# EFFECTS OF DIRECT INSTRUCTION ON THE USE OF AND RESPONSE TO PREPOSITIONS BY STUDENTS WITH AN INTELLECTUAL DISABILITY

by

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# ABSTRACT

SUSAN CHRISTY HICKS. Effects of Direct Instruction on the use of and response to prepositions by students with an intellectual disability. (Under the direction of DR. CHARLES L. WOOD)

Students with an intellectual disability often struggle with significant language delays or impairments. Although this population of students can acquire language skills, they often require methods of explicit instruction of language skills to do so. Direct Instruction (DI), a system of explicit and systematic instruction, could be one of these methods. The purpose of this study was to investigate the effects of DI on the use of and response to prepositions by three elementary school students with an intellectual disability. A multiple baseline design across prepositions was used in this study with replication across students. The researcher used DI to model examples and nonexamples (i.e., “This is above,” “This is not above.”) of three prepositions (e.g., above, behind, beneath) to the students. In addition to the instructional sessions, students participated in three generalization activities. Results of this study showed a functional relationship between Direct Instruction and students' use of and response to prepositions. Students demonstrated the ability to use and respond to prepositions consistently after receiving DI on each of the three target prepositions. Furthermore, all three students maintained the skill up to 56 days from instruction on each of the prepositions. These findings are important to this population of students because of the need for explicit and systematic instruction of language skills; it has been demonstrated that DI is an effective instructional tool in teaching these skills in an efficient and effective way.

# DEDICATION

I like to dedicate this dissertation to my family and friends. Without you all, none of this would have been possible. Thank you to my partner, Lori, for your unwavering support and love. You have provided me with the strength and resolve to make it through this journey, and I am thankful. To my mother, thank you for your support and for setting the bar high. To my father, thank you for your encouragement which helped me through some hard days. To my sister, Kim, I am grateful for the sacrifices you made that allowed me to be fully present in my studies. To my sister, Karen, thank you for all of your support which was invaluable in more ways than one. To all my friends, thank you for your patience with my three year absence. To Chris and Dawn, without you both, I would not have finished. To Nanny and Buck, thank you for believing in me. I love you all.

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TABLE OF CONTENTS

# CHAPTER 1: INTRODUCTION

## Statement of the Problem

Students with an intellectual disability often struggle with significant language delays or impairments, and their acquisition of language happens at a much slower rate than that of typically developing students (Sigafoos & Pennell, 2000; Westling & Fox, 2000; Yoder, Kaiser, Alpert, & Fischer, 1993). These language delays and impairments make students' communication with those around them difficult. While many students develop expressive and receptive language skills incidentally through conversations and inferences, students with an intellectual disability (ID) often require explicit instruction of these skills (Ganz & Flores, 2009; Rice, 1989; Waldron-Soler et al., 2002).

As these students acquire language, their expressive language includes nonvocal-verbal expressions (e.g., pointing to a cookie to "ask" for a cookie) and vocal-verbal (e.g., saying "cookie, please."). Vocal-verbal behavior is commonly referred to as language use; it is this expressive language students with an intellectual disability have difficulty acquiring, as language delays and impairments often coexist with their primary disability (Garguilo, 2009; Rice, 1989). While students with ID can communicate their needs and wants using nonvocal-verbal behavior, the lack of expressive language skills often makes effective communication challenging.

Cooper, Heron, and Heward (2007) define behavior as "the activity of living organisms" (p. 690), and they assert that all behavior is reinforced through interactions

between the behavior and the environment. This assertion includes language use, which Skinner (1957) called verbal behavior. If a child says “Movie, please” and his mother turns on a movie for him, that behavior was reinforced, so it is likely to continue at the same rate or increase. Some behaviors when exhibited give individuals access to new contingencies. Once a child learns to talk, she has access to reinforcers that were previously out of her reach. She can say, “Milk” when she wants milk or “Eat” when she is hungry. She can interact with others around her and gain access to items she can label. This behavior will be maintained by the access to the social interaction and tangible reinforcers such as milk and food. These particular behaviors are called behavioral cusps, and they can be very simple or complex (Rosales-Ruiz & Baer, 1997).

Behavioral cusps are behaviors that by definition are life-changing behaviors that ensure that old behaviors within the same repertoire will cease to exist (Smith, McDougal, & Edelen-Smith, 2006). For example, once a child learns to talk, eventually words will replace crying as a way to gain a reinforcer such as attention or food. While talking is quite complex, opening a door is a simple task. After learning to open a door, a person has access to everything behind or beyond that door and other doors, and the consequences of obtaining access to everything beyond that door serve as positive reinforcers for the behavior of opening the door. The consequences of that behavior increase the likelihood it will occur more frequently in the future, and the simple skill of opening a door is a life changing event for that person. Countless behaviors have yet to be identified as behavioral cusps, and Bosch and Fuqua (2001) propose a set of selection criteria to apply to potential target behaviors for instruction. For a behavior to be identified as a behavioral cusp, Bosch and Fuqua (2001) recommend that it must meet

one or more of the following five criteria: "(a) access to new reinforcers, contingencies, and environments; (b) social validity; (c) generativeness from the individual; (d) competition with inappropriate responses; and (e) number and importance of people affected" (p. 123).

