amount and type of mediation and the effects on students' classifier production.

Recalled Events

Intervention

Student narratives were coded for the percentage of recalled events that they included in each retell (i.e., those events included in the ASL narrator's rendition) across each condition (i.e., no pictures and pictures) and intervention phase to investigate the effects of picture support on the number of recalled events. The percentage of recalled

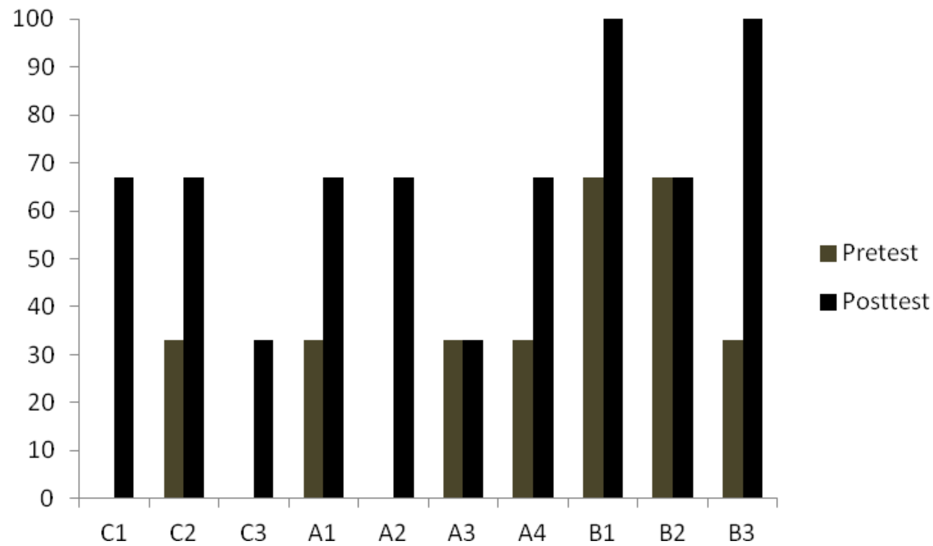

Figure 10. Percentage of handling classifiers identified by students for *The ASL Receptive Test* pretest and posttest.

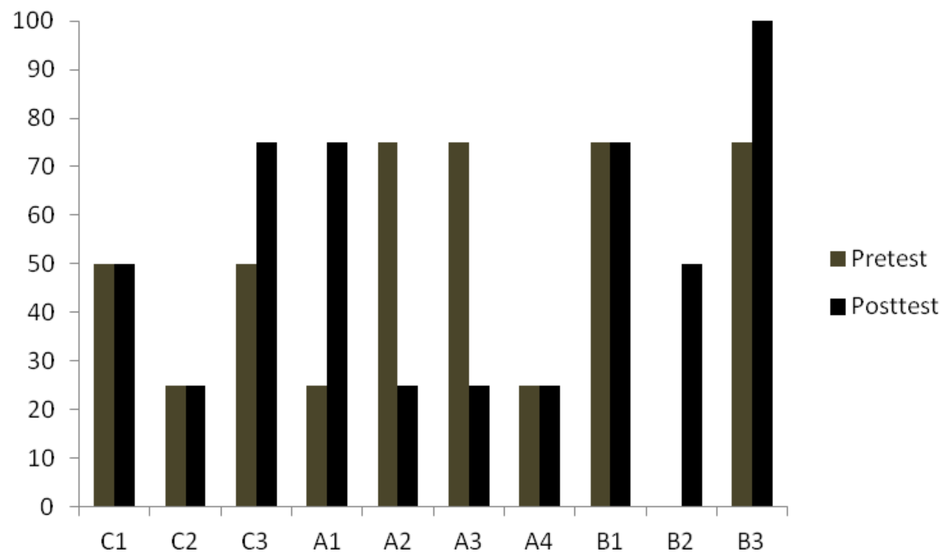

Figure 11. Percentage of SASS classifiers identified by students for *The ASL Receptive Test* pretest and posttest.

events was calculated by dividing the number of events a student included in his or her narrative retell by the number of events included by the ASL narrator. Students' recall percentages within a group were averaged and graphed as a group mean for each retell. Group C included more story events overall with picture support (see Figure 12). Without picture support, Group C recalled the following mean percentage of story events across intervention phases: Retell 1: 41%; Retell 2: 58%; Retell 3: 65% (mean = 55%). With picture support, Group C included the following mean percentage of events: Retell 1: 47%; Retell 2: 57%; Retell 3: 65% (mean = 56%). Individually, C1 included 0 to 7 additional story events with picture support (mean = 2.0), C2 included 0 to 3 (mean = 0.8) and C3 included 0 to 3 (mean = 1.6).

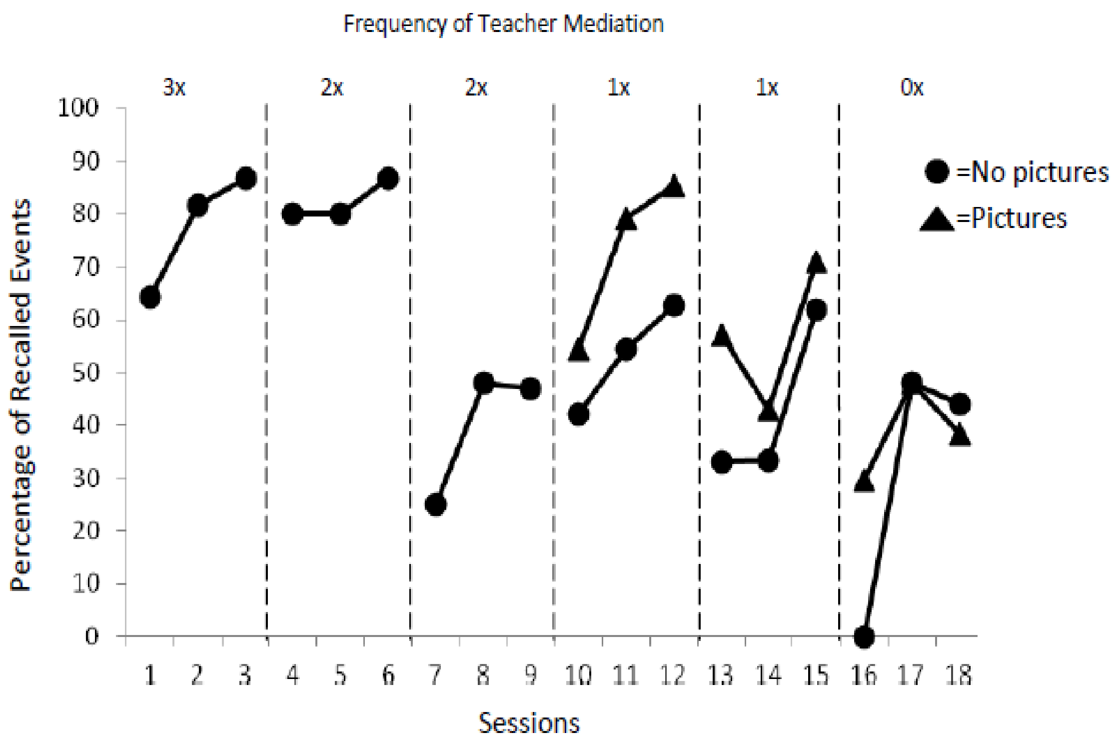

Figure 12. Mean percentage of events included in retells by Group C.

Group A also included more story events during retells that were supported by pictures (see Figure 13). Across repeated viewings and retells, students in Group A increased the number of events in their retells after each viewing (i.e., from the first to third retell of the same story). Without picture support, Group A recalled the following mean percentage of story events across each retell within intervention phases: Retell 1: 37%; Retell 2: 52%; Retell 3: 56% (mean = 48%). With picture support, they included the following percentage of events: Retell 1: 60%; Retell 2: 57%; Retell 3: 70% (mean = 62%). Individually, A1 consistently included one additional event with picture support, A3 included 2 to 3 additional events, and A4 included 0 to 3 additional events. Although A2's data were excluded from the group calculations for intervention data, picture support made a significant difference in his retells across the intervention, with a range of

0 to 8 additional events included in his retells with picture support (mean = 3.1).

Picture support was not added as a component of intervention for students in Group B because they continued to recall more than 30% of the events within stories. The mean percentage of recalled events for Group B across phases ranged from 54% to 95% (overall mean = 75%; see Figure 14). Group B increased their retell means across repeated viewings of stories and across six stories with mean event recall as follows: Retell 1: 65%; Retell 2: 76%; Retell 3: 82%. Additionally, I analyzed the number of events included in students' pretest and posttest retells of *The Trunk* and *A Day in the Park.* Students used the pictures in all retells of these two stories.

The Trunk. Three students performed at ceiling on the pretest (mean=84%; min = 57%, max = 100%) for the percentage of events included in their retells of *The Trunk* (see Figure 15). Five students increased from pretest to posttest (mean = 90%; min = 57%,

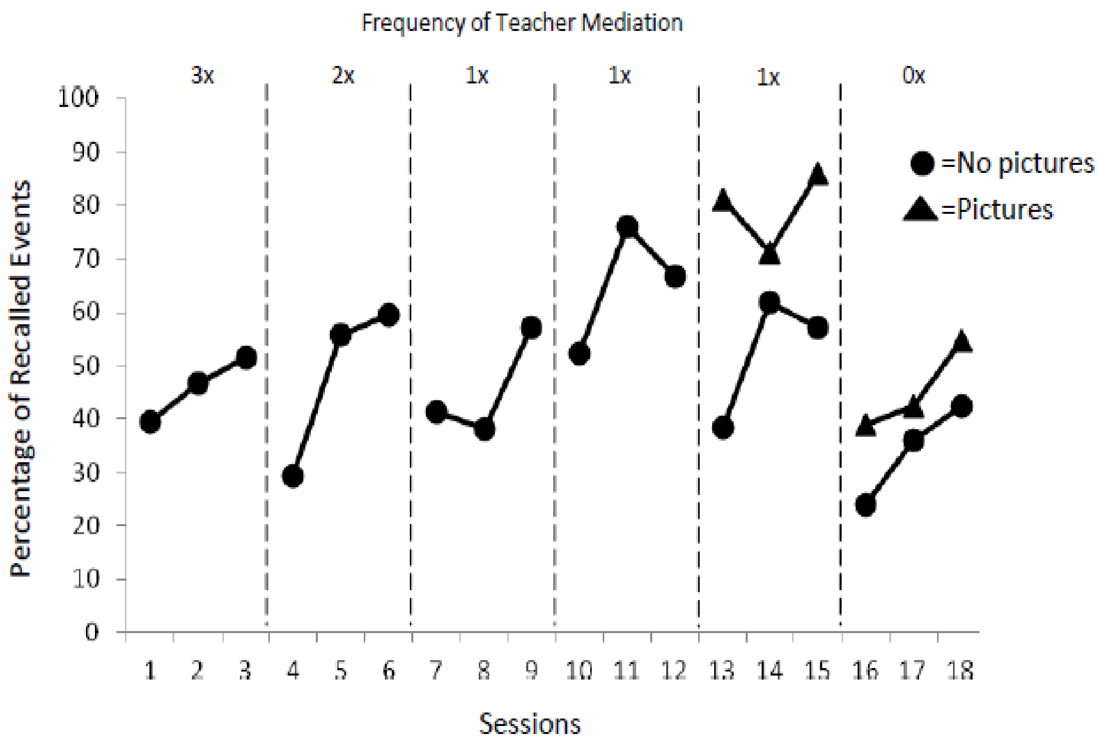

Figure 13. Mean percentage of events included in retells by Group A.

