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A COMPARISON OF VOCAL TRAINING ALONE
AND VOCAL PLUS SIGN LANGUAGE TRAINING ON THE
ACQUISITION OF TACTS AND MANDS MADE BY PRESCHOOL
AGED CHILDREN WITH DEVELOPMENTAL DISABILITIES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

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The Ohio State University

1995

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ACKNOWLEDGMENTS

I would like to express my sincere appreciation to my advisor, Dr. Ralph Gardner III for his constant encouragement, insights, and diligent reviews of this document. I would also like to thank and recognize the members of my advisory committee, Drs. John O. Cooper and Diane M. Sainato for their suggestions, encouragement, and support throughout my dissertation.

To the data collectors, Gary Jacobs, Caylee Carpenter, Stephanie Skully, and Dawn Phillips, thank you for going the extra mile each and everyday by setting up the area, keeping track of the kids, the recordings, and the time, and for logging the scores in the summary book. I don’t think I could have kept up with all the details without your help. You were the best data collectors!

To the families and children of the study, thank you for the opportunity to work with your children each school day for four months, for without them there wouldn’t have been a study.

I would like to express my appreciation to my fellow classmates, Kelly Heckaman, Manfred Haertel, Kim Killu, and Stacy Martz for helping to create a cohesive group with abundant support and understanding. I am truly grateful for the many amusing conversations and lunches we had together.
To my friends and family, thank you for making it easy for me to leave home for three years and making me feel like I never left each time I came home for a visit. Special thanks go to Barb and Nancy, for making sure I had fun even though my budget was small and for making the extra effort to stay in touch when I would forget to call.

Much gratitude is expressed to my mother and father, Kay and Donald Weber and to my sister, Donna Schindler, who I owe so much. Donna thank you for helping to raise me and for all of the phone calls and packages that made me feel less homesick.
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CHAPTER I
INTRODUCTION

Verbal behavior is an essential part of everyday life (Bryen & Joyce, 1985; Papalia & Olds, 1987; Reed, 1994; Sundberg, 1990). A competent speaker can make statements, ask questions, take notes, ask for things, express needs, read to others, hold a conversation, etc. For example, a young boy may ask for a drink of water by saying, "water." Often this verbal statement in the presence of his mother will be reinforced by the boy getting water from his mother. The most obvious benefit of verbal behavior is the vast community of individuals available to interact in this manner. If we take just a few minutes, to account for the number of times that a verbal episode occurs in our own lives, in one single day, the results would be overwhelming. Peterson (1987) states, "... language offers one of the most crucial tools for all subsequent intellectual and social learning. Without question, language plays a pivotal role in children's learning" (p. 256).

Individuals lacking the ability to readily communicate with others may become frustrated and emit inappropriate behaviors such as physical aggression, self-abuse, self-stimulation, or tantrums (Bailey & Wolery, 1984; Hurvitz, J.A., Pickert, S.M., & Rilla, D.C., 1987; Johnston & Reichle, 1993;
Meyer & Evans, 1986; Sundberg, 1990). For these individuals other behaviors like tantrums, aggression, or self-abuse may functions as the verbal behavior. For example, a young girl who does not speak or use sign language may in the presence of her mother begins to hit herself and continues hitting while her mother offers her various food items. The hitting behavior frequently stops when the young girl is offered and receives a food item that she finds acceptable. In remediating these behavior problems, intervention programs must address the role that communication plays in relation to the exhibited behavior problem.

Over the years there has been much research completed on language and speech development or the lack of this development. The types of philosophies and approaches used to describe the development or delays in language have been as vast as the research itself. The most known philosophies and approaches include the cognitive/developmental models, the biological model, and the linguistic model. Less known philosophies include behavior analysis, naturalistic language, and verbal behavior. Investigations of the usefulness of these philosophies is warranted. Skinner's view of verbal behavior is probably the least known or used of these philosophies.

B. F. Skinner in his book, Verbal Behavior (1957) defines verbal behavior as, "behavior reinforced through the mediation of other persons we do not, and cannot, specify any one form, mode or medium. Any movement capable of affecting another organism may be verbal" (p. 14). In this definition of verbal behavior vocal behavior, gestures, written languages,
pointing to words, sign language, or even disruptive behavior can be considered verbal behavior under specific circumstances. For example, a concierge outside of a hotel gains access to a taxi for a guest of the hotel by blowing a whistle. This blowing of the whistle in the presence of a taxi driver is a mand for the taxi driver to pick up a passenger. Non-verbal behaviors are those behaviors that are not reinforced through the mediation of another person. An example of non-verbal behavior would include a woman walking down a hall way and along the way drops her pencil. The woman does not notice that she has dropped the pencil and continues to walk down the hall. Another person walking down the hall sees the woman drop the pencil picks it up and gives it back to the woman.

Michael (1985) explains the differing topographies of verbal behavior and places these forms of verbal behavior into two categories, stimulus selection-based verbal behavior and topography-based verbal behavior.

These modes can be used to teach individuals with limited language or communication difficulties. The types of modes taught to individuals with disabilities may vary greatly depending on the persons physical limitations, amount of vocal sounds consistently produced or by what others consider appropriate for the individual. The types of response forms may range from speech as a sole mode of communication to speech combined with a picture or symbol book or speech combined with sign language. Choosing the most appropriate response mode for a person with developmental disabilities continues to be dependent on the type and complexity of each individual’s disability.
Present research needs additional confirmation to support claims that the use of sign language training seems to facilitate oral communication (Clarke, Remington & Light, 1988; Kouri, 1989).

**Purpose of Study**

The purpose of this study is to compare the effects of vocal training alone and vocal plus sign language training on the development of vocal verbal tacts and mands of preschool children with minimal vocal verbal and communication abilities.

**Research Questions**

This study was designed to produce empirical data in response to the following questions.

1) What were the effects of the two experimental conditions (vocal only and vocal plus sign language) on the development of single word vocal verbal tacts by preschool children with limited communication skills?

2) What were the effects of the sign plus vocal condition on the development of non vocal verbal (i.e., sign language) tacts by preschool children with limited communication skills?

3) What were the effects of the two experimental conditions (vocal only and vocal plus sign language) on the development of single word vocal verbal mands by preschool children with limited communication skills?

4) What were the effects of the sign plus vocal condition on the development of non vocal verbal mands by preschool children with limited communication skills?
5) How many learning trials were needed to master the target words under the vocal only condition and the vocal plus sign language condition for each verbal operant trained?

6) Did the tacts learned under the vocal only or vocal plus sign language condition transfer to an untrained verbal operant (i.e., mand)?

7) Did the items that received tact training under the vocal only or vocal plus sign language condition occur when other individuals (i.e., teachers, aides) in the classroom completed a formal baseline condition probe?

8) Did the children initiate vocal or sign language responses for items that were trained during the study during non session school times and under what experimental condition (vocal only or vocal plus sign language) was the word/item assigned?

9) What were the parent’s opinions of the study’s outcomes?

10) What were the teacher’s opinions of the intervention and outcomes of the study?

**Terminology**

All special terms used in this study are described below.

**Additional Practice/Corrective Feedback**

After any type of error response occurred during recorded trials the experimenter provided an opportunity for additional practice before beginning the next trial. Both the vocal only and the vocal plus sign language conditions received two opportunities for a correct response during one practice trial. At any point during the practice trial that a correct
response or approximation occurred the child would be given access to the specific item along with vocal verbal feedback from the experimenter. After the child had access to the item for approximately 60 seconds or the entire practice session was completed a recorded trial was presented.

**Vocal only training.** For the vocal only training the experimenter modeled the correct vocal response and a vocal approximation for the child (e.g., "book - say, B") then gave the child time to respond. If the child did not respond or responded incorrectly the experimenter provided another prompted opportunity for the child to respond during the practice trial.

**Vocal plus sign language.** For the sign language plus vocal training the experimenter modeled the correct vocal and sign language response for the child then gave the child time to respond. If the child did not respond or responded incorrectly the experimenter provided another opportunity for practice. This time the experimenter shaped the sign language response using the child's hands and then provided a vocal and sign language model. The experimenter then waited a short period of time for the child to repeat the vocal and or the physical movements or approximation to those physical movements.

**Correct Responses**

The correct response category were differentiated as either correct before the delay prompt or correct after the delay prompt. Each correct response had to occur prior to the time constraints listed below for the two types of correct responses.
Correct before delay prompt. A correct before the delay prompt was recorded when a child tacted or manded the appropriate item, in the training environment during a specific trial, before the experimenter stated the delay prompt (i.e., “name of the item”). The time period before the experimenter provided the prompt varied from one to three seconds depending upon the number of correct responses each child made for each word.

Correct after delay prompt. A correct after the delay prompt was recorded when a child tacted or manded the item appropriately within six seconds after the delivery of the delay prompt.

Critical Stimulus

To begin each trial the experimenter either stated, "What is this?" for the verbal operant condition tact or "What do you want?" for the verbal operant condition mand. These two statements functioned as the critical stimuli.

Delay Prompt

The delay prompt was a verbal or a verbal and a sign language response the experimenter provided. This prompt was given after the critical stimulus had been presented and a specified amount of time had elapsed without an appropriate response from the child during the training trial.

Error Responses

The error response category were differentiated as an error before delay prompt, an error after the delay prompt, or a non-response. Each error response was recorded after a specific time period listed below for each type of error response.
**Error before delay prompt.** An error before the delay prompt was recorded when a child tacted or manded the item incorrectly, in the training environment during a specific trial, before the experimenter stated the delay prompt. The time period before the experimenter provided the delay prompt varied from one to three seconds. Timing delays for each child were different for each word depending upon the number of correct responses each child made for each word.

**Error after delay prompt.** An error after the delay prompt was recorded when the child tacted or manded the item incorrectly within six seconds after the delivery of the delay prompt.

**Non-response.** A non-response was recorded when the child did not make a vocal or sign language response before the delay prompt was provided or after the six second time period after the delay prompt was provided.

**Impure Tact**

There can be many types of impure verbal operants, many of those have multiple variables or causation. In our case, the impure tact combines components of the tact, mand, and intraverbal. For our purposes, the impure tact was a verbal operant that contained two controlling variables a prior non verbal stimulus (i.e., tact component) and an establishing operation (i.e., a mand component) these controlling variables were paired with a verbal stimulus, "What is this?" (i.e., the intraverbal component) and the verbal response specified its reinforcement (i.e., mand component) in addition to a facilitative consequence(i.e., tact component) provided by the listener.
Skinner (1957) describes the control of the impure tact, "the stimulus control of the tact may be disturbed by consequences which are more important to the speaker than the generalized reinforcement usually accorded his behavior"(p.151). Simply put, the speaker is reinforced by gaining some specific event from the listener.

Sundberg (1990) discusses the use of multiple variables and causation to develop a beginning repertoire with individuals with developmental disabilities. The purpose for using the impure tact form is to facilitate the probability of vocal acquisition of a preschooler with limited verbal behavior.

A narration of an impure tact might involve a child, Kristi, who sees a cookie on the counter in the kitchen. Kristi has not had any cookies in over two weeks and these are chocolate chip cookies which are her favorite. The mother is also in the kitchen sitting at the table reading the newspaper. The mother looks up and sees Kristi looking at the cookies and says, "What do you want?" Kristi continues to stare at the cookies and then says, "Coo--ee." The mother responds, "that's right, you said, cookie." and then hands a cookie to Kristi. If we break this situation apart we can label each component. Seeing the cookies on the counter is a prior non verbal stimulus (i.e., tact component). Not having cookies in two weeks and the cookies are her favorite kind sets the occasion that their is a high probability of an establishing operation (i.e., mand component). The mothers vocal response, "What do you want?" is an prior verbal stimulus that does not have point to point correspondence with the verbal response "coo--ee" (i.e., intraverbal). The mothers vocal verbal response, "That's right, you said, cookie" is
probably a generalized conditioned reinforcer for Kristi (i.e., tact component) then her mother gets her a cookie (i.e., mand component).

**Limited Communication Skills**

The preschool children were considered limited in communication if they vocally emit less than twenty discernible words.

**Mand**

"The mand is a type of verbal operant in which a particular response form is reinforced by a characteristic consequence and is therefore under the functional control of the establishing operation relevant to that consequence" (Michael, 1988, p. 7). Micheal's (1985, 1988, 1993) refined definition from the definition Skinner provides in his (1957) book *Verbal Behavior* that limited the mand to conditions under the functional control of deprivation or aversive conditions. The most important defining characteristic of the mand is the establishing operation. Keller and Schoenfeld (1950) introduced this term as a variable that momentarily establishes the reinforcing effectiveness of some other object or event. An establishing operation can refer to any operation that has this effect and is not limited to deprivation or aversive conditions.

An example of a mand: John is in the living room with his father. John has not had anything to drink in a long time and is really thirsty for some juice. John says, "Can I have some juice, Dad?" (i.e., a soft mand) immediately, the father goes to the kitchen and returns moments later with a cup of juice and hands it to John. John says, "thanks Dad," then the father replies, "you're welcome, and remember to be careful so you don't spill."
Potential Reinforcer

The experimenter talked with the parents and teachers to determine items that the children would voluntarily interact with. In addition, the experimenter observed and recorded the items that the child frequently interacted with in the classroom. An item was considered a "possible" reinforcer if the child interacted with it at least one time per day.

Sign Language

Sign language was the physical behaviors that occurred that were correlated to the specified item in the study. Only single sign language responses occurred during the study. No attempt was made to teach a specific form of sign language (e.g., American Sign Language or Signing Exact English).

Signed Speech

Signed speech is a specific response mode of simultaneous signing and speech by the learner.

Tact

A tact is a verbal operant whose response form is controlled by a prior non verbal stimulus (Michael, 1982). The effect of the establishing operation on the form of the response is minimal due to the fact that the reinforcement of the tact is frequently a generalized conditioned reinforcer (e.g., social consequences, tokens, tickets, money). Skinner called this type of reinforcement facilitative.

An example of a tact: I am sitting with my mother on the front porch and a dog walks by, I see the dog then I say "dog." My mother hears me
say, "dog" and then my mother says, "yes, that's a dog." In other words, tpecting is naming environmental conditions, in this case a dog.

There is a temptation to use simpler terms to describe the tact as labeling or describing however, Skinner warns against this (Skinner, 1957). Skinner opposes using the alternative terms for the tact because the focus is taken away from the behavior and is placed on the object.

**Topography-Based Verbal Behavior**

In topography-based verbal behavior (e.g., signing, vocal), the form of the response is distinguishable from other responses and their forms. Topography-based verbal behavior provides an opportunity for an individual to select items by using distinctively different and specific response forms for each item. When using sign language each item has a physical movement that corresponds with the item. Correspondence for topography based verbal behavior is point to point in many cases. For vocal to written responses, finger spelling to vocal, or written to finger spelling etc. the correspondence is point to point. Although, with sign language to vocal, written, or finger spelled responses the correspondence is not point to point.

**Total Communication**

Total communication refers to the teaching technique of using simultaneous productions of alternative communication forms (e.g., sign language and speech) to teach the learner to produce these modes to communicate.
CHAPTER II

LITERATURE REVIEW

This chapter reviews literature on individuals with special needs including specific areas of developmental disabilities and communication disorders. Issues of typical language development in young children and preschool aged children with developmental disabilities including the undesirable behaviors children with minimal communication abilities may emit were presented. The alternative response modes available to individuals with severe communication disabilities were provided. The differing philosophies of language and verbal behavior were presented including brief descriptions of the cognitive and developmental, biological, and linguistic models. The philosophies of behavior analysis, naturalistic language, and verbal behavior were addressed in greater detail with the most detailed information presented on verbal behavior and verbal behavior research.

Individuals with Special Needs

Several different terms are used for individuals with special problems that limit involvement or interaction with educational materials, physical structures, daily tasks, or other individuals in society. One term used is "disabled" meaning a person who is structurally, physiologically, or
neurologically different from typically developing persons as a result of an accident, disease, congenital abnormality, or developmental problems (Peterson, 1987). The term disability refers to a "variety of conditions that can limit a person's ability to perform in the same way a typical person would" (Heward & Orlansky, 1995 p. 8). For example, if a person lost the ability to walk and used a wheelchair as a primary mode of transportation from one place to another, this would constitute a disability. For clarity purposes, it is beneficial to note that the terms impairment and disability are often used interchangeably.

On the other hand, a handicap refers to the consequences of the disability that prohibits the person from manipulating the environment in the same way as a typical person. A child is handicapped if the disability interferes with normal functioning so that performance is effected and possibly limited by the condition. A child with a club foot may have a handicap when running with his non-disabled peers. A disability can be a handicap in some circumstances while not a handicap in others. For example, the same child with a club foot may function at the same level or above his peers in Algebra class. There are numerous handicapping conditions including physical, sensory, emotional, psychological, and developmental.

Developmental Disabilities

A developmental disability refers to conditions that originate prior to age 18 that may prevent a person's ongoing developmental progress. The Ohio Department of Education in the (1982) Rules for the Education of Handicapped Children defines "developmentally handicapped" as
significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior manifested during the development period, which adversely affects a child's educational performance. Individuals with developmental disabilities can exhibit only a few significant delays in certain areas to a full range of delays in most or all of the major categories. The disabling conditions that can be displayed by individuals with developmental disabilities can range from being mentally retarded, hard of hearing, deaf, speech impaired, visually impaired, orthopedically impaired, to combinations of these conditions. There is also a wide variance across individuals in regard to the severity of disabling conditions.

Determining whether an individual should be labeled developmentally disabled or delayed requires that a specific amount of delays in level of functioning or other criteria be substantiation. When testing individuals for delays there are five major areas that are focused upon: cognitive development; physical development, that includes vision and hearing; language and speech development; psychological development; and self-help skills (Fewell, 1991).

Individuals with more severe the cognitive problems are more likely to be diagnosed at an earlier age (Bailey & Wolery, 1984). Developmental disabilities that are based on biological determinants (e.g., Downs Syndrome) are typically identified at or before the child is born. Frequently, these children have delays in all of the developmental areas to some degree and may display more extensive delays in one area and minimal delays in another
area. These developmental areas include language skills, cognitive abilities, social skills, and motor skills. Those children with more severe delays tend to lack most expressive language except for some single word utterances (Thurman & Widerstrom, 1990).

Communication/Language Disorders

The estimations of communication disorders in children varies greatly and reliable figures are difficult to obtain because researchers frequently use different definitions of what constitutes a speech or language disorder (Heward & Orlansky, 1995; Reed, 1994). Several prevalence studies of school aged children were reviewed and it was concluded that children with speech impairments that were severe enough to warrant special attention existed in approximately 4% of children (Fein 1983). This percentage is the equivalent of approximately two to three million children in the United States. However, Reed (1994) stated that about 1% of school age children are considered to have a language disorder.

The types of language delays in young children are typically discussed as speech impairments. The speech impairments included articulation problems, voice disorders, or fluency, while functional communication disorders do not have specific physical conditions and origins are generally difficult to detect.

Articulation problems are the inability to produce accurate oral productions of the vocal and consonant sounds of the child’s native language (McCormick & Schiefelbush, 1984). Articulation errors are frequently classified as either omissions, substitutions, distortions, or additions
(Peterson, 1987). Omissions are when only a portion of a word is produced (e.g., saying, “Coo-ie” for cookie). Substitutions are when a different sound replaces the correct one (e.g., saying, “den” for pen). Distortions are when slightly altered version of the correct sounds occur due to the inability to produce the correct sound (e.g., saying, “th” for a “t” sound). Additions occur when the child adds additional sounds to words (e.g., saying, “crackder” for cracker).

Voice disorders include the use of a loud or inappropriate pitch, volume, or voice quality. Individuals with a voice disorder may have initially spoken softly and were never expected or required to speak louder as they developed. Moore (1982) stated that voice disorders may be considered, if the person’s voice is considerably different than others within in the same age, gender, or cultural background.

Fluency disorders are most commonly identified as stuttering although extremely rapid speech would also be considered a fluency problem (VanRiper, 1978). Fluency disorders involve the rate of sound production, including hesitations or speaking quickly. A person with a fluency disorder may talk so rapidly that individual sounds can not be identified, have abnormal repetitions, or extended length in emitting speech sounds.

Language Development

There are specific milestones in the development of language by children. Discussing the typical development of children provides a basis for discussing those children diagnosed with communication or language disorders.
Young Children

It is truly amazing that despite the complexity of vocal language systems, that most children acquire language without any formal training. The development of speech and language begins at birth and is basically mastered between ages six and eight. From birth to approximately three months an infant learns to make different crying sounds to show discomfort, pain, or hunger. As early as three days it is believed that an infant can tell their mother's voice from a stranger's (DeCasper & Fifer, 1980). In addition, at approximately one month babies can tell the difference between sounds as alike as "pah" and "bah" (Eimas, Siqueland, Jusczyk, & Vigorito, 1971) and the infant is able to produce vowel sounds (Holland, 1984). By the time the child is four to six months old regular babbling occurs with many sounds being produced by the infant. During the nine to 14 month time period the child begins to combined different sounds together and starts to form words that are recognizable to others. At approximately 18 months the toddler starts to combine two words together and has a recognizable vocabulary of about 25 words. By two years to two and a half years the toddler has learned to combine words into phrases and has a usable vocabulary between 450 and 900 words. Also, the toddler is continuing to develop consonant sounds. When the child is approximately three to four years old their usable vocabulary ranges from 1,200 to 1,500 words and the child begins using pronouns and proper endings on words. A child at this age is able to use simple sentence forms and while asking a question may invert the subject and verb. Wagner (1985) stated that about age five children can use over 20,000
words in a day and by the time the child is six to eight years old, word vocabulary has increased to more than 2,600 words and at age ten a child uses a variety of sentence structures. The typical child by age eight demonstrates mastery of language.

**Preschool Children with Developmental Disabilities**

Language and communication disorders in young children are frequently very different and the differences in delays in one child often can not be used for comparison purposes with another child. Due to these differing rates and levels of language developments preschool children with delays may not seem problematic or detected until later in their school career unless their delays are more severe (Heward & Orlansky, 1995; Prizant, Wetherby, & Roberts, 1993). Children who are just learning to speak may frequently make pronunciation errors or grammatical misplacements, these errors should not be confused with language disorders (Culpepper, 1992). In addition to the typical vocal errors children make the expectations of behaviors emitted by toddlers and preschoolers is very flexible therefore detecting delays in development becomes more difficult to notice. Since the range of typical acquisition of beginning words can be between 12 and 20 months (Bates, O'Connell & Shore, 1987), significant others often do not realize there is a problem in language development until after that time period. For children with less noticeable delays frequently the differences in demands from preschool to kindergarten may make the child's delays more apparent (Bailey & Wolery, 1984). Although for individuals with more mild delays or learning disabilities it is only over time where the children are required to do
more and more tasks that the gaps between the typical child and delayed child increase. For children with more severe delays the likelihood of being diagnosed with a disability at a younger age is increased, although all too often an official diagnosis does not occur until after age three (Prizant, Wetherby, & Roberts, 1993).

Each child develops language at different rates with some children that progress quickly, others that develop at typical rates, some that develop more slowly, and some that develop in an atypical order. Specific types of language disorders vary greatly. Under these conditions it can be very difficult to detect a language delay. Therefore it is important to discuss language delays according to type of develop.

The first group are those who do not develop vocal language by age three. These children do not speak spontaneously and it is believed that they may not understand the meaning of the words that are said to them. Typically these children are much easier to classify with language delays and disorders because the severity of their language limitations.

The next group displays less extreme conditions for the child. These children display delays in the rate of language learning yet for the majority of these children language development follows a normal pattern. What is different for these children is that the rate of language acquisition is much slower than their peers. The type of future problems for a child with this type language delay may range from eventual normal language functioning to cumulative delays over time that become significant deficits.
The final group may encounter an interruption in the language learning process. This learning interruption is often related to an injury, illness, or emotional trauma. Like children who have delays in rate of language learning, the interruption of learning may have future problems that range from normal to significant.

The environment is believed to play an important role in the development of language. Some environmental conditions may promote expressive and receptive language while others may play a crucial role in punishing language efforts (Pennington, Lloyd, & Wallis, 1991). Language attempts that are punished may contribute to delayed, disorganized or the absence of language. As children begin to use speech they need to hear correct syntactical forms from adults and others around them. If a child hears poor models of language that use incorrect syntax the child will often learn to imitate those errors.

The distinction between delays and typical development can be confusing at times because errors may be misinterpreted. In general, errors in language should not be considered a problem, as errors frequently occur in the acquisition of language development (Peterson, 1987). Only when errors are not corrected over time is it appropriate to consider that a problem may exist.

The developmental history of a child may affect the development of language. The collaborative perinatal project (Lassman, Fisch, Vetter, & LaBenz, 1980) revealed that children whose mothers were under age eighteen, had many children, had a weight gain during pregnancy under
fifteen pounds, had mental retardation, or who delivered the child prematurely had a higher occurrence of speech and language disabilities. Other factors that correlate with spoken language disorders may consist of environmental deprivation, hearing impairments, emotional or behavioral disorders, mental retardation, or structural abnormalities (Chaney & Frodyma 1982).