Many behaviors have the potential to become a behavioral cusp; however, that specific distinction is made when an individual acquires a new behavior and actually uses it to access new reinforcers or in another way that meets one or more of the criteria set forth above. For example, a child can be taught to open a door, and he may perform that skill across a variety of doors; however, if he never walks or reaches through that door to obtain new reinforcers, that skill could not be considered a behavioral cusp. It will simply remain one behavior in a repertoire of behaviors. The consequences of opening the door will not serve as positive reinforcers for that behavior thus not increasing the likelihood that behavior will increase or generalize to other doors (Bosch & Fuqua, 2001).

Bosch and Fuqua (2001) propose that manding (requesting) has the potential to be a behavioral cusp because once learned, it could compete with an inappropriate behavior such as a tantrum. In addition to the one previously mentioned, manding also meets the remaining four criteria. Manding may (a) provide access to reinforcers an individual had no access to previously; (b) be a socially appropriate behavior to request a desired item; (c) generalize to other people and settings; and (d) have the potential to affect interactions with many individuals. While it is clear that manding gives individuals access to new reinforcers, students with an intellectual disability face challenges in acquiring receptive and expressive language, which impedes their ability to communicate their needs and wants to others (Heward, 2009).

In a study that provides some support for manding as a behavioral cusp, Bourret, Vollmer, and Rapp (2004) trained participants to mand high-preference items (e.g., chips, music) using modeling, shaping, and stimulus fading. Results showed each of the three participants began using the target mands without prompts from the experimenter. The parents of one participant taught him to use the mands "Mom" and "Dad" when he wanted their attention. He began to use those mands without prompts to gain their attention in an appropriate way. The authors discuss the potential for mands to become a behavioral cusp for the participants because of the increasing frequency of the mands exhibited outside of the training sessions. Their assertion is that the participants gained access to reinforcers they were unable to access prior to the instruction.

In addition to providing access to new reinforcers, behavioral cusps may also be behaviors that can replace inappropriate behaviors. For example, it is well documented that students with language delays experience increased levels of problem behavior (Silva, Williams, & McGee, 1987; Willinger et al., 2003). This could be due to frustration at not being able to obtain the reinforcers they want because they do not have the language abilities to communicate this want to others. Carr and Durand (1985) conducted a study in which four students with developmental delays were trained in functional communication. Results showed that students replaced problem behavior with a socially appropriate alternative that served the same function. Mand training has also shown success in reducing problem behavior because it provides students with a socially acceptable way to obtain reinforcers (e.g., food, drink, play; Peck et al., 1996). These studies add support to the assertion that manding is a behavioral cusp for students.

Manding requires receptive and expressive language skills, and the acquisition of these skills falls along a continuum. According to McCarthy (1960), typically developing students begin to acquire receptive language skills (e.g., understanding spoken words) between 8 and 13 months of age and expressive language is exhibited approximately 5 months later (Myklebust, 1956). Upon acquisition of expressive and receptive language skills, students will use these skills during interactions with others. During these interactions, students will be expected to express themselves as well as understand what is being communicated to them. They might communicate a need using a mand (Heward, 2009). Because of potential continued language or vocabulary deficiencies, students may not be able to name a particular item or place that is the focus of their communication. Kelley, Shillingsburg, Castro, Addison, and LaRue (2007) state that students with limited verbal repertoires can learn to mand items without labeling everything they want in their environment. Use of prepositions to describe an item's location could provide access to a desired reinforcer for students who lack comprehensive expressive language skills (Hicks et al., in press). Conversely, comprehension of prepositions can increase a student's ability to follow instructions which is critical in developing daily living skills (Frisch & Schumaker, 1974).

Branigan, Pickering, and McClean (2005) assert that comprehension of prepositions is a vital component of understanding spoken language. Students' comprehension or receptive understanding of prepositions is the first step in using them correctly, which could give them access to a new set of reinforcers or environments. Because of this potential access, use of prepositions could meet the criteria to be considered a behavioral cusp.

A study by Internicola and Weist (2003) showed that typically developing students demonstrated the correct use of simple locative prepositions (e.g., in, on, under) as early as 18 months of age and as late as 31 months. Participants in this study exhibited complex locative prepositions (e.g., across, around) as early as 29 months and at 57 months at the latest. In addition to correctly using simple and complex locative prepositions, the participants in this study were able to contrast similar prepositions (e.g. across/along, front/back) at 24 months of age. For the duration of the study, the frequency of participants' use of simple and complex prepositions was recorded. Simple prepositions were used, on average, 21 times more frequently in speech generated by the participants than complex prepositions.

Participants in the Internicola and Weist (2003) study acquired their language skills incidentally. Students with an intellectual disability can acquire language skills but may need explicit instruction to do so. There is limited research on effective teaching strategies or methods to teach preposition use to students with an intellectual disability, but Direct Instruction (DI) could be one of these methods. DI is explicit, systematic instruction that is carefully sequenced to maximize teacher efficiency and effectiveness (Marchand-Martella, Slocum, & Martella, 2004). DI has empirical evidence showing its effectiveness in teaching inferencing, fact use, analogies, and reading skills such as fluency and comprehension (Fallon, Light, McNaughton, Drager, & Hammer, 2004; Flores & Gantz, 2007; Reis, McCoach, Coyne, Schreiber, Eckert, & Gubbins, 2007). There is also evidence demonstrating the effectiveness of DI in teaching students with intellectual and developmental disabilities (Allor, Mathes, Roberts, Jones, & Champlin, 2010; Flores, Shippen, & Alberto, 2004; Hicks et al., in press).