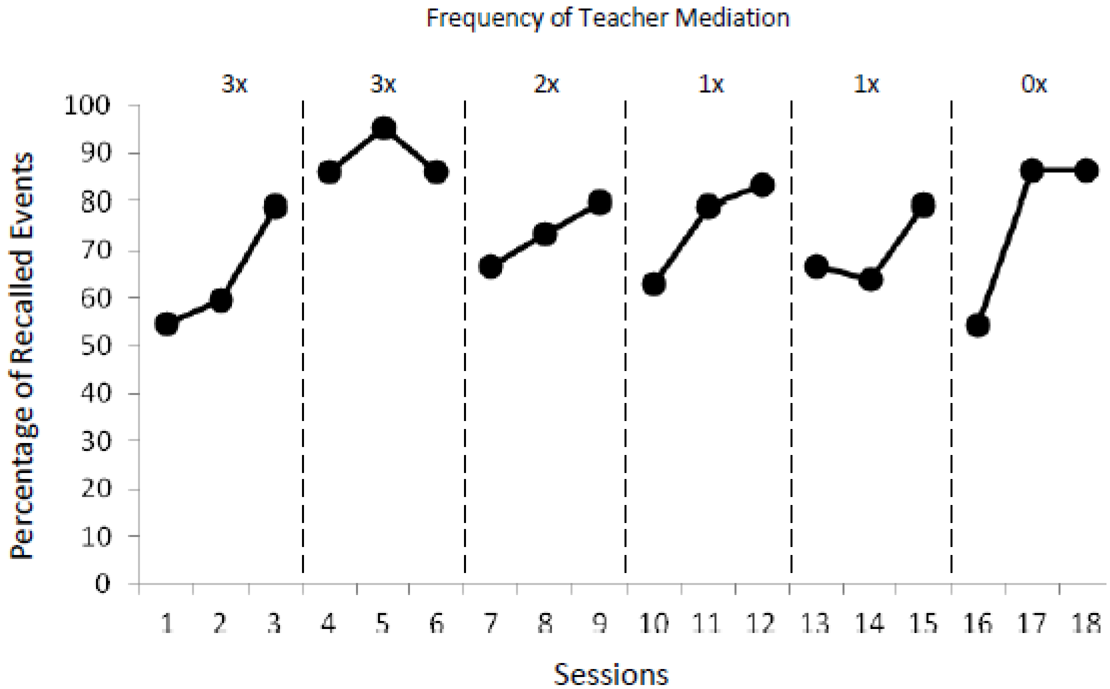

Figure 14. Mean percentage of events included in retells by Group B.

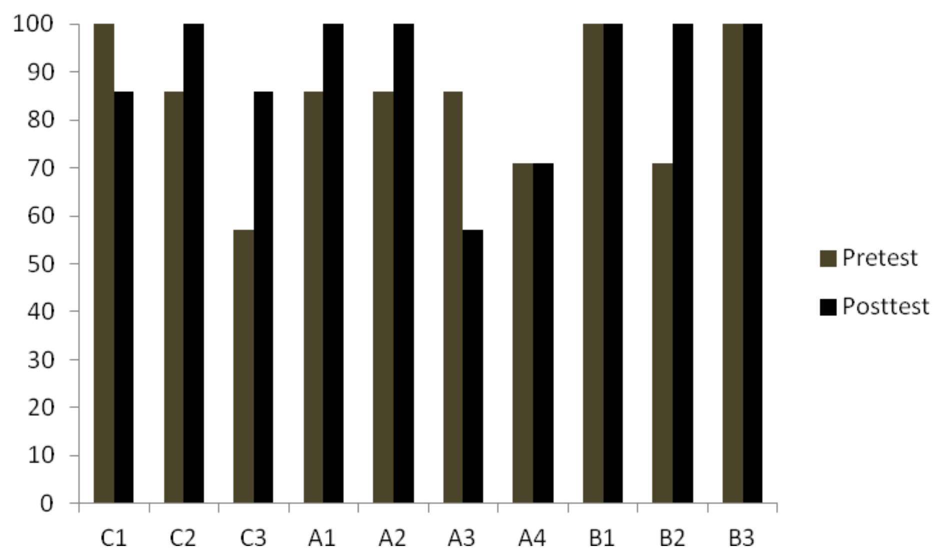

Figure 15. Percentage of events included in *The Trunk* pretest and posttest by student.

max = 100%) and three performed the same across measures. Six students performed at ceiling for retell events on the posttest.

A Day in the Park. Eight students increased in their percentage of included retell events from pretest to posttest for *A Day in the Park* (see Figure 16) with a pretest mean of 55% (min = 24%, max = 88%) and a posttest mean of 69% (min = 41%, max = 100%). Only B3 performed at ceiling on the posttest.

Recalled Events and Classifier Production

To investigate the relation between the number of events students recalled and their classifier production, I compared the number of events and the number of classifiers produced by each student on the pretests and posttests of *The Trunk* and *A Day in the Park*. Four patterns emerged across participants: (a) An increase in the number of events occurred with an increase in classifier production for three students on *The Trunk* and six students on *A Day in the Park*; (b) three students increased their classifier production for

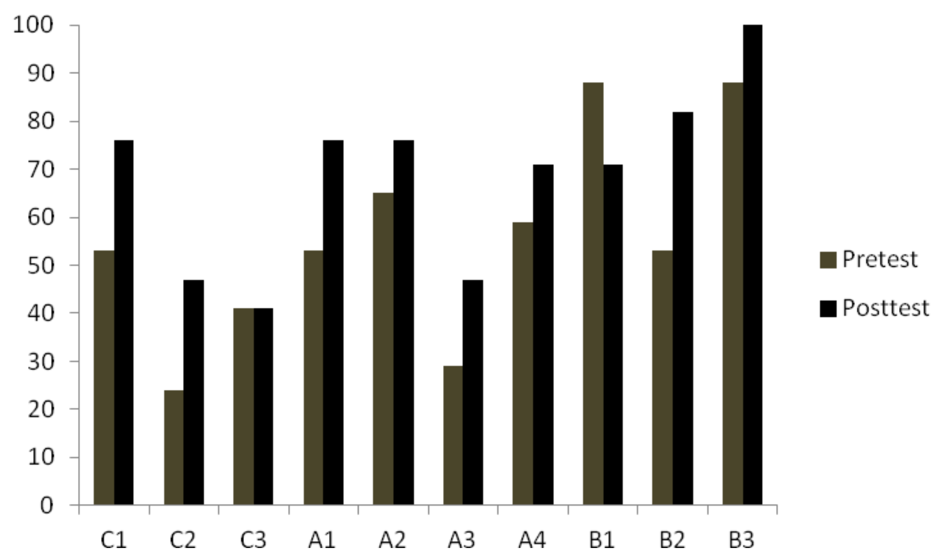

Figure 16. Percentage of events included in *A Day in the Park* pretest and posttest by student.

The Trunk while they decreased the total number of events; (c) two students increased or maintained the number of events included on their retells but decreased the number of classifiers that they used; (d) two students varied across recalled events and classifier production for the picture books.

Amount of Mediation

Group A. All students in Group A demonstrated a similar decrease in classifier production when mediation was reduced to one session during the third phase of the intervention (see Figure 2). Classifier production was higher for students' retells that followed the provision of teacher mediation and lower for the third retell after two days with repeated viewings but without mediation. Picture support was added at this point for the following two weeks of intervention, in which students received one and zero occurrences of teacher mediation. They did not return to previous levels of higher performance that coincided with more frequent teacher mediation (i.e., two and three provisions) despite repeated viewings of ASL models. For example, students in Group A did not include classifiers that were modeled by the ASL narrator but were not explicitly modeled by the teacher (e.g. *down the rope*, *under the bridge*). Instead, they only included those classifiers that were modeled by the teacher (e.g., *girl walks forward, girl in bed*). It appears that students in Group A required at least two occurrences of classifier mediation paired with repeated viewings to produce the majority of classifiers included in the ASL stories.

Group C. Students in Group C increased their classifier production across all intervention phases except the final week, regardless of the amount of teacher mediation (see Figure 2). However, their overall classifier production decreased in the fourth intervention phase when teacher mediation was reduced to one session and remained lower throughout the following two intervention phases in which the teacher provided one and zero occurrences of classifier mediation. In the final phase, without teacher mediation, student classifier production decreased for the third retell despite three viewings of an ASL model. Similar to Group A, it appears that students in Group C benefitted the most from at least two provisions of teacher mediation paired with repeated viewings.