For young children, services provided to remediate or improve communication or language disorders can be provided by home visits, a few hours a day preschool program, or supplemental services provided through the recommendation of the Individual and Family Service Plan. Individual Family Service Plans are set up to not only meet the needs of the child but to also meet the needs of the family.

**Severe Language Disabilities and Effects on Behavior**

For many years intervention programs for individuals with severe disabilities focused on reducing problem behaviors (Carr & Durand, 1985; O'Leary & O'Leary, 1977; Sulzer-Azeroff & Mayer, 1977). Few, if any, attempts were made to increase verbal repertoires or even recognized the verbal repertoire, as a possible function of some behavior problems (Carr & Durand 1985). Michael (1988) speculated that much aberrant behavior seen in individuals with severe developmental disabilities and limited verbal repertoires may be the result of inadequate manding abilities. Michael (1988) continued by stating that when mand training is completed often there is a reduction in frequency of the inappropriate behaviors.
In 1987, Hall and Sundberg successfully contrived and manipulated a blocked response conditioned establishing operation to increase manding skills of two individuals with severe disabilities. Tasks were set up by the experimenter that provided the subject with all but one targeted item to complete a task (i.e., making instant coffee or wiping a table). The procedures used either a tact prompting procedure or an imitative prompting procedure to teach the subjects to mand for specific items. During the baseline condition, on the wiping the table chain, Subject 1 did not display the appropriate mand for the “paper towel” and instead aggressed toward the experimenter. This type of response strengthens Michael’s speculations that minimal manding repertoires are linked to aberrant behavior. Drash and Tudor (1993) observed the interactions of children with verbal delays with their parents and found that disruptive or aggressive behavior often functioned as a mand for an item or activity.

Intervention programs should be designed to eliminate behavior problems and address the possible functional relationship that exists between the undesirable behaviors and lack of appropriate communication. Frequently, if the undesired behavior is not recognized as verbal behavior an intervention may be directed at only reducing the unwanted behavior, yet the problem behavior may persist, only decrease temporarily, or manifest itself in new undesirable behavior.
Types of Response Modes for Individuals with Limited Communication Abilities

The types of response modes taught to individuals with disabilities may vary greatly depending on the person's physical limitations, amount of vocal sounds consistently produced, or by what others consider appropriate for the individual. The types of response forms can range from speech as a sole mode to speech combined with a symbol book or sign language. It should be noted that speech is still the most desired form of verbal behavior, due to its obvious advantages (Sundberg, 1993). These advantages of speech include being able to easily interact with other speakers in the community, having needs met more easily, and engaging in conversation without the requirement of additional equipment or effort. Choosing the most appropriate response mode for a person with developmental disabilities continues to be dependent on the type and complexity of each individual's disability.

There are several types of alternative communication possibilities for individuals with limited verbal behavior. These alternative forms of communication can be placed in two categories according to their form, either stimulus selection-based verbal behavior or topography-based verbal behavior or a combination of both.

Some researchers have used both types of modes under antecedent conditions (i.e., total communication) to teach language to individuals with limited verbal capabilities (Schaeffer, Musil, & Kollinzas, 1980). The response forms used by the individual with disabilities may include both stimulus
selection-based verbal behavior and/or topography-based verbal behavior. These combinations are usually stated by their form. For example, if a child says and signs a response it is typically called, “signed speech.”

**Stimulus Selection-Based Verbal Behavior**

The forms of verbal behavior that are considered stimulus selection-based verbal behavior are symbol boards, picture boards and communication books, or computerized speech. Symbol boards are typically displayed on a flat area often attached to a tray, clipboard, or possibly the table on a wheelchair. The types of symbols used can vary from concrete pictures that resemble features of the item to abstract symbol forms. The most commonly used symbols used are Picture Communication Symbols (Mayer-Johnson, 1986) and Blissymbols (McDonald, 1980). Picture boards and communication books are used in a very similar manner as symbol systems. The difference in picture boards is that typically photographic pictures are used as the referent. Also, when using picture books a few pictures with a specific theme (i.e., foods, leisure activities, family members) are typically placed on one page and on another page a different group of items are displayed. Computerized speech produces sounds, specific words, or sentences when an individual presses either symbols or pictorial displays on the computer surface.

Stimulus selection-based verbal behavior provides an opportunity for individuals to select items by emitting the same physical response to different stimuli. Since the physical response is the same every time the individual is required to visually scan and then either point, touch, or grasp a picture of an
item, a word, a symbol, or a combination of the above. A child may have a book with several pictures of items on one page. The child may be asked, "what do you want?" and then the child points to a banana on the page, then the child is immediately given the banana.

A current trend in speech pathology is to teach individuals with developmental disabilities with little or no vocal verbal behavior to use stimulus selection-based verbal behavior like symbol, picture, or computerized speech to communicate to others in the community (Sundberg 1990; Sundberg & Sundberg 1990; Wraikat, Sundberg, & Michael 1991). In considering whether to use stimulus selection-based response forms it is critical to state the advantages and disadvantages.

**Advantages of stimulus selection-based verbal behavior.** The logic provided in support of this type of communication is that the listener, audience, or community will be able to interact with these individuals because symbols and pictures are easy to understand. Computerized speech or a picture board merely requires the person to point and/or push the correct button(s) while in the presence of a listener.

**Disadvantages of stimulus selection-based verbal behavior.** Sundberg and Sundberg, (1990) describe some practical limitations with stimulus selection-based verbal behavior (i.e., pointing systems). Augmentative devices may be bulky and difficult to transport limiting accessibility to the speaker. These devises also may have limited response capabilities and/or awkward symbols to represent complex actions. If the augmentative device used does not convert the required response form into a vocal response the
listener may be required to learn the correspondence of the symbol to the meaning of the symbol being used. A further requirement of the listener is that they must be within close proximity of the speaker.

Michael (1985) also provides a reason why the pointing form of verbal behavior might actually be more difficult to acquire than signing, especially as vocabulary size and complexity increase. Michael (1985) suggests that stimulus selection-based verbal behavior (e.g., pointing to a picture, pressing a board) involves two controlling variables while topography-based verbal behavior (e.g., signing) involves only one controlling variable. The controlling variables for stimulus selection-based verbal behavior are: first, the presence of a specific stimulus (i.e., a specific object, a verbal stimulus) and then that first stimulus alters the strength of second stimulus (i.e., visual scanning) to the response form (i.e., pointing, touching) which is the same physical response to different stimulus situations (Sundberg & Sundberg, 1990). For example, some picture or symbol systems use one picture or symbol for several different responses. To change the meaning of what is being said the person points to a another symbol or presses a button that changes the computer to a different level that provides different responses when the keys are pushed. Under these conditions the response of pointing or pressing a button becomes even more complicated because the person now has an additional symbol or picture to point to or press to have what they are trying to say understood by the listener.
Topography-Based Verbal Behavior

Topography-based verbal behavior is extremely different from stimulus selection-based verbal behavior. The form of verbal behavior that is most commonly linked to topography-based verbal behavior is sign language, although vocal verbal behavior or gesturing are also topography-based verbal behavior. Topography-based verbal behavior provides an opportunity for an individual to select items by using distinctively different and specific response forms for each item. When using sign language each item has a physical movement that corresponds with that item. This correspondence frequently is not point to point to the spoken word yet often resembles some quality of the item. For example, the sign for banana is completed by placing one hand in the form of the sign letter "d" with the index finger pointing, and then the other hand with the index finger and thumb touching motion from the top of the "d" hand at the index finger to the base of the index finger like something was being peeled. These physical movements resemble a person peeling a banana. This example shows the resemblance of the physical behaviors that frequently occur to peel a banana and uses the physical behaviors to label the item with the sign language sign. This sign does not have point to point correspondence with the spoken word. Circumstances where the sign language response does have point to point correspondence to the spoken word are sign language signs that contain finger spelling. If a person were to finger spell "b-a-n-a-n-a" it would have point to point correspondence to the spoken word "banana". However, with vocal verbal behavior, the physical differences are the sounds that are
made and the groupings of sounds to label or ask for objects, actions, properties, or conditions.

Michael (1985) states some major differences between stimulus selection-based verbal behavior and topography-based verbal behavior. In topography-based verbal behavior (e.g., signing), the form of the response is distinguishable from other responses and their forms. Another difference that Michael (1985) identified between topography-based verbal behavior and stimulus selection-based verbal behavior is that topography-based verbal behavior always has point to point correspondence between the response form and the response product. Michael (1985) continues:

When one speaks of the vocal muscle action and the relevant details of the auditory stimulus that results, and likewise with the writing and the use of signs and their respective visual response products. When one points at a word, picture or symbol, however, the muscle action of the pointing response has no correspondence with the important features of the selected stimulus (p. 3).

Advantages of topography-based verbal behavior. Michael (1985) suggests that topography-based verbal behavior (e.g., signing) involves only one controlling variable while stimulus selection-based verbal behavior (e.g., pointing to a picture, pressing a board) involves two controlling variables. The controlling variable for topography-based verbal behavior is the presence of a specific stimulus (i.e., a specific object, a verbal stimulus) that controls the physical response. Micheal (1985) states that since topography-
based verbal behavior has only one variable and specific stimulus controls a specific physical responses it should be much easier to learn especially as vocabulary size and complexity increase.

Disadvantages of topography-based verbal behavior. Opposition to sign language training has occurred because it requires specific training on the part of the listener whereas picture boards and computers may not. Sign language appears more difficult for the learner because each response has different hand positions and movements even though the movements frequently resemble the object or a relationship to the object.

A limitation in using sign language for individuals with limited or no verbal behavior is that when using sign language there are specific motor requirements needed for intelligible use and production of the signs (Bryen & Joyce, 1986). Required motor movements include prehension patterns (e.g., pointing the ulnar finger, wrist movement, and thumb abduction), unilateral movements (e.g., across the midline), bilateral movements (e.g., two movers), and adequate voluntary motor planning abilities (Dennis, Reichle, Williams, & Vogelsberg, 1982). For individuals with limited motor movements sign language responses may not be a reasonable option.

Another limitation of using sign language is that sign language requires the listener to have specific skills. The listener usually needs training in sign language in order to engage in a verbal episode with a speaker.

A final reason that sign language may not be encouraged, by speech therapists, is the belief that sign language not only does not promote speech development it inhibits the development of speech (Sundberg, 1990).
Sundberg (1990) provides several ways to set up training so that speech in fact can be enhanced through the use of sign language training. Sundberg begins by suggesting that individuals should be encouraged for making any sounds. Rewarding this vocal verbal behavior may create further motivation for these individuals to attempt to speak in the future. Then during training trials the individual can sign for an item or activity and then the trainer can prompt the individual to make a vocalization by modeling the response for the individual to copy so that the shaping process of appropriate vocal verbal behavior may occur. Finally, Sundberg (1990) asserts that there is a link between signing and vocal verbal behavior within the sequential ordering of the word. This sequential ordering in sign language is the same as the sequences of vocal cord movements that are used to make specific words. An example would be signing slowly "dog" while trying to say "dog" vocally.

**Total Communication/Signed Speech**

In total communication the simultaneous use of alternative forms of communication are used as an option to teach individuals with limited communication (Schaeffer, Musil, & Kollinzas, 1980). The most common response forms used in total communication are sign language and speech. Although, total communication may include a number of different types of response modes like the combination of symbol systems and sign language or synthesized speech and vocal approximations. These additional language response forms are important to recognize but, are not included in our further discussion about total communication and signed speech.
For the purposes of this paper the modality forms addressed to teach individuals with limited communication includes the simultaneous production of sign language and speech. Current literature comparing the efficacy of total communication using speech and sign language together or sign language alone training have been varied (Clarke, Remington, & Light, 1988). Total communication was found to be more effective in increasing receptive signing (Brady & Smouse, 1979) and in expressive sign training (Barrera, Lobato-Barrera, & Sulzer-Azeroff, 1980; Gaines, Leaper, Monahan, & Weickgenant, 1988). While Remington and Clarke (1983) found that there was no difference in learning between the two approaches. Remington and Light (1983) stated that the exact relationship between speech and sign language still needs to be determined.

A recent study by Kouri (1989) provided an example of total communication. A longitudinal case study with one child over an eight month period documented the transition from manual sign language to oral language production through the use of signed speech training. Forty minute sessions twice a week using a child directed treatment program with simultaneous sign and speech input were implemented. During the sessions the child was allowed to play with objects and items of her choice. The experimenter typically modeled the label of an object or an action of the object using the simultaneous response modes of sign language and speech. The subject's responses were differentiated as either an imitated response or a spontaneous response. Imitated responses occurred after the experimenter modeled the production of the word and spontaneous responses were those
that occurred prior to the experimenter model. The results demonstrated that
sign language played an important role in the subject's early verbal
development. In the discussion Kouri (1989) stated that the use of sign
language seemed to have a facilitated the onset and development of speech
acquisition. This study was consistent with previous research by Daniloff
and Shafer (1981) and Weller and Mahoney (1983). The most common
response pattern reported was the production of manual signs followed by
the use of sign language with an oral response and then finally the use of the
oral response without sign language.

**Philosophies of Language/Verbal Behavior Toward Individuals with Developmental Disabilities**

Thurman & Widerstrom (1990) provide perspective on the research of
language and its outcomes:

Language is an aspect of human development that has been the
subject of lengthy and intensive investigation. Its form and
function and the process by which it is acquired have long
been of interest to researchers. Perhaps in no other
developmental area has research produced more differences of
opinion regarding the very nature of the processes under study.
This reflects that language is not only extremely complex
structurally, but closely related to other equally complex
developmental areas, primarily cognition and socialization.
Indeed, theorists have not even been able to agree upon what
language is (p. 83).
The philosophies of language or verbal behavior on the development of children with disabilities are vastly different. Thurman and Widerstrom (1990) depict the differing views of language (e.g., the above statement) in a manner that many would agree. The most important, widely used, and relevant philosophies include cognitive and developmental, biological, linguistics, behavior analysis, naturalistic language training, and verbal behavior.

This discussion briefly describes the basic components of the cognitive and developmental, biological, and linguistic approaches however, a comprehensive literature review of them is not provided. These approaches are important to present because of their impact on how language is currently taught and due to the number of methodologies and techniques based on these philosophies. A personal observation throughout the review of the literature made it difficult to address the different approaches separately as many of them overlapped and were often described together. Frequently, the cognitive, developmental, and linguistic philosophies were described as one method or approach.

A more extensive discussion was completed for behavior analysis, naturalistic language training, and verbal behavior which are directly related to this study.

**Cognitive/Developmental**

The cognitive approach to language views language as the structure of thought and that which is controlled by an internal processing system that classifies and stores information for future use. Function or causality is given
to the internal processes and when an individual fails to produce speech the failure is attributed to the lack of internal processing ability or lack of cognitive ability. The language of humans is considered to represent a special form of abstract and symbolic thinking unlike any other form of communication by other species. This complex language form is seen as influencing how we perceive the world around us (Papalia & Olds, 1987).

Because language production involves the ability to represent things that are not present, many researchers have attempted to explain language development in terms of general cognitive development and that cognitive abilities are prerequisite to language development (Bates, 1976; Bloom, 1973, Sinclair, 1970). Other researchers believe that language and cognitive abilities develop simultaneously (Correigan, 1978; Piaget, 1968). In both cases, for the individual with delayed or immature cognitive skills the approach is to help improve or develop the cognitive abilities to improve language production.

One way that cognitive abilities have been addressed with children with developmental disabilities in the first stages of learning language has been to improve verbal routine contexts. Verbal routines are conversational contexts that may contain predictable and recognizable sequences, have a limited set of variation and have at least one turn for each speaker (Yoder & Davies, 1992; Yoder, Spruytenburg, Edwards, & Davies 1995). Examples of verbal routines may include talking about familiar picture books, talking about familiar play scenes (e.g., feeding the baby), or taking turns at a nursery rhyme. Repeating these interactions around the same picture book has been
used to develop these routines and therefore builds the needed cognitive abilities that are in turn used to improve language development.

**Biological**

The biological position states that language is innate and function is attributed to a device such as the "language acquisition device" (Chomsky, 1959, 1965, 1968). Miller (1981) elaborates that infants are born with distinctive acoustic abilities and the human auditory system does not develop these features, they are already there along with a predisposition to be interested in communication. When language is not formed in an individual, the cause may be attributed to defective neurology.

The biological view continues by stating that humans have an inborn capacity for acquiring language and learn to talk as naturally as we learn to walk. Chomsky (1965, 1968) proposes that the human brain is specifically constructed to give us this innate ability. As stated earlier, this ability to acquire language is know as the "language acquisition device". The language acquisition devise enables children to analyze the language they hear and to extract the grammatical rules, that they use to create new sentences that they have never heard before. Our brains are programmed to extract these rules; all we need is the basic experiences that will activate our innate language capacity. The evidence to support this view states that all normal children learn their native language and master complex aspects of grammar in the same age-related sequence. In addition, this view states that humans are pre programmed for language.
The biological view is not without shortcomings. It does not take into account that some learning must take place if children are to learn the rules of English opposed to another language.

An explanation to a possible reason why individuals may have language delays has been linked to the family (Lewis, 1990) although no specific genetic transmission has been traced or identified. Locke (1994) stated, "In many cases of developmental language disorders, there are demonstrated differences in the way the brain is assembled" (p. 608). Since the delays are considered to be biological in nature remediation may begin by activating the internal mechanisms (Locke, 1994). This may be done through increasing the stored utterance material if this is not accomplished the viability of the specialized capacity is believed to decline and therefore reduces the probability that relevant data to improve language may not occur.

**Linguistics**

Linguistics is the study of language that includes speech sounds, meaning, and grammar. Language is a means of communicating through spoken sounds, gestures, or sign language that express specific meaning and sentences. Complete thoughts are arranged by grammatical rules. Most often linguistics is discussed in the development of a typical person.

According to Skinner (1957), "Linguistics have recorded and analyzed speech sounds, semantic and syntactical practices, but comparisons of different languages and the tracing of historical changes have taken precedence over the study of the individual speaker" p. 4.
**Normal language development.** This model explains the sequence of development from semantics, to phonology and syntax, to pragmatics. The model begins by describing early infant language and ends with the elementary aged child. A brief description of the grammatical constructs was completed next. A phoneme is the smallest unit of a sound. English has forty-six basic speech sounds while other languages may have as few as fifteen or as many as eighty-five speech sounds. Semantics is the study of meaning and a morpheme is the smallest element of speech that has meaning. Syntax is the set of rules for structuring language. For example, in English we say, "The boy runs" not "runs the boy" or "the runs boy". Grammar is the set of rules that specifies meaning and structure.

**Atypical development.** Tyler and Sandoval (1994) conducted a study with six preschool children with moderate to severe language and phonology disorders. The study was set up to determine the effects of using a combined phonological and naturalistic approach, compared to either an isolated direct phonological or naturalistic approach (e.g., indirect narrative language). Subjects were assigned to one of three treatment conditions with two children in each group. In the direct phonology condition sessions began with an introduction of a targeted sound. Production and spontaneous practice of the training words were completed. The narrative language approach utilized a story retelling format that provided focused stimulation and language facilitation strategies such as expansion and recasting. Indirect phonological stimulation was provided through auditory incorporation of the narrative approach. The results of this study showed that both direct
phonology treatment alone and direct phonology treatment in combination with narrative language improved phonology and language. The indirect narrative language treatment only had minimal gains in language and limited positive effects on phonological skills.

Behavior Analysis

Behavior analysis over the past 40 years has provided research based studies on the effects of communication and language development for individuals with disabilities (Carr & Durand, 1985; Kaiser, Alpert, & Warren, 1987; Lovaas, 1968; Lovaas, 1977; McCook, Cipani, Madigan, & LaCampagne, 1988). Baer and Sherman (1964) were at the forefront of research development of verbal behavior by successfully using imitation training that provided information about teaching other forms of verbal behavior.

A limiting factor in this approach is that behavior analysts used operant procedures but frequently explained verbal behavior using linguistic terminology. By doing this, behaviorists have essentially ignored one of the major works of Skinner. Most of the behavioral analytic research from the 60's into the early 80's did not use Skinner's Verbal Behavior to describe the development of verbal operants (Sundberg & Partington, 1982). A possible reason for this is the complex nature of Skinner's 1957 book.

In 1977, Stremel-Campbell, Cantrell, and Halle used a delay procedure to teach moderately and severely handicapped children sign imitation and production. The students were first taught to imitate manual signs using a hand-shaping procedure as the controlling stimulus. The teacher modeled a
sign, and after systematic delays, shaped the hand of the student so that his or her hand configuration matched the teachers. After the student learned to imitate the manual sign, imitation was used as the controlling stimulus to teach appropriate sign usage. The teacher presented an object, said "What is this?" then after a specified delay interval the teacher modeled the sign and vocally stated the object's name. The manual sign and vocal verbal name were paired throughout training. The results showed that all students acquired sign language usage with the use of the delay procedure and a majority of the students began to pair speech with their sign usage midway through training. This study did not start out to show that speech production would be increased through the use of vocal and sign language training, yet the outcome results showed that vocalizations did increase for a majority of the subjects.

In the MacFarland-Smith, Schuster, and Stevens (1993) study, three preschoolers with developmental disabilities were taught to use expressive language to label objects. Sessions were held two times a day either two or three days a week in a one to one setting. The maximum length of any given session was five minutes. A multiple probe design across behaviors was used. During training sessions the teacher simultaneously delivered a task direction and the controlling prompt (e.g., "What is this? Apple"). If the child correctly labeled the item within four seconds of the prompt verbal praise was provided. If the child responded incorrectly or did not respond within the four seconds, the teacher re-stated the prompt requiring the student to repeat the correct label. Full probe and daily probe sessions were used prior to
training sessions each day. During the probe sessions the controlling prompt was not provided. The results demonstrated that simultaneous prompting procedures were effective in teaching expressive labels to the children with the results maintaining over time. In this study specific information about the type of consequence provided during probe sessions was unclear. It could not be determined whether a correct response during probe sessions would gain the child access to an item or if verbal praise was the only consequence.

**Naturalistic Language Training Methods**

Naturalistic language training focuses on communication that occurs in everyday settings. The environment is purposefully organized to facilitate language and to teach the child to use language in a functional way (Hart & Risley, 1968; 1980). The strategies referred to as naturalistic are typically used by trained adults within the classroom, playground, or anywhere children are involved in activities. The exchanges between adults and the child are frequently brief and occur at a variety of times during the day such as freeplay or snack, allowing more frequent opportunities for the child to practice or learn new language skills. The historical beginnings of naturalistic and what is also called milieu language training began with the work of Hart and Risley in 1968. Their beginning research focused on the effects of incidental teaching on low income students. The strategies Hart and Risley (1975; 1982) set up were designed to give the child many opportunities to practice their communication skills with an adult through frequent interactions that naturally occurred in an unstructured setting such as snack, free time, transition time, etc.
The three language training techniques described below may also be considered milieu teaching strategies. There are approximately five similar features of these naturalistic language training techniques. First, teaching occurs following the child's interest or lead. In the mand-model the child provides the interest and the adult initiates the conversation, while the other strategies provide the child with an opportunity to initiate (i.e., time-delay) or require the child to initiate the communication in some way (i.e., incidental teaching). Second, many opportunities to communicate what naturally occurs in the environment are used to teach simple and elaborate language forms. Third, the child's response of language is prompted if they do not respond or do not respond correctly. Fourth, the consequences for the child's responses are associated with the context under which the teaching occurs. Finally, the teaching episode is embedded in ongoing interactions between the teacher and the student (Kaiser et al, 1987).

**Incidental teaching.** Incidental teaching research began with Hart and Risley in 1968 and they have continued to provide leadership through their research on this topic over the years (Hart & Risley, 1968; 1974; 1975; 1980; 1982). The components of incidental teaching are as follows. Training begins when the environment is set up in a way that facilitates the child's interest in an object, activities, etc. Then, the child must initiate some communication. This communication does not necessarily need to be spoken. An example might be a child who is having difficulty getting his or her coat on or a child who is reaching for an object that is out of reach. In many circumstances the child does make some vocal or signing behavior. Third,
once the child initiates the conversation the adult then becomes responsive to the child and what he/she is doing. A frequent comment the adult may make is "that's interesting" or "tell me what you are doing". If the adult is uncertain of what the child is communicating the adult may ask for verification of the topic. Next, the adult asks a question to the child about the topic that has been established. The adult then waits for a few seconds to give the child an opportunity to respond. If the child responds minimally or incorrectly to the question presented the adult then models the correct response and then repeats the question. The type of response expected from the child will vary. Some children may be only expected to emit one word to obtain an object, while others who have used partial or full sentences in the past may be asked to elaborate by the adult (e.g., "tell me in a sentence"). If the child makes an elaborated response the child is given access to the item or activity and praised for communicating with the adult. If the child still does not respond or responds incorrectly the adult may state an appropriate response and another question pertaining the topic. If the child does not respond or does not respond correctly after two or three attempts the child is then given access to the item or object. The training trials are keep brief and are presented in a natural environment so that the child will frequently be involved. People working with the child are varied as well as the settings to prompt the child to communicate in a changing environment.