Ganz and Flores (2009) used DI to improve oral language skills for three elementary school students with autism. Using *Language for Learning* (Engelmann & Osborn, 1999), students were taught to identify items that were made from different materials (e.g., wood, plastic). Another study by Waldron-Soler et al. (2002) examined the effectiveness of DI on language acquisition and social interactions of preschoolers. This study demonstrated evidence that DI is an effective teaching method when teaching language and reading skills to students with a variety of ability levels.

A third study conducted by Hicks, Stevenson, Wood, Cooke, and Mims (in press) examined the effects of DI on the acquisition of prepositions by students with an intellectual disability. The results of this study showed a functional relationship between DI and the acquisition of prepositions by the participants. These authors proposed that the use of prepositions by individuals with an intellectual disability could become a behavioral cusp for them; however, there was no measurement of participants' generalization of prepositions to other environments or people and no measure of their ability to access more reinforcers or environments as a result of their preposition use.

These studies show that students with an intellectual disability often experience language delays, but that they can acquire language. Language use could become a behavioral cusp for these students, if the effects of the language use prove to be far-reaching. Direct Instruction has been shown to be effective in teaching reading and language skills but more research is necessary.

## Purpose of the Study

Even though the results of the study by Hicks et al. (in press) added to the knowledge base of methods of teaching language skills, specifically prepositions, to

individuals with an intellectual disability, little additional support exists that DI is an effective method to teach prepositions to students with a moderate intellectual disability. The success of Hicks et al. (in press), Flores and Ganz (2007), and Ganz and Flores (2009) in teaching language and other skills in these studies suggests that it may be an effective method to teach prepositions to students with an intellectual disability; therefore, the purpose of this study was to investigate the effects of DI on the acquisition and use of prepositions by students with an intellectual disability. The results of this study may provide additional support for using DI with students with an intellectual disability. Additionally, social validity surveys were administered to teachers, caregivers, and other stakeholders in the students' lives to determine the extent, if any, of their prepositions generalized outside the confines of the study.

## Significance of the Study

First, this study may add to the knowledge base of teaching language skills to students with an intellectual disability. Extensive research has been conducted on the language development of typically developing students, and some researchers (Ganz & Flores, 2009; Rice, 1989; Waldron-Soler et al., 2002) state that students with an intellectual disability need explicit instruction in order to acquire the same skills. This research could encourage more investigation of strategies to improve language skills of students with an intellectual disability.

Second, this research will serve to bolster current research involving Direct Instruction. Direct Instruction has a long history of research of its effectiveness, but lacks a strong research base for teaching students with ID. The results of this study may add to

the support of DI as a way to teach concepts effectively and efficiently to students with an intellectual disability.

## Research Questions

The following questions will direct this research:

1. What are the effects of DI on participants' correct use of prepositions during a eighteen-item daily probe?
2. What are the effects of DI on participants' correct responses to prepositions during a eighteen-item daily probe?
3. What are the effects of DI on participants' correct use of prepositions during generalization activities?
4. What are the effects of DI on participants' correct responses to prepositions during generalization activities?
5. To what extent will students maintain their use of and response to prepositions over time?
6. To what extent do educators and caregivers report a difference in participants' use of and response to prepositions?

## Delimitations

This study will examine the effects of DI on the acquisition of prepositions by students with an intellectual disability through the use of single-subject research design. There are possible limits to this investigation. First, this investigation will be conducted with three students and one researcher. The small number of participants is a known attribute of single-subject research, and this, by nature, limits the ability to generalize the findings to the general population of students with an intellectual disability (Gast, 2010).

Second, the participants in the study will be in elementary grades, and because of this, it is difficult to state that participants of other ages would demonstrate similar results. Finally, the researcher will serve in the teacher's capacity, so it will be impossible to determine the extent to which a teacher may obtain comparable results.

Definitions of terms

Behavior - "the activity of living organisms" (Cooper, Heron, & Heward, 2007, p. 690)

Behavioral cusp – "any behavior change that brings the organism's behavior into contact with new contingencies that have even more far-reaching consequences" (Rosales-Ruiz & Baer, 1997, p. 533)

Direct Instruction – Direct Instruction (DI) is a model for teaching that uses explicit, sequenced, and scripted instruction developed by Siegfried Engelmann and Wesley Becker. The model of DI used in this study is based upon the instructional design principles developed by Siegfried Engelmann and Douglas Carnine (Engelmann & Carnine, 1991; Marchand-Martella, Slocum, & Martella, 2004)

Explicit instruction – Explicit instruction "involves carefully designed materials and activities that provide structures and supports that enable all students to make sense of new information and concepts" (Heward, 2003, p. 263)

Expressive language – the production of speech or written language that others can comprehend (McCarthy, 1960)

Locative preposition – a part of speech used to "describe static spatial relationships between objects" (Trannel & Kemmerer, 2004, p. 720)

Mand – a form of communication in which a reinforcer (e.g., food, water, attention) is requested (Skinner, 1957)

Receptive language – the ability to comprehend language (McCarthy, 1960)

Reinforcer – "a stimulus change that increases the future frequency of a behavior that immediately precedes it" (Cooper, Heron, & Heward, 2007, p. 702)

Tact – a form of communication in which an object or event is labeled (Skinner, 1957)

# CHAPTER 2: REVIEW OF LITERATURE

This chapter reviews the relevant literature on the following topics: behavioral cusps, language, prepositions, and Direct Instruction. The chapter concludes with a summary of the literature to support the significance and purpose of the current study.