Group B. Students in Group B exhibited a different pattern regarding mediation. They increased in classifier production from the first to the second retell for the first two phases of the intervention, in which the teacher provided mediation prior to each of three retells. However, their classifier production across the following three intervention phases, in which they received two, one, and zero sessions of teacher mediation, respectively, was the highest for their first retell. Despite repeated viewings of an ASL model, these students did not increase their classifier production across time. In the final phase with no teacher mediation Group B's classifier production peaked on the second day but declined significantly on the third day. In contrast to Groups C and A, students in Group B produced the most classifiers following the first or second viewing with teacher mediation. Despite the provision of a third viewing followed by a retell, students in Group B only surpassed their classifier production following the first viewing of a story one time during their third retell. During the fourth phase of the intervention, the teacher provided mediation for only the first viewing of *A Pet for Me.* From the first to second retell, all students' classifier production decreased, even though they included the majority of events in their retells. In place of classifiers students relied on enactment, such as acting out trying to catch a turtle instead of showing the turtle with a [bent V] handshape as modeled by the ASL narrator. They used the lexical sign ESCAPE instead of showing a frog with a [bent V] handshape as it hopped out of the character's hands. It seems that the students relied on enactment in lieu of classifiers, as the classifiers were not reinforced during the second and third viewings. It appears that Group B benefitted from one to two viewings paired with mediation but may not have needed the third viewing and/or retell session.

Intensity of the Intervention

The intensity of the intervention varied slightly across the three groups because of the multiple baseline design. Across six intervention phases and six stories, Group A received teacher mediation of classifier production paired with viewing of an ASL story eight times for a total of about 80 minutes (10 minutes per session). They watched 10 viewings of ASL stories without teacher mediation for about 50 minutes (5 minutes per story). In sum, they received 130 minutes of intervention (not including narrative retell sessions). Additionally, Group A received picture support during their retells on six occurrences across the final two stories. Group C received teacher mediation paired with viewing of an ASL story nine times (90 minutes) and repeated viewings alone for 2 hours and 15 minutes. Group C received picture support for nine occurrences across three stories. Group B received teacher mediation paired with viewing of an ASL story for 10 viewings (about 100 minutes) and repeated viewings alone for eight viewings (about 40 minutes) for a total of 2 hours and 20 minutes of intervention. They did not receive picture support for any retells. In sum, the total intervention time for the current study ranged from 2:10 to 2:20 across three groups and six weeks, not including retell sessions during which they received no feedback on their performance.

Each classifier was modeled a minimum of three times (each of three viewings of the ASL narrator) and a maximum of 6 times (ASL narrator and teacher) for each story and each group. The number of classifiers per story ranged from 4 to 8. Because of the format of the mediation script, in which the teacher prompted the students to produce each classifier, students also received peer modeling of the target classifiers with teacher feedback for a possible total of six renditions for each classifier in Group A and five for Group C. However, Group B may have received additional modeling of target classifiers. While only three students participated in the narrative retell portion of the current intervention, there were six students in the class. While following the mediation scripts during this intervention, the teacher for Group B allowed each student in her class a turn to produce each target classifier. This resulted in the possibility of up to eight renditions of each target classifier during each viewing.

Social Validity

Students

All students completed the social validity survey with a group mean of 21.6 out of a possible 25. Higher scores indicate stronger agreement with the 5 statements provided on the survey. All students strongly agreed with the statement *I enjoyed watching the sign language stories* and 9 out of 10 students strongly agreed with the statement *I felt proud when I told the stories*. Notably, A4 responded by circling her responses in a diagonal fashion and it appeared that she did not comprehend the survey questions, despite their presentation in ASL. Eight students strongly agreed with the statement *I liked to tell the stories myself* and eight students strongly agreed or agreed with the statement *I learned a lot watching the sign language stories*. B3 responded to this statement with *strongly disagree*. Finally, the students were divided between strongly agree (6) and strongly disagree (4) with the statement *I would watch the sign language stories at home.*

Teachers

Two out of three teachers completed the teacher social validity survey with a mean of 2.8 and 3.9 out of a possible 5 across 10 statements (higher scores indicate stronger agreement; see Table 7). Both teachers agreed or strongly agreed with the following three statements: *The students benefitted from having a model of the classifiers*; *I felt comfortable modeling the classifiers in the script*; and *I will continue to use the sign language stories as a group activity*. Teacher 2 agreed or strongly agreed with the remainder of the comments on the survey with the exception of *Three viewings of each story were adequate*. In contrast, Teacher 1 disagreed with the statements *The students enjoyed watching the sign language stories*, *I liked the mediated script*, and *The script was easy to use*. She strongly disagreed with the statement *This intervention was a*

Table 7

Teacher Survey Results

Survey Item		Teacher 1	Teacher 2
1.	The students enjoyed watching the sign language stories.	2	5
2.	Three viewings of each story were adequate.	5	2
3.	The students benefitted from having a model of the classifiers.	4	5
4.	I liked the mediated script.	2	4
5.	The script was easy to use.	2	4
6.	I felt comfortable modeling the classifiers in the script.	4	4
7.	This intervention was a valuable addition to the instruction in my classroom.	1	5
8.	I will continue to use the sign language stories as a group activity.	5	5
9.	I will continue to model elements from the sign language stories.	3	5
10.	Which parts do you think were most important in this intervention? (circle all that apply)		
	a. sign language stories	X	X
	b. repeated viewings	X	X

c.	mediated scripts		X
d.	teacher modeling		X
e.	students' story retells	X	X
TOTAL		28	39
Mean		2.8	3.9

valuable addition to the instruction in my classroom but agreed that the students benefitted from a model of the classifiers and strongly agreed that she would continue to use the language stories. Based on her contrasting responses to *The students enjoyed watching the sign language stories* and *I will continue to use the sign language stories as a group activity*, it is unclear if the teacher misunderstood the question or the response format. For the final question on the survey, both teachers agreed that the sign language stories, the repeated viewings, and the students' story retells were *most important to the intervention*. Additionally, Teacher 2 also reported that the mediation scripts and teacher modeling were important components of the intervention.

Summary

When provided with a combination of repeated viewings of ASL models and teacher mediation of classifiers, all students increased in their classifier production during narrative retells. Most students also increased their classifier production from preintervention measures to postintervention measures. Students maintained near-adult-like accuracy for the parameters of classifiers, including handshapes and movements, although they varied in their identification of the figure and ground. Finally, students appeared to benefit from different amounts of teacher mediation and repeated viewings.

CHAPTER 5

DISCUSSION

In this study, I investigated deaf children's ability to produce classifiers after mediated instruction using repeated viewings of ASL stories. Students who were DHH in second, third, and fourth grades increased their classifier production after 6 weeks of repeated viewings of ASL models paired with teacher mediation. In this chapter, I discuss students' vocabulary scores, followed by overall classifier production and accuracy results for classifier elements and parameters. Then I discuss students' recalled events and the amount, type, and intensity of mediation students received. Finally, I discuss the social validity, implications, and limitations of the current study, followed by suggestions for future research.

Interpretation of Results

Vocabulary Scores

Although vocabulary and classifier production relations were not a direct question of the research, students' *PPVT* and *EOWPVT* scores demonstrated a positive relation between receptive and expressive scores for students in the current study. These data were examined because receptive and expressive English vocabulary scores may be a factor related to classifier production. In addition, receptive vocabulary skills, in this case in ASL, were required by the listener to comprehend the story modeled by an ASL narrator. C2 and C3, two of the youngest students, who had the lowest receptive scores based on the *PPVT*, produced the fewest classifiers across stories. However, A3, the oldest student in the sample, had one of the three highest receptive vocabulary scores but performed the lowest across classifier production measures. These results appear to be related to students' amount of exposure to sign language rather than students' chronological ages. Older students with hearing parents did not necessarily have better ASL grammar skills than younger DOH students, similar to Schick and Hoffmeister's (2001) findings. While their DOH students' ages correlated with their scores on the *EOWPVT* and a measure of receptive classifier identification, similar to the present study, the students' ages did not correlate with their scores on measures of more complex language skills that incorporated use of space, pronominalization, and role shift (Schick & Hoffmeister).

If we assume that deaf children with native signing models in the home acquire vocabulary at a rate similar to typically hearing children (Biemiller, 2005), then deaf children of deaf parents would have somewhere between 7,000 to 8,000 words in their receptive vocabulary by 9-10 years of age, when they likely approach adult-like classifier production (deBeuzeville, 2006; Schick, 1990a). Students in the current study ranged in receptive vocabulary age equivalencies of 3;8 to 6;7 in Group C; 5;0 to 8;9 in Group A; and 9;10 to 11;3 in Group B, so that based on age-equivalent scores, all students in Groups C and A had receptive vocabulary scores below what DOD children likely have at the production of adult-like classifiers. Based on the *PPVT*, which may produce inflated scores due to the iconicity of some of the test items, only students in Group B and possibly student A3 should be near adult-like production of classifiers, as these age equivalency scores were similar to the 9-10 year age range of classifier production. In contrast, the remaining students in Groups C and A scored below this age range, possibly lacking the needed receptive vocabulary threshold to comprehend the ASL stories and engage in narrative retells. Based on the *EOWPVT*, all students in the current study had expressive English age equivalent scores above the cited age for classifier emergence for DOD children (i.e., 2;4, Newport, 1981; 3;9 to 4;6; Ellenburger & Steyaert, 1978) except C3. As expected based on these comparisons, all students produced classifiers. Ellenburger and Steyaert reported frequent classifier use when a child was between 5;1 and 5;11, which describes the age equivalence scores and performance of seven students in the current study. The three students below this age equivalent expressive vocabulary score, C2, C3, and A3, produced the fewest classifiers across this study. Becker (2009) noted a lack of correct classifier use by the DOH children in her sample, who were older than the students in the current study. Based on these results, the current findings support previous research regarding the age of emergence of classifiers, the age at which children use classifiers more frequently, and previous findings for DOH children.