Mand model. The mand model (Warren, McQuarter, & Rogers-Warren, 1984) has some similar components to incidental teaching. The mand-model was developed to teach the child to respond to questions asked by others.
This is the only naturalistic technique where the adult initiates the communication. The adult sets up the environment with something of interest to the child to increase the probability to facilitate communication. When the child and adult jointly attend to a particular item or activity or the adult notices the child attending to a particular object the adult begins by asking a question to the child, (i.e., "Tell what that is?", or "What do you want?"). If the child responds minimally or incorrectly then the adult models the response and asks the question again. If the child responds by naming the object the adult praises the child for appropriate communication or language usage and provides the object or item to the child. Children who have very limited skills may only be required to make a vocalization to obtain the item at hand. A child with more sophisticated skills may be required to name the item or provide an elaborated response stating the name of the object and a property of the object (i.e., red ball).

**Progressive time-delay response prompts procedure.** The “time-delay” procedure (Charlop, Schreibman, & Thibodeau 1985; Halle, Baer, & Spradlin, 1981; Halle, Marshall, & Spradlin, 1979) has some similar components to incidental teaching and the mand-model. When using the time delay procedures, begin by having the adult set up the environment to facilitate communication and items that will be of some interest of the child. When the child and adult jointly attend to a particular item or activity the adult then will wait for a specified amount of time usually between 10 to 30 seconds to give the child an opportunity to communicate. If the child responds minimally or incorrectly to the item or activity presented the adult
models the correct response asks a question to help initiate the correct response and then waits the specified amount of time. If the child does not respond or responds incorrectly after two or three trials then the adult gives the child access to the item or activity. If the child responds correctly the adult praises the child for appropriate language usage and provides the object or item to the child immediately.

**Impact of naturalistic language techniques.** There are several advantages to using naturalistic language training which provides instruction in the natural environment. Because training is done in the natural environment the problems of transferring stimulus control from training sessions to the natural environment are decreased. Training provided in this manner enhances the possibility for generalization across settings. Next, generalization across persons is also likely to occur since many different people will be involved in training and facilitating the child at different times. Another advantage is that training is functional because the child is communicating about people, places, events, objects etc. that are common to the her/his environment and/or routine. The environment has been purposely set up with common items and activities that the child will come in contact with in other settings so that there are increased probability of usage of communication with each additional contact. In addition, by teaching functional communication skills this increases the probability of maintaining the language skills taught. Finally, maintenance is also enhanced because performance in the natural environment can be naturally and functionally reinforced. This may eliminate the need to program for generalization using
contrived situations and reinforcers that are frequently used in structured training sessions (Halle, Alpert, & Anderson, 1984).

**Skinner's Verbal Behavior**

Skinner's analysis of verbal behavior is extremely different from what is traditionally taught concerning language development. Skinner (1957) defines verbal behavior as a unique type of behavior because reinforcement is mediated through another person specifically trained to do so. Skinner (1957) continues by stating that verbal behavior may have different forms, modes, or medium and can include any movement capable of affecting another organism. Skinner views verbal behavior as learned behavior controlled by environmental events such as discriminative stimuli, consequences, and motivational factors (i.e., establishing operations) (Sundberg, 1990). Skinner (1957) purports that a satisfactory functional or causal explanation for verbal behavior is lacking:

> Together with other disciplines concerned with verbal behavior, psychology has collected facts and sometimes put them in convenient order, but in this welter of material it has failed to demonstrate the significant relations which are the heart of a scientific account. For reasons which, in retrospect, are not too difficult to discover, it has been occupied by certain fictional causes which psychology has been slow in disavowing. (p. 5)

Skinner rejects the view of most psychologists that language development or verbal behavior is controlled by a person's cognitive processing or to events taking place inside the organism's mind. In addition, Skinner rejects
Chomsky's view that verbal behavior is inherited. When working with individuals with little or no verbal behavior, Skinner's view that verbal behavior is learned has its advantages. If verbal behavior is a learned behavior controlled by historical and environmental variables, then teaching verbal behavior can be possible through the manipulation of the controlling variables. This is by no means an easy task yet, it does provide optimism and opportunities for research and development to teach individuals that may seem to others as unteachable.

Instead of using linguistic terminology Skinner (1957) describes the basic verbal operants as echoics, mands, tacts, intraverbals, and textuals. Michael (1982) revises Skinner's work and changes the groups echoics and textuals which are limited, to duplices and codics. The five verbal operants that will be discussed further are duplices, codics, intraverbals, mands, and tacts, with detailed information about mands and tacts.

A duplic is a verbal operant whose controlling variable is a prior verbal stimulus that has point to point correspondence and formal similarity. Point to point correspondence is when the stimulus and response product have the same form. Formal similarity is when the stimulus and response product are in the same sense mode and physically resemble each other. In this class of verbal operants Skinner (1957) described the echoic and copying a text which would be in the duplic category.

A codic is a verbal operant whose controlling variable is a prior non verbal stimulus that has point to point correspondence but does not have
formal similarity. There are many types of codic behavior, taking dictation, reading out loud, Braille, finger spelling, spelling tests, and so forth.

An intraverbal is a verbal operant whose controlling variable is a prior verbal stimulus that does not have point to point correspondence and the reinforcement variables are facilitative. An intraverbal would occur when the teacher says, "state the days of the week", "Class" and the students respond by saying, "Sunday, Monday, Tuesday, ...," when the class is finished responding the teacher says, "that's right class." This could be classified as an intraverbal episode.

A mand is a verbal operant where a particular response form is reinforced by a characteristic consequence and is under the functional control of the establishing operation relevant to that consequence (Michael, 1988). This definition has been refined from the definition Skinner provides in his (1957) book Verbal Behavior that limited the mand to conditions under the functional control of deprivation or aversive conditions. The most important defining characteristic of the mand is the establishing operation. Keller and Schoenfeld (1950) introduced this term as a variable that momentarily establishes the reinforcing effectiveness of some other object or event. The term establishing operation can refer to any operation that has this effect and is not limited to deprivation or aversive conditions. The mand is also the only verbal operant that specifies its reinforcer and the verbal episode benefits the speaker.

An example of a mand: John is in the living room with his father, Carl. John has not had anything to drink in a long period of time and really wants
some juice. John says, "Can I have some juice, Dad?" (i.e., a soft mand) immediately, the father goes to the kitchen and returns moments later with a cup of juice and hands it to John. John says, "thanks Dad," then the father replies, "your welcome, and remember to be careful so you don't spill."

A tact is a verbal operant whose response form is controlled by a prior non verbal stimulus (Michael, 1982). The effect of the establishing operation on the form of the response is minimal due to the fact that the reinforcement of the tact is frequently a generalized conditioned reinforcer (e.g., social consequences, tokens, tickets, money). Skinner called this type of reinforcement facilitative.

An example of a tact: I am sitting with my mother on the front porch and a dog walks by, I see the dog then I say "dog." My mother hears me say, “dog” and then my mother says, “yes, that’s a dog.” In other words, tacting is naming environmental conditions, in this case a dog.

Although there is a temptation to use simpler terms to describe the tact as labeling or describing Skinner warns against this (Skinner, 1957). Skinner's warning against using the alternative terms for the tact is because the focus is taken away from the behavior and is placed on the object.

Since verbal behavior episodes which occur in daily life are frequently not separate according to classification type (i.e., mand, tact, intraverbal, codic, or duplic) the study of verbal behavior can be extremely complicated. Carroll and Hesse (1987) stated that multiple control contributes to the complexity and adeptness of verbal behavior yet often makes the analysis of
the controlling variables very difficult. Skinner (1957) discussed multiple variables in the impure tact by stating:

Under carefully generalized reinforcement, the type of verbal operant called the tact approaches the condition in which its form is determined by only one variable. But insofar as the response is likely to have a special effect upon the listener, it varies in strength with the states of deprivation or aversive stimulation associated with that effect (p. 234).

There can be many types of impure verbal operants having multiple variables or causation. A tact may have two controlling variables. The two controlling variables might be a prior non verbal stimulus (i.e., tact component) and an establishing operation (i.e., a mand component). An example of a impure tact with two controlling variables is provided. Aaron goes into the kitchen at breakfast time because he hasn’t eaten (i.e., mand component) and after he gets into the kitchen he sees a cinnamon role on the counter (i.e., tact component) due the conditions presented Aaron says, “cinnamon bun” to his mother. In this case the response, cinnamon bun, is neither a pure mand or a pure tact because of the two possible controlling variables and therefore is considered to be a combination of the mand and the tact. The consequence for the vocal verbal response could also contain two controlling variables. If Aaron’s mother then said, “yes, that’s right”(i.e., tact component) and then gave Aaron part of the cinnamon bun (i.e., mand
component) the consequence provided generalized conditioned reinforcement and specified reinforcement to the speaker.

Skinner (1957) described the verbal operants in this way because he believed that traditional views provided a limited view and explanation of verbal behavior. In Skinner's (1957) book *Verbal Behavior*, he provides a different way of addressing deficits in verbal behavior by addressing verbal behavior like all other behaviors, as being learned. Because of this view, Skinner rejects the common views that verbal behavior occurs because of a cognitive processing system or an innate language acquisition device. Although Skinner's (1957) book was not based on formal scientific research the system of classification on verbal operants lends itself to research that aims to manipulate variables in the search of causal variables that would eventually provide information that would allow researchers to predict and control specific episodes of verbal behavior (Carroll & Hesse, 1987).

Research based on the principles of behavior (Skinner, 1953) and verbal behavior (Skinner, 1957) should be sought out to address the issues of prediction and control that could provide support for Skinner's views.

**Verbal Behavior Research**

This section discusses current research that focuses on the use of Skinner's (1957) book, *Verbal Behavior*, to implement and explain the results of their research.
Teaching Mand by Manipulating Conditioned Establishing Operations

The basic component of this study by Hall and Sundberg (1987) was to ascertain whether teaching sign language response as a tact would lead to the same signed response being emitted under mand conditions.

Two students between the ages of 16 and 17 years old diagnosed with a profound hearing deficit and severe mental impairment were chosen to participated in the study due to their low rates of manding. Although the students had a minimal mand repertoire, both students had an extensive tact repertoire. A multiple baseline across subjects and behaviors with a multielement component was employed. Prior to the implementation of the study pre-training sessions occurred to make sure that the students were able to perform the prerequisite skills for the specified tasks in the study at 100% accuracy for two consecutive days. These skills ensured that the students were able to initiate the first action for each object that would be trained later as a mand. The basic tasks for the students were making instant soup, opening a can of fruit, wiping water spilled on a table, operating a vending machine, making instant coffee or coloring a large picture.

Mand probes were used as baseline measures. During these probes the students were presented with all but one of the needed items to complete the task. The trainer then signed the specific discriminative stimulus to begin the task.

A tact prompt and an imitative prompt were used the teach the appropriate responses. Of the four mands two were taught using the tact prompt and two were taught using the imitative prompt. The tact prompt
occurred in the same manner as the baseline probes. In addition, if a student did not mand the correct item, the trainer presented the missing item and signed, "What that?" and the student tacted the item. If the correct sign did not occur then the trainer modeled the correct sign language response and asked the question again. After the item was tacted correctly it was left in sight of the student and the trainer signed, "What you want?" if the correct response did not occur the trainer again modeled the correct response and again stated the question. These procedures were repeated until a correct response occurred. At this point all of the items were removed for approximately five seconds. At the end of that time period all items except for the targeted item were represented. If a correct mand occurred without prompting the student was reinforced with the missing item. The imitative prompt procedure differed from the tact procedure in that instead of presenting the missing item after an incorrect or non-response within 10 seconds after the prompt, "What that?" the trainer signed, "Do this!" and then the trainer modeled the correct sign language response. If the correct response occurred the trainer presented the next step, "What you want?" If not the trainer physically prompted the correct response and then continued the general procedures.

The results of this study attest that manding for missing items can be trained using contrived conditions, where the trainer produces the situations and conditions that training occurs. Furthermore, the results showed that it was necessary to provide mand training to obtain consistent mand responses.
Differences in the effectiveness of the tact prompt and imitative prompt were about the same throughout the study.

**Mand and Tact Training on the Acquisition of Tacts**

In 1987, Carroll and Hesse completed a study that compared the effects of alternating mand and tact training in order to record the number of training trials necessary to teach new verbal responses to normal children. Six children ranging in age from three years old to four years and two months old participated in the study.

Each subject was placed in the four training groups within two phases. In each phase contained a tact only and a mand-tact training condition. The first phase contained fairly easy names of a specific toy part, while in phase two the names of the toy part was more difficult. The words in phase two were made more difficult by using unknown words that had no relation to the toy part. Also, during phase one tact and mand-tact training did not occur at the same time. Subjects had to complete all of the parts under one condition before moving on to the next condition. Subjects 1-3 were trained on the tact only first and subjects 4-6 were trained with the mand-tact condition first. In phase two the tact and mand-tact training occurred within the same sessions.

Tact training consisted of the experimenter placing a toy part on a table in front of the subject and saying, “This is a (name of item). What is this?” If the child made a correct response the experimenter praised the subject and in the event of an incorrect response the experimenter repeated the name of the toy part and the statement, “What is this?” If the student
still did not get the correct response the experimenter provided vocal verbal prompts of the sounds or syllables within the word. After the correct response occurred the experimenter presented other commands to create a period of time between the next trial. These other commands were also used to match the time span that occurred during the mand-tact trials which were a little longer. Each trials began with the presentation of the toy part and the prompt and ended with the child's correct response.

During mand-tact training mand and tact trials were alternated. The first trial for each toy part began with mand training. The procedures for mand training began with the experimenter displaying unassembled parts of a toy on the table with the exception of the toy part to be trained. The experimenter then said, "Make a (name of the toy)." The subjects were unable to complete the task unless they asked for the missing part. At the point where the subjects we unable to finish putting the toy together without the part the experimenter said, "(name of the toy part)" and when the subject repeated the name the experimenter gave the toy part to the child. The second trial was a tact trial and procedures were the same as described earlier.

All of the subjects in this study learned tacts more effectively under the mand-tact training procedure than with the tact only procedure. In addition, fewer trials were needed to meet criteria during the mand-tact training. Due to the differences in the training conditions, it appears that less training trials were needed for both the mand and tact repertoires when training was combined. In addition, the mand training procedure was effective at creating the establishing operation for the missing item (i.e., the
toy part). Although this study was done with typically developing children it may also be effective at teaching verbal behavior to children with developmental disabilities and further research is warranted.

**Specific Versus Non Specific Reinforcement on Verbal Behavior**

Braam and Sundberg (1991) conducted research on the effects of specific versus nonspecific reinforcement on verbal behavior. In this study a within-subject and between subject design was used with eight subjects. The eight subjects ranging in age from 18 to 24 years old were essentially non-verbal.

Subjects were then matched and assigned to a treatment group according to their age and functioning level. Reinforcer sampling was completed to prioritize and rank each subject's deprivation/satiation level for each reinforcer. From the rank ordered list half of the nonspecific reinforcement subjects were trained with the item that ranked first on the list (e.g., cookie) and reinforced with the ninth ranked item (e.g., popcorn). One half of the specific reinforcement subjects were trained with the same first item on the list (e.g., cookie) and reinforced with the same item (e.g., cookie). The other two halves were set up in the same manner.

The training sessions the experimenter placed a piece of food on a paper plate on a colored mat. The experimenter prompted the subject to look at the plate by pointing to it. After the subject looked at the food the experimenter said, “What is this?” If the subject signed the correct response within five seconds after the verbal stimulus, “What is this?” the experimenter praised the subject and gave them food. In the specific
reinforcement condition, immediately following a correct tact subjects were given the specific type of food item that had been used during training. In the non specific reinforcement condition, immediately following a correct response, subjects were given a different food item than what was used during training. For incorrect responses or no responding a graduated prompting procedure was used. The first was a model of the correct response and second was the experimenter helped the subject sign the correct response. On each of these prompted procedures the training stimulus was represented each time. Post training probe sessions also occurred to measure the resistance to extinction of the previously reinforced responses.

This study found no significant difference in the rate of acquisition or the resistance to extinction for the tacts learned with either condition. Although, a difference was found in the occurrence of mand compliance following specific reinforcement tact training.

**Teaching Intraverbal Behavior to Preschool Children**

In 1993, Partington and Bailey, conducted two experiments. The first experiment used a multiple probe design with typically developing children to determine whether training a response under one type of verbal operant (i.e., the tact) would transfer to another type of verbal operant (i.e., the intraverbal). The second experiment used the results of the first experiment to extend the research and to examine the effects of teaching a second tacting response that included tacting the class of each item. This was done to see if this second tact would have any effects on the acquisition of the intraverbal responses.
In the first experiment, the experimenters taught four pre-school children to tact a set of Peabody picture cards. Prior to tact training and six weeks after training, an intraverbal probe was completed. During probe sessions the same four verbal stimuli were presented and verbal responses were not reinforced. Following the first probe session tact training was begun. Tact training was finished when each subject could correctly tact 95% of the cards without an echoic prompt on two consecutive training sessions. Intraverbal training consisted of transfer stimulus control from a non-verbal stimulus to a verbal stimulus. This was completed by providing the verbal stimuli with praise after each response and a prompt to provide another response. Whenever a child was unable to emit five correct responses or made an incorrect response, the experimenter provided a prompt using the non-verbal stimuli. The results of experiment one showed that tact and intraverbal responses are separate verbal operants. Intraverbal responses did not occur at consistent rates until after intraverbal training had been implemented.

In experiment two, four different children were taught to tact the 20 picture cards. The same procedures used in experiment one were used for this experiment, except that multiple tact training was added. Multiple tact training taught the children to tact the class that each of the items were a member, in addition to tacting the specific item. The results showed that after training two types of tacting repertoires that two children were able to increase intraverbal responses, while the two other children did not.
This dissertation used the progressive time delay response prompts procedure to compare the effects of vocal training alone and vocal plus sign language training on the development of vocal verbal tacts and mands of preschool children with minimal vocal verbal repertoires.
CHAPTER III
METHODS

Setting/Subjects

This study was completed in a university operated educational program for pre-school students with and without developmental disabilities. The study was conducted in two separate classrooms at the university affiliated preschool. All sessions, including generalization probes and follow-up were completed in each child's classroom (see Figure 1).

Students were recommended for the study by their teachers, based on their limited vocal communication. An initial subject selection assessment was used to determine eligibility for the study (see Appendix A). A total of nine preschool aged children between the ages of two years and three months and four years and ten months were given the initial subject selection assessment. The criterion to be included in the initial subject selection assessment was based on teacher referral (e.g., based on limited vocal communication) and parent approval. The experimenter sent a letter to the parents explaining the project and obtained parental permission (see Appendix B) allowing their child to be given the initial subject selection assessment and to participate in the study if the eligibility criterion was
Figure 1. Classroom arrangements for Katie and Melinda.
achieved during the initial subject selection assessment. Of the nine children tested, five were female and four were male. The children had to meet all of the requirements stated in the method section describing the initial subject selection assessment to be included in the study. Six of the children assessed were found to be ineligible for the study, two were eliminated due to exceeding the limit required on the number of vocal verbal words stated, one was eliminated due to limited manual dexterity, and three were eliminated due to compliance issues and not following one step directions.

After completion of the initial subject selection assessment, three children were selected for the study. However, due to the erratic pattern of attendance one child was unable to complete the study. This third child was absent for 19 of the 49 sessions due to several illnesses. The absences occurred every few days. To illustrate, this child would be at school for two days and then miss one day. On other occasions the child would be at school for a week and then the child would be gone the next week.

Two children with limited communication skills ranging in age from two years ten months to three years and five months participated in the study (see Table 1). The two children were considered limited in communication due to the fact that they vocally emitted less than twenty words prior to beginning the study. Both children were able to emit at least one vocal verbal word prior to the beginning of the study. Both children, Katie and Melinda, were female. Katie had the most limited vocal verbal repertoire and only vocalized one word during the initial subject selection assessment.
<table>
<thead>
<tr>
<th>Child</th>
<th>Age</th>
<th>Diagnosis</th>
<th>ECE(^a)</th>
<th>Additional Services</th>
<th>Sign Language(^b)</th>
<th>Vocal Words(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katie</td>
<td>3 years 5 months</td>
<td>Mild CP Language Delays</td>
<td>2 years</td>
<td>Private Speech Therapy In School Speech Services In School Physical Therapy</td>
<td>more, eat, dog, open, and me</td>
<td>this</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melinda</td>
<td>2 years 11 months</td>
<td>Down Syndrome</td>
<td>2 1/2 years</td>
<td>In School Speech Services In School Physical Therapy</td>
<td>more, play, drink, and eat</td>
<td>no, yes, dude, Daddy, ball, Mommy, Amy, off, Megan, Ashley, pop, Matthew, juice, Laura, cracker, okay, eat</td>
</tr>
</tbody>
</table>

\(^a\) Represents how long each child has received Early Childhood Education services.

\(^b\) Represents sign language signs used at least one time per day for Katie and a minimum of one time per week for Melinda.

\(^c\) Represents vocal words each child has said in the presence of others at least one time.
Katie

Katie was three years and five months at the beginning of the study. At birth Katie was not considered high risk and there were no complications during the pregnancy or delivery. Her parents reported concern about Katie's development after she was a year old. Katie was taken to the Cleveland Clinic where a diagnosis of very mild CP was suggested in 1993. Katie began an early intervention program in May of 1993. On February 21, 1995 Katie was diagnosed with a severe receptive and expressive language disorder from the Columbus Speech and Hearing Center. As reported on Katie's current IEP her current level of functioning is as follows. For the domain of cognitive development, Katie is able receptively locate 6 or more body parts, can match simple shapes (i.e., circle square, triangle), completes a four piece puzzle, paints or draws with in limits of paper, and demonstrates use of objects. In the self-help domain, Katie cooperates during diapering, sits on the toilet, attempts to pull pants up when prompted, helps to wash hands. In the language domain, Katie receptively understands and frequently complies to simple directions. In expressive language, Katie makes vowel-like sounds to verbalize, has 20 or more signs although she only uses a few spontaneously, and has good eye contact. Language goals for Katie are to increase the number of sign language signs she uses, encourage sign usage in a functional and spontaneous manner, and to increase vocalizations to accompany signs.

It is important to note that prior to the language study training Katie received private speech therapy two times a week on, Tuesdays and
Thursdays, for 30 minutes. This speech therapy continued throughout the entire language study. It is believed that the private therapy neither benefited nor hindered Katie’s results in the language training study. This is believed because the speech therapist and parents did not know about the specifics of the language study. Katie’s parents reported that the speech therapist made few sign language or vocal gains with Katie during the time that overlapped with the language study. An updated report on June 8, 1995 from Columbus Speech and Hearing Center provides information about Katie’s progress for the past five months. Four of the five goals addressed are relevant to this study. The first goal stated that Katie would attempt to imitate signed or verbalized single-words with adult prompts as necessary approximately 75% of all trials. This goal was considered completed with the provision that the use of gestural, verbal, and physical prompts were provided to Katie. Progress on the second goal stated that Katie used eye contact and waved during greetings and closings at 75% accuracy using adult cues. Goal three was set to increase Katie’s attention span and to have her complete activities approximately 75% of the time using adult prompts. This goal was still considered in progress with activities completed 50% of the time with prompts. The fourth goal was to increase Katie’s incentive to communicate, (i.e., request specific items) by expecting approximated verbalizations and/or signs used before acquiring desired or specific items. This goal was considered in progress. This report also included an updated phonetic inventory that included the following sounds: /b/, /d/, “j,” /s/, sh, /k/ and /m/.
Melinda

Melinda was two years and eleven months at the beginning of the initial assessment. Melinda was diagnosed with down syndrome at birth and her parents were referred to the Franklin County Mental Retardation and Developmental Disabilities agency when Melinda was three months old. Shortly thereafter Melinda and her family received home based services and were involved in the infant/toddler program. Melinda’s primary medical concern during this time was frequent respiratory infections. In May of 1993 Melinda was reported as having a mild hearing loss. This information was documented an Early Childhood Education (ECE) Evaluation completed in August of 1993. Melinda began attending an ECE program in September of 1993.

A communication assessment was given to Melinda in October 1994. Several types of measures were taken including a teacher conference, observation, and MacDonald’s SCS. The results provided information in five categories, receptive, expressive, social interactions, oral motor skills, and augmentative communication. Melinda’s receptive skills were reported as being able to follow the class routine and follows one and two step directions as long as the steeps are related. Melinda also has the ability to receptively respond to communication words and identify pictures when they are named. Expressively Melinda communicates using sign language along with vocalizations. The vocal responses are limited in variety although Melinda will attempt to imitate if provided with a model. Melinda’s social interactions include making and keeping good eye contact, initiating interactions with
others although interactions are frequently brief, and responding to prompts to maintain interactions. Melinda’s has low oral motor tone. It was recommended that an alternative form of communication for Melinda be the use of sign language.

On staff at the preschool was a speech therapist. The speech therapist provided informal services to students while they were engaged in particular activities within the confines of the preschool, mostly in the classroom. Individual speech therapy sessions in a separate room from the teacher and other children did not occur.