## Behavioral Cusps

Some behaviors when taught specifically or learned incidentally can become a foundation for other behaviors or can have life altering, far-reaching effects. Rosales-Ruiz and Baer (1997) called these behaviors behavioral cusps. These behaviors are similar in nature to pivotal behaviors but differ in the magnitude of the consequences the individual experiences after emitting the behavior.

Pivotal behaviors. Pivotal behaviors are "behaviors that, once learned, produce corresponding modifications or covariations in other untrained behaviors" (Cooper, Heron, & Heward, 2007, p. 59). These behaviors are chosen and trained based upon their accompanying impact on other behaviors (Koegel & Koegel, 1995, Schreibman, Stahmer, & Pierce, 1996). More specifically, target behaviors are chosen based upon how far reaching the impacts may be. Koegel, Koegel, Harrower, and Carter (1999) list three primary goals of pivotal behavior interventions: (a) to increase individuals' responsiveness to social and learning opportunities, (b) to decrease dependence on the interventionist, and (c) to decrease the removal of the individual from his natural environment for services. These goals are often addressed through interventions aimed at

increasing motivation and self-initiation in the context of social communications (Koegel, Koegel, & Brockman, 2003).

Koegel and Frea (1993) targeted social communicative behaviors for intervention and examined whether or not improvements in those target behaviors would positively impact similar behaviors with no extra intervention. Two students, ages 13 and 16, with autism participated and their target behaviors included perseveration of topic, nonverbal mannerisms, and eye gaze. During the intervention, participants were taught to discriminate between appropriate and inappropriate displays of the target behaviors and to use a self-management recording sheet. During interactions with peers in community settings, the students recorded instances of appropriate target behaviors, and after 1 minute of appropriate behavior, the students received reinforcement. This time increased over the course of the study. Results of this multiple baseline across behaviors design showed a functional relationship between the intervention and appropriate displays of the target behaviors. Additionally, generalization data showed improvements in other untrained behaviors that exist as part of a larger response class.

In another study, Pierce and Schreibman (1995) investigated the effects of Pivotal Response Training (PRT) on social behaviors of two students, age 10, with autism. The intervention in this multiple baseline across participants was implemented by peers, and was directed at the students' language and attention during social interactions with the peers. Some of the dependent measures were initiations, language use, and joint attention. Results showed increases in language use for both students, but more importantly, both students showed improvements in joint attention. In this study, participants were able to pay attention to objects they were playing with and to an adult who requested their

attention instead of focusing solely on one or the other. The joint attention was not targeted during intervention, so because of the observed increase, it can be surmised that the target behaviors of language and attention are pivotal areas as described by Koegel, et al. (1999).

Behavioral cusps. Behavioral cusps are a separate, but connected concept to pivotal behaviors. Where pivotal behaviors are behavior changes that generalize, untrained, to other related behaviors, and serve as a foundation for other behavior changes, Rosales-Ruiz and Baer (1997) define a behavioral cusp as a behavior that when changed presents the individual with access to new environments, reinforcers and punishers, contingencies, responses, stimulus controls, and maintaining or destructive contingencies. These behaviors can be simple, such as learning to open a door, to complex, such as learning to read. The importance of the behavioral cusp is characterized by the extent of its consequences.

Examining literature on pivotal behaviors, Rosales-Ruiz and Baer (1997) explain that some behaviors are pivotal behaviors and behavioral cusps. For example, in Koegel and Frea's (1993) study, the participants showed an increase in duration of eye contact as a result of the intervention, and with the increased eye contact came more appropriate social interactions with peers. This increase in social interactions could give those participants access to new reinforcers and contingencies, in which case the behavior change would be a pivotal behavior and a behavioral cusp. The distinction of becoming a behavioral cusp depends entirely upon what occurs after the behavior change. For example, Rosales-Ruiz and Baer (1997) give an example of a girl who continued to crawl even after learning to walk. The access to new reinforcers and their contingencies was not

important enough to maintain walking as a replacement behavior for crawling. For this girl, learning to walk was not a behavioral cusp. In another example, a child who asked to have doors opened for her learned to work a door latch and suddenly had access to everything beyond the door. In accessing these new reinforcers, this child demonstrated that the latch-opening behavior was a behavioral cusp. Extending the concept of a behavioral cusp, Smith, McDougall, and Edelen-Smith (2006) add that a behavioral cusp will replace previous behaviors completely, rendering them obsolete.