Students performed similarly between the *PPVT* and the *EOWPVT* with higher receptive scores related to higher expressive scores (except A3). Students who scored higher on vocabulary measures also scored higher on elicited classifier production measures. For example, B1 and B3, who performed near the top across all measures in this study, were 1-2 years behind in their expressive vocabulary when compared to hearing peers based on the *EOWPVT*. In contrast, C2 and C3 were over 4 years behind in expressive vocabulary and they produced less coherent narrative retells, which led to fewer opportunities for classifier production. A3 was more than 6 years behind his chronological age based on his expressive vocabulary score and he scored at the lowest levels across classifier production measures, frequently at floor levels. When investigating macrostructure development during a story retelling task, Petersen (2011) posited that "expressively producing modeled narratives is key to narrative macrostructure development" (p. 217). Because students need expressive vocabulary to retell stories, expressive vocabulary delays may result in an inability to retell the modeled ASL stories effectively and hence to use the modeled classifiers. These findings support the idea that a lexicon of a certain size may be required prior to the consistent use of classifiers. However, expressive vocabulary alone may not indicate that a student can use the more complex syntactic features of ASL grammar. In contrast to the current results, Schick and Hoffmeister (2001) reported that expressive vocabulary and receptive classifier identification scores appeared related to chronological age, while children's age was not correlated with more complex measures of ASL syntax that required integration of space, pronominalization, and role shift, similar to classifier production.

All students in Groups A and B fell within the proposed 9- (Kantor, 1980; Schick, 1990a) to 12-year-old (Slobin et al., 2003) window for mastery of classifier production by DOD children, but only two students in the current study had deaf parents. Perhaps classifier production continues to develop within the age span of the current study but progresses at a variable rate based on factors such as receptive and expressive vocabulary skills, native language at home (i.e., ASL, signed English, spoken English), and amount of exposure. A child's age at exposure to sign (Goldstein & Bebko, 2003) and his length of exposure to ASL (Chamberlain & Mayberry, 2008; Mayberry & Lock, 2003) may predict his ASL ability. Students in the current sample had varying levels of exposure to sign language at home and varied in their age at which they began using sign language. Based on parental report three children had no sign language at home (C2, A2, A4); ASL was used at home with five students (C1, A1, A3, B1, B3); C1 and B1 were exposed to both ASL and signed English; and signed English was used with B2. Three children reportedly began signing prior to 2 years of age (C2, A1, B3), two of whom had deaf parents, and five students began signing between 2-3 years of age. Two students began signing between 3-4 years of age. A4 did not begin signing until 9 years of age, when she immigrated to the United States. Those students with higher scores for vocabulary and classifier production also had parents who signed at home (C1, A1, B1, and B3). Their higher production of classifiers may be an effect of an increased amount of language exposure. The classifier production abilities of A1 and B3, who both had early exposure and early acquisition of sign language at home, support previous findings for the relation among early ASL exposure, acquisition, and ability (Chamberlain & Mayberry; Goldstein & Bebko; Mayberry & Lock). In contrast, students who were exposed to only spoken or signed English in the home likely were not exposed to classifiers (Schick, 2003; Wilbur, 2000). In the current study, all students produced at least one classifier on at least two of the preintervention measures. Perhaps language models at school compensated for limited exposure to classifiers at home. Regardless of these vocabulary, age, and exposure factors, targeted intervention on classifier production increased students' production across vocabulary levels.

Overall Classifier Production

All students produced classifiers across the intervention phases of the current study and frequently with high levels of accuracy across classifier parameters. Schick (1990a) reported that DOD children increased their classifier production accuracy to around 70% at 8 years of age but were not yet at adult levels. In comparison, when students in the current study produced classifiers, they did so at a higher rate of accuracy after they engaged in repeated viewings of stories presented in ASL and teacher modeling of classifiers. However, they performed at about half the adult rate as a group across measures for overall classifier production in obligatory contexts.

Similarly to procedures of previous researchers (deBeuzeville, 2006; Schembri, 2001), I administered the classifier production tasks in the current study to two deaf adults who were native signers as a means of comparing the students with the adults in their community (Beal-Alvarez & Easterbrooks, 2012; Beal-Alvarez & Easterbrooks, submitted) for “target” performance (deBeuzeville, p. 144). Kitty (pseudonym) was DOH and attended residential school for all of her schooling; she also had a college degree. Penny (pseudonym) was DOD with deaf grandparents and a deaf child and attended residential school until high school. Both women were paraprofessionals at the research site. Students’ mean performance for classifier production for the *Ozcaliskan Stimuli* between baseline and at the end of the 6-week intervention increased 25%. While Kitty and Penny produced classifiers for 94% and 100% of the *Ozcaliskan Stimuli* (Beal-Alvarez & Easterbrooks, 2012), students produced a mean of 44% at pretest and 69% at posttest, demonstrating an increase in classifier production, but they did not approach adult-like performance. Similar results occurred with pretest and posttest scores for *The Trunk*, in which students increased their overall mean classifier production by two classifiers for a posttest mean of 8.6 classifiers and their number of different classifiers by 3.7 classifiers for a mean of 6.4. In comparison, Kitty produced 15 total classifiers and Penny produced 17 classifiers, with 14 different classifiers (Beal-Alvarez & Easterbrooks, submitted). While some students performed similarly to Kitty on *A Day in the Park*, only A2 at pretest and A1 at posttest surpassed Penny’s performance. Perhaps Kitty’s performance on *A Day in the Park* was not indicative of typical deaf adult performance, or perhaps Kitty and Penny, with their varied backgrounds, represent variation within the adult population that may be similar in the student sample for the current study. Based on their group mean, students used about half of the total number of classifiers for *The Trunk* and *A Day in the Park* compared to Penny. While most students increased their total number of classifiers and the number of different classifier productions across the 6 weeks between pretests and posttests, none of them signed adult-like narratives using these two picture books for elicitation when compared to the productions of Kitty and Penny.

All students produced at least one classifier on all classifier production measures, except A3, and only two students (A1 and A2) performed at ceiling level, as defined by the highest adult performance, on *A Day in the Park.* It appears that these classifier elicitation measures were effective measures of classifier production for children across the current sample and two the adults. The set of materials used in the current study appeared to bypass previously noted limitations of the use of only one genre for narrative elicitation (Baker et al., 2005; Becker, 2009; Morgan, 2002).

Generalization and Maintenance

Generalization measures for the current study included a postintervention administration of the *Ozcaliskan Stimuli*; postintervention narrative retells of *The Trunk* and *A Day in the Park*; and a narrative retell of a book that was not previously used, *Goodnight Gorilla*, 4 weeks after the completion of the intervention. These tasks were used to measure students' abilities to transfer classifier production to narrative contexts without modeling by deaf adults or mediation by teachers. All students (except A3) increased their classifier production from preintervention to postintervention for the

Ozcaliskan Stimuli. The majority of students also increased their total classifiers used and the number of different classifiers they produced from pre- to postintervention for *The Trunk* and *A Day in the Park*. Additionally, all students (except A3) produced various classifiers 4 weeks after the intervention ended during their narrative retells of *Goodnight Gorilla*. They produced a similar group mean for the total number of classifiers used for *Goodnight Gorilla* (7) compared to the means for the pretests of *The Trunk* (6.5) and *A Day in the Park* (7). However, the number of events that could be represented by classifiers varied across the three stories, which limits a direct comparison among the three measures. For example, longer stories permit more opportunities to produce classifiers in a narrative context.

The current results suggest that after 6 weeks of intervention, including repeated viewings and teacher mediation, most students were able to transfer their production of classifiers to the natural situation of narrative retell using picture books without any modeling or mediation four weeks after the intervention ended. Petersen (2011) reported that generalization of some narrative skills occurred because of “the systematic, purposeful introduction and removal of supports and prompts that led to independent narrative retellings” (pp. 218-219). In the current study, picture support was introduced to scaffold any memory difficulties students may have encountered during their narrative retells. Additionally, the amount of scripted mediation provided by teachers was systematically faded across the intervention and verified by measures of fidelity. These systematic procedures may have permitted student generalization of classifier production across narrative measures and maintenance of classifier production across time.

Manipulation of Classifiers

Four students in the current study exhibited manipulation of classifiers (A1, A2, C3, B3) during their narrative retells for purposes of embellishing the story, similar to adults, who used specific parameters of signs for humorous purposes (Napoli & Sutton-Spence, 2011; Schick, 1990c), and children, who manipulated classifiers in one study (Supalla, 1982). For example, both A1 and A2 accurately produced classifiers to represent a squirrel that climbed up a tree in *The Trunk* but then depicted the squirrel jumping from the top of the tree to the ground, which did not occur in the story, while laughing. B3 also manipulated his portrayal of the squirrel to show it looking around. A1 created his own story events during *I Can't Find my Roller Skates* by producing a classifier to depict a girl riding a rocket. While using a [V] to represent a girl looking under a bed, A1 moved his index and middle fingers up and down to model the legs of the girl 'trapped' under the bed, which did not occur in the story, and paired it with a frightened facial expression. Finally, C3, the youngest student in the current study, used a [5] handshape in place of [V legs] to show an animate figure crawling across a rug, even though he correctly used [V legs] in other examples in the same task. When I asked him "Are you being silly?" he nodded yes with a smile. While deBeuzeville (2006) noted that manipulation of classifiers was not evident in her sample of children, she suggested limitations of the elicitation tasks and the inclusion of only 3 children who were 10 years of age, the age at which adult-like production of classifiers may be displayed by children. The current results support the conclusion that children may manipulate classifiers for humorous purposes as they develop their classifier production system.

Types of Classifiers Produced

All students in the current study produced a majority of semantic classifiers and produced them accurately, similar to Schick's (1987) findings of 75% to 85% accuracy for semantic and SASS classifiers for DOD children between 5 and 8 years of age. Semantic classifiers were the most prevalent type of classifier across student retells, which is reasonable given the narrative task of retelling characters involved in motion events. All students also accurately produced SASS classifiers, with the youngest group using the largest number of SASS classifiers in their narrative retells. Schick (1990a) reported that handling classifiers were mastered first in her sample of students and the current results support this finding, given that the three youngest students in the current study produced handling classifiers during their retells. This may suggest that even the youngest group of students was able to produce all three types of classifiers. However, Groups A and B lacked opportunities to produce handling classifiers based on their selected intervention stories, so the current study did not document the provision of handling classifiers across all included students.