**Initial Subject Selection Assessment**

Children were selected to participate in the study based on the following six qualities. The initial subject selection assessment covered the following skills: (a) communication history, including information on vocalizations, sign language usage, and gestures used to obtain specified items; (b) history of items frequently used by the child (e.g., a ball, a truck, a blanket, an apple). The children needed to have at least 4 objects that they played with or would take from others when offered to them; (c) manual dexterity, the specified physical movements and hand positions (e.g., point index finger, make hands into a fist, curve hand into a cup shape) the child would be required to make and maintain for a minimum of three seconds; (d) imitative behavior, physical movements the child emitted within six seconds after the experimenter had emitted the same behavior (e.g., raise both hands above head, clap, open and close hands) along with the vocal verbal stimuli, "Do this"; (e) one step directions, the physical behavior the child emitted
within six seconds after the vocal stimuli (e.g., "Look at me", "Stand up", "Come here") provided by the experimenter. These one step responses were needed to insure that the child had a few very basic skills under instructional control and would attend to the experimenter during the implementation of the study; and (f) echoic responses, the vocal sounds the child would emit within six seconds of the experimenter stimuli (e.g., /a/, /e/, /u/, /bl/, /kd/, /vl/, /p/).

This section used a modified version of Sundberg's (1987) echoic evaluation form (p. 127). The initial subject selection assessment can be found in Appendix A. The modifications of Sundberg's echoic evaluation form include omitting the presentation of an entire word to the children.

**Communication and Item History**

Information on communication history and the item history (i.e., frequent play with an item) was obtained by observing the child, as well as by teacher and parent report. Any sign language usage that was reported by parent or teacher to occur accurately on the average of at least one time per day by the child was considered as a known sign language response. Any word vocalization that the child stated at least once in the presence of another person was considered known by the standards of this study.

When the teacher or parent reported that an item was frequently (i.e., at least one time per day) used or played with by the child, the item was considered to be a potential reinforcer even though the child's use of the item may have been atypical in manner. For example, the child may have used a plastic bowl to spin on the floor rather than using it for scooping sand or for putting other
items in it. The child had to have at least four items that were potential reinforcers to be eligible for the study.

**Manual Dexterity and Imitative Behavior**

Information on manual dexterity, imitative behavior, one step directions, and echoic responses were obtained by completing individual assessments in each area.

**Manual dexterity.** Each subject's manual dexterity was tested to make sure they were able to form a minimal number of specific hand and body movements needed to form basic sign language signs. The experimenter first formed the physical movement to provide an example to the child and stated, "Do this". If the child did not make the same physical movement as the experimenter within ten seconds the experimenter repeated the physical movement and the vocal statement, "Do this," if the child still did not respond with the correct physical movement the experimenter attempted to manipulate the child's movements so the required physical or hand movement was made. Once the physical movement had been established the child was required to hold the physical movement for a minimum of three seconds without any help from the experimenter. Each child was required to make four of the six hand positions.

**Imitative behavior.** Imitative behavior was assessed in a similar manner as manual dexterity. The experimenter first performed the physical movement to provide an example to the child and stated, "Do this". If the child did not make the same physical movement as the experimenter within six seconds the experimenter repeated the physical movement and the vocal statement, "Do
this," if the child still did not respond with the correct physical movement within six seconds the experimenter recorded the imitation as incorrect. Each child was required to make four of the six imitative behaviors in this section.

**One Step Directions and Echoic Responses**

The one step directions and the echoic behaviors were assessed differently than those in the two previous sections. The experimenter measured these behaviors by only providing a vocal stimuli to the child. As in the imitative behavior section, the child was given six seconds after the experimenter's vocal stimuli to respond appropriately to the one step direction or the echoic stimuli. Each child was required to follow four of the six one step directions, but no requirement for the number of echoic responses needed was set. In each case, the child was provided with the presentation of the stimuli twice if needed in order to respond to the experimenter.

Students who did not meet the requirements outlined in the initial subject selection were eliminated from this study. Once the initial subject selection was completed qualified students were assessed on targeted words to insure the children did not know the correct sign language or vocal response to the words used in the study.

**Experimenter and Observers**

The experimenter is a third year doctoral candidate majoring in Special Education with an emphasis in Applied Behavior Analysis, at The Ohio State University. The experimenter provided the instruction for all sessions to the children during the study.
There were four observers that collected data during the study. The primary observer was a first year doctoral student in the Special Education and Applied Behavior Analysis program. The secondary observers were three undergraduate students. The first secondary observer was an undergraduate student in the teacher certification program for Special Education at The Ohio State University, the second observer was an undergraduate student admitted to the M.Ed. program at The Ohio State University in Special Education, and the third observer was an undergraduate with an undeclared major at The Ohio State University.

Definition and Measurement of the Dependent Variables

There were two dependent variables the single word utterances (vocal) and sign language responses emitted by each child in a tact (impure form) and mand situation. Each item in the tact and mand training had 7 trials per session, to insure the exposure to the independent variable was the same.

Single Word Utterances

For the vocal alone training, the critical stimulus presentation for the tact was, "What is this" in the presence of the target object. If the child stated the correct vocal verbal response, a recognizable or a specified approximation (see Table 2 and Table 3) the experimenter gave the object to the child for approximately sixty seconds as a consequence. The dependent variable was recorded in two different categories either correct responses and error responses. Correct responses were recorded when the child emitted a vocal and/or sign response that correctly correlated to the stimulus conditions and occurred either before or after the delay prompt within the specific time
Table 2

Acceptable Word Approximations For Katie

<table>
<thead>
<tr>
<th>Word</th>
<th>Acceptable Approximations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen</td>
<td>pe, dem, pem, dim, pim, din, pin, den</td>
</tr>
<tr>
<td>Book</td>
<td>boo, boc, bok</td>
</tr>
<tr>
<td>Muffin</td>
<td>mu-in, mupin, muf, muddin, mutin, ma-in, mu-im</td>
</tr>
<tr>
<td>Cereal</td>
<td>cere, sere, cerel, serel, sire, cera, cerea, serea, sereal</td>
</tr>
<tr>
<td>Mirror</td>
<td>mer, mir, merr, mirr, merrer</td>
</tr>
<tr>
<td>Piano</td>
<td>dano, dino, deano, pamo, peamo, pano, pino, peano</td>
</tr>
<tr>
<td>Banana</td>
<td>nana, bama, bana, anana, amama</td>
</tr>
<tr>
<td>Ball</td>
<td>baa, baal</td>
</tr>
</tbody>
</table>

Table 3

Acceptable Word Approximations For Melinda

<table>
<thead>
<tr>
<th>Word</th>
<th>Acceptable Approximations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen</td>
<td>den, pem, pim, pin, pchen</td>
</tr>
<tr>
<td>Book</td>
<td>boc, bok</td>
</tr>
<tr>
<td>Mirror</td>
<td>merr, mirr, mirer, merrer</td>
</tr>
<tr>
<td>Cookie</td>
<td>ooki, ookie, cooke, cooki, coo-e</td>
</tr>
<tr>
<td>Piano</td>
<td>dano, dino, diano, pano, pino, peano</td>
</tr>
<tr>
<td>Pretzel</td>
<td>drezel, prezel, dresel, presel, perzel, dretzel</td>
</tr>
<tr>
<td>Block</td>
<td>blak, bloc, blok, bwok, bwack</td>
</tr>
<tr>
<td>Lotion</td>
<td>loshun, loshin, lotun, lochin</td>
</tr>
</tbody>
</table>
constraints. Error responses were recorded when the child either did not respond or a vocal and/or sign response occurred that either did not correlate to the stimulus conditions that occurred or the response was did not meet the minimal requirements to be recorded as a correct response either before or after the delay prompt within the specific time constraints.

**Correct before the delay prompt.** A correct before the delay prompt was when the child responded accurately before the experimenter stated the delay prompt. The delay prompt was the appropriate verbal or signed and verbal response. The experimenter provided this prompt after the critical stimulus had been presented and a specified amount of time had elapsed (i.e., 0 - 3 seconds) during the training trial. A correct before the delay prompt response was when the experimenter presented a cup to the child and stated, "What is this" (then experimenter waited for two seconds until the specified time delay passed giving the child an opportunity to respond). If the child said, "cup" during the two second wait period, immediately the experimenter said "that's a cup" and gave the child the cup for approximately one minute.

**Correct after the delay prompt.** A correct after the delay prompt was when the child responded within six seconds after the delivery of the delay prompt. For example, the experimenter presented a doll to the child and stated, "What is this" (the experimenter waited for one second until the specified time delay passed giving the child an opportunity to respond) the child did not respond during the one second time period, so the experimenter said, "doll" and waited for six seconds to give the child an opportunity to respond to the prompt provided, within the six seconds the child said, "doll"
immediately the experimenter said, "that's right, doll" and gave the child the doll for approximately one minute.

**Non-response.** Error responses were differentiated as a non-response, an error before the delay prompt, or an error after the delay prompt. A non-response was recorded when the child did not make any vocal verbal response before or after the delay prompt was provided. An example of a non-response was when the experimenter presented a doll to the child and stated, "What is this" (then experimenter waited for one second until the specified time delay passed). The child did not respond during the one second time period, then the experimenter said, "doll" and waited for six more seconds to see if the child would respond to the prompt, after the passage of the six seconds the child still did not respond, immediately the experimenter said, "doll" and did not give the child the doll.

**Error before the delay prompt.** An error before the delay prompt is when the child responds incorrectly before the experimenter delivers the delay prompt. An example of an error before the prompt was when the experimenter presented a pencil to the child and stated, "What is this" (the experimenter waited for two seconds until the specified time delay passed). The child said, "dog" during the two second time period, immediately the experimenter said, "No, pencil" and did not give the child the pencil.

**Error after the delay prompt.** An error after the prompt was when the child responded incorrectly within six seconds after the experimenter gave the delay prompt. Here is an example of an error after the delay prompt. The experimenter presented a bowl to the child and stated, "What is this" (then
The experimenter waited for one second until the specified time delay passed). The child did not respond during the one second time period, then the experimenter said, "bowl" and waited for an additional six seconds to give the child an opportunity to respond to the prompt provided, within six seconds the child said, "book" immediately the experimenter said, "No, bowl" and did not give the child the bowl. Appendix C displays the data collection form that was used to keep track of the child's correct and error responses.

**Sign Language Responses**

For the sign language plus vocal training condition, sign language responses were recorded in addition to vocal responses. The sign language responses are the physical motor movements required to form each specific sign. Sign language responses were recorded as correct when a recognizable approximation of the sign occurred. An example of a correct sign language response for the item, book, would be when bringing hands apart at the top while keeping the little fingers together. These physical movements represent the opening of a book. Another acceptable response would include the hand opening movement with the little fingers not touching at the end of the movement. An unacceptable response would be if the child began with the palms of both open hands together in front of their chest, fingers angled forward, and then opened hands from their wrist to the tip of their fingers.

Prior to baseline, observers were shown the sign language responses that correlated to the items in the study. Observers were again shown the correct sign language responses prior to each targeted item beginning intervention.
Definition of the Independent Variables

The independent variables for this study are: (a) vocalization training alone and (b) vocalization training paired with sign language training. The vocalization training procedure consisted of the experimenter presenting different antecedent stimuli for two different verbal operants and the correct vocal response to each stimuli if needed. In the vocalization paired with sign language training, the procedures were exactly the same as the vocalization training alone except for a simultaneous sign language prompt in addition to the vocal response that corresponded to the item presented by the experimenter.

Each specific physical item was randomly assigned to either of the two training conditions. A description of the process of assigning words/items to specific training conditions is described below. Table 4 provides a list of targeted words for each child and under what training condition the words were assigned. The order of the words on the list are in the order that words were trained with the first word under each condition being the first word to be trained.

Assignment of Treatment Condition

Each specific word was randomly assigned to either vocal training alone or vocal with sign language training. This was accomplished at the same time by placing four strips of papers saying, "vocal alone" and four strips saying, "vocal and sign language" in a brown paper bag. In another
Table 4

Assignment of Targeted Words to Training Condition

<table>
<thead>
<tr>
<th></th>
<th>Vocal training</th>
<th>Vocal + Sign training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katie</td>
<td>Pen</td>
<td>Book</td>
</tr>
<tr>
<td></td>
<td>Muffin</td>
<td>Cereal</td>
</tr>
<tr>
<td></td>
<td>Mirror</td>
<td>Piano</td>
</tr>
<tr>
<td></td>
<td>Banana</td>
<td>Ball</td>
</tr>
<tr>
<td>Melinda</td>
<td>Pen</td>
<td>Book</td>
</tr>
<tr>
<td></td>
<td>Mirror</td>
<td>Cookie</td>
</tr>
<tr>
<td></td>
<td>Piano</td>
<td>Pretzel</td>
</tr>
<tr>
<td></td>
<td>Block</td>
<td>Lotion</td>
</tr>
</tbody>
</table>

There was a piece of paper with the name of each specific item written on it. The process of assignment began by taking one piece of paper out of each bag. Whatever word was chosen was assigned to the condition written on the paper just pulled from the other bag. These papers were then discarded. These above steps were repeated until all words were assigned to a treatment condition for both children in the study.

Materials

Assessment Form

The assessment form was used to evaluate the children's ability to vocally emit or sign the targeted items and to insure a novel pool items were used during the study. The assessment form used can be found in Appendix D.
Assessment: Sequence of Trials

The assessment sequence of trials provided the data collectors and the experimenter with a detailed description of how the trials should be completed (see Appendix E).

Clip Board

Clip boards were used to hold data collection sheets and procedural checklists for the primary and secondary observers.

Data Collection Forms

The data collection forms were used to keep track of the item presented, independent variable assigned, the response mode(s) used, the amount of delay, whether the response was correct or an error, and the type of correct or error response the children made during each trial. A sample data collection form can be found in Appendix C.

Generalization Data Collection Forms

The generalization data collection forms were used to formally and informally keep track of whether the children used the words being trained with someone other than the experimenter (i.e., teacher, classroom aides). Two different types of information were gathered in this section using two different data collection forms (see Appendix F).

The first generalization measure was to have the teacher, an aide, other preschool staff, or a student visitor conduct a formal trial of each word being taught at least one time per week. Data was collected by the experimenter, the primary data collector, or the secondary observers.
The second generalization measure was an informal measure. At the end of each day, the experimenter, primary, or a secondary observer showed a card with a list of words being trained for each child to the teacher and or classroom aides. The specific classroom personnel looked at the card and then told the recorder if the child had signed and/or said any of the targeted words and then the recorder marked the card for each time a targeted word was emitted by the child. (see Appendix F)

**Graph Paper**

Graph paper was used to provide a graphic display of each child's responding to the different treatment conditions.

**Initial Subject Selection Assessment**

The initial subject selection assessment was used to assess whether subjects would be eligible to participate in the language study. This assessment contained six sections covering communication history, history of frequently used or played with items, manual dexterity, imitative behavior, one step directions, and echoic responses. This assessment form can be found in Appendix A.

**Parental Consent Form**

A parental consent form was sent to each child's parent to obtain written consent to have their child participate in the initial assessment and if qualified to be included in the research project. In this letter parents were informed that they could withdraw permission for their child to participate in the study at any time. The parents were also provided with a phone
number that they could call if they had any questions about the research project. A sample letter and consent form can be found in Appendix B.

Parental Questionnaire

A questionnaire was given to each parent at the end of the experiment to gage their views of their child's progress. The questionnaire was placed in an envelop with another envelop stamped and addressed to the primary observer. The phone number of the primary observer was placed on the questionnaire to address any questions parents may have had about the questionnaire (see Appendix G).

Pencils

Pentel mechanical pencils with .5mm lead size were be used by the primary and secondary observers to record information on each trial and on procedural measurements.

Procedural Checklist

A procedural checklist was used on at least 25% of all training sessions for each child under each condition to show that the experimenter followed the same procedures throughout the entire project. A sample checklist can be found in Appendix H.

Targeted Items

This category includes every item targeted by the experimenter for possible training of the two children during the study. Items used in the study will be specified below.

Balls. Balls were used for assessment and baseline measures for Katie. A green and pink tennis ball, a green and yellow pump ball, a multi-colored
(e.g., blue, red and yellow) koosh ball, and a blue and pink squish ball were used.

**Banana.** Several different sized, shaped, and colored bananas were used for assessment and baseline measures for Katie.

**Blocks.** Blocks were used for assessment and baseline measurements for Melinda. Five 2 inch by 2 inch plastic blocks of various colors (e.g., blue, yellow, pink, orange, and green) with alphabet letters on four of the sides were used. Also two one inch by one inch wooden blocks were used.


**Cereal.** Katie used this type of item in training. Several different types of cereals were used in the study including Fruitloop’s, Sugarpop’s, Honeycomb’s, and Sugarsmack’s.

**Cookies.** Melinda used this type of item in training. Several different types of cookies were used in the study including Keebler rainbow mini-
chocolate chip cookies, Keebler mini-pecan sandies, vanilla wafers, animal cookies, and sugar cookies.

**Cracker.** Melinda used this type of item in the assessment of possible targeted words. The type of crackers used were Pepperidge Farm's cheese fish crackers and McCormick's Champagne toasted wheat crackers.

**Hat.** Katie child used this type of item in the assessment of possible targeted words. A light taupe adult sized fishing hat with a two and a half inch rim was used.

**Lotion.** Jergen's ever soft lotion was used for the assessment and baseline measures for Melinda.

**Mirrors.** Both children used this type of item in training sessions. Three different mirrors were used in formal training sessions and two additional mirrors were used for formal generalization probes. The three training mirrors were all different in shape, color, and size. The first mirror was green and blue and had a three and a half inch plastic handle and had a four inch in diameter mirror facing on one side with the green plastic on the other side. The second mirror was circular with a two and three fourths inch in diameter mirror facing on both sides. The handle was plastic, purple in color and had clear plastic holding it the mirror frame that was also clear plastic. The third mirror was a compact type mirror and had a shell pattern on both sides. The outer shell of this mirror was light purple and made of plastic. The two mirror facings inside were two and one quarter inches in diameter. The other two mirrors were mounted in the classroom and were at least one foot
in width by two feet in height. One mirror was against the wall in the kitchen area and the other was on the back of a shelf near the bathroom.

**Muffins.** All of the muffins used in this study were Hostess brand mini muffins and only Katie used this type of item in training sessions. The flavors of these muffins were chocolate brownie, chocolate chip, apple cinnamon, banana nut, and blueberry.

**Pens.** Both children used this type of item in training. Over thirty different pens were used in the study. Approximately ten of the pens were thick point brush tipped markers with colors ranging from black to yellow. Another ten pens were buffalo artist color number 1300 and the range of colors used was from a light beige to a dark green. The other ten pens varied from a red ink medium ball-point papermate pen to a green Bic ball-point to a purple Bic metal point pen.

**Piano.** Both children used this type of item in training. Only one piano was used for training in the study due to the cost of pianos. A purple DSI programmable electronic keyboard (Model number 57711) was used for training. This keyboard played notes, recorded notes played, played back recorded notes and played eight different previously recorded songs.

**Pretzels.** Mike-Sell's brand mini-twists and pretzel sticks were used for Melinda during the study.

**Tape.** An audio tape of George Winston and Raffi were used for the assessment of possible words for both children.
Teacher Questionnaire

A questionnaire was given to each teacher at the end of the experiment to obtain the teacher's views of each child's progress and if they would alter their methods of teaching language. The questionnaire was placed in an envelop with another envelop stamped and addressed to the experimenter along with the experimenter's phone number to address any possible questions about the questionnaire (see Appendix I).

Training: Sequence of Trials for the Tact and the Mand

The training sequence of trials provided the data collectors and the experimenter with a detailed description of how the trials should be completed (see Appendix J).

Assessment

Prior to beginning the study, the children were tested to make sure that they were unable to emit the vocal verbal responses or the sign language responses presented in the study to the specified stimulus conditions. A pool of nine to ten words were selected for the assessment (see Table 5). If a child made a vocal approximation of the beginning or ending of the word/item it
was eliminated from the pool. Also, if the child made a sign language approximation to the word/item it was eliminated from the pool. After completing the assessment, the words that remained on the list were assigned to either the vocal training condition or vocal and sign language treatment condition. (See section on assignment of treatment conditions above for details).

Each word had to be recorded as an error for two consecutive and separate sessions that were collected on different days to be included in the pool of words for a specific child. A session consisted of one trial for each verbal operant (i.e., tact and mand). On days when all of the trials were not completed the next day was used to finish that session. On the following day the second session was started.
General Procedures of the Assessment

**Tact condition.** The item was presented (shown) to the child and the experimenter stated, "What is this?" if the child attempted to take the item or she did not respond within six seconds, the experimenter repeated, "What is this?" If the child still did not respond using the correct word, a correct approximation of the word, the correct sign language response, or a correct approximation of the sign language response within 10 seconds it was recorded as an error response. If the child responded correctly the child was given the object for a short period of time and the word was taken off of the list of words to be used in the study. See Appendix E for an outline of the specific sequence of the assessment trials.

A vocal verbal tact proceeded in this manner. The experimenter presented a pencil and stated, "What is this?" the experimenter then waited six seconds to provide Suzie an opportunity to respond, if six seconds passed and Suzie did not respond, the experimenter again presented the pencil. The experimenter stated, "What is this?" then waited ten seconds, if Suzie said, "pencil" before the 10 second time constraint after the stimulus was presented, the experimenter gave Suzie the pencil and then marked the response correct on the recording form and eliminated the item from the list of words to be considered for the pool of words for the study.

A sign language verbal tact proceeded this way. The experimenter presented a pencil and stated, "What is this?" the experimenter then waited six seconds to provide Suzie an opportunity to respond, if Suzie did not respond, the experimenter again presented the pencil and stated, "What is
this?" then the experimenter waited ten seconds. If Suzie still did not respond using a sign language or vocal verbal response within the ten seconds, the experimenter made no verbal response and marked the item as an error on the recording form and kept the item on the list of possible words to use in the study. During the trials the experimenter prevented Suzie from obtaining access to the items if she attempted to take the object from the experimenter. Each word was tested twice under both the tact and mand conditions and if the child got the same word incorrect twice under both conditions it was added to the pool of words to be used in the study.

**Mand condition.** Each child was presented with a situation where the target item needed to complete a task was placed out of view plus an instruction was given that required the use of the targeted item and then the experimenter stated, "What do you want?" if the child did not respond or attempted to find an alternative item to use instead within six seconds, the experimenter repeated, "What do you want?" If the child still did not respond using the correct word, an approximation of the word, correct sign language response, or a correct sign language approximation within 10 seconds it was recorded as an error response. See Appendix E for an outline of the specific sequence of the assessment trials.

An example of a vocal verbal mand: the experimenter handed the child a thick string with a knot at the end and stated, "make a necklace" immediately the experimenter continued by stating, "What do you want?" then the experimenter waited six seconds to see if Emily would request using the vocal verbal response "bead(s)", Emily said, "beads" before six seconds
elapsed, immediately the experimenter gave Emily the beads and marked the word as a correct response and eliminated the word from the pool of possible words for the study. If Emily had responded incorrectly or did not respond after the second question provided by the experimenter within the ten seconds the trial would have been recorded as an error response.

An example of a sign language verbal mand: the experimenter handed the child a piece of paper and stated, "draw a picture" immediately the experimenter stated, "What do you want?" then the experimenter waited six seconds to see if Ed would request "pencil." Ed did not respond within the six second time period, the experimenter repeated, "What do you want" and waited ten seconds, Ed signed "coat" within the ten seconds, then the experimenter did not give Ed the pencil and recorded the response as an error.

Sign Language Training Prior to Beginning Study

The two children in the study had more than five sign language or gestural responses in their repertoire before the beginning of the study, therefore, there was no need to train sign language responses.

Procedures

General Procedures

The sessions began with the experimenter walking, carrying, or asking the child to come to the specified area where trials were completed within the classroom. Trials were completed in a specific area in the classroom each day. In Katie’s classroom, trials occurred near the paint easels, circle time area, coat area, and front door (see Figure 1). Children frequently played close to the
training sessions and children often came up and asked the experimenter and data collectors questions. In this classroom children asked to borrow toys or books. In Melinda’s classroom, the trials took place next to the kitchen, dress-up, and snack area (see Figure 1). Other children from the class frequently were within two feet of the trials and sometimes asked the experimenter and data collectors questions during trials.

The number of trials per sessions varied upon how many words in tact or mand training. Each night the experimenter set up the data collection sheets for the next day. The order that the words were presented varied daily and were written on the data collection sheets prior to that days session. A filled sample data collection sheet can be found in Appendix K. Child responses to the tact and mand training trials were recorded on the same data collection sheet. Baseline and mand probe measures were collected on different data collection sheets (see Appendix C).

The general procedures consisted of the experimenter presenting a specific verbal stimulus depending on the operant being trained. The two different verbal operants that were used in this study are tacts and mands. The tact (impure form) was trained initially to criteria. Criterion was set at three days of five or more correct vocal verbal and/or non-vocal verbal responses before the experimenter provided the delay prompt. When criterion was reached, a probe for mand responding was completed. If a child did not respond correctly under the mand probe condition then mand training was employed. The vocal verbal antecedent stimuli for the tact was, "What is this?" and for the mand condition it was, "What do you want?" A
progressive time delay response prompts procedure was used to teach the verbal operants.