In an effort to make choosing important behaviors to teach more efficient, Bosch and Fuqua (2001) suggest some criteria that may help identify, prior to instruction, behaviors that may become behavioral cusps: "(a) access to new reinforcers, contingencies, and environments; (b) social validity; (c) generativeness from the individual; (d) competition with inappropriate responses; and (e) number and importance of people affected" (p. 123). Once a behavior has been taught, it can be analyzed experimentally to determine whether or not it is a behavioral cusp (Hixson, 2004; Rosales-Ruiz & Baer, 1997), but these five criteria may be beneficial in identifying behaviors to teach that may have far reaching and important consequences for the students. Pelios and Lund (2001) state that generalization is insignificant unless it creates future changes in behavior. In addition to experimental analysis of a trained behavior, further data would have to be collected on future behavior development, generativeness of the behavior, or number of people affected by that behavior (Bosch & Hixson, 2004). There is no known research that confirms that a target behavior became a behavioral cusp for a participant; however, there are three studies that compare the outcomes of the intervention against the criteria set forth by Bosch and Fuqua (2001).

In a case study, Esbenshade and Rosales-Ruiz (2001) taught a 5 year old boy with autism to ask questions when presented with unknown items. This child received in-home behavioral support and was proficient in asking "where" and "what" questions; however, the "what" questions were only asked in the presence of known stimuli but not in the presence of unknown stimuli. Beyond the intervention sessions, data were collected on four separate generalization probes, one of which was a tacting (i.e., labeling) task. Results showed that the child learned to ask the question "what is that?" when presented with unknown stimuli, and the generalization data showed this skill generalized, untrained, to three of four other probes. The authors believe that question asking exposed the participant to new reinforcers (e.g., new information, appropriate social interaction), because it was an appropriate use of question asking. Because of this new access, it met one of the five criteria necessary to qualify as a behavioral cusp for this participant.

Stokes, Cameron, Dorsey, and Fleming (2004) conducted a study in which they used a task analysis to teach personal hygiene skills to three adults, ages 34 to 38, with an intellectual disability. These three participants were involved in the study because they all needed intensive assistance with hygiene after restroom use, had experienced success learning to follow a complex task analysis, and experienced medical, social, and vocational repercussions of poor hygiene habits. The results of the study showed that each participant gained and maintained appropriate hygiene skills he could perform independently. More importantly, the repercussions each participant experienced due to poor hygiene were resolved by the new behavior while the changes the participants experienced aligned themselves with the criteria suggested by Bosch and Fuqua (2001). One individual was placed in a higher paying job with more social interaction which gave

him access to new reinforcers (e.g., money, social interaction) and new environments (e.g., new workplace) at the same time as affecting the people around him. A second participant was able to spend increased time with his family, because he learned new hygiene behaviors which were in direct competition with the inappropriate behavior of placing his hands in his pants.

In the third study, Ingvarsson, Tiger, Hanley, and Stephenson (2007) taught four preschoolers, ages 2 to 5, to respond to questions with two answers: "I don't know" and "I don't know, please tell me." Three of the four children received special education services in their preschool classroom. All four children either did not answer questions or answered them inappropriately when they were asked. For example, one child answered "red" to the question, "What did you have for breakfast." After the intervention in this multiple baseline across responses study, all children acquired both responses to questions with unknown answers and three of the four generalized the new responses to untrained questions. The authors proposed that this untrained generalization gave the children access to social reinforcers they did not have access to prior to the intervention and access to novel answers to the "I don't know, please tell me" response. These novel answers may prove over time to be a benefit to the children's educational development. The authors claim these behavior changes met two of the criteria for the behavior to qualify as a behavioral cusp: (a) access to new reinforcers and (b) generativeness of the skill.

Many behaviors qualify as possible behavioral cusps, but this qualification depends upon whether or not the individual uses that behavior in a way that meets the criteria described by Bosch and Fuqua (2001). Participants in the previous studies

experienced an increase in social interaction which has the potential for far-reaching effects (Esbenshade & Rosales-Ruiz, 2001; Ingvarsson, Tiger, Hanley, & Stephenson, 2007). The results of the study by Stokes et al. (2004) showed that the new behaviors taught during the intervention had tangible, observable effects that were of great magnitude to the participants. These studies taught specific behaviors and were compared to the criteria after the fact. Bosch and Fuqua (2001) suggest using their criteria as a way to choose behaviors to target for intervention. Language skills may have the potential to meet one or more of their criteria and have far-reaching effects for students.

## Language

It is well documented that students with an intellectual disability can and do acquire language, but it is also well documented that the rate of language acquisition is significantly delayed as compared to that of children without disability (Fowler, Gelman, & Gleitman, 1994; Tager-Flusberg & Sullivan, 1998; Westling & Fox, 2000). Myklebust (1956) describes functional dimensions of language that include receptive and expressive dimensions. Receptive language is what individuals use to understand communications from others, and expressive language is the system individuals use to convey their own ideas and thoughts to others (McCarthy, 1960).

To examine the relationship between the development of receptive and expressive language, Guess and Baer (1973) conducted a study to determine generalization of plural nouns taught receptively to expressive use and those taught expressively to receptive understanding. Four participants, ages 11 to 21, with severe disabilities were included in this study. Results of this multiple baseline across word endings showed that for three of four participants, there was no generalization of plural nouns trained in either condition.