Specific Parameters of Classifier Production

Figure identification. During intervention narrative retells, Group C identified the figure about 40% of the time, Group A about a third of the time, and Group B two-thirds of the time. With the exception of B3, students frequently did not identify an unchanging figure across narrative retells, similar to findings in previous narrative contexts for children (Morgan, 2005) and adults (Lucas et al., 2001). While the children in her sample were older than those in the current study, Becker (2009) reported that DOH children frequently did not identify the main character of a story, while some DOD children used spatial reference and role shift to establish and indicate a change in characters. Consistent use of role shift was observed in B3's (DOD) narrative retells but not in those of the other students. Similar to Becker's findings, when students included figure identification, the DOH students in the current study used lexical signs or nominal pointing to the book cover or pictures, unlike the preferred method of spatial reference used by DOD students and a deaf adult. Perhaps the students assumed that the researcher to whom they told the story knew the character's identities based on the cover or pictures within the storybooks.

Figure identification during the narrative retells decreased with picture support for Groups C and A. This may have been due to the presence of the pictures in the view of both the student and the researcher or due to an immediate second retelling of the story to the same researcher in which students deleted previously included details. Based on the present data, the older students in this sample (Group B) identified the figure more frequently than the younger students (Groups A and C) during retell of the intervention stories, although the older students were not assessed with picture support during the intervention. These results are similar to Morgan's (2006) finding that DHH students decreased the number of ambiguous classifiers with age. Perhaps the older students in the current study were approaching adult-like figure identification within classifier production (Aarons & Morgan, 2003; Becker, 2009; Beal-Alvarez & Easterbrooks, submitted).

Student identification of the figure for preintervention and postintervention retells of *The Trunk* and *A Day in the Park* remained the same, with overall means of 64% and 32%, respectively, although three students increased their performance between measures for both stories (C1, A2, A4). In comparison, Kitty and Penny identified the figure in *The*

Trunk, which rotated among three characters, 100% of the time. During their retells of *A Day in the Park*, in which the main character remains the same, they identified the figure about 36% of the time. As a group, students performed below adult-like performance for *The Trunk* and similar to the adults for *A Day in the Park*. In the current study, students frequently assumed the identity of the main character, without directly identifying it, by enacting the motion event and facial expressions of the character in place of or in addition to classifier productions. This corresponds with the lower figure identification by both the students and adults for *The Park,* in which the main character of a cat engages in all of the action throughout the story. Perhaps the number of characters within a story affects students' figure identification strategies. While five students increased their figure identification from pretest to posttest for the *Ozcaliskan Stimuli*, four students never identified the figure on the posttest and the group mean for the posttest, excluding B3's score, was 10% and Kitty and Penny identified the figure about half of the time (Beal-Alvarez & Easterbrooks, 2012). In contrast, B3 identified the figure near and at ceiling levels on both assessments. In general, students frequently did not identify the unchanging figure across the 18 animated clips, perhaps due to the assumption of shared knowledge with the researcher, and performed below adult-like productions.

Ground identification. Identification of ground seemed to follow a developmental pattern based on age for the three groups during their narrative retells. Group C, the youngest, performed at floor levels half to two-thirds of the time during their intervention narrative retells regardless of the presence of picture support. Group A performed 7% higher with picture support than without but only identified the ground a quarter of the time. Group B had the highest mean for ground identification during their narrative retells but included it less than half of the time. In contrast, deBeuzeville (2006) reported that at 8 years of age DOD students included the ground in their classifier productions 90% of time, although this was not exclusive to a narrative context. The group mean across students for ground identification for their retells of *The Trunk* increased from 50% on the pretest to 75% on the posttest. This is higher than the performance of Kitty and Penny, who identified the ground 13% and 29% of the time. The group mean for ground identification increased from 12% to 23% between pretest and posttest student retells of *A Day in the Park,* similar to Kitty (25%) and Penny (6%). However, the three youngest students in the study and A3 never identified the ground during their retells of this picture book. On the *Ozcaliskan Stimuli*, the students' overall group mean increased from 28% to 41% for ground identification but did not approach adult-like identification based on the performance of Kitty (94%) and Penny (78%). All students, except A3, identified the ground at least once and most students increased between pretest and posttest, with the exception of two of the youngest students. It seems that students in Group C infrequently included ground identification unless it was specifically modeled for them. Only B2 and B3 approached adult-like levels of identification on the posttest, again suggesting that perhaps younger children need specific instruction in the required elements of narrative retell and classifier production (Becker, 2009).

During administration of the *Ozcaliskan Stimuli* and students' retells of *The Trunk* and *A Day in the Park,* the researcher had visual access to the animated clips and storybook pictures. All three interlocutors to whom the students told their intervention narrative retells also had visual access to the pictures during the retells with picture support for Groups C and A. Decreased ground identification for those stories with picture support may be a result of telling the stories to the same researcher a second time, whom the students assumed was familiar with the story after the first retell, similar to deBeuzeville's (2006) proposal that students assumed the listener was aware of the ground and therefore omitted it in their classifier productions. Ground identification omission may be a result of the change in formality from pretest to posttest situations, as the students saw the interlocutors one to three times per week across the 6-week intervention. Perhaps telling these stories to an authentic audience of deaf children might elicit better representations of students' optimal classifier production abilities.

Finally, previous researchers (Aarons & Morgan, 2003; Becker, 2009) suggested that deaf children of comparable ages and language backgrounds frequently omitted necessary narrative elements, such as establishing characters using spatial reference and the production and accurate use of classifiers during narrative retells to a native signing adult. Perhaps some of the students in the current study were unaware of the necessity to identify the figure and ground upon introduction, as was common practice by native signing adults during narrative retells (Aarons & Morgan; Becker). Deaf adults identified all figures upon introduction in a narrative context through the use of lexical signs or fingerspelling and constructed action, spatial location, body shift, and eye gaze (Aarons & Morgan; Becker). Two children in the current study (A4, B3) used role shift to demonstrate a change in action between two characters, but students rarely established figures in space (except B3) nor referred to the same space to indicate the character. Morgan (2005; Morgan & Woll, 2003) reported that DOD students did not master spatial reference until 11-13 years of age, which exceeds the ages of the students in the current sample. In contrast, many of the students, eight of whom were DOH and had language delays compared to typically developing hearing peers, ambiguously pointed to the page to reference a figure or did not identify the figure or ground prior to classifier production, similar to Pfau's (2011) findings. Schick (1990c) noted that SASS classifiers frequently do not require lexical labels because of the small range of possible objects they refer to based on the context. This is similar to the SASS classifiers used by Group C, such as *strainer*, for which students did not identify the object prior to their use of a classifier to represent the object. Some students paired pointing with lexical identification, such as when A1 pointed to the picture in general, without contact with the page, followed by lexical signs (i.e., CAT, BALLOON). If a student did not accompany a point with a label for the figure or ground it was not coded as identification of the noun phrase, which may have resulted in underrepresentation of students' identification of the noun phrase by some students.

Handshape accuracy. Mean figure handshape accuracy for intervention narrative retells was 88% or greater across student groups and most students scored at or near ceiling levels for post-intervention retells of *The Trunk* and *A Day in the Park*. These results support Singleton and Newport's (1993) finding of adult-like classifier handshape production by children between 6-10 years of age. It appears that all students in the current study had already acquired and accurately used handshapes in the context of classifiers. Schick (1990a) reported that children were most likely to produce semantic handshapes accurately, while SASS and handling handshapes were more difficult. However, in the current narrative context in which semantic and SASS classifiers were modeled and mediated, students accurately produced all types of handshapes within classifiers.

When they used ground handshapes, students used them accurately, at or above 82%. Half of the students performed at ceiling for ground handshape during preintervention and postintervention narrative retells of *The Trunk*, while half simply omitted the ground of [tree], which was consistent throughout the story, similar to previous results for children in this age range (Boudreault & Mayberry, 2006; deBeuzeville, 2006; Kantor, 1980; Morgan, 2006; Slobin et al., 2003). The youngest students in the current study performed similarly to Supalla's (1982) finding that younger DOD children omitted ground handshape 22% of the time. However, students significantly increased their accuracy of ground handshape from preintervention to postintervention retells for *A Day in the Park*. In sum, it appears that when students used ground handshapes, they were highly accurate, but they did not use ground handshapes in all obligatory contexts.

Movement accuracy. Similar to previous research (Siedlecki & Bonvillian, 1993, 1997; Marentette & Mayberry, 2000; Singleton & Newport, 2004), the students in this study had high accuracy for their production of movement within their classifier productions, with mean movement accuracy during intervention narrative retells above 85% for all groups. With the exception of C2 for *The Trunk* and C1 and A3, who produced no classifiers on the pretest of *A Day in the Park*, all students scored at ceiling for movement accuracy on the pretests and posttests of both stories. When students produced classifiers, they produced accurate movement primes and accuracy increased with age.

Kantor (1980) proposed that the sequence of classifier parameter acquisition for children aged 3-11 years was location, movement, then handshape and orientation. It appears that students in the current study were beyond the age of acquisition for each parameter and closer to the age of mastery, as their scores across the three parameters only varied by 6% for the youngest students and 2% for the oldest students based on group means. However, Kantor's proposal may explain students' higher levels of accuracy for movement compared to their accuracy levels for ground handshapes.

Children may omit the use of classifiers in more syntactically complex situations, such as those that require them to change hands or use their hands differentially to represent the classifier within an utterance (Kantor, 1980). Additionally, context may influence students' use of classifiers. Children may pay attention to specific details within a motion event or relevant to a visual description, in lieu of focusing on the overall motion event, or their productions may be limited by the physical context, such as holding an object in one's hands that prohibits use of a secondary ground handshape (deBeuzeville, 2006). In the current study, two children often brought objects with which they played during their narrative retails (e.g., rubber bands on their wrists, paperclips). This may have impeded their use of ground handshapes. Students may also lack the two-handed coordination required for complex classifiers (Boudreault & Mayberry, 2006). These additional issues of complexity and context may explain students' omissions of some classifiers or certain classifier parameters (i.e., ground handshapes) in certain situations.

Types of Classifier Identification

The majority of students increased their receptive identification of handling classifiers and increased or maintained their identification of SASS classifiers based on *The ASL Receptive Test* across the 6-week intervention period. Perhaps repeated exposure to native signing models in the context of narrative stories is enough to increase students' comprehension of these types of classifiers. While young DOD children receptively understood around 70% of classifiers (Lindert, 2001), it is not clear what the appropriate level of classifier comprehension should be at specific ages for students with diverse linguistic backgrounds, such as deaf students with hearing parents.