Progressive time delay response prompts procedure began when the delay prompt was presented immediately (e.g., a zero second delay) following the cue (e.g., "What is this?" or "What do you want?"). Once the child was able to repeat the vocal verbal or sign language response within six seconds on a minimum of five trials for three consecutive sessions at the zero time delay the delay was lengthened to one second. Criteria for moving to a two second delay was the child stating the correct vocalization and/or sign language manipulation prior to the delay prompt or within six seconds after the delay prompt for at least five trials for three consecutive sessions. The progression for the time delay was increased in one second intervals until the child was able to vocalize or sign the correct word prior to the delay prompt for a minimum of five trials for three consecutive sessions at which time a mand probe began. If at any point the child made three consecutive errors during a session the delay time was decreased by one second on the next session. For each three consecutive errors during a session the delay was decreased by one second until a zero delay prompt was reached. At that point, the zero delay prompt was used until the child met the criteria to go to the next level of delay as stated above.

The time delays and the wait time of six seconds were monitored by the trained primary observer who then cued the experimenter, by stating, "okay," to provide either the delay prompt after the time delay or to provide feedback about the response after the six seconds.
When the children emitted a correct response they were given access to the object or item for approximately sixty seconds. This time period was chosen for a few reasons. Sixty seconds was an adequate amount of time for the children to engage the item without becoming disinterested. It provided the children with a small break between trials without disrupting the session. The time period that the children had access to the items varied as some items were consumable and were eaten in a few seconds, while other items were used the entire time allotted. No specific data collection or record keeping was completed on the exact time periods that students had access to specific items. The experimenter estimated the sixty second time period.

During each session the children were presented with seven trials of each vocal alone and vocal plus sign language words, in addition to baseline or probe trials when needed. Small breaks occurred during several sessions, due to the class schedule. Katie’s sessions occurred right after snack time although several times snack time was later than usual and part of the session was completed before snack and the rest of the session was completed after Katie finished snack. Melinda had a few breaks in sessions due to her time of arrival at school and the activity planned for the morning. If the morning activity ran long or if Melinda got to school late then part of a session was completed in the morning and then the rest of the session was finished after snack or after gross motor activities at the end of the day. When ever non-compliant behaviors occurred the child was redirected back to the training situation or area. While non-compliant behaviors occurred the next trial was withheld until the child voluntarily followed a single instruction presented by
the experimenter. These procedures for non-compliant behavior were discussed with the teacher prior to the implementation of the study.

**Baseline.** The number of trials per word was two for the first two baseline sessions for both children. After the first two sessions the number of trials was reduced to one trial per word per child. The number was reduced to decrease the chance that the children might become frustrated and not respond during training trials. Baseline measures were collected prior to training sessions and were discrete sessions. When ever baseline measures were collected, it was completed on a separate data collection sheet than the training trials (see Appendix C).

**Tact training.** For each word in tact training, seven trials occurred each session per word per child. The same data collection sheet was used for tact and mand training. The placement of words within a session were varied.

**Mand probe.** The number of trials per word was one per word per child. Mand probe measures were taken after baseline measures and before training sessions and were discrete sessions. The child response to mand probe measures were collected on a separate data collection sheet than the training trials (see Appendix C).

**Mand training.** For each word in mand training, seven trials occurred each session per word per child. The same data collection sheet was used for mand and tact training. The placement of words within a session were varied.
Maintenance. Words that met criterion for either tact only or tact and mand conditions had maintenance sessions. Each word in maintenance had seven trials per session. Maintenance sessions occurred approximately once a week for each verbal operant trained to criterion. For instance, if the word cookie met criterion for the verbal operants tact and mand, then one time each week a maintenance session for tact occurred and one session on a different day occurred for the mand. The amount of time used for the delay prompt was the same amount of time needed to meet criterion. Melinda’s delay prompt for book met criterion at a three second delay, therefore during maintenance sessions a three second delay occurred before providing a prompt to Melinda.

Follow-up. The same procedures used in the maintenance sessions were used in the follow-up sessions. Only those words that had met the criterion for word completion had follow-up sessions.

Vocal Verbal Response Training

The training procedure for vocal verbal responses followed the general procedures stated above.

Tact condition. The item was presented to the child and the experimenter stated, "What is this?" then the experimenter immediately (e.g., zero second delay) or wait for a specified time period (e.g., one second delay, two second delay) stated "(Name of item)" if the child responded by vocally stating the correct word during the delay period or within six seconds after the prompt the response was recorded in the correct response category depending on at what point the child responded correctly. If the child
responded correctly before the delay prompt it was recorded as a correct before the delay prompt. If the child responded correctly after the delay and the delay prompt the response was recorded as a correct after the delay prompt. Each time that the child responded correctly the item was given to the child for approximately sixty seconds along with a feedback statement vocally naming the item. If the child vocally stated the wrong word or did not respond the trial was marked in the error response category. There were three types of error responses: a non-response, an error before the delay prompt, and an error after the delay prompt. When the child did not vocally respond before or after the delay prompt was given (non-response), the experimenter did not give the item to the child and before beginning the next trial the experimenter repeated the name of the object vocally to the child in the presence of the item. When the child stated the wrong name of an item before the delay prompt was given (error before the delay prompt) the experimenter stated, "(name of item)" and did not give the item to the child. When the child did not respond during the delay period before the delay prompt and responded incorrectly within six seconds after the delivery of the delay prompt (error after the delay prompt) the experimenter stated, "(name of item)" and did not give the item to the child. See Appendix J for an outline of the specific sequence of the training trials.

Whenever any type of error occurred, the experimenter provided an opportunity for additional practice to the child that was not recorded. The experimenter began by stating, "say, (name of object)"; then experimenter waited for approximately three seconds to give the child an opportunity to
respond, if the child vocally named the correct item presented the experimenter gave the item to the child for approximately sixty seconds and then a recorded trial was completed. If the child responded incorrectly or did not respond during the three second time period when the experimenter stated the name of the object, the experimenter then stated, "say, (name of object)," and waited for six seconds for the child to make a vocal response. If a correct vocal verbal response was stated the experimenter gave the item to the child for approximately sixty seconds and then a recorded trial was completed. If the child did not respond or responded incorrectly, the experimenter stated, "(name of object)," and then a recorded trial was completed.

**Mand condition.** This condition had an additional antecedent condition to insure that the child did not randomly request items from the environment. The child was presented with a situation where the target item needed to complete a task was missing. For example, the experimenter handed the child a piece of paper without a pencil and stated, "draw a picture" and then the experimenter stated, "What do you want?" then the experimenter immediately (e.g., zero second delay) or waited for a specified time period (e.g., one second delay, two second delay) and stated, "(name of item)." If the child responded by vocally stating the correct word during the delay period or within six seconds after the prompt the response was recorded in the correct response category depending on at what point the child responded correctly. If the child responded correctly before the delay prompt it was recorded as a correct before the delay prompt. If the child
responded correctly after the delay and the delay prompt the response was recorded as a correct after the delay prompt. Each time that the child responded correctly the item was given to the child for approximately sixty seconds along with a feedback statement vocally naming the item. If the child vocally stated the wrong word or did not respond the trial was marked in the error response category. There were three types of error responses non-response, an error before the delay prompt, and an error after the delay prompt. The procedures for when an error occurred were exactly the same as under the vocal verbal tact condition above. See Appendix J for an outline of the specific sequence of the training trials.

**Sign Language Plus Vocal Verbal Training**

The training procedure for sign language and vocal verbal responses follow the general procedures, but adds a sign language stimuli for the child.

**Tact condition.** The child was presented with the item and the experimenter vocally stated, "What is this?" then the experimenter immediately (e.g., zero second delay) or waited for a specified time period (e.g., one second delay, two second delay) then stated, "(Name of item)" and simultaneously used the sign language response that named the item. If the child responded by vocally stating and/or signing the correct word during the delay period or within six seconds after the prompt the response was recorded in the correct response category depending on at what point the child responded correctly. If the child responded correctly before the delay prompt it was recorded as a correct before the delay prompt. If the child responded correctly after the delay and the delay prompt the response was
recorded as a correct after the delay prompt. Each time that the child responded correctly the item was given to the child for approximately sixty seconds along with a feedback statement vocally naming the item. If the child vocally stated and/or signed the wrong word or did not respond the trial was marked in the error response category. There were three types of error responses non-response, an error before the delay prompt, and an error after the delay prompt. When the child did not vocally state or use a sign language response before or after the delay prompt was given (non-response), the experimenter did not give the item to the child and before beginning the next trial the experimenter in the presence of the item repeated the name of the object vocally and through the use of sign language to the child. When the child stated the wrong name of an item before the delay prompt was given (error before the delay prompt) the experimenter stated and signed, "(name of item)" and did not give the item to the child. Before beginning the next trial the experimenter repeated the name of the object vocally and by sign language to the child in the presence of the item. When the child did not respond during the delay period before the delay prompt and responded incorrectly within six seconds after the delivery of the delay prompt (error after the delay prompt) the experimenter vocally stated and signed, "(name of item)" and did not give the item to the child. Before beginning the next trial the experimenter repeated the name of the object vocally and by sign language to the child in the presence of the item. See Appendix J for an outline of the specific sequence of the training trials.
Whenever any type of error occurred after a trial the experimenter provided an opportunity of additional practice to the child that was not recorded. The experimenter began by stating and signing, "(name of object)", the experimenter waited for approximately three seconds to give the child an opportunity to respond, if the child vocally stated or used sign language to name the correct item presented the experimenter gave the item to the child for approximately sixty seconds and then a recorded trial was completed. If the child responded incorrectly or did not respond during the three second time period then the experimenter vocally stated, “say, (name of item)” and signed the name of the object, then the experimenter shaped the hands of the child into the correct sign language response. A shaping process for the correct sign language response occurred at this time. If a correct or approximation to a vocal or sign language response was made the experimenter gave the item to the child for approximately sixty seconds and then a recorded trial was completed. If the child did not respond or responded incorrectly on the second practice, the experimenter stated and signed, "(name of object)," and then a recorded trial was completed. See Appendix J for an outline of the specific sequence of the training trials.

**Mand condition.** This condition has an additional antecedent condition to insure that the child did not randomly request items from the environment. The child was presented with a situation where the target item needed to complete a task was missing. For example, the experimenter handed the child a piece of paper without a pencil and stated, "draw a picture" and then the experimenter vocally stated, "What do you want?" then
the experimenter immediately (e.g., zero second delay) or wait for a specified
time period (e.g., one second delay, two second delay) stated, "(Name of
item)" and simultaneously used sign language to name the item. If the child
responded by vocally stating and/or signing the correct word during the
delay period or within six seconds after the prompt the response was
recorded in the correct response category depending on at what point the
child responded correctly. If the child responded correctly before the delay
prompt it was recorded as a correct before the delay prompt. If the child
responded correctly after the delay and the delay prompt the response was
recorded as a correct after the delay prompt. Each time that the child
responded correctly the item was given to the child for approximately sixty
seconds along with a feedback statement vocally naming the item. If the
child vocally stated and/or signed the wrong word or did not respond the
trial was marked in the error response category. There are three types of error
responses non-response, an error before the delay prompt, and an error after
the delay prompt. The procedures for when an error occurs were exactly the
same as under the sign language plus vocal verbal tact condition.

Criteria for reinforcing sign language responding. Due to the
additional component of sign language in this procedure there was a
possibility that the children would respond using only one response form,
either sign language or vocal but not both. Since the experimenter had taken
steps to promote the use of vocal verbal, the guidelines set up in the general
procedures for reinforcement of either response form still applied.
Experimental Design

The experiment involved a multiple baseline design across novel behaviors (Barlow & Hersen, 1984; Cooper, Heron, & Heward, 1987). Within this design there was a probe component to assess for generalization to the verbal operant (mand) and training occurred under the mand condition whenever generalization did not occur. Additional measures providing information on response maintenance and stimulus generality for the tact were taken as well as informal measures on vocal verbal or signed verbal usage of the targeted words in the natural environment.

Data Collection

Observers

Human observers were trained for a one week prior to the beginning of the study on how to record the information during the sessions. There were eight full days of practice sessions and at least five sessions with each child. The primary observer was present on six of the eight practice sessions. The two secondary observers were present for four of the eight practice sessions. On the first day that a targeted word was put into training a review of the acceptable vocal and sign language responses was reviewed. An additional review of appropriate vocal and signed responses occurred approximately every other week to recalibrate the observers to the specific targeted responses to be recorded. For the last three days of practice sessions the primary and secondary observers agreed at least 92% of the time.

Prior to baseline, observers were shown the sign language responses that correlated to the items in the study. Observers were again shown the
correct sign language responses prior to each targeted item beginning intervention.

The primary and secondary observers had the data collection sheet that had the order of trials for the session and the time periods for the amount of each delay.

**Primary observer.** The primary observer sat on the side of the child approximately 18 inches away from the child and within visual view of the experimenter. The purpose of this close proximity was to insure that the observer could hear and see the responses of the child clearly, hear the experimenter's directions, and provide cues to the experimenter about timing trials. The observer began counting to himself (e.g., one thousand one, one thousand two) for the progressive delay as soon as the experimenter has finished stating the stimulus condition. The primary observer then tracked the experimenter's response to make sure it correlated to the correct time period for the delay of time set for the next step of the sequence. The primary observer again began counting to himself after the experimenter had stated the delay prompt. After counting for six seconds the primary observer cued the experimenter by saying, “okay” that the time had passed, then the observer recorded the child's response on the data collection sheet before the next trial began.

**Secondary observers.** The secondary observer sat on the other side of the child approximately 18 inches away from the child and within visual view of the experimenter. The secondary observer then tracked the experimenter's response to make sure it correlated to the correct time period
for the delay of time set for the next step of the sequence. The secondary observer again began counting to herself after the experimenter had stated the delay prompt. After counting for the six second time period the secondary observer recorded the child's response on the data collection sheet before the next trial began. The secondary observer did not cue the experimenter on specific time delays.

**Interobserver Agreement**

Interobserver agreement scores were obtained from the secondary observers on at least 25% of all sessions. The formula used to establish the percentage of agreement among observers was the number of agreements divided by the number of total agreements plus disagreements multiplied by 100.

\[
\frac{\text{Agreements}}{\text{Agreements} + \text{Disagreements}} \times 100 = \% \text{ of Agreements}
\]

**Integrity of the Independent Variable**

Procedural integrity was obtained by having a trained observer complete the procedural checklist for at least 25% of all sessions. See Appendix H for a copy of the procedural checklist form.

**Generalization Data**

This study recorded three different measures for generalization two under the tact condition and one informal generalization measure that was not specifically tracked by verbal operant conditions. Since the tact
condition was trained first a measure was taken using the same methods described in the procedures to see if the trained word would occur in a non-trained verbal operant condition (i.e., the mand). This was called the mand probe. The second measure for generalization was used to formally track whether the children would use the trained tact if the persons doing the trial changed and was the classroom teacher, a classroom aide, or another personnel. This data was obtained by having the classroom teacher or other personnel conduct one formal trial of each word being taught at least one time per week. Data was collected by either the experimenter, the primary data collector, or a secondary data collector or a combination of two of them.

The third generalization measure was a daily informal measure recorded by either the experimenter, the primary data collector, or a secondary data collector by asking the classroom teacher or staff if the child had said or signed any of the targeted words. This was done at the end of the day by showing the classroom personnel a card with a list of words being trained for each child and having the teacher or staff state whether they had heard the child say or sign any of the words on the card for that particular day. The classroom personnel were also asked to state the number of times each response had occurred on that day.

Parental Opinions

Due to the fact that the children were virtually non-verbal, a series of questions were given to the parents at the end of the study. The questionnaires were given to the parents to fill out at their convenience. The questionnaire was placed in an envelop with another envelop stamped and
addressed to the primary observer. The phone number of the primary observer was placed on the questionnaire to address any questions parents may have had about the questionnaire (see Appendix G). The purpose of the questionnaire was to gauge the parents view of their child's progress during the experiment.

**Teacher Opinions**

Due to the fact that the children were virtually non-verbal, a series of questions were given to the teachers at the end of the study. The questionnaires were given to the teachers to fill out at their convenience. The questionnaires were placed in an envelop with another envelop stamped and addressed to the experimenter along with the experimenter's phone number to address any possible questions about the questionnaire (see Appendix I). The purpose of the questionnaire was to obtain the teacher's view of each child's progress and if they would alter their methods of teaching language after being exposed to the study.
CHAPTER IV
RESULTS

This chapter presents the results of this study comparing the effects of vocal training alone and vocal plus sign language training on the development of vocal verbal tacts and mands of preschool children with minimal vocal verbal and non-vocal verbal abilities. The results of the initial subject selection assessment are presented briefly, as well as the results of the assessment to determine targeted words that were used for each child in the study. Data on the number of correct vocal verbal and sign language responses to each targeted word are presented along with the results for each separate verbal operant. A description of the interobserver agreement, accuracy measures, and procedural checklist results are reported. The results of the generalization measures are then presented for each child. The chapter concludes with a summary of the parent and teacher opinions about the progress of their child.

Initial Subject Selection Assessment

An initial subject selection assessment to determine eligibility for the study was completed on nine preschool aged children between the ages of two years and three months and four years and ten months. Three students
met the criterion of the initial subject selection assessment. However, one
subject's erratic attendance of (often missing one to two days each week or
missing a week then attending a week) caused him to be dropped from the
study. Two children, Katie and Melinda, are described in this section.

Katie

Katie was three years and five months at the beginning of the study
and had a diagnosis of mild CP with language delays (see Table 1). The
results of Katie's initial subject selection assessment indicated that she had an
extremely limited vocal verbal response repertoire. During the initial subject
selection assessment Katie only emitted one word, "this." She used the word
"this" frequently as she pointed to objects or pictures in a book. Then
Katie's ability to repeat vocal sounds in isolation was evaluated to gauge
what sounds she would make. Katie emitted three vowel sounds, "/a/" like
in the word far, "/e/" like in the word pen, and "/u/" like in the word cut.
Katie also emitted 11 consonant sounds, they were d, g, h, j, m, p, r, s, sh, th,
and z. Katie may have the ability to say other isolated sounds, yet she did not
do so during the initial subject selection assessment and therefore the
experimenter only required Katie to make these sounds to create words
during the study. Katie's sign language repertoire was more extensive with
approximately signs although 15 of those signs she used less than one time
per week in school as reported by her teacher. See Table 1 for the list of signs
that occurred at least one time per day. Here is a list of the other 15 signs that
Katie used periodically: cookie, apple, horse, fish, orange, look, body, hug,
sleep, milk, girl, drink, hi, bye and finished. Her teacher also expressed
concerns about Katie’s lack of initiating signs or vocal verbal sounds for communication.

The initial subject selection assessment also measured frequency of item or toy usage, manual dexterity, imitative behavior, and direction following behavior. Katie displayed an interest in a variety of items in the classroom (e.g., pens and drawing, music, books, puzzles, hats, computer) making it easy to pick specific items to be used in the experiment. Katie’s manual dexterity was assessed to be complex enough to form and hold the sign language topographies that would be used in the study. Katie’s imitative behavior was excellent, she was observed imitating mouth movements of the teacher, physical behaviors of other children, as well as repeating the behaviors of the experimenter who at that time was unfamiliar to her. Katie also complied to several simple one-step directions of “look at me,” “give me the book,” “sit down,” “give me a high 5,” and “touch the ball.”

Melinda

Melinda was two years and eleven months at the beginning of the initial assessment and was diagnosed with down syndrome (see Table 1). The results of Melinda’s of the initial subject selection assessment indicated that Melinda had a very limited vocal verbal response repertoire. During initial subject selection assessment Melinda emitted sixteen words: no, yes, Dude, Daddy, Mom, Amy, off, Megan, Ashley, Matthew, pop, juice, cracker, okay, ball, and eat. Melinda’s ability to repeat vocal sounds in isolation was evaluated to gauge what sounds she would make. Melinda emitted five
vowel sounds, "/a/" like in the word far, "/ae/" like in the word fat, "/e/" like in the word pen, "/u/" like in the word cut and "/U/" like in the word put. Melinda also emitted 7 consonant sounds, they were b, ch, d, h, k, m, and r. Melinda may have the ability to say other isolated sounds, yet she did not do so during the initial subject selection assessment and therefore the experimenter was not able to require that Melinda make these sounds to create words during the study. Melinda’s sign language repertoire was limited to approximately six signs or gestures and use of these signs had been reported as infrequent by the classroom teacher. A list of signs used by Melinda at least once a week can be found in Table 1. The classroom teacher also expressed concerns about Melinda’s lack of initiating signs or a variety of vocal sounds for communication. Melinda does say, “Mom,” quite often to engage others and to let them know there is something she needs or wants.

The initial subject selection assessment measured frequency of item or toy usage, manual dexterity, imitative behavior, and direction following behavior. Melinda displayed an interest in a variety of items in the classroom (e.g., pens and drawing, music, books, mirror, snack-time including crackers, pretzels, and juice; blocks, and lotion) making it easy to pick specific items to be used in the experiment. Melinda’s manual dexterity was assessed to be complex enough to form and hold the sign language formations to be used in the study. Melinda’s imitative behavior was excellent, she was observed imitating songs and hand motions during circle time, physical behaviors of other children, as well as repeating the behaviors of the experimenter.
Melinda also complied to several simple one-step directions of “look at me,” “go to the door,” “hand me the lid,” “come here,” and “come cook.”

**Assessment**

These two children were then assessed on word knowledge on the pool of words selected for possible use in the study (see Table 5). The pool of ten or eleven words were established for each child from the items frequently used by them during the initial subject selection assessment. The children were then tested to make sure that they were unable to emit the vocal verbal or sign language responses correlated to each item/word selected to be tested.

**Katie**

The assessment was completed on ten different words and the purpose was to make sure Katie did not know the sign language or vocal response to the items chosen for the study. These ten words were muffin, book, mirror, pen, cereal, tape, banana, ball, hat, and piano. The words tape and hat were eliminated because Katie made vocal approximations to the words stating the beginning sound of each word. The other eight words were used in the study.

**Melinda**

The assessment was completed on eleven different words, the purpose of which was to make sure Melinda did not know the sign language or vocal response to the items chosen for the study. These eleven words were mirror, book, pen, tape, ball, cracker, pretzel, lotion, block, cookie, and piano. The words tape, cracker, and ball were eliminated because Melinda made vocal
approximations to the words. For ball and cracker she made approximations for the entire word and for the word tape she made an approximation of the beginning sound. The other eight words were used in the study.

**Vocal Only Condition**

For each child four words were assigned to the vocal only condition. Four or five days of baseline data was collected prior to the start of intervention. All targeted words in the vocal only condition had a zero correct response rate during the first four of five days of baseline. Results from the vocal only condition are presented with the use of descriptive information and two different graphs for each subject. One graph displays all correct responses and the other graph displays only correct response that occurred prior to the experimenter emitting the delay prompt.

**Katie**

Of the four targeted words only one had a correct response during baseline although the response form was not vocal. Two days in a row one trial per day, on sessions 47 and 48, Katie made one correct approximation out of one trial for the sign language response for the word banana.

Appendix L provides information on the number of correct, error, and non-responses during each session.

**Tacts.** Three of the four targeted words were trained under the tact condition. The words that were trained were pen, muffin, and mirror. Of the three words trained pen received 45 days of training, muffin received 20 days of training, and mirror received 11 days of training.
None of these words met the criterion of three consecutive days of five or more correct vocal verbal approximations before the delay prompt. The targeted words muffin and mirror did not have any correct vocal verbal approximations throughout the entire study, while pen came close to meeting the required criterion twice (see Figure 2). At sessions 34 and 35, Katie had seven correct vocal verbal responses before the delay prompt (see Figure 3). The next week, Katie was absent because she was diagnosed with chicken pox. Upon her return, on session 41, Katie only made one correct vocal verbal approximation to the targeted word pen. This response was before the delay prompt. Then on session 56, Katie made six correct vocal verbal approximations with five of those responses before the delay prompt, and on session 57 Katie made six correct vocal verbal approximations before the delay prompt. Yet, on session 58 Katie made only three correct vocal verbal approximations with two before the delay prompt. Figure 2 shows all correct responses while Figure 3 only shows correct responses before the presentation of the delay prompt.

**Mands.** Since tact training criterion had to be met before mand training could be implemented no mand training was completed for the targeted words in the vocal only condition.