The fourth participant demonstrated the ability to generalize from one condition to the other after reinforcement for correct responses was provided. Given the participants' lack of generalization, the authors concluded that the target skill must be taught in both conditions for participants to acquire complete language skills. These results demonstrate that individuals with significant disabilities may need instruction in both receptive and expressive language skills whereas a typically developing student can learn in one condition (e.g., receptive) then generalize to the untaught condition (e.g., expressive).

Complete language skills are necessary for effective communication between individuals with an intellectual disability and those around them. Ineffective or incomplete communication can lead to frustration and the display of undesirable behavior (Willinger et al., 2003). Teaching communication skills to these individuals can provide functionally equivalent behaviors to replace the problem behaviors while building expressive and receptive language. Carr and Durand (1985) taught four children, ages 7 to 14, with developmental disabilities functional communication skills to replace problem behaviors. Through an ABAB reversal design, the participants were taught two phrases: one phrase helped them obtain attention and the other served to get them help on a difficult task. Only one of the phrases was relevant to each participant, depending upon the function of his problem behavior. In the conditions where the participants used their relevant phrase, the occurrence of problem behavior across participants showed a drastic decrease in level and for one participant barely occurred at all. Results demonstrated that the students were able to learn communication skills and these new skills were effective in replacing their problem behavior.

In a similar study, Derby et al. (1997) worked with four children between the ages of two and five with significant problem behaviors to investigate the effectiveness of functional communication training in replacing the problem behaviors (e.g., head-banging, destruction) with appropriate ones. The participants were receiving early intervention services in their homes and had communication skills that fell along a continuum from nonvocal-verbal to vocal-verbal. Parents were the interventionists in this study, and the children were taught to mand to escape an aversive situation or to gain attention. Results from this study showed as appropriate mands increased, self-injurious and destructive behaviors decreased. Additionally, for three participants, the intervention was transitioned successfully into the classroom.

Waldron-Soler, Martella, Marchand-Martella, Tso, Warner, and Miller (2002) conducted an investigation of the Direct Instruction program, Language for Learning (Englemann & Osborn, 1999), on the receptive and expressive language skills of preschool students with and without disabilities. There were 36 participants, eight with developmental disabilities, in the nonequivalent control group design study. These students attended three different preschools, two of which served as the control group for the study. All participants were administered pretests and posttests which included the Peabody Picture Vocabulary Test-Third Edition (PPVT; Dunn & Dunn, 1997), the Expressive Vocabulary Test (EVT; Williams, 1997), and the Social Skills Rating System-Social Skills Scale and Problem Behaviors Scale (SSRS; Gresham & Elliott, 1990). Results from the 15 week intervention showed that students with developmental delays in the experimental group made statistically significant gains from the pretest to the posttest of the PPVT and the EVT; however, similar students in the control group scored lower on

the same posttests. Also notable were the scores on the SSRS-Problem Behaviors Scale. Even though no social skills were taught in the intervention, students in the experimental group showed statistically significant gains on the posttest. This study demonstrates that explicit instruction of language skills results in higher gains when compared to instruction that is not explicit, and for students with developmental delays, the lack of explicit instruction may result in a loss of skill.

These studies show that students with intellectual and developmental disabilities can acquire language skills. In these studies, students were taught expressive and receptive nouns, functional communication skills which replaced problem behaviors, and language skills using a curriculum. Results across studies showed functional relationships between the intervention and the dependent variables and statistically significant gains for students.

Manding. Examining a specific, expressive language skill, Bosch and Fuqua (2001) state that teaching a child to ask for help opening a container could replace the inappropriate behavior of throwing that container when he was unable to open it. This behavior, manding (i.e., requesting), would compete with the inappropriate response of throwing objects, so by meeting one of the five criteria set forth by Bosch and Fuqua, manding could qualify as a behavioral cusp. Ingvarsson et al., (2007) taught the participants to mand the correct answer by saying, “I don’t know, please tell me.” This behavior change competed with the inappropriate response of the child answering “red” when he was asked what he had for breakfast; that same response, “I don’t know, please tell me” is a socially valid response and has the potential to give the individual access to new reinforcers through increased social interactions with others in their lives.

In order to teach a child to mand (i.e., request), there must be an establishing operation of deprivation in place (Michael, 1988), and the target response must have an appropriate history of reinforcement (Hernandez, Hanley, Ingvarsson, & Tiger, 2007). For example, if a child has a high preference for pizza and he has not had access to pizza for a while, this is likely to serve as an establishing operation for the mand, "*pizza, please*." The mand, "*pizza, please*," would be reinforced by the child actually getting pizza. Some research supports the notion that mands and tacts are functionally independent from one another (Hall & Sundberg, 1987; LaMarre & Holland, 1985) in that teaching a student to tact objects will not result in those tacts being presented as mands in an effort to obtain a desired reinforcer. Other research refutes the claims that mands and tacts are functionally independent from one another in their acquisition (Hernandez, Hanley, Ingvarsson, & Tiger, 2007; Petsursdottir, Carr, & Michael, 2005).