Recalled Events

All students increased the number of events that they recalled across repeated viewings of the same story, regardless of the provision of pictures, and recalled events increased with age. Pictures made little difference for Group C, who recalled about 55% of the story events across intervention phases and conditions. In contrast, Group A recalled 48% of events without picture support and 62% with picture support. It is not clear why Group A recalled more events with picture support while Group C performed the same across conditions. While A2 was not included in the group calculations for Group A, his parents mentioned undiagnosed attention and memory issues at the onset of this study. Perhaps these issues also affected students within Group A, although this is purely speculation without preintervention measures of memory and attention. Receptive and expressive vocabulary scores across students in Groups C and A varied significantly, from age equivalencies of 3;0 to 8;9 across measures, perhaps accounting for some of the variation in the number of events recalled among the students. In contrast, students in

Group B, who had the highest receptive and expressive vocabulary scores, consistently recalled the majority of events within the ASL stories during their narrative retells.

The current study did not include a pretest measure for memory ability; recall may have affected the difference in recalled events with picture support across the groups. In other studies, during digit and letter span tasks that required memory of unrelated sequential information, serial recall was higher when using speech compared to sign (Cowan, 2001; Hall & Bavelier, 2011; Gozzi et al., 2010). I proposed that students would have higher recall for stories with a relative sequential story line and this appeared to be the case for most students. However, Group A required picture support to recall more events, even within sequential stories. Perhaps students in Group C had higher memory abilities than students in Group A that resulted in their ability to recall more events than Group A without picture support.

Group B recalled a mean of 75% of the events without pictures across intervention stories. Students in Groups C and A recalled up to three additional events with picture support. Perhaps students benefitted differently from picture support. A2 more than doubled his recalled events when provided with picture support, in contrast to previous findings that students labeled pictures instead of retelling the story when provided with pictures (Baker et al., 2005; Becker, 2009; Morgan, 2002). However, other students reverted to labeling the pictures using lexical signs in place of classifiers, similar to previous findings (Baker et al.; Becker; Morgan). When students produced classifiers during retells with picture support, they were less likely to identify the figure and ground. While picture support increased the number of events students recalled, it did not necessarily increase the number or accuracy of students' classifier productions during narrative retells.

It is possible that the addition of the picture support condition decreased students' performance on their initial retells without pictures. Because they knew that an opportunity to tell the story with pictures would follow the initial retell, students may have decreased the quality of their initial story retells. One limitation of these data is that students always told the story without picture support first, possibly resulting in a lack of desire to tell the story in as much detail a second time immediately following the first retell. However, alternating picture versus no-picture conditions so that students might tell the picture condition first would have resulted in the provision of additional mediation for the students' retell without picture support. Additionally, telling the stories twice back-to-back to the same researcher may have resulted in fewer recalled events in students' second retell because of assumed shared knowledge of the story between the researcher and student after the first retell or a lack of motivation to tell the story again.

Most students increased the number of recalled events from pretest to posttest for *The Trunk* and *A Day in the Park*. Nine students performed near ceiling levels for *The Trunk* (only A3 scored below 70% on the posttest). *A Day in the Park* appeared to be more complex for students and adults. Only B3 scored at ceiling on the posttest with a range of 41% to 100% for recalled events across students. Three students recalled less than half of the events. Additionally, Kitty and Penny performed differently on this measure: Penny produced twice as many classifiers as Kitty. It appears that the use of these two books permitted elicitation of classifiers from students at two story levels. The use of picture books that are leveled based on the complexity of the story (i.e., number of characters and motion events) might provide clarification on classifier production for children and adults.

Amount and Type of Mediation

The level of mediation required by students varied across groups. It appears that students in Groups C and A required at least two occurrences of teacher mediation paired with repeated viewings to produce the majority of classifiers included in the ASL stories. A direct relation between the amount of teacher mediation and students' classifier production for Group B was not apparent based on the current data. These students had the highest language scores in the study and may have been bored by repeated retells of the stories beyond the first or second occurrence. Students in Group B may have benefitted by telling the stories to a more socially valid audience, such as younger DHH peers.

Group B also had more exposure to the stories based on how their teacher implemented the intervention. In total, there were six students in the class, all of whom watched the ASL stories and participated in the mediation. Three students did not retell the story to the researcher because of the participant selection procedures for this study. Prior to modeling each classifier, the teacher was instructed to do the following based on the teacher mediation script: *Pause the video. Point to the narrator's classifier production on the screen. Prompt students 'What is that?' Wait 5 seconds for students to respond*. Teacher B permitted every student to have a turn. Because they appeared to have the highest language skills of all participants, students in Group B gave detailed retells of each ASL story, recalling aloud what happened up to the point of the classifier produced by the ASL narrator on the screen. Many times up to six students recapped the story for each classifier production, providing expanded dialogue about the story and various student interpretations. In contrast, students in Groups C and A rarely provided much information about the story when prompted by the teacher and usually waited for the teacher to model the classifier during the first viewing of a story, as if they were unsure what they were expected to produce. This is similar to Cannon et al.'s (2010) findings, for which the authors added a preteaching component to repeated viewings in their vocabulary intervention. Classes C and A had fewer students, with four in each class, and therefore fewer peer modeling opportunities.

In the current study, it appears that three viewings were not sufficient to elicit classifiers in a narrative context for some students and may have been too many viewings for others. Also, some students required picture support in addition to repeated viewings to recall story events in their narrative retells. To ensure students' comprehension of a story signed by a deaf adult and to reduce memory constraints, Becker (2009) provided DOD and DOH students, aged 10-12 years, with four repeated viewings of a story paired with teacher and student discussion. Additionally, Becker incorporated interaction with an adult native signer who provided prompts and modeling to scaffold students' narrative retells and demonstrate narrative expectations. In the current study, the researchers only provided the prompts "Can you tell me what happened in the story?" and "Can you tell me more?" Perhaps students include additional narrative elements, and therefore classifier productions to represent those elements, with expanded adult prompts during narrative retells. The current results, combined with those of Becker, reinforce the provision of individualized levels of repeated viewings and picture support based on student abilities.

Intensity of the Intervention

Across a 6-week period, students in the current study increased their classifier production after they received teacher mediation paired with concurrent viewing of an ASL story for 80 to 100 minutes and engaged in repeated viewings without teacher mediation 40 to 50 minutes. In their sample of DHH students, Cannon et al. (2010) reported increases in vocabulary production during a total of 30 minutes of mediation paired with 30 minutes of repeated viewings across 2 weeks for each student. Additionally, in the current study, Group A received picture support during their retells on six occurrences and Group C on nine occurrences. While the time engaged in narrative retells was not counted toward the intervention because modeling and mediation were not provided, students engaged in about 90 minutes of narrative retell across the intervention period. In sum, students engaged in activities related to the intervention for a period of 3.5 to 4.0 hours across 6 weeks, or about 15 minutes per day, which is comparable to students in Cannon et al.'s study. The current total time of intervention is significantly less than the 24 hours of intervention across 4 weeks used in Petersen et al.'s (2008) intervention that resulted in increases in narrative macro- and microstructure and Swanson et al.'s (2005) 15 hours of intervention across 6 weeks that was deemed by the authors as too short. Petersen et al. used picture-prompted and verbally prompted narratives to elicit narrative retells form students with language impairments. Perhaps the use of repeated ASL models in a narrative context in the current study resulted in more efficient classifier production than picture-prompted narratives alone. Finally, Petersen (2011) noted that previous narrative interventions with children with language impairments offered "limited information concerning the degree and type of scaffolding and support that the clinicians offered during the intervention" (p. 217). The current study provides detailed and systematic procedures for the degree and type of teacher mediation provided across intervention phases and the results of different levels of mediation across students.

Social Validity

All students and Teacher 2 strongly agreed with the statement *I enjoyed watching the sign language stories.* Interestingly, Teacher 1 strongly disagreed with this statement, although it appears that she may have misjudged students' reactions or misunderstood the question or scoring on the social validity survey based on the responses of her students. The majority of students strongly agreed that they felt proud when they told the stories, similar to increases in self confidence in second graders with specific language impairment during story retells (Swanson et al., 2005). Most students strongly agreed that they liked to retell the stories and that they learned a lot watching the stories. Because the students were divided on whether they would watch the ASL stories at home, an extension of these stories to the home environment may be an appropriate activity for some students and their families, similar to the Shared Reading Project (Schleper, 1998). This is also supported by Teacher 2's disagreement with the statement that three repeated viewings were adequate. Perhaps Teacher 2's students had the lowest language scores and required more viewings of fluent ASL models. Teacher 1 agreed that she felt comfortable modeling the classifiers in the script but disagreed with the statements that she liked the mediation scripts and that they were easy to use. Perhaps Teacher 1 had higher sign language skills than Teacher 2 and felt the mediation script was unnecessary, or perhaps the format of the scripts could be modified to a more user-friendly format in future investigations. Based on both teachers' strong agreement that the students benefitted from having a model of classifiers, Teacher 1's feedback on the scripts, and Teacher 2's selection of mediation scripts and teacher modeling as important components of the intervention, it appears that varying levels of support may be required depending on the corresponding students' current classifier production abilities. The information from the teacher's social validity survey may be limited by the anonymity factor in that one does not know the ability level of the corresponding students. However, due to the small number of teachers involved, they might not honestly complete the survey without this qualification.

Previous research involving narrative with students who had language impairments was restricted in cultural and linguistic diversity, as eight of nine studies included only English-speaking, European-American students (Petersen, 2011). In contrast, the current study included 10 participants from diverse ethnicities (i.e., Black, biracial, Hispanic, and White) who were either DOH or DOD and from second, third, and fourth grades with various modes of communication and various levels of English and ASL skills. Additionally, the spoken languages at home included English, Spanish, and Swahili. The current study expands previous narrative findings, such as inclusion of noun phrase (Petersen et al., 2010) and use of classifiers (Morgan, 2006; Morgan & Woll, 2003) to a more diverse sample of students.