**Melinda**

Of the four targeted words zero correct responses occurred during the baseline condition for the entire study. Appendix L provides information on the number of correct, error, and non-responses during each session.
Figure 2. These words were assigned to the vocal only condition. Correct responses include all responses before or after a delay prompt. Vocal responses are indicated by colored in oval dots. The two open circles indicate a correct sign language response during the baseline probe.
Figure 3. These words were assigned to the vocal only condition. The responses recorded as correct are only those that occurred prior to the delay prompt. Vocal responses are indicated by colored in oval dots. The two open circles indicate a correct sign language response during the baseline probe that did have any prompts. Correct responses before a prompt can not occur during the 0 second delay due to a procedural artifact.
Tacts. Three of the four targeted words were trained under the tact condition. The words that were trained were pen, mirror, and piano. Of the three words trained pen received 35 days of training, mirror received 21 days of training, and piano received 9 days of training. Pen was the only word to meet criterion. Criterion on the word pen was meet on the 35th day of training. Pen began and maintained at one or less correct responses for the first eleven sessions of training (see Figure 4). Then in four more sessions Melinda had seven correct response out of seven at the zero delay prompt. After meeting the criterion to move to the one second delay prompt on session 25, Melinda had six correct responses with two of those responses occurring before the delay prompt (see Figure 5). On the next day Melinda only made two correct responses with none before the delay prompt. The experimenter then returned to the zero delay prompt for sessions 27 through 40 until criterion to return to the one second delay prompt had been met again. During the next set of trials at the one second prompt level, Melinda obtained seven correct responses out of seven each day (see Figure 4). Not all of these correct responses were before the delay prompt (see Figure 5). During sessions 45 through 47 Melinda was absent. Criterion was meet at the one second delay prompt on session 48. Figure 4 shows all correct responses while Figure 5 only shows correct responses before the presentation of the delay prompt.

The targeted words mirror and piano did not have any correct vocal verbal approximations throughout the entire study (see Figure 4).
Figure 4. These words were assigned to the vocal only condition. Correct responses include all responses before or after a delay prompt. Vocal responses are indicated by colored in ovals. Follow-up data was taken on the word, pen, because it had met criterion.
Figure 5. These words were assigned to the vocal only condition. The responses recorded as correct are only those that occurred prior to the delay prompt. Vocal responses are indicated by colored in ovals. Follow-up data was taken for the word, pen, because it met criterion prior to completion of the study. Correct responses before a prompt can not occur during the 0 second delay due to a procedural artifact.
The targeted word pen was also the only word in this condition to have two follow-up sessions. The first follow-up session was only one week after the completion of the study and the second follow-up session was two weeks after the completion of the study. On the first follow-up session Melinda made seven correct vocal verbal approximations for the word, pen, yet only four of those seven were before the delay prompt. On the second follow-up session Melinda made seven correct vocal verbal approximations for the word pen with all seven before the delay prompt.

Mands. Since tact training criterion had to be met before mand training could be implemented mand training was not completed for any of the targeted words. Three mand probe sessions were completed for the targeted word, pen, and one more mand probe session was needed with no correct vocal verbal responses before mand training could be implemented. Time did not permit additional sessions to occur.

**Vocal plus Sign Language Condition**

For each child four words were assigned to the vocal plus sign language condition. Four or five days of baseline data was collected prior to the start of intervention. All targeted words in the vocal plus sign language condition had a zero correct response rate for vocal verbal approximations and non-vocal verbal sign language approximations during all of the baseline sessions. Results from the vocal plus sign language condition are presented with the use of descriptive information and two different graphs for each subject. One graph displays all correct responses and the other graph displays only correct response that occurred prior to the experimenter
emitting the delay prompt. Appendix L provides information on the number of correct, error, and non-responses during each session.

Katie

Tacts. Three of the four targeted words were trained under the tact condition (see Figure 6). The words that were trained were book, cereal, and piano. Of the three words trained book and piano met criterion on the non-vocal verbal sign language approximations, yet did not meet criterion for the vocal verbal approximations. Criterion for the signed response on the word book was meet after 18 days of training. Criterion for the signed response on the word piano was meet after 15 days of training and one follow-up session (see Figure 7). The criterion was set at three consecutive sessions of five or more correct vocal verbal or non-vocal verbal sign language approximations before the delay prompt. Figure 6 shows all correct responses before or after a delay prompt, while Figure 7 shows only correct responses that occurred before he delay prompt. The targeted word, cereal, did not meet criterion on vocal verbal or non-vocal verbal sign language approximations. Throughout the 31 training sessions for the targeted word, cereal, a few correct vocal verbal responses occurred during sessions 49, 50, and 52. No correct non-vocal verbal sign language approximations occurred for the targeted word, cereal (see Figure 6).

Four maintenance sessions were conducted on the targeted word book. Three of the four maintenance sessions for the tact showed seven correct non-vocal verbal sign language approximations. In the other
Figure 6. These words were assigned to the vocal plus sign language condition. Correct responses include all responses before or after the delay prompt. Vocal responses are indicated by colored in ovals and sign language responses are indicated by uncolored circular marks.
Figure 7. These words were assigned to the vocal plus sign language condition. The responses recorded as correct are only those that occurred prior to the delay prompt. Vocal responses are indicated by colored in ovals and signed responses are indicated by open circular marks. Correct responses before a prompt can not occur during the 0 second delay due to a procedural artifact.
maintenance session Katie had six correct non-vocal verbal sign language approximations. A minimum of five correct non-vocal verbal sign language responses occurred before the delay prompt on all four maintenance sessions (see Figure 7).

One follow-up session was conducted on the targeted word piano for the tact. The follow-up session was conducted one week after the completion of the study. During this follow-up session, Katie made seven correct non-vocal verbal sign language approximations for the word piano, with six of those seven before the delay prompt.

Mands. Since tact training criterion had to be met before mand training could be implemented mand training was completed for the targeted word, book, in the vocal plus sign language condition. Criterion for the signed response on the word book was met after seven days of training.

Four maintenance sessions were conducted on the targeted word book. All four maintenance sessions for the mand had seven correct non-vocal verbal sign language approximations with a minimum of six correct non-vocal verbal sign language responses before the delay prompt.

One follow-up session was conducted on the targeted word book for the mand. The follow-up session was conducted one week after the completion of the study. During this follow-up session, Katie made seven correct non-vocal verbal sign language approximations for the word book, with six of those seven responses before the delay prompt.
Figure 8. These words were assigned to the vocal plus sign language condition. Correct responses include all responses before or after a delay prompt. Vocal responses are indicated by colored in ovals and sign language responses are indicated by uncolored circular marks.
Melinda

**Tacts.** Three of the four targeted words were trained under the tact condition (see Figure 8). The words that were trained were book, cookie, and pretzel. Of the three words trained, book and cookie met criterion on the non-vocal verbal sign language approximations, yet did not meet criterion for the vocal verbal approximations. Criterion for the signed response on the word book was met after 33 days of training and at a three second delay prompt. Figure 9 shows at what point the Melinda began to respond before the delay prompt for the word book. Criterion for the signed response on the word cookie was met after 7 days of training. The criterion was set at three consecutive sessions of five or more correct vocal verbal or non-vocal verbal sign language approximations before the delay prompt. The targeted word, pretzel, did not meet criterion on vocal verbal or non-vocal verbal sign language approximations. Throughout the 10 training sessions for the targeted word, pretzel, a few correct non-vocal verbal sign language approximations occurred on sessions 41, 42, 44, 48, 49, 50, and 51 and no correct vocal verbal responses occurred (see Figure 8).

Three maintenance sessions were conducted on the targeted word cookie. Two of the three maintenance sessions for the tact showed seven correct non-vocal verbal sign language approximations and one had five out of seven non-vocal verbal sign language responses. On the first maintenance session for the tact only two of the five correct responses were before the delay prompt. On the other two maintenance sessions a minimum of six
These words were assigned to the vocal plus sign language condition. The responses recorded as correct are only those that occurred prior to the delay prompt. Vocal responses are indicated by colored in ovals and sign language responses are indicated by uncolored circular marks. Correct responses before a prompt can not occur during the 0 second delay due to a procedural artifact.
correct non-vocal verbal sign language responses occurred before the delay prompt.

Two follow-up sessions were conducted on the targeted word book and one on the word cookie. The first follow-up session was conducted one week after the completion of the study. During this follow-up session, Melinda made seven correct non-vocal verbal sign language approximations for the word book, with four of those seven before the delay prompt. The second follow-up session was conducted two weeks after the completion of the study. During the second follow-up session, Melinda made six correct non-vocal verbal sign language approximations for the word book, with all six responses occurring before the delay prompt. The follow-up session for the word cookie occurred two weeks after the completion of the study. Melinda made seven correct non-vocal verbal sign language approximations for the word cookie, with all seven responses occurring before the delay prompt.

**Mands.** Since tact training criterion had to be met before mand training could be implemented mand training was completed for the targeted word, cookie, in the vocal plus sign language condition. Criterion for the signed response on the word cookie was met after 10 days of training.

Two maintenance sessions were conducted on the targeted word cookie. All of the maintenance sessions for the mand had seven correct non-vocal verbal sign language approximations before the delay prompt.

One follow-up session was conducted on the targeted word cookie for the mand. The follow-up session was conducted one week after the
completion of the study. During this follow-up session, Melinda made seven correct non-vocal verbal sign language approximations for the word cookie, with six of those seven responses before the delay prompt.

**Interobserver Agreement**

Interobserver agreement scores were obtained separately for each child, as well as, separately on each of the conditions. For Katie, interobserver agreement measures were taken on 10 of 14 baseline sessions equaling 71 percent of the sessions, 15 of 47 tact training sessions totaling of 31 percent of the sessions, 1 of 3 mand probe sessions equaling 33 percent of the sessions, and 5 of 12 mand training sessions totaling 41 percent of the sessions. For Melinda, interobserver agreement measures were taken on 10 of 16 baseline sessions totaling 62 percent of the sessions, 17 of 40 tact training sessions equaling 42 percent of the sessions, 4 of 8 mand probe sessions totaling 50 percent of the sessions, and 5 of 13 mand training sessions equaling 38 percent of the sessions. An overall mean percentage of agreement across conditions equaled 46 percent for Melinda.

Percentage of interobserver agreement was calculated separately for each child as well as across conditions. The mean percentage of interobserver agreement calculated separately for each condition for Katie was 95 percent of baseline sessions (range: 75 to 100), 91 percent of tact training sessions (range: 76 to 100), 100 percent of mand probe sessions, and 98 percent of the mand training sessions (range: 92 to 100) (see Table 6). The total mean percentage of agreement including all conditions together was calculated for each session that recorded agreement measures. This total mean percentage
Table 6

Interobserver Agreement Measures Calculated in Total Percentage Per Session Across Conditions for Katie

<table>
<thead>
<tr>
<th>Session No.</th>
<th>Baseline (14)</th>
<th>Tact Training (47)</th>
<th>Mand Probe (3)</th>
<th>Mand Training (12)</th>
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<td>91</td>
<td>100</td>
<td>98</td>
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</table>

(#) Represents the total number of sessions provided per condition.
for Katie was 93. The mean percentage of interobserver agreement calculated separately for each condition for Melinda was 100 percent of baseline sessions, 94 percent of tact training sessions (range: 86 to 100), 100 percent of mand probe sessions, and 96 percent of the mand training sessions (range: 92 to 100) (see Table 7). The total mean percentage of agreement including all conditions together was calculated for each session that recorded agreement measures. This total mean percentage for Melinda was 96.

**Integrity of the Independent Variable**

Procedural integrity scores were obtained by having the trained observers complete the procedural checklist (see Appendix H) for a minimum of 46 percent of all sessions across conditions. The procedural checklist scores were obtained separately for each child, as well as, separately on each of the conditions.

**Katie**

The procedural checklist was completed on 71 percent of baseline sessions, 82 percent of tact training sessions, 100 percent of mand probe sessions, and 58 percent of the mand training sessions. Of the times the procedural checklist was completed, the mean percentage that the procedural checklist was followed correctly and completely was 100 percent of baseline sessions, 97 percent of tact training sessions, 100 percent of mand probe sessions, and 98 percent of the mand training sessions (see Table 8). The total combined mean percentage of integrity measures across conditions was 98.
Table 7

Interobserver Agreement Measures Calculated in Total Percentage Per Session Across Conditions for Melinda

<table>
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<td>96</td>
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(#) Represents the total number of sessions provided per condition.
Table 8

Procedural Checklist Measures for Each Condition for Katie

<table>
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<tr>
<th></th>
<th>Baseline</th>
<th>Tact Training</th>
<th>Mand Probe</th>
<th>Mand Training</th>
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<td>Checklist Completed</td>
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<td>Total Sessions</td>
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<td>Percentage of Checklist Taken</td>
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<td>100</td>
<td>58</td>
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<td>Mean Percentage of Checklist Followed</td>
<td>100</td>
<td>97</td>
<td>100</td>
<td>98</td>
</tr>
</tbody>
</table>

Melinda

The procedural checklist was completed on 81 percent of baseline sessions, 82 percent of tact training sessions, 100 percent of mand probe sessions, and 98 percent of the mand training sessions. Of the times the procedural checklist was completed, the mean percentage that the procedural checklist was followed correctly and completely was 99 percent of baseline sessions, 94 percent of tact training sessions, 100 percent of mand probe sessions, and 98 percent of the mand training sessions (see Table 9). The total combined mean percentage of integrity measures across conditions was 97.
### Table 9

**Procedural Checklist Measures for Each Condition for Melinda**

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Tact Training</th>
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<tbody>
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<td>Checklist Completed</td>
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<tr>
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<td>13</td>
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<td>Percentage of Checklist Taken</td>
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<td>100</td>
<td>46</td>
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<td>Mean Percentage of Checklist Followed</td>
<td>99</td>
<td>94</td>
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**Generalization Data**

This study recorded three different measures for generalization. The first was the mand probe that was used to see if a word trained under one verbal operant (i.e., tact) would occur in a non-trained verbal operant condition (i.e., the mand). The second measure for generalization was used to formally track whether the children would use the trained tact with persons other than the experimenter. The third generalization measure was a daily informal measure that measured whether any classroom personnel had heard
the child say or sign any of the targeted words in training or maintenance on that particular day.

Transfer of a Response Across Verbal Operants (Mand Probe)

The mand probe was only measured on one targeted word for Katie. The targeted word was book and it was assigned to the vocal plus sign language condition. No correct responses occurred for the three sessions that measured the mand probe.

For Melinda the mand probe occurred for three words, book and cookie that were assigned to the vocal plus sign language condition and pen that was assigned to the vocal only condition. No correct responses occurred for the words book and cookie during the mand probe condition. For pen, a correct response occurred on the first mand probe session. On the next two mand probe sessions the correct response did not occur.

Transfer of Responses Across Persons (Formal Tact Probe)

During the vocal only condition for Katie formal generalization probes were taken on the targeted words pen, muffin, and mirror (see Figure 10). Formal probes were taken eleven times on the word pen. The first six times Katie either did not respond or made an error during the probe session. On the seventh probe for pen Katie made a correct vocal verbal response. On the eighth probe Katie either made an error or did not respond. On the ninth through the eleventh probe Katie made correct vocal verbal approximations. For the targeted word, muffin, four formal probes were taken on each of these probes Katie either did not respond or made an error. Formal probes were
Figure 10. These words were assigned to the vocal only condition. A correct or an error/non-response was recorded on formal probes with different individuals presenting the items during the probe sessions. Formal probes were only taken on words in training. Vocal responses were indicated by colored ovals. The lines and headings indicating when treatment conditions were in effect are provided for clarity purposes and by no means indicate that training occurred during the probe sessions.
taken on the targeted word, mirror, three times. On each of these three probes Katie either did not respond or made an error.

Formal generalization measures were also taken on the targeted words assigned to the vocal plus sign language condition for Katie (see Figure 11). Probes were taken on the targeted words book, cereal, and piano. For book formal probes were taken eleven times, the first five times Katie either did not respond or made an error during the probe session. On the sixth probe session for book Katie made a correct non-vocal verbal sign language response. On the seventh and eighth probe Katie either made an error or did not respond. On the ninth through the eleventh probes Katie made correct non-vocal verbal sign language responses. For the targeted word, cereal, five formal probes were taken and on each of these probes Katie either did not respond or made an error. For the targeted word, piano, three probes were taken and on each of these probes Katie made a correct non-vocal verbal sign language response.

During the vocal only condition for Melinda formal generalization probes were taken on the targeted words pen, mirror, and piano (see Figure 12). For pen formal probes were taken twelve times. Correct vocal verbal responses occurred on seven out of the twelve generalization probes taken for Melinda on the targeted word pen. On the first probe session Melinda made a correct vocal verbal response. On the next two trials Melinda either did not respond or made an error during the probe sessions. On the fourth and fifth probe sessions for pen Melinda made a correct vocal verbal response. On the sixth probe Melinda either made an error or did not
Figure 11. These words were assigned to the vocal plus sign language condition. A correct or an error/non-response was recorded on formal probes with different individuals presenting the items during the probe. Formal probes were only taken on words in training. The lines and headings indicating when treatment conditions were in effect are provided for clarity purposes and by not means indicate that training occurred during the probe sessions.
Figure 12. These words were assigned to the vocal only condition. A correct or an error/non-response was recorded on formal probes with different individuals presenting the items during the probe. Formal probes were only taken on words in training. Vocal responses were indicated by colored ovals. The lines and headings indicating when treatment conditions were in effect are provided for clarity purposes and by no means indicate that training occurred during the probe sessions.
respond. Melinda made correct vocal verbal approximations on the seventh and the eight probe sessions. The next two probe sessions Melinda either made an error or did not respond. On the eleventh and the twelfth probe sessions Melinda made correct vocal verbal approximations. Four formal probes were taken on the targeted word, muffin. On each of these probes Melinda either did not respond or made an error. For the targeted word, mirror, two probes were taken, on these probe sessions Melinda either did not respond or made an error.

Formal generalization measures were also taken on the targeted words assigned to the vocal plus sign language condition for Melinda (see Figure 13). Probes were taken on the targeted words book, cookie, and pretzel. For book formal probes were taken thirteen times. On the first ten probes Melinda either did not respond or made an error during the probe session. Melinda made a correct non-vocal verbal sign language response on the next probe session for book. On the twelfth probe session, Melinda either made an error or did not respond. Then on the thirteenth probe Melinda made correct vocal verbal and a non-vocal verbal sign language response. Five formal probes were taken on the targeted word, cookie. Melinda made a correct vocal verbal and a non-vocal verbal sign language response on the first probe session. On the second and third probe sessions Melinda either did not respond or made an error. On the fourth probe Melinda made a correct non-vocal verbal sign language response. On the fifth probe Melinda made a correct vocal verbal response to the targeted word cookie. For the
Figure 13. These words were assigned to the vocal plus sign language condition. A correct or an error/non-response was recorded on formal probes with different individuals presenting the items during the probe. Formal probes were only taken on words in training. The lines and headings indicating when treatment conditions were in effect are provided for clarity purposes and by no means indicate that training occurred during probe sessions.
targeted word, pretzel, two probes were taken and on each of these probes Melinda either did not respond or made an error response.

Informal Recordings of Targeted Words Outside of Training

Each day that sessions occurred and each child was present, informal data was collected on whether the targeted words (in training or maintenance) had been vocalized or signed by the child. For Katie, the sign language response for the targeted word, book, occurred eleven times throughout the study and a correct vocal approximation occurred once during the day of session 35. Also, the vocal verbal approximation for the word, pen, occurred 8 times throughout the study. For Melinda, the vocal verbal response for the targeted word, pen, occurred twice on the same day near the end of the study. The vocal verbal response for the word, book occurred once. The vocal verbal approximation to the word, cookie, occurred once and the sign language approximation occurred twice during the study. Finally, the sign language approximation for pretzel occurred once near the end of the study.

Parental Opinions

Parents were asked to state their views of their child's progress during the language study (see Appendix G).

Katie's parents stated that they were impressed with how she did in the study. When asked if Katie's vocal responses had increased during the study, they stated that single syllable vocal responses have increased including th, er, o, e, and k. The parents stated an increase in the number of words or approximations of words Katie vocally says. The list of words are
yo-yo, tiger, duck, cer (for cereal), milk, straw, then or den (for pen), kite, and juice. Parents reported sign language usage increased and includes the sign for cookie, butterfly, all done, orange, and book. When asked if they felt the study helped to improve Katie’s communication skills the parents stated, “Yes. Katie has shown a greater desire to talk and attempts a wide variety of sounds since her participation in this study.” When asked what condition they believed improved their child’s communication skills best, the parents stated, “Vocal alone. If Katie knows signing gets her the same result as a vocal, she will sign.” Parents were asked to provide any additional comments about the language study. This parent stated, “I am extremely impressed with how well this has worked for Katie. The everyday reinforcement and structure of the trials was a big motivator for her. We will participate in future studies!”

The parents of the Melinda stated that she improved during the study and it put her in the right direction for future language improvements. The parents stated an increase in vocalizations in general and increase in the usage of multiple syllable sounds. Melinda also increased the number of words she vocally says that includes baby, done, drink, bye, cookie, and mama (meaning Grandma). Sign language usage increased and includes the sign for cookie and eat. The parents stated that Melinda uses other signs, but they are just learning them and don’t know all of the signs yet. When asked if they felt the study helped to improve Melinda’s communication skills the parents stated, “Absolutely. Because someone was spending quality time with her and made her focus on it and because she really liked the
person(s).” When asked what condition they believed improved their child’s communication skills best, the parents stated, “I really didn’t watch much.” Parents were asked to provide any additional comments about the language study. This parent stated, “I think it was a wonderful study. I feel Kim was a great motivator for Melinda and I appreciate all of her hard work. I feel it was the push that Melinda needed to get her moving in the right direction.”

Teacher Opinions

The questionnaire was used to obtain the teacher’s view of each child’s progress and if they would alter their methods of teaching language after being exposed to the study (see Appendix I).

Katie’s teacher stated that her student improved vocal responses during the study. Improvements in the usage of single syllable were noted by the teacher. The teacher stated that the student increased the number of words she vocally says and that includes blue, green, duck, snake, all done, snack, pen, book, and a few more. The teacher reported that Katie’s spontaneous use of sign language did not increase, although imitations of signs did occur. When asked if she felt the study helped to improve her student’s communication skills the teacher stated, “Yes. Because Katie has made a real connection with Kim. She is very excited to see Kim. She imitates her by sitting in her chair and does teacher stuff.” When asked what condition she believed improved her student’s communication skills best, the teacher stated, “I do not really know for sure, but probably vocal alone because vocalizations have increased and spontaneous use of sign language has not.” The teacher was also asked what changes she would make to
improve her student’s language performance. This teacher stated, “More
direct one to one situations and raise expectations for verbalizations.” When
asked to provide any additional comments about the language study, this
teacher stated, “Thanks Kim. It has been a wonderful experience. I know
Katie thought so!”

Melinda’s teacher stated that her student improved during the study,
yet she could not be sure the difference was due to the language study, as
gains in language would have been expected anyway. Improvements in the
usage of single syllable sounds, single words, and 2 word phrases were noted
by the teacher. The teacher stated that the Melinda increased the number of
words she vocally said that includes baby, up, down, and book. The teacher
reported that this Melinda’s use of sign language did not increase. When
asked if she felt the study helped to improve her student’s communication
skills the teacher stated, “Maybe. Can’t tell. I would have expected some
improvement anyway.” When asked what condition she believed improved
her student’s communication skills best, the teacher stated, “I can’t tell the
difference.” The teacher was also asked what changes she would make to
improve her student’s language performance. This teacher stated, “Wait
longer, be more insistent about them saying something.” When asked to
provide any additional comments about the language study, this teacher
stated, “Can’t tell whether it made a difference, but Melinda seemed to enjoy
the adult attention.”
CHAPTER V
DISCUSSION

This chapter discusses the results of the study comparing the effects vocal training alone and vocal plus sign language training on the development of vocal verbal tacts and mands of preschool children with minimal vocal verbal and non-vocal verbal abilities. This chapter begins by discussing the results relative to the ten research questions presented at the study’s inception. Also included in this chapter are limitations of the study, implications for classroom usage, and suggestions for future research.

Research Question One
What were the effects of the two experimental conditions (vocal only and vocal plus sign language) on the development of single word vocal verbal tacts by preschool children with limited communication skills?

The vocal only condition had the greater effect on the development of vocal verbal tacts that met criterion according to the standards of this study. It should be noted here that although the vocal only condition had the greater effect on vocal verbal tacts that only a minimal number of correct vocal verbal responses occurred throughout the entire study.
In the vocal only condition, only Melinda met criterion on one vocal verbal tact response. Criterion was met on the word, pen, after 35 days of training. The other words for both of the children did not met criterion. In fact, for the vocal only condition two of the three words in training had zero correct responses for both children. The first word that received tact training for Katie, did have some correct vocal verbal responding and she almost met criterion twice for the word, pen, each time missing criterion on the final day.

Neither child met criterion on vocal verbal responses in the vocal plus sign language condition. This may have occurred due to the requirements of responding for this condition. Since the children had limited vocal verbal repertoires prior to the study the experimenter decided not to require both a vocal verbal and a non vocal response for the sign language plus vocal condition. In this condition either a vocal verbal or a non vocal verbal (i.e., sign language) response sufficed to obtain access to the specified item. Therefore, the children were only required to use one form of responding to obtain the potential reinforcer. This study showed that for both children if a vocal response was not required that the vocal response dropped out when another form of responding (i.e., sign language) became stronger (see Figures 6 & 8).