Lamarre and Holland (1985) taught preschoolers, ages three to five, without disabilities to mand and tact a specific location of an object in a multiple baseline across conditions study. Four of the nine were taught to mand the location where they wanted an object to be placed, either "on the left" or "on the right." The remaining five were taught to tact the location of an object using the same phrases. Generalization probes showed that none of the participants generalized across responses without training in both. In their discussion, the authors note that under normal circumstances, after an individual masters a specific tact, the equivalent mand occurs naturally with no training. They hypothesized that it could happen for several reasons, one of which is the reinforcer they receive as a result of the response; some reinforcers may be given as though a mand

was presented as a tact and vice versa. This naturally occurring reinforcer could be the difference between this controlled experiment and natural acquisition.

Petsursdottir, Carr, and Michael (2005) taught five, typically developing preschool students, ages 2 to 3 years, to tact and mand objects required for a task completion. The design was a multiple probe across two assembly tasks, and there was a different set of objects used for each condition. The purpose of the study was to examine the extent to which trained tacts would generalize to untaught mands, and taught mands would generalize to untaught tacts. To teach students tacts and mands, the experimenter asked "what is this?" or "what do you need?" Upon a correct response, the experimenter provided praise and stickers. If students gave incorrect responses or failed to respond within 20 s, the experimenter provided the correct answer then asked the question again. Results showed that taught mands generalized to untaught tacts for four of the five students; however, only two students of the five showed any generalization of taught tacts to untaught mands. The authors suggested that future research on teaching tacts and mands should be conducted with variables that have a clear establishing operation in place to promote appropriate mand responses.

In a similar investigation using three preschool children, ages 2 to 4, Hernandez, Hanley, Ingvarsson, and Tiger (2007) studied the specific conditions in which differential reinforcement of appropriate mands, single words and frames would lead to the emergence of other mands. For example, differential reinforcement of a single-word mand for a specific toy would result in increased single-word mands for all toys. In the experimental conditions of this reversal design study, researchers reinforced single-word (i.e., *"pizza"*) and framed mands (i.e., "*I want pizza, please*.") by giving participants

access to the requested item. All undesirable forms of requesting were not reinforced. Each of the three participants primarily used inappropriate responses (e.g., crying, pointing) to gain access to a desired reinforcer even though they were capable of vocalizing needs and wants in the classroom setting. Because of this, they were nominated for participation as a way to increase appropriate communications. Results showed that differential reinforcement of framed mands produced an increase in untaught framed mands for other desired objects. For only one participant, differential reinforcement of single-word mands resulted in increased untaught single-word mands. The authors observe that previous research supports the instruction of single-word mands; however, one participant's results suggest that teaching one or two framed mands, after the acquisition of single-word mands, will generalize to an increased display of untaught framed mands.

In another investigation of students' use of mands and tacts, Kelly, Shillingsburg, Castro, Addison, and LaRue (2007) conducted a study with three students, ages 3 and 10, with autism and other disabilities to examine the functional independence of verbal operants or generalization from one verbal operant to another (i.e., tact to mand). Each of the three participants was enrolled in a program specifically designed to increase their adaptive and communication skills, as all three had language deficiencies. The experimenter used high preference objects during instructional sessions to increase the chances that language instruction will generalize to across responses. The design of this study was a multiple baseline across responses, and generalization probes conducted after instruction provided data about response generalization. During the one-to-one tact teaching, participants were given an object and asked, "What is it?" This question was

followed immediately by the correct tact. Mand instruction was conducted in a similar format. Participants were shown an object and asked, "What do you want?" This question was followed by the correct mand. Upon mastery of tacts and mands, probes were administered to participants to assess generalization across the taught verbal operants. Results showed that two of the three participants' responses generalized across their mastered verbal operants; however, one participant's responses generalized readily from tact to mand but not from mand to tact. The results for one participant add some support to the functional independence of verbal operants; however, results for the other two suggest verbal operants will generalize untrained across responses.

Some students in these studies demonstrated that being trained on tacts and/or mands proved to be a pivotal behavior for them, because those taught behaviors produced changes in untaught behaviors. Because the tact and mand instruction generalized to untaught tacts and mands for some students, this meets Koegel, Koegel, Harrower, and Carter's (1999) three goals of pivotal behavior interventions. Mand and tact instruction increased individuals' responsiveness to social and learning opportunities because they did not need increased instructional trials to emit new tacts and mands. This instruction decreased dependence on the interventionist by negating the need for additional instruction, and it decreased the need to remove students from their natural environments.

Bosch and Fuqua (2001) suggest that manding could be a behavioral cusp for students because this skill has the potential to meet at least one of the five criteria they set forth as a way to determine which behaviors to target for instruction. Results from the Kelly et al. (2007) study showed that students were able to generalize tacts to mands, a socially valid response, which has the potential to give them access to new reinforcers.

Additionally, participants in Hernandez et al. (2007) generalized from one or two framed mands to other framed mands demonstrating generativeness, thus lending more support to mands as a behavioral cusp. Manding is a language skill that has the potential for far-reaching consequences; however, if a student has limited language skills, it may be important for him to be able to describe the location of a desired reinforcer. He could use prepositions to enhance his language skills.