Implications for Teachers

Based on the results of the current study, repeated viewings of ASL models who produced classifiers in a narrative context paired with teacher mediation and student narrative retells can increase student classifier production. While the existing research foundation for classifier production is based on DOD students and non-narrative elicitation tasks (deBeuzeville, 2006; Schick, 1987; Singleton & Newport, 1993), the current results expand knowledge of DHH children's classifier production to a specific intervention and to a larger portion of the DHH population (i.e., DOH) within a narrative context. Because teachers of the deaf frequently vary in their ASL skills and instruct DHH students with diverse linguistic backgrounds and ASL skills among various grades, use of the current intervention, which took only 5-10 minutes per day, is a feasible option to increase students' classifier productions regardless of their prior language experiences. Additionally, use of multiple classifier elicitation measures, such as picture books and animated clips, permits teachers to obtain information on their students' current levels of classifier production and measure change in those skills over time. Some students may require more mediation than others during narrative retells to produce appropriate narrative and syntactic language (Becker, 2009; Morgan, 2002) and the repeated viewings and retells inherent in the current intervention present multiple practice opportunities for students to master these narrative skills. Finally, because the ASL DVDs used in this study are readily available to teachers, they can implement this intervention promptly.

Limitations

Assessments

Student scores on the classifier production pretest-posttest measures for this study were compared to those of two deaf adults. Measures of reliability and validity are not currently available for the *Ozcaliskan Stimuli*, *A Trunk,* and *A Day in the Park.* However, based on the item analysis of student performance using the *Ozcaliskan Stimuli*, this task was sufficient to elicit classifiers from all students and from two adults. Additionally, student scores for classifier productions increased across the three measures following the intervention, suggesting that this set of assessments captured change in student performance across time.

The picture books used in pre- and postintervention narrative retell tasks were not controlled for the number of events that could be represented by a classifier, resulting in varied numbers of classifiers across measures. Therefore, I could not measure the significance of the total number and number of different classifiers produced by students on the pretests of *The Trunk* and *A Day in the Park* compared to the maintenance and generalization measures of *Goodnight Gorilla.* These data can only be compared between narrative retells of the same book.

While Penny and Kitty performed similarly for the total number of classifiers produced for *The Trunk*, Penny produced twice as many classifiers as Kitty during her rendition of *Park.* This may be a limitation in defining adult-like classifier production using only two deaf adults. Future research should investigate the specific classifier production of both DOD and DOH adult signers to define target adult-like performance levels on picture book measures and use as a comparison for student productions. In comparison to the books used for intervention, *The Park* contained more motion events and a longer storyline. This complexity may have affected student performance on this measure.

Intervention Stories

The stories in this study were part of a large series of leveled (i.e., pre-school through high school reading levels) children's story books that have been rendered and recorded in ASL by fluent models. Because books used in this study had to have at least four opportunities for classifier production, the content of the stories was not controlled. Some stories appeared to have a sequential storyline (e.g., *Tadpoles and Frogs, Making Butter*), which appeared to assist students in their recall of the stories, while others did not (e.g., *Sleeping Animals, I Can't Find My Roller Skates*). For example, compared to other stories, Groups A and C had significant decreases in classifier production performance during *I Can't Find my Roller Skates*, in which a girl searches in random places without a sequential storyline, and Group B had a decrease in classifier production for *A Pet for Me*, in which pets are named in no specific order. In contrast, Group A had high performance for the sequential story *Tadpoles and Frogs* and Group C had high production for *Butterfly*. Sequential life cycles of animals are presented in each of these stories.

Additionally, the varying number of classifiers contained in the stories appeared related to variation within students' overall classifier production scores. For example, Group B used *Video Game*, with the opportunity to produce eight classifiers, and *A Pet for Me*, with an opportunity to produce only four. Because of this discrepancy, a student who used four of the classifiers out of eight opportunities scored the same percentage-wise as a student who used two out of four opportunities despite using twice as many classifiers during her retell.

Preece (1987) reported that retelling a narrative from visual media, such as a DVD, is more difficult than retelling a story based on printed material and that video-based retells may result in a focus on a funny or scary event within the story instead of a sequential retell. Therefore, the format of repeated viewings from DVD may be a limitation in the breadth and depth of a student's retell. However, previous researchers reported gains in vocabulary for DHH students (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) and attention to educational material for typically hearing children (Anderson et al., 2000; Crawley et al., 1999; Mares, 1997). Future researchers might add a story generation task to pretest and posttest measures, as Swanson et al. (2005) reported that students enjoyed a story generation task more than a retell task. This may be more appropriate for students with higher language skills, such as those in Group B, and may result in higher classifier elicitation.

Finally, there may be a possibility that some students bypassed the use of ASL during their narrative retells. For example, sometimes students used lexicalized signs, similar to labeling the figures and action (e.g., BOY RUN) within a story during narrative retells in place of the modeled classifiers. Perhaps at times they bypassed the ASL components of the intervention and relied on their memory of the pictures, which were displayed behind the narrator, during their retells. This could be related to a lack of ASL in the home and a tendency toward more English-like signing in the classroom. All teachers at the research site are required to achieve an Intermediate Plus on the *SLPI*. One teacher achieved an Intermediate rating and the other two teachers met and surpassed this requirement. Some teachers from whom the students previously received instruction may be currently working toward this rating, similar to one of the teachers in the current study. Perhaps these students have been exposed to more English-like signing, which presents signs in English word order (Bornstein, 1975), and their lack of classifiers during narrative retell is related to their past language experiences in the nonmediated phases of the intervention, following Berman and Slobin’s (1994) form and function proposal.

Formality of Setting

Children may provide more narrative information during formal settings compared to informal settings (Hausendorf & Quasthoff, 1996) based on motivation to perform the task at hand (Becker, 2009). Some students had higher scores for the picture book task at baseline compared to after the intervention, notably A2, A4, and B1. At the time of postintervention measures, students had interacted with the researcher during pre-intervention measures (approximately an hour per student) and three times per week (approximately 5-10 minutes each occasion) for 6 weeks. A decrease in the formality of the assessment setting or completing the same tasks for a second time may have affected students' motivation for optimal performance.

Scheduling

The regular classroom teachers implemented the intervention in the current study. Based on the criteria for entry into intervention (i.e., teachers and three students who first returned consent and parental permission), third graders comprised the first intervention group instead of the group anticipated to have the most success during the intervention. Therefore, groups C and B repeated their phases with two and three mediation sessions, respectively, even though they met the criterion of three increasing data points to move into the next intervention phase. The established time frame for this study, including pre- and postintervention measures, was 8 weeks. While the flexibility of a multiple baseline design permitted alteration of the intervention, it also required that teachers consent to an additional week of intervention. Additionally, the three teachers were blind to the results of the intervention during data collection. While a functional relation was exhibited between teacher mediation paired with repeated viewings on students' classifier production during narrative retells, given more time, I could have investigated further the required intensity of each intervention component across students at three grade levels to determine optimal combinations of mediation. For example, students in Groups C and A required more mediation and more repeated viewings to incorporate more classifiers into their narrative retells. In contrast, students in Group B frequently decreased their classifier productions across narrative retells following repeated viewings. I might speculate that the latter students required less mediation and fewer viewings when compared to the younger students. Further investigation could identify the best combination of mediation and repeated viewings on classifier production across students of different language levels.

Coding of Noun Phrase

In the current study, identification of the noun phrase was coded only if the student identified the figure and ground through labeling, as opposed to nominal pointing for classifier productions. In some instances, it appears that identification of the figure or ground in the noun phrase corresponding to a classifier production during a narrative retell was redundant and therefore eliminated by students, as well as adults (Beal-Alvarez & Easterbrooks, submitted). For example, when tracing one's ears to show the shape of a monster's ears, it is already inherent that the object of discussion is ears. This coding rule may have resulted in lower scores for students' noun phrase component of classifier production.

Coding of Movement

One limitation in the coding of classifier parameters was that manner and path, two components of movement (Supalla, 1990; Tang & Yang, 2007), were collapsed in the data analysis in this study. Additionally, the angle of the camera in many of the videotaped retells slightly disguised movement in a forward direction with movement in a left to right direction, resulting in some variation in coding the movement parameter in classifier production. This resulted in some variation between the two coders, as one coder focused on manner (e.g., back and forth), while the other coder focused on path (e.g., left to right). However, coding of movement was within reasonable agreement. Future coding schemes that investigate the parameters of classifier production should separate manner and path for a more reliable agreement between data coders.

Picture Support

After the first day in the fourth and fifth phases of the intervention for Groups C and A, respectively, the students knew that their first retell of the story would be followed by an opportunity to retell the story while looking at the pictures. This had one of two effects on most students. It appeared that some students exerted less effort while telling the story the first time. Other students provided less information about the story the second time, simply labeling pictures instead of portraying the action from the narrated story in ASL. Picture support influenced recall and therefore classifier production for some students but not others. Future research should investigate characteristics of students who may need more picture support during narrative retell so that this support can be provided in an appropriate dose to increase classifier production.

Finally, while the participants in the current study represent a diverse sample of DHH students, the external validity of this study may be limited by the small number of participants.

Suggestions for Future Research

Future research should tease apart the critical components and optimal levels of repeated viewings, ASL models, teacher mediation, and narrative retell opportunities on students' classifier production across students of varying ages, linguistic experiences, and parental hearing status. While all students in the current study produced classifiers, some students produced more classifiers than others, and the oldest student (A3) produced the fewest classifiers across measures. Future researchers should investigate the possibility of required receptive and/or expressive vocabulary thresholds prior to emergence of classifier production. A measure of students' expressive narrative ability in sign language, such as the *Signed Reading Rubric* (Easterbrooks & Huston, 2008), should be included to measure any differences in children's expressive vocabulary in comparison to their expressive narrative ability. Future research should include a separate measure for memory (Hermans et al., 2010) to investigate the relation between memory performance and the number of events a child includes in his narrative retell. Additionally, future investigations should identify which mediation strategies are appropriate for particular students, from elaboration and expansion to recast, modeling, and prompting (Becker, 2009; DesJardins & Eisenberg, 2007), to increase classifier production and other elements of narrative discourse in students' narrative retells. An investigation of the types of classifiers that are commonly paired with constructed action by fluent adults may guide instruction at the student level.