The words assigned to the vocal plus sign language condition did show some correct vocal verbal responses across each of the words that received training for Katie and two of the words that received training for Melinda.
Katie emitted some correct vocal verbal responses during the vocal plus sign language condition although these responses were not consistent or at a high enough level to met the specified criterion. For the word book, Katie quickly began to emit correct vocal verbal responses for the tact, yet as the correct sign language response increased the correct vocal verbal response for book decreased. On session 19, the correct number of sign language responses was low and then again a correct vocal verbal response occurred (see Figure 6). Katie made several correct vocal verbal responses on the word cereal within a five day period near the end of the study but then these correct vocal responses dropped out. Katie only had one correct vocal verbal approximation for the word, piano.

Although Katie emitted correct vocal verbal responses during the vocal plus sign language condition her vocal verbal skills may not have been accurate enough to consistently reproduce the appropriate sounds. In other words, Katie may have accidentally produced the correct responses, yet did not have the vocal ability to consistently reproduce those sounds at appropriate times even with similar and appropriate stimulus conditions. The word piano may also be an example of Katie’s limited ability to consistently reproduce correct responses.

During the study Katie frequently made vocal sounds after the experimenter modeled the referent to the item in the study. Only a few of these were within the response class that would gain her access to the item. Many of her vocal responses occurred outside of the response class, which did not gain her access to the items in the study during recorded trials.
During the vocal plus sign language condition Melinda had a few correct vocal verbal responses during the first week’s training sessions and then as the sign language response increased in accuracy correct vocal verbal responses decreased (see Figure 8). For the word, book, one correct vocal verbal response occurred for a session across several days during the first two weeks of training then dropped out when correct sign language responses increased to five or more per session. When the number of correct sign language responses decreased during the first implementation of the one second delay again a correct vocal response occurred. Melinda showed this same pattern with the word, cookie, although the correct vocal verbal responses were fewer. Since Melinda acquired the correct sign language response very quickly for the word, cookie, there was no longer a need for her to respond vocally. In this case, the lack of a required vocal response makes it difficult to state whether Melinda under other circumstances would have maintained an accurate vocal verbal response in addition to the sign language response. Bonvillian and Nelson (1978) suggest that the spoken component of total communication might interfere with sign language learning, creating the possibility that both responses might have dropped out as it may have been too confusing to acquire acquisition on the two completely different response modes at the same time. Stremel-Campbell, Cantrell, and Halle (1977) taught sign language responses first not simultaneous with the intervention therefore, decreasing the possible confusing nature of learning two responses at the same time. Research by Clarke, Remington, and Light (1988) contend that total communication is
probably one of the most effective procedures used to develop sign language skills, and clinicians should not be overly concerned about competing issues between vocal and sign language acquisition as total communication has been shown to enhance expressive speech skills with vocally imitative children. Since in this study, vocal verbal responses were not forthcoming, the statement by Bonvillian and Nelson (1978) may have merit.

With both vocal and vocal plus sign language conditions a minimal number of correct vocal verbal responses occurred throughout the study. The reason these responses may have been so minimal may have to do with the lack of vocal sounds the children were able to consistently imitate. Research has contended that adequate verbal imitation may be a positive indicator of speech development (Carr, 1979; Carr, Pridal, & Dores, 1984).

The results of this study are contrary to the results of Kouri (1989) that demonstrated the link between manual sign language to oral language production. The results of Kouri's (1989) study, showed that sign language played an important role in a child's early vocal verbal development. In the Kouri (1989) study the author stated that the use of sign language seemed to facilitate the onset and development of the acquisition of speech for the child in the study. The most common pattern reported for the child in this study was the production of manual signs followed by the use of sign language with an oral response and then finally using the oral response without sign language. What is not known about the Kouri (1989) study is whether access to specific items was contingent upon a correct vocal response or whether praise and access to items were sporadically presented with signed
and/or vocal responses. This lack of information may have provided key factors about the possible cause for the child's production of vocal verbal responses.

**Research Question Two**

What were the effects of the sign plus vocal condition on the development of non vocal verbal tacts by preschool children with limited communication skills?

This question does not address the vocal only condition as it did not have a non vocal verbal (i.e., sign language) component. Although, for the vocal only and vocal plus sign language condition, correct sign language responses were recorded during the assessment of possible words, baseline, and mand probes.

Both children met the required criterion for two of the words that received tact training in the vocal plus sign language condition. Katie met criterion on the word, book, after 18 sessions and on the word piano after 16 sessions if the follow-up session is included. Figure 6 shows the acquisition of the sign language responses and Figure 7 shows the point that the responses met criterion prior to the delay prompt for Katie.

Katie acquired the sign language responses more quickly than vocal responses. This in part may be due to the difference in shaping physical and vocal responses by the experimenter. Sign language responses were easy for the experimenter to provide physical assistance. Shaping and molding Katie's hands into the required physical responses were provided to facilitate a correct response. Vocal responses do not work in the same manner, as they
can not be shaped or molded through physical means, only verbal examples can be provided to the child.

The second word that was trained for Katie did not met criterion on the sign language or the vocal response. It is important to report that the signed response for cereal, maybe considered more difficult due to the use of two hands and three different formations and movements required to obtain a recognizable approximation. Katie frequently attempted the sign for cereal during recorded sessions and practice trials yet, she was not proficient enough to make a correct response during recorded trials during the study.

Melinda met criterion on the word, book, after 33 sessions and on the word cookie after 7 sessions. Figure 8 shows the acquisition of the sign language responses and Figure 9 shows when responses met criterion prior to the delay prompt for Melinda. There are some possible explanations for why the sign for book took 33 sessions and why the sign for cookie took only 7 sessions. During the initial subject selection assessment Melinda looked at and played with books often. The experimenter added the word book to the possible list of words due to the frequency at which Melinda played with the books. Then after Melinda did not say or sign any approximations for book during the assessment, it was assigned to the vocal plus sign condition. During the first two sessions of training Melinda looked at the books during practice sessions after the experimenter helped her to shape a correct signed response or emitting a correct vocal verbal approximation. Then on the third day of training Melinda handed the book back to the experimenter without even looking at it after providing an appropriate sign language
approximation. At this time in the study the experimenter had only two different books to use during training. The experimenter discovered that after Melinda had looked a particular book she was likely to be less interested if the book was presented to her again during that same session. The experimenter then purchased several different types of books to remediate the possible lack of an establishing operation (i.e., motivation) or possible satiation for the previous books presented to her. Another possible reason for a continued lack motivation for books may have been due to the fact that Melinda had access to over forty different books in her classroom outside of training sessions non contingent of any sign language or vocal response.

The reason that the sign language response for cookie may have been met more quickly could be that Melinda’s access to cookies was less in her classroom, as cookies were only available at snack time on days when cookies were provided as the snack. Another possible factor in the speed that Melinda met criterion for cookie could have been the possible reinforcing quality of cookies to Melinda.

**Research Question Three**

*What were the effects of the two experimental conditions (vocal only and vocal plus sign language) on the development of single word vocal verbal mands by preschool children with limited communication skills?*

None of the words assigned to the vocal only or the sign language plus vocal condition met the required criterion with the verbal operant, mand for vocal verbal responses. Neither Katie nor Melinda got mand training in
the vocal only condition. This was due to the amount of time it took for
Melinda to meet criterion for the word pen and for not meeting criterion on
the other two words. Katie did not meet the required criterion during the tact
condition for the vocal only condition therefore there was no opportunity for
her to receive training under the verbal operant mand.

Mand training occurred on one word for each child during the vocal
plus sign language condition. During mand training for both children not a
single correct vocal verbal response occurred. Katie had mand training on
the word book for seven sessions before the required criterion was met for
the sign language response. It is believed that Katie had no need to make a
correct vocal verbal response as the sign language response had been
established and was adequate at obtaining access to the targeted item.
Melinda had 10 sessions of mand training without a single correct vocal
verbal response. Again it is believed that Melinda had no need to respond
using vocal verbal behavior as a correct sign language response could gain
Melinda access to a specific item.

There is very little that can be said about the effects of either the vocal
only or the vocal plus sign language condition on the effects of vocal verbal
responding for the mand as no training was completed under the vocal only
condition and correct vocal verbal responding did not occur for either child
in the vocal plus sign language condition.
Research Question Four

What were the effects of the sign plus vocal condition on the development of non vocal verbal mands by preschool children with limited communication skills?

Only one word per child received mand training in the vocal plus sign language condition. Both children met the required criterion for the one word that was trained for the verbal operant, mand. Katie met criterion on the word, book, after 7 sessions. Under the mand condition Katie learned the correct response in ten days less that under the tact condition. This may be due to the fact that the sign language response did not need to be taught, it just needed to be taught to occur under different stimulus conditions. Melinda met criterion on the word cookie after 10 sessions for the mand. This was three more sessions than what was needed to train the same response for the tact. A possible reason for this additional time span was that Melinda began to sign cookie using one finger in the middle of her hand which she had never done before and it was not considered a close enough approximation to gain access to the potential reinforcer.

Research Question Five

How many learning trials were needed to master the target words under the vocal only condition and the vocal plus sign language condition for each verbal operant trained?

During the vocal only condition only one word for one child met criterion under the tact condition and no words met the required criterion, of three consecutive days of five or more correct vocal verbal approximations
before the delay prompt, under the mand condition. Actually mand training was not completed for either child for the vocal only words. This was due to the procedural requirements that stated that criterion must be met under the verbal operant tact before training on the verbal operant mand could take place. The only word that met the criterion was pen and it took Melinda 35 sessions to achieve the criterion. It is not known how many sessions would have been needed for each targeted word to meet the specified criterion for a vocal verbal response. It is projected that a similar or an extended number of sessions would have been needed to obtain criterion for the vocal verbal responses.

For the vocal plus sign language condition, both children met criterion for two tacting responses and one mand response using the sign language response form. Katie met criterion for the word book under the tact verbal operant after 18 sessions and on the mand after 7 sessions. Katie also met criterion under the tact condition for the word piano after 16 sessions. Melinda met criterion for the word book under the tact verbal operant after 33 sessions. Katie also met criterion under the tact condition for the word cookie after 7 sessions and the mand after 10 sessions.

The vocal plus sign language condition had the most words that met criterion using the sign language response form, yet criterion was not met on any words for the vocal verbal response form.
Research Question Six

Did the tacts learned under the vocal only or vocal plus sign language condition transfer to an untrained verbal operant (i.e., mand)?

This question addresses the issue of whether or not verbal operants are separate responses and if learned under one verbal operant will the same response automatically be transferred to an untrained verbal operant.

Neither child transferred responses from the tact to the mand condition under either condition. Melinda did have a correct vocal verbal response to the mand on the first day of the mand probe session for the word pen (see Figure 4). But on the next two days Melinda did not respond correctly to the mand probe. This information supports Partington and Bailey’s (1993) finding that showed that typical children who were taught to tact pictures cards did not use the learned response under the stimulus conditions of the intraverbal without training.

In typical training based upon cognitive, developmental, or linguistic models frequently assume that if a vocal response occurs that it has meaning for the child and can occur in different situations. The results of this study does not support this, in that the children did not produce verbal response under different verbal operant conditions without training.
Research Question Seven

Did the items that received tact training under the vocal only or vocal plus sign language condition occur when other individuals (i.e., teachers, aides) in the classroom completed a formal baseline condition probe?

Determining which condition the vocal only or the vocal plus sign language had the greater effect on the occurrence of vocal verbal tacts using different people to present the trials was difficult to determine. It should be noted here that a distinction was not specified in the question on if a certain type of response form (i.e., vocal or sign) was required. Comparing the two different response forms to each other is risky at best, therefore the information reported here will separate correct responses by their form.

For each child correct responses to formal probe words occurred at varied rates. In the vocal only condition both children responded correctly using vocal verbal responses to several formal probes for the first targeted word, pen (see Figures 10 & 11), and did not respond correctly once to the other two words that received tact training. In the vocal plus sign language condition only Melinda emitted the correct vocal verbal responses during formal probes. These correct vocal verbal responses occurred on three out of seven probe sessions for the targeted word, cookie and once on the targeted word, book, near the end of the study. These few correct responses do not correspond with the minimal responding that occurred during training.

Correct sign language responses occurred for both children on at least two of the words that received training. Katie had four correct sign language responses out of 11 formal probes for the word book and three correct sign
language responses out of three formal probes for the word, piano. Melinda had two correct sign language responses out of 13 formal probes for the word book and three correct sign language responses out of seven formal probes for the word, cookie.

Overall comparisons can be made on under what conditions the children correctly responded to formal probes. Words that had a number of correct responses during training often had at least one correct response during formal probes. Words that did not have any correct responses during training did not occur during the formal probes. This transfer of responding for correct responses across stimulus conditions may have occurred for two reasons. First, the training sessions occurred in the natural environment so there was similar or common stimuli present with the daily training session and with the formal probes. Second, individuals familiar to the children that often asked them to respond to certain situations were the individuals used for formal probes. Heward (1993) may consider these two reasons correlated to the component of training common stimuli. Programming common stimuli sets up the training environment to include stimuli that already exists in the generality setting and that might function as cues for the targeted behavior (Heward, 1993).

The results that showed the use of sign language or vocal verbal responses with other person’s in formal sessions also has support from the naturalistic training model (Kaiser et al, 1987). Several of the procedures in this study parallel those of the naturalistic training methodology including many opportunities to communicate, prompting appropriate responses if the
child does not respond, providing specific consequences related to the
response being taught, and providing training within a familiar environment.

**Research Question Eight**

Did the children initiate vocal or sign language responses for items that were
trained during the study during non session school times and under what
experimental condition (vocal only or vocal plus sign language) was the
word/item assigned?

Some of the words that received training did periodically occur in the
natural environment. It is difficult to determine which condition had the
highest rate of responses. This question has limitations, in that it does not
specify a specific response form, therefore response forms were separated for
each condition to decrease any possible confusion. Katie had six different
days where at least one correct vocal verbal response occurred for the
targeted word, pen. The first time that Katie made a vocal verbal response
outside of training or probe sessions was on the day of session 31. The two
other words in the vocal only condition were not reported to have occurred
by the personnel in Katie’s classroom. Melinda had only one correct vocal
verbal occurrence during the vocal only condition. The vocal verbal
response, pen, was emitted near the end of the study and was heard by the
classroom staff twice on that one day.

Vocal verbal responses also occurred for at least one word that
received training for both children on the words assigned to the vocal plus
sign language condition. It was reported that Katie emitted one vocal verbal
response for the word, book. Vocal responses were reported on two different
words (e.g., book, cookie) for Melinda. These words occurred one time each on different days as reported by the classroom staff.

Correct sign language responses occurred without experimenter influence for both children on at least one of the words that received training. Katie had nine days where correct sign language responses occurred for the word book, yet did not have any other sign language responses for the other two words that received training. Melinda had correct sign language responses on two words (e.g., cookie, pretzel) trained during the vocal plus sign language condition. For the word cookie Melinda emitted two correct sign language responses and one correct sign language response for the word, cookie, at the end of the study.

Variance in the rate of vocal or sign language responses may have been effected by the availability or access to a similar type of items in the classroom, the voice volume of the child, the proximity or attentiveness of the classroom personnel to the child at the time a sign or vocalization occurred, or the staff knowledge of the sign language response or the vocal approximations. In addition, the rate at which correct responses may have or not been emitted by the children, seen by the staff, or whether the child was provided with the specific item when a correct response occurred could have also effected the rate of responding.

It is important to mention that responding did occur outside of training conditions which emphasizes the point that the trained responses have some value to the child, as well as providing a demonstration of appropriate usage beyond the training environment.
Research Question Nine

What were the parent's opinions of the study's outcomes?

The parents of both children stated in the questionnaire that they felt the study had a positive effect on their child's language ability. Katie's parents stated that they were impressed with how well she did in the study and hired the experimenter at the end of the study to continue to work on Katie's language development. Katie's parents ended the questionnaire by stating, "We will participate in future studies!" Melinda's parents stated that they thought it was a wonderful study and it provided Melinda with some needed structure and required her to focus. Melinda's parents also commented that they felt this study has given Melinda the push that she needed to get her moving in the right direction.

Parents were asked what condition they believed improved their child's communication skills best. Katie's parents stated that they believed the vocal alone condition worked best for their child because if Katie knows that signing alone will get her what she wants she has no need to make vocalizations. The parents of Melinda did not have an opinion of what method increased Melinda's vocal and sign language responses. They also stated that they didn't watch the sessions much.

When parents were asked to state whether they have noticed any increases in vocal and/or sign language responses both parents noted increases in vocalization and sign language responses. Katie's parents described increases in vocal responses during the study. Specific areas of improvement include single syllable vocal responses, words or
approximations of words, and sign language usage. Melinda’s parents noted
an increase in vocalizations in general, an increase in the usage of multiple
syllable sounds, an increase in the number of words she vocally says, and
increases in sign language usage.

Research Question Ten
What were the teacher’s opinions of the intervention and outcomes of the
study?

The two teachers stated in the questionnaire their differing views on
the effects the study had on their student’s language ability. One teacher
stated that the study had improved her student’s spontaneous use of vocal
responses, while the other teacher did not believe the study had much effect
on her student’s language ability. Both teachers did agree that the students
seemed to enjoy the experience.

Katie’s teacher stated that not only did her student increase the
number of vocal responses but Katie also increased her usage of spontaneous
verbalizations. Sign language responses were noted to be imitated by Katie
but did not occur spontaneously as reported by her teacher. Melinda’s
teacher stated that although vocal responses increased including some new
words during the study, she was not sure whether those changes were due to
the study as it was her belief that Melinda would have made some language
gains anyway.

When asked what condition the teachers believed improved their
student’s communication skills best one teacher was wasn’t really sure but
then chose the vocal only while the other teacher stated that she could not
tell the difference in the conditions. Katie's teacher was uncertain about the conditions but then stated that the vocal alone condition as making the greatest impact on Katie's vocalizations as they increased while the spontaneous use of sign language did not. Melinda's teachers comments about the difference in conditions was that she could not tell the difference and therefore could not state if one was better than the other.

The teachers were also asked what changes they would make to improve their student's language performance. Katie's teacher stated that she would provide more direct one to one situations and her raise expectations for vocalizations from Katie in the future. Melinda's teacher stated that she would wait longer for a response and be more insistent about Melinda saying something.

**Limitations**

This study was limited by the following factors: subject characteristics, teacher characteristics, absences, the varying difficulty of the assigned words, the limited response requirements, the setting, the limited duration of the study, and the time of the school day.

**Subject Characteristics**

Due to the nature of this study, specific subject characteristics were assessed prior to the beginning of the study. This assessment as described in chapter 3 was specific enough that only a very limited number of subjects from those assessed (e.g., 3 of 9) were eligible to participate in the study. In addition to the limited number or subjects in the study, subjects that were included had limited vocal sound responses.
The initial subject selection assessment required that each subject had some isolated vocal sounds, yet did not set specific criterion on how many different sounds were a minimum or what variety of sounds were required. Also, the initial subject selection assessment only measured whether each child was able to approximate the correct vocal sound once out of two trials to be included as a known sound. This assessment let the experimenter know that the child could produce the sound yet did not tell the experimenter if the child could consistently or accurately reproduce that same sound when modeled by the experimenter. It is not known what the effects this study would have on other children with similar disabilities.

**Teacher Characteristics**

The experimenter served as the instructor rather than the classroom teacher. It is not know what type of results may have been obtained had the children been taught by their classroom teacher.

**Absences**

Student absence was a problem throughout the study. One of the three children originally eligible for the study was frequently absent. This child was absent a couple days a week or missed an entire week and then attended a week and therefore was eliminated from the study. The other two children also had periodic absences. Katie was diagnosed with chicken pox after about three quarters through the study and was absent for a full week. Melinda also missed an entire week of sessions near the end of the study.
Difficulty in Variance of the Assigned Words

Prior to the assignment of words to conditions the experimenter tried to make sure that the items/words chosen for the pool of possible words were similar in difficulty. Words with one or two syllables and items that the child played with frequently during free play sessions increasing the probability that these items could serve a possible reinforcers for using vocal and/or sign language responses were used. The experimenter did not take into account the difficulty of the topography of each sign language response. The difficulty of sign language responses varied from simple two movement symmetric two handed response to a two handed asymmetrical three step movement. there is no way to tell what the results might have been had the experimenter also limited the type and difficulty of sign language responses during the study.

Response Requirements

A major limitation of this study was that vocal verbal and sign language responses combined were not required in the vocal plus sign language condition therefore the children could obtain access to a specific item by either emitting a non-vocal verbal response or vocal verbal response. Vocal responses under these requirements did not have to occur and in this study vocal responding dropped as sign language responses became stronger. It is not known what other outcomes may have occurred had the requirement a vocal response been included.
Setting

The setting was an university affiliated preschool setting with typical and delayed children. Within the preschool the children were taught in their classroom with their peers and teachers present in the environment. The results may have been different had the experimenter taught the children in another room with less the distractions than the classroom. Had trials occurred in a different setting the children may have been able to focus on the training trials without distractions, yet the generalization of known responses my have also been affected.

The results may have also been different had sessions taken place with the students within specific corresponding activities within the classroom. A consideration of the experimenter at the onset of the study was to place learning trials within specific activities. This was unable to occur due to the arrangement of the classroom and classroom routine.

Session Length

The length of each session lasted from approximately fifteen to forty minutes. At the start of the study sessions were shorter in length as only one word from each condition was in training. As the study continued the length of the sessions increased due to the addition of words that began training. The results of this study may have been different had the length of the sessions been consistent throughout the study.

Limited Duration of the Study

The study was conducted during the last four months of the school year. The study was required to end with the end of the school year as the
children were not going to be attending summer school sessions. It is not known what effects an extended number of sessions would have had on the results.

**Time of the School Day**

Each child had a specific time that sessions occurred each day. Katie had sessions in the late morning just after snack. Frequently the time that sessions started varied up to 20 minutes. This variation occurred due to several factors. Sessions began early if Katie did not want to eat snack and the snack was presented at the typical time frame. Sessions occurred later if Katie ate snack, her class played outside, the class had a special activity prior to snack, or if circle time was completed later than usual. On many occasions Katie would sit at the snack table for a few minutes and would refuse to eat snack. After a few moments her teacher would allow her to put away her snack and go to the area where the experimenter taught Katie. On these days sessions occurred earlier than usual. When the weather was nice the class might stay outside longer than usual and had snack later in the day making the training session later than normal. The problem with having snack later in the day was that the preschool day ended just a few minutes after snack was over limiting the amount of time the experimenter had to complete training with Katie.

Sessions were conducted for Melinda at the beginning of the school day during her free play time. Melinda had sessions in the morning during the first hour of school. Frequently the time that sessions started varied up to 20 minutes. This variation occurred due to several factors. Sessions
began late if Melinda arrived at school after the scheduled time period, if the free play activity lasted for an extended amount of time, or if Melinda was engaged in a preferred activity. A few times sessions were not completed during the free play time period. Upon those occasions the session was completed at the end of the school day during a free play time period. If sessions began later than usual a limited amount of time existed to complete the training session as circle time began promptly after the free play period.

Implications for Classroom Usage

Implication for classroom usage are limited at this time due to the lack of research that has been completed that uses Skinner’s (1957) Verbal Behavior to explain vocal and non vocal verbal behavior in children with disabilities. The data from this study does suggest that formal sessions for individuals with very limited verbal abilities can improve verbal responding.

Specifically for preschool children with severe language delays, setting up an area in the classroom where multiple trials on possible high preference items that occurs over a short period of time may provide these children with needed practice to improve their verbal behavior (i.e., vocal and/or non vocal). Trials should be set up within a specific activity if possible or at least to help the child gain access to a preferred item.

The children seemed to be consistently interested in participating in the study. This could be seen, as both children were willing to come with the experimenter each day and remained in the session until it was over even when sessions lasted for approximately 40 minutes in length.
Also noteworthy is that the other children in the classroom frequently came up to the experimenter during training and asked for specific items that they did not have available access too in their classroom. Some students from Katie’s classroom came up several times after training sessions were completed and wanted to work with the experimenter. If time permitted the experimenter used the same training techniques to obtain vocal responses from these children. This type of environment could easily be placed in a preschool setting with preferred items placed in an area where a teacher or aide provided access to specific items after the child made an appropriate vocal, sign language, pointing response, etc.

What is clear about this study is that this type of direct and specific instruction with the use of vocal and sign language prompting successfully increased the verbal behavior of the children in the study.

**Suggestions for Additional Research**

In the area of verbal behavior as a whole there are a multitude of research topic areas. Sundberg (1991) lists 301 areas that could and should be researched to learn more about verbal behavior. In this article, Sundberg (1991) provides several areas of research in the areas of early development, communication for non vocal individuals, and individuals with autism or developmental disabilities.

This study shows that if a vocal response is not required then a vocal response may occur, but then quickly drops out if there is a non vocal verbal response alternative that can gain the child access to the preferred item for these two children. The next step might be to continue this line of research...
by requiring a vocal response in addition to a sign language response, making
the vocal response contingent but the sign language response optional, or by
making vocal approximations contingent on obtaining access to the possible
reinforcer after it has been emitted at least once during training. This
research could investigate trials and time needed to acquire both vocal and
sign language skills under a specific verbal operants. Another study might
investigate whether a transfer across verbal operants would occur if training
occurred for more that one verbal operant or if there was a point at which
verbal operants generalize across each operant.