## Prepositions

Coventry and Garrod (2004) state that describing where objects are and being able to locate them based upon another's description are some of the most fundamental survival skills for individuals. Being able to comprehend and use locative prepositions allow individuals to develop these necessary skills. Locative prepositions are parts of speech that communicate a positional relationship between an object and a reference point (Coventry & Prat-Sala, 2001; Tyler & Evans, 2003).

Internicola and Weist (2003) examined archives of the Child's Language Data System to determine the age at which prepositions emerged for six, typically developing children who were acquiring English as their first language. The prepositions the children used were simple (e.g., in, on, into, out) and complex (e.g., across, along, through). Thirteen prepositions were verbalized by the participants, and the preposition, on, emerged for one participant at age 1 year 5 months. The latest acquisition of the preposition, on, occurred at 2 years 6 months. Other prepositions (e.g., into, out of) were acquired and emitted at 1 year 9 months at the earliest and 2 years 6 months at the latest. Of the more complex prepositions (e.g., through, between), the earliest acquisition was 2 years 5 months and the latest was 3 years 2 months. Overall, the mean age of acquisition

of simple locative prepositions was 2 years 1 month and of complex prepositions was 3 years 5 months. The children were assumed to have mastered the prepositions upon correct use and appropriate contrast with another preposition of similar complexity, and the analysis showed that the children used simple locative prepositions 21 times more frequently than complex prepositions.

Casasola and Wilbourn (2004) conducted a study with 32 fourteen-month-old children to determine if they could create spatial relationships using new and nonsense words using a modified habituation procedure (i.e., switch design). A second purpose was to investigate how much experience the children needed to connect a particular word with a spatial relationship. During the intervention, the participants listened to a nonsense word (e.g., *teek* meaning in) while watching a video in which an action was paired with the nonsense word. For example, a plastic animal was placed *in* a red box. A second nonsense word, blick, was substituted for *on*. The plastic animal and the red box were used for all video demonstrations of the two words. The demonstrations were filmed and shown from a variety of perspectives including low and high angles. After the children watched a maximum of 20 demonstrations of the single word, the two nonsense words were used in sentences (e.g., The toy is teek the box). In the testing trials, two visual representations of the word-spatial pairing were presented to the children; the children responded to the correct visual representation of the word-action pairing by looking longer at the correct demonstration than the incorrect one. Results showed the children were able to make discriminations between correct word-spatial relationships with an average of 2.6 minutes of exposure to demonstrations and that 14-month-olds can learn to form word–relation associations quickly, requiring only a few minutes of experience with

each word–relation pairing. The authors acknowledge the limitations of this study include the number of cues that were available to the children and the fact the children may not have learned the associations if they were presented in isolation. Another limitation was the testing trials were presented with the same items (i.e., yellow toy, red box) as the demonstrations, so there was no measure of generalization.

In a study that examined neurological systems, Tranel and Kemmerer (2004) investigated which neural systems were responsible for participants' understanding of locative prepositions. The participants in this study were 78 individuals with left and right hemisphere brain damage who were in the experimental group and 60 individuals in the control group. All participants were asked to perform a series of tasks that required the use and comprehension of prepositions. In the first task, participants were required to name the preposition that was represented in a drawing. For example, an apple was depicted as being in a bowl. Participants would say "in" to identify the location of the apple. In the second task, participants were directed to match the appropriate picture to a preposition. Three pictures comprised the third task, and participants had to identify the one picture that showed a different preposition than the other two. The fourth task was a verification activity where participants were shown one line drawing on a page with a preposition written at the top. Participants were directed to confirm or deny that the preposition written at the top of the page was accurately represented in the drawing. Results showed that of the 78 participants with brain damage, six had significant difficulties, and the authors were able to determine which areas of the brain were affected. In the discussion, the authors noted that although the participants performed poorly on the tasks in the study, they had no difficulty identifying prepositional

relationships between concrete objects, suggesting that future research should assess student knowledge of prepositions using physical objects instead of pictorial representations. Another important point is that prepositions represent a range of spatial relationships. For example, in common language usage the preposition *in* can depict a two-dimensional relationship (e.g., the cat is in a square taped on the floor) or a three-dimensional relationship (e.g., the fruit is in the basket); linguists state that these relationships must be represented to ensure comprehension of the range of relationships.

Fisher, Klingler, and Song (2006) investigated sentence structure as a way for 48 two year olds to learn the meaning of prepositions. The children watched two color video monitors where examples and nonexamples of two nonsense words (e.g., acorp and corp) were presented with narration. A gloved hand moved a duck on and around a box. After each move, the narrator verbalized what was happening with the duck. For example, if the duck was on the box, the narrator said "acorp." During the nonexamples, the narrator said, "not acorp." There was a contrast phase in which two new visual stimuli were presented with examples and nonexamples. Following the contrast phase was a test phase. In this phase, an example of acorp was given with narration along with two other visual stimuli. The narrator asked what else was acorp? The children responded by gazing at the appropriate video screen. Results of this study showed that the children looked at the video screen with the correct choice depicted upon it a full second longer than the screens with the incorrect depictions indicating their comprehension of prepositions.

Teaching prepositions to students with disabilities. Sailor and Taman (1972) examined the