The relation between classifier production during narrative retell and its connection to the rendition of printed text should also be investigated. Preliminary results (Beal-Alvarez & Easterbrooks, submitted) suggest that deaf adults who are fluent signers and readers use classifiers when rendering printed text in sign language. However, these results are based on only two deaf adults; therefore, future research should investigate the results of larger samples of deaf adults, divided evenly between DOD and DOH, to identify differences in how deaf adults produce classifiers based on printed text that may direct modeling and mediation during instruction for a variety of DHH students. How deaf readers acquire and master these print to classifier production skills is an area for future research.

Conclusion

The results of this study suggest that repeated viewings of ASL models with teacher mediation can improve students' classifier production during narrative retell. Despite variation in ages, expressive and receptive vocabulary scores, linguistic backgrounds, and levels of hearing, all children in this study increased the number of classifiers they used across multiple narrative retell tasks. Some students required more support, such as repeated mediation or the provision of pictures during narrative retell, than others. Students' abilities to recall story events, and therefore produce classifiers when discussing the events, must be considered when eliciting classifiers through a narrative retell context. When students in the present study produced classifiers, they had high levels of accuracy across figure and ground handshapes and movement. Students in the current study appeared to be in the stages of acquisition for the obligatory use of figure and ground identification. These current findings expand the results of previous investigations of repeated viewings with mediation and vocabulary gains (Cannon et al., 2010; Golos, 2010; Mueller & Hurtig, 2010) to the specific ASL vocabulary subsystem of classifiers.

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APPENDIXES

APPENDIX A

Background Information Form

Today's Date: ________
Child's Name: ________________________________ Child's Date of Birth ________________
Person completing form:
Name: _______________________________ Relation to child: ____________________________
*Please write **ages** as years and months (ex: 4 yrs. 5 mos) as close as you can remember.*
At what age was the above child identified as deaf or hard-of-hearing? ______________________
What was the cause of the child's hearing loss? ____
At what age was the child first enrolled in intervention services? __________________________
At what age did the child enter his/her current school? ______________________________
At what age did the child first use hearing aid(s)? __________
Does the child wear hearing aid(s) now? ___ yes ___no
If yes, how many: circle: one or two
How much does s/he use it at school? *circle:* Never Occasionally Almost Always
How much does s/he use it at home? *circle:* Never Occasionally Almost Always
Does the child have a cochlear implant(s)? ___ yes ___no *If yes: circle:* one or two
At what age(s) did the child get the implant(s)? __________
How much does s/he use it at school? *circle:* Never Occasionally Almost Always
How much does s/he use it at home? *circle:* Never Occasionally Almost Always
Is the child's mother deaf? ___ yes ___no
Is the child's father deaf? ___ yes ___no
Mother's highest education________________
Father's highest education_________________

Mother's ethnicity *(circle below)*
American Indian or Alaskan Native
Asian or Pacific Islander
Black
White
Hispanic
Mixed
Other

Father's ethnicity *(circle below)*
American Indian or Alaskan Native
Asian or Pacific Islander
Black
White
Hispanic
Mixed
Other

Does your child receive free or reduced lunch? ___ yes ___ no
What language is used at home? *(circle all that apply)*
Spoken English, Spoken Spanish, American Sign Language, Signed English, a combination of spoken and signed language, other _________________
If your child uses sign language, at what age did s/he start using it (*years and months*)? _______
Please check any area(s) that the child has an additional disability.

	Diagnosed	Suspected
Attention	☐	☐
Cognitive/intellectual	☐	☐
Motor/physical	☐	☐
Emotional/behavioral	☐	☐
Other: ____________	☐	☐

Please describe any information you have on the specific kind and severity of the disability (if known) and any testing done to diagnose the disability on the back of this paper.

APPENDIX B

EXAMPLE CODING SHEET

Title: *The Trunk* **Participant:** _________________ **Date:** ____________

	Phrase	Figure ID	Ground ID	Figure Handshape	Ground Handshape	Movement	Time
1	Squirrel sits by tree			[bent V] Correct incorrect	[tree] Correct incorrect	[down-by] Correct incorrect	
2	Squirrel climbs tree			[bent V] Correct incorrect	[tree] Correct incorrect	[upward] Correct incorrect	
3	Cat sits by tree			[bent V] Correct incorrect	[tree] Correct incorrect	[down-by] Correct incorrect	
4	Cat climbs tree			[bent V] Correct incorrect	[tree] Correct incorrect	[upward] Correct incorrect	
5	Monkey sits by tree			[bent V] Correct incorrect	[tree] Correct incorrect	[down-by] Correct incorrect	
6	Monkey climbs tree			[bent V] Correct incorrect	[tree] Correct incorrect	[upward] Correct incorrect	
7	Squirrel sits on elephant			[bent V] Correct incorrect	[B palm-down] Correct incorrect	[down-on] Correct incorrect	
8	Cat sits on elephant			[bent V] Correct incorrect	[B palm-down] Correct incorrect	[down-on] Correct incorrect	
	Figure: /8= % Ground: /8= % None:			Correct: /8= % Incorrect: /8= % None:	Correct: /8= % Incorrect: /8= % None:	Correct: /8= % Incorrect: /8= % None:	
Total Correct		%	%	% figure handshape	% ground handshape	% movement	
Total Occurrences							
Percentage Correct							
Grand Total Correct (Correct F+G+M)							
Grand Total Correct		/2					

Percentage	4= %					

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Sequence of Events: Place a checkmark in front of each event that the student includes in his/her retell.

____ A trunk.
____Squirrel by trunk.
___ Squirrel climbs trunk, cat by trunk.
___Squirrel climbs trunk, cat climbs trunk, money by trunk.
___ Cat climbs trunk, monkey climbs trunk.
____Squirrel, cat, and monkey on elephant.
___ Monkey, cat, and squirrel slide off of elephant’s trunk.

APPENDIX C

SAMPLE TEACHER MEDIATION SCRIPT

Teacher Mediation Script

Title: *I Can't Find My Roller Skates*

Directions: Pause the video at each indicated time and provide instruction as outlined below. You will see the classifier produced in the DVD at the designated time.

0:49: Pause the video. Point to the narrator's classifier production on the screen. Prompt students "What is that?" Wait 5 seconds for students to respond.

If students do not respond, model the classifier:

1	Sign "book."
2	With both hands, sign [B] palm down with thumbs touching.
3	Move hands away from each other keeping palms down. Repeat twice, moving hands about 6 inches higher each time, to outline book shelves.
4	Have students imitate your classifier using both hands.

If student(s) responds, expand their response with all missing elements of the classifier listed above. After all students have imitated the classifier, continue the video.

1:34: Pause the video. Point to the narrator's classifier production on the screen. Prompt students "What is that?" Wait 5 seconds for students to respond.

If students do not respond, model the classifier:

1	Sign "bed."
2	With non-dominant hand sign [B] palm-down and hold.
3	Sign "girl."
4	With dominant hand sign [V] palm-down by corner of eye.
5	Move [V] from eye to under non-dominant hand.
6	Have students imitate your classifier using both hands.

If student(s) responds, expand their response with all missing elements of the classifier listed above. After all students have imitated the classifier, continue the video.

APPENDIX D

EXAMPLE INTERVENTION CODING SHEET

Title: *I Can't Find My Roller Skates* Student: ________________Date: ___________

Coder: _________________________________

Directions: For each given phrase, circle the [prime] used by the student for each parameter (Figure Handshape, Ground Handshape, Movement). If the [prime] is not included in the list of choices, circle [other] and note the prime under "comments." If the student omits a prime, circle [none].

Time	Phrase	Figure	Ground	Figure Handshape	Ground Handshape	Movement
	book shelf			[B] [other] [none] correct incorrect	[B] [other] [none] correct incorrect	[away] [other] [none] correct incorrect
	look under bed			[V] [index] [other] [none] correct incorrect	[B] [other] [none] correct incorrect	[under] [other] [none] correct incorrect
	look behind door			[V] [index] [other] [none] correct incorrect	[B] [other] [none] correct incorrect	[around] [other] [none] correct incorrect
	girl looks under chair			[V] [index] [other] [none] correct incorrect	[H] [B] [other] [none] correct incorrect	[under] [other] [none] correct incorrect
	Total Correct					
	Total Occurrences					
	Percentage Correct					
	Grand Total Correct (Correct F+G+M)					
	Grand Total Occurrences					
	Grand Total Correct Percentage					

Sequence of Events: Place a checkmark in front of each event that the student includes in his/her retell.

____Can't find roller skates
____Looked in toy box
____Looked on the bookshelf.
____Looked upstairs
____Looked under the bed
____Looked behind the door
____Saw sister out the window using roller skates

APPENDIX E

FIDELITY CHECKLIST EXAMPLE

Treatment Fidelity Checklist

Date: ____
Observer: ____
Title of DVD: *I Can't Find My Roller Skates*________________________________

Directions: Check "yes" if the element occurs during observation of the DVD session. Check "no" if the element does not occur during observation of the DVD session.

Yes	No	
		Teacher and students watch entire DVD from start to finish.
		Teacher plays "real-aloud" version of DVD.
		Teacher pauses DVD at time 0:19.
		Teacher points to narrator's production on the screen.
		Teacher prompts students "What is that?"
		Teacher waits 5 seconds for students to respond.
		If student(s) respond, teacher expands responses with all missing elements of classifier listed below. If students do not respond, teacher models classifier with all elements listed below.
		Teacher signs "bed."
		With the non-dominant hand the teacher signs [H] palm-down and holds it.
		Teacher signs "girl."
		With the dominant hand the teacher signs [H] palm-down and places it on the non-dominant hand.
		All students present imitate 'girl sits' classifier.
		Teacher provides corrective feedback as needed on student classifier productions.
		Teacher continues video.
		Teacher pauses DVD at time 0:49.
		Teacher points to narrator's production on the screen.
		Teacher prompts students "What is that?"
		Teacher waits 5 seconds for students to respond.
		If student(s) respond, teacher expands responses with all missing elements of classifier listed below. If students do not respond, teacher models classifier with all elements listed below.
		Teacher signs "book."
		With both hands, the teacher signs [B] palm-down with thumbs touching.
		The teacher moves her hands away from each other.
		The teacher repeats twice with hands about 6 inches higher.
		All students present imitate 'book shelf' classifier.
		Teacher provides corrective feedback as needed on student classifier productions.
		Teacher continues video.