A logical step in this line of research would be to investigate the use of
the progressive time delay response prompts procedure to increase vocal
verbal responses with children that already have a sign language repertoire,
yet lack vocal verbal responses. Under this type of study vocal responses
could be shaped over time to response

A case can made here for increased research with the use of impure or
multiply caused verbal operants to teach verbal behavior. Future research
may extend the Carroll and Hesse (1987) study on using an alternating mand-
tact training conditions to teach tacts to typical children. Since the Carroll
and Hesse (1987) study demonstrated that tact responses were learned more
quickly under the mand-tact condition, it would be important to manipulate
the appropriate variables to see if children with developmental delays would
also develop this repertoire more quickly.
Other additional areas to extend this research could include the use of additional subjects, the use of different settings and activities, or the use of different trainers.

**Summary**

The ability to communicate with others is an essential part of everyday life, therefore developing a verbal repertoire in children with a limited verbal repertoire is an important task. This study investigated the use of a vocal only training condition in comparison to a vocal plus sign language condition using the progressive time delay response prompts procedure to increase a vocal and/or sign language repertoire.

The research has shown that young children that do not develop language tend to have difficulties throughout their lives if it is not remediated; areas of major difficulty include education and social competence (King, Jones, & Lasky, 1982). Children with limited or non verbal skills may develop disruptive or aberrant behaviors that function as communication. For individuals with these deficits, interventions programs to address these issues is pertinent.

Skinner's (1957) book *Verbal Behavior* provides a different way of addressing deficits in verbal behavior by addressing verbal behavior like all other operant behaviors. Because of this view, that verbal behavior is learned, all of the conditions that apply to learned behavior apply to verbal behavior. For example, verbal behavior like other behaviors is controlled by environmental stimuli or events like discriminative stimuli, motivational stimuli
or establishing operation, and consequences upon the occurrence of those behavior.

The results of the study demonstrated that the two children acquired one vocal verbal word during the vocal only condition and did not acquire any vocal verbal responses during the vocal plus sign language condition. However, both children did acquire non vocal verbal responses in the sign language plus vocal condition. For the words that met criterion either under the vocal only or sign plus vocal condition the children did emit verbal responses periodically during the formal probe where another person completed the formal trials. Although, the number of responses that occurred in the natural setting outside of training conditions was much more sporadic.

The lack of vocal verbal responding in this study was limited by two possible factors. First, the children in this study did have some single sound vocal imitation but, the frequency and accuracy of these vocal responses were not measured therefore consistent replication of these sounds even under similar and appropriate stimulus conditions could not be guaranteed. The second limitation was that during the vocal plus sign language condition both vocal and no vocal response were not required. If either a vocal or a non vocal verbal response occurred the children were reinforced with the specific item. This barrier limits what can be said about whether vocal verbal responses would have strengthened had the vocal and sign language response been required by the children.
REFERENCES


INITIAL SUBJECT SELECTION ASSESSMENT FORM

Information for sections I & II will be gained by reports by teachers or direct observation. Information for sections III, IV, V, & VI will be obtained by individually assessing each child.

I. Communication History
   A. Does the child emit any words vocally? (List all known words here)

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

   B. Does the child use any sign language? (List all known words here)

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

   C. Does the child emit any gestures that functionally attain reinforcers or serve as communication.

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
II. Item Usage History
A. List items that the child likes to play with, eat, drink, or uses frequently?

B. Of the items listed above, are there any the child will work for?

III. Manual Dexterity
A. Does the child have the ability to form several different hand positions and maintain those positions for a minimum of 2 seconds. Criterion (4 of 6)

<table>
<thead>
<tr>
<th>Physical movement</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Other Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make hands into a fist</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Point index finger</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Curve hands into a cup shape</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Place thumb between index and second finger</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Touch index finger to thumb</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Use both hands together to make a gesture</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>
IV. Imitative Behavior

A. The objective of this portion of the evaluation is to see if the child will imitate movements presented by the experimenter. The stimulus will be presented (i.e., "Do this") to the child along with the physical movement. If the child imitates the physical behavior within 6 seconds of the presentation that imitation will be marked correct. Criterion (4 of 6)

<table>
<thead>
<tr>
<th>Physical Stimulus</th>
<th>Response</th>
<th>Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clap hands together</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Raise both hands above head</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Turn body in a circle</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Tap floor with one foot</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Repeatedly open and close fist</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Jump up and down</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

V. Following One Step Directions

A. The objective of this section is to see if the child will follow one step directions presented by the experimenter. Each specific stimulus will be presented to the child. If the child emits the correct the physical behavior within 6 seconds of the presentation that behavior will be marked correct. Criterion (4 of 6)

<table>
<thead>
<tr>
<th>Vocal Stimulus</th>
<th>Response</th>
<th>Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look at me</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Stand up</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Bring the book here</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Go to the table</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Go to the door</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Come here</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
VI. Echoic Responses

A. The objective of this section is to see if the child will vocally emit specific vowel and consonant sounds. This section uses a modified version of Sundberg's (1987) echoic evaluation form (p. 127).

B. | Vowel sounds | Trial 1 | Trial 2 | Other Information |
---|---|---|---|---|
/a/ | far | YES | NO | YES | NO |
/ae/ | sat | YES | NO | YES | NO |
/e/ | pen | YES | NO | YES | NO |
/i/ | in | YES | NO | YES | NO |
/a/ | all | YES | NO | YES | NO |
/U/ | put | YES | NO | YES | NO |
/u/ | but | YES | NO | YES | NO |

C. | Consonant sounds | Trial 1 | Trial 2 | Other Information |
---|---|---|---|---|
/b/ | boat | YES | NO | YES | NO |
/ch/ | children | YES | NO | YES | NO |
/d/ | dark | YES | NO | YES | NO |
/f/ | far | YES | NO | YES | NO |
/g/ | gold | YES | NO | YES | NO |
/h/ | home | YES | NO | YES | NO |
/j/ | jury | YES | NO | YES | NO |
/k/ | cold | YES | NO | YES | NO |
/l/ | let | YES | NO | YES | NO |
/m/ | man | YES | NO | YES | NO |
/n/ | nest | YES | NO | YES | NO |
/p/ | part | YES | NO | YES | NO |
## C. Consonant sounds

<table>
<thead>
<tr>
<th>Sound</th>
<th>Word 1</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>/r/</td>
<td>art</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/s/</td>
<td>send</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/sh/</td>
<td>ship</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/.../</td>
<td>vision</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
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<tr>
<td>/t/</td>
<td>ten</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
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<tr>
<td>/th/</td>
<td>then</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
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<tr>
<td>/.../</td>
<td>thin</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/v/</td>
<td>very</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/w/</td>
<td>went</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/wh/</td>
<td>when</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>/y/</td>
<td>you</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
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<tr>
<td>/z/</td>
<td>zoo</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
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</table>

Name of Child: _______________________________

Date assessment given: _______________________

Assessment given by: ________________________
APPENDIX B

COVER LETTER AND PERMISSION SLIP
January 12, 1995

Dear ______________________,

This letter is to request your permission for an initial criterion assessment, to include ______________________ in a research project, and to obtain permission to view the Nisonger Early Childhood Education Program records pertinent to your child’s development if he/she meets the specified criterion of the study, being conducted in cooperation with The Ohio State University. The study will be conducted by Kimberly P. Weber, under the direction of Dr. Ralph Gardner III, at the Department of Education Services and Research. The purpose of this study is to gather information to help us understand and improve the vocal communication skills of children with limited or no verbal ability.

If included in the study, your child will be taught to vocally name and request specific items using two different teaching methods. This will be done to compare the effectiveness of the strategies used. The training methods will be a vocal training method and a vocal plus a sign language training method. If your child is not going to be included in the study I will send a letter to notify you.

In addition to working with your child, I would appreciate your cooperation in completing a questionnaire twice during the study and once at the end of the study on your perspective of your child’s ability and progress.

Please understand that your child’s identity will not be revealed in any publication, document, audio tape, or any other form of report developed from this research. Also understand that you may withdraw your consent for your child’s participation at any time.

If you are willing to allow your child to participate in this research project, please sign and date the form on the following page and return it as soon as possible to your child’s teacher or mail it to Kimberly Weber directly in the self-addressed stamped envelope provided. If you would like more information, please feel free to contact Kimberly Weber at 261-8492 or 292-8148. We appreciate the opportunity to work with you and your child.

Sincerely,

Kimberly P. Weber, M.A.
Doctoral Candidate

Dr. Ralph Gardner
Assistant Professor

[Signature]

[Signature]
I agree to allow my child to be assessed for this research project. I also agree to allow my child to participate in the research project and give permission for the experimenter to view the Nisonger Early Childhood Education Program records pertinent to my child's development, if my child is chosen to participate in the study that will be investigating the effects of vocal training alone and vocal training in combination with sign training to improve speech. This study will be conducted by Kimberly P. Weber, under the direction of Dr. Ralph Gardner III, in the Department of Education Services and Research at The Ohio State University. This study will require approximately 20 minutes of your child's school day for approximately 12 weeks.

I understand that my child's identity will not be revealed in any publication, document, audio tape, or any other form of report developed from this research. I also understand that I may withdraw my consent for my child's participation at any time.

If you would like more information, please feel free to contact Kimberly Weber at 261-8492 or 292-8148.

Name of Student

Signature of Parent or Guardian Date

Kimberly P. Weber, Investigator Date 10/15/95
February 2, 1995

Dear Mr. & Mrs. _________:

This letter is to inform you that _________ will not be included in the research project being conducted in cooperation with The Ohio State University, by Kimberly P. Weber under the direction of Dr. Ralph Gardner III, in the Department of Educational Services and Research.

Due to the specific needs of the project it was necessary to be sure that children included in the study displayed certain behaviors and did not display other behaviors. For example, children with more than twenty vocal words were not included in the study. Also, children with less than four imitative behaviors were eliminated from the study.

During the assessment _________ was able to use more than forty words thus making her ineligible for the study.

Thank you for allowing me the opportunity to assess your child for this study. If you have any questions, please feel free to contact Kimberly Weber at 261-8492 or 292-8148.

Sincerely,

Kimberly P. Weber, M.A.
Doctoral Candidate
APPENDIX C

DATA COLLECTION FORMS
Data Collection Form

Subject: ___________________ Date: ___________ Session#: ________
Experimenter: ______________ Observer: ___________________

<table>
<thead>
<tr>
<th>Word</th>
<th>IV Response Mode</th>
<th>Delay</th>
<th>Corrects Before</th>
<th>Corrects After</th>
<th>Errors Before</th>
<th>Errors After</th>
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</thead>
<tbody>
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</tbody>
</table>

Totals:
- Vocal only (V)
- Vocal + Sign (V)
- Vocal + Sign (S)

Procedural checklist
1. Did the experimenter provide sign language prompts at appropriate times for the student during recorded trials?
   - YES
   - NO
   - NOT NEEDED

2. Did the experimenter present each item during tact trials or did the experimenter set up & state mand conditions/materials?
   - Vocal
   - Sign + Vocal

Additional Practice Procedural checklist
1. Did the experimenter provide sign language prompts at appropriate times for the student during practice trials?
   - YES
   - NO
   - NOT NEEDED

2. Did the experimenter shape the child's hands into correct sign position for the item at appropriate times during the practice trials?
   - YES
   - NO
   - NOT NEEDED
Baseline Data Collection Form

Subject: ____________________ Date: ______________ Session#: ________
Experimenter: ____________________ Observer: ________________

As soon as the experimenter says, "What is this" or "What do you want" count to yourself, one thousand, two thousand, three thousand, four thousand, five thousand, six. This should be six seconds from the statement. Then record the response that occurred during the 6 second time period.

<table>
<thead>
<tr>
<th>Word</th>
<th>Response Mode</th>
<th>Correct</th>
<th>Error</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>s</td>
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</tr>
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<td>v</td>
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Totals:
Data Summary Sheet

Subject: 

IV: V = vocal alone  S = sign language plus vocal

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APPENDIX D

ASSESSMENT FORM
ASSESSMENT FORM

Subject: ________________ Date: __________

Experimenter: __________________

Response Mode: V = vocal  S = sign language  NR = non-response

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<th>Time Allotted</th>
<th>Response Mode</th>
<th>Operant Type</th>
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APPENDIX E

ASSESSMENT SEQUENCE OF EACH TRIAL FOR THE TACT AND MAND
SEQUENCE OF EACH TRIAL FOR THE ASSESSMENT

TACT CONDITION

1. Show item + state, "What is this?"
2. Wait 6 seconds
   a. Correct (vocal and/or sign language response)
      - give item to child
      - remove item from possible pool of words
      - go to next trial
   b. Incorrect (vocal and/or sign language response)
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
   c. No response
      - go to step 3
3. Show item + state, "What is this?"
4. Wait 10 seconds
   a. Correct (vocal and/or sign language response)
      - give item to child
      - remove item from possible pool of words
      - go to next trial
   b. Incorrect (vocal and/or sign language response)
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
   c. No response
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
SEQUENCE OF EACH TRIAL FOR THE ASSESSMENT

MAND CONDITION

1. Task conditions + targeted item missing + state, "What do you want?"
2. Wait 6 seconds
   a. Correct (vocal and/or sign language response)
      - give item to child
      - remove item from possible pool of words
      - go to next trial
   b. Incorrect (vocal and/or sign language response)
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
   c. No response
      - go to step 3
3. Task conditions + targeted item missing + state, "What do you want?"
4. Wait 10 seconds
   a. Correct (vocal and/or sign language response)
      - give item to child
      - remove item from possible pool of words
      - go to next trial
   b. Incorrect (vocal and/or sign language response)
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
   c. No response
      - do not give item to child
      - maintain item on possible pool of words
      - go to next trial
APPENDIX F

GENERALIZATION DATA COLLECTION FORMS
Generalization Formal Data Collection Sheet

Subject: ____________________________  Observer: PRI or IOA______________________

IV: VOCAL ONLY or VOCAL + SIGN LANGUAGE
V = vocal  S = sign  T = tact  M = mand

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<th>Date</th>
<th>Session #</th>
<th>Word</th>
<th>Item</th>
<th>Presenter</th>
<th>Response Mode</th>
<th>Condition Tact/Mand</th>
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Informal Generalization Data Collection Form

Date: _______________________

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Please make tally marks each time a child uses the specified words.
APPENDIX G
PARENT QUESTIONNAIRE
Parent Questionnaire

Please fill out the questions below to the best of your ability. If you have any questions feel free to contact Gary Jacobs at 292-8148.

1. Has your child’s vocal responses increased in the past 5 months? Yes or No
   If so, what type of vocal responses have increased? (i.e., single syllable sounds, multiple syllable sounds, words, phrases) (Name all that apply.)

   ____________________________________________________________

   Please list any new words or approximations to words you have heard your child say in the past 5 months.

   ____________________________________________________________

2. Has your child’s use of sign language increased in the past 5 months? Yes or No
   If so, what signs or approximations of signs have you noticed?

   ____________________________________________________________

   ____________________________________________________________

3. If your child’s communication skills have improved, Do you think that your child improved as a result of participating in the language research. Why or Why not?

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________

4. Which condition do you believe produced the best results at increasing your child’s communication skills the vocal alone training or sign language plus vocal training? Explain. (If you have no preference or knowledge please state that.)

   ____________________________________________________________

   ____________________________________________________________

5. Please convey any additional comments you have about the language research: ____________________________

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________
APPENDIX H

PROCEDURAL CHECKLIST
Procedural Checklist

Subject: _______________________ Date: __________ Session#: ____

Experimenter: ___________________ Procedural observer: ___________________

Condition: Baseline or Tact Training or Mand Probe or Mand Training

Data Collection Materials
1. Did the data collection observer(s) have a pencil ready to use prior to the beginning of the session? YES NO
2. Did the data collection observer(s) have a clip board to use prior to the beginning of the session? YES NO
3. Did the data collection observer(s) have a ready to use data collection sheets prior to the beginning of the session? YES NO
4. Was the tape recorder set up and ready to use prior to the beginning of the session? YES NO

Session Details
1. Were the targeted items at the session area and ready to use prior to the beginning of the session? YES NO
2. Did the experimenter escort the student to the training area? YES NO
3. Did the experimenter make sure the student was sitting on a chair in the training area prior to the beginning of the session? YES NO
4. Did the experimenter present the item during each trial of tact training or the correct stimulus conditions during mand training or probe sessions? YES NO
5. Did the experimenter verbally prompt the student correctly throughout the session? YES NO
6. Did the experimenter provide reinforcement or corrective feedback correctly to the student throughout the session? YES NO

For sign and vocal training combined only
1. Did the experimenter provide sign language prompts to the student correctly throughout the session? YES NO
APPENDIX I

TEACHER QUESTIONNAIRE
Teacher Questionnaire

Please fill out the questions below to the best of your ability. If you have any questions feel free to contact the experimenter, Kimberly Weber at 292-8148 or 261-8492.

Students Name: ______________

1. Has your student’s vocal responses increased in the past 5 months? Yes or No
   If so, what type of vocal responses have increased? (i.e., single syllable sounds, multiple syllable sounds, words, phrases) (Please name all that apply.)

   __________________________________________________________
   __________________________________________________________

   Please list any new words you have heard your student say in the past 5 months.

   __________________________________________________________
   __________________________________________________________

2. Has your student’s use of sign language increased in the past 5 months? Yes or No
   If so, what signs or approximations of signs have you noticed?

   __________________________________________________________
   __________________________________________________________

3. If your student’s communication skills have improved, Do you think that it improved as a result of participating in the language research. Why or Why not?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. Which condition do you believe produced the best results at increasing your student’s communication skills the vocal alone training or sign language plus vocal training? Explain.

   __________________________________________________________
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Teacher Questionnaire - Page 2

Please fill out the questions below to the best of your ability. If you have any questions feel free to contact the experimenter, Kimberly Weber at 292-8148 or 261-8492.

Students Name: ___________

5. From observing the experimenter and the techniques used in your classroom, what changes would you make to improve your students language performance.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

6. Please convey any additional comments you have about the language research: __

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
APPENDIX J

TRAINING SEQUENCES FOR EACH TRIAL FOR THE VOCAL ONLY AND THE VOCAL PLUS SIGN LANGUAGE CONDITIONS FOR THE TACT, MAND, AND THE PRACTICE SESSIONS.
VOCAL ONLY CONDITION: TACT SEQUENCE DESCRIPTION

(Zero delay)
1. Item + "What is this?"
2. Zero delay
3. Delay prompt
   - name item
4. Child response - vocal only
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial

(1 second delay or more)
1. Item + "What is this?"
2. Delay (i.e., 1 second, 2 second, 3 second)
3. Child response - vocal only
   NOTE: CHILD ONLY HAS TIME SPECIFIED IN DELAY TO RESPOND
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect
      - do not give item to child
      - state name of item (i.e., "No, cookie")
      - go to a practice trial
   c. No response
      - go to step 4
4. Delay prompt
   - name item
5. Child response - vocal only
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial
VOCAL + SIGN CONDITION: TACT SEQUENCE DESCRIPTION

(Zero delay)
1. Item + "What is this?"
2. Zero delay
3. Delay prompt
   - name item + sign name of item
4. Child response - vocal and/or sign language
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial

(1 second delay or more)
1. Item + "What is this?"
2. Delay (i.e., 1 second, 2 second, 3 second)
3. Child response - vocal and/or sign language
   NOTE: CHILD ONLY HAS TIME SPECIFIED IN DELAY TO RESPOND
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect
      - do not give item to child
      - state name of item (i.e., "No, cookie")
      - go to a practice trial
   c. No response
      - go to step 4
4. Delay prompt
   - name item + sign name of item
5. Child response - vocal and/or sign language
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial
ADDITIONAL PRACTICE TRIALS PROCEDURE
(SUBJECT DATA NOT RECORDED)

Vocal Only
1. Item + "Say, (item)"
2. Wait 3 seconds
3. Child response - vocal only
   a. Correct
      - give item to child (for up to 60 seconds)
      - feedback statement
      - go back to recorded trials
   b. Incorrect/ No Response
      - do not give item to child
      - item + item name
      - go to step 4
4. Item + "say, (name of item)"
5. Wait 6 seconds
6. Child response - vocal only
   a. Correct
      - give item to child for up to 60 seconds
      - go back to recorded trials
   b. Incorrect/ No Response
      - do not give item to child
      - item + name item
      - go back to recorded trials

Vocal + Sign Language
1. Item + "Say, (item)" + sign name
2. Wait 3 seconds
3. Child response - vocal / sign
   a. Correct
      - give item to child (for up to 60 seconds)
      - feedback statement
      - go back to recorded trials
   b. Incorrect/ No response
      - do not give item to child
      - item + name item + sign
      - shape child's hands to sign
      - go to step 4
4. Item + "say, (item )" + sign name
5. Wait 6 seconds
6. Child response - vocal / sign
   a. Correct
      - give item to child for up to 60 seconds
      - go back to recorded trials
   b. Incorrect/No Response
      - do not give item to child
      - item + name item + sign
      - go back to recorded trials
VOCAL ONLY CONDITION: MAND SEQUENCE DESCRIPTION

(Zero delay)
1. Item missing + task instruction
2. Waits 2 seconds then states, "What do you want?"
3. Zero delay
4. Delay prompt
   - name item
5. Child response - vocal only
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial

(1 second delay or more)
1. Item missing + task instruction (vocal verbal)
2. Wait 2 seconds + "What do you want?"
3. Delay (i.e., 1 second, 2 second, 3 second)
   NOTE: CHILD ONLY HAS TIME SPECIFIED IN DELAY TO RESPOND
4. Child response - vocal only
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect
      - do not give item to child
      - state name of item (i.e., "No, cookie")
      - go to a practice trial
   c. No response
      - go to step 5
5. Delay prompt
   - name item
6. Child response - vocal only
   NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial
VOCAL + SIGN CONDITION: MAND SEQUENCE DESCRIPTION

(Zero delay)
1. Item missing + task instruction (vocal verbal)
2. Waits 2 seconds then states, "What do you want?"
3. Zero delay
4. Delay prompt
   - name item + sign name of item
5. Child response - vocal and/or sign
NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial

(1 second delay or more)
1. Item missing + task instruction (vocal verbal)
2. Waits 2 seconds then states, "What do you want?"
3. Delay (i.e., 1 second, 2 second, 3 second)
4. Child response - vocal and/or sign
NOTE: CHILD ONLY HAS TIME SPECIFIED IN DELAY TO RESPOND
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect
      - do not give item to child
      - state name of item (i.e., "No, cookie")
      - go to a practice trial
   c. No response
      - go to step 5
5. Delay prompt
   - name item + sign name of item
6. Child response - vocal and/or sign
NOTE: CHILD HAS UP TO 6 SECONDS TO RESPOND AFTER PROMPT
   a. Correct
      - give item to child for approximately 60 seconds
      - state name of item (i.e., "Yes, pen" or "Right, book")
      - go to next trial
   b. Incorrect / No Response
      - do not give item to child
      - state name of item (i.e., "No, cookie" or "cookie")
      - go to a practice trial
APPENDIX K

COMPLETED DAILY DATA COLLECTION FORM
Data Collection Form

Subject: Katie  Date: 3/10  Session: 19

Experimenter:  Observer: 21

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Totals:
- Pen: Vocal only (V) 0 0 1 0
- Book: Vocal + Sign (V) 0 0 3 3
- Vocal + Sign (V) 0 0 0 0

Procedural checklist

1. Did the experimenter provide sign language prompts at appropriate times for the student during practice trials?
   - Vocal
   - Sign + Vocal

2. Did the experimenter shape the child’s hands into correct sign position for the item at appropriate times during the practice trials?
APPENDIX L

DATA OF EACH CHILD'S VOCAL VERBAL AND NON-VOCAL VERBAL
RESPONSES INCLUDING CORRECTS, ERRORS AND NON-RESPONSES
In the Vocal Only Condition, Vocal Verbal Responses were Recorded as a Correct, an Error, or a Non-Response During Each Session for Katie.

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Notes:
a C stands for correct responses.
b E stands for error responses.
c N/R stands for a non-response.
In the Vocal Plus Sign Language Condition Vocal Verbal Responses were Recorded as a Correct, an Error, or a Non-Response During Each Session for Katie

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b E stands for error responses.
c N/R stands for a non-response.
In the Vocal Plus Sign Language Condition, Non-Vocal Verbal Responses were Recorded as a Correct, an Error, or a Non-Response During Each Session for Katie

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\(^a\) C stands for correct responses.
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\(^c\) N/R stands for a non-response.
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\(a\) C stands for correct responses.

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In the Vocal Plus Sign Language Condition, Vocal Verbal Responses were Recorded as a Correct, an Error, or a Non-Response During Each Session for Melinda.

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a C stands for correct responses.
b E stands for error responses.
c N/R stands for a non-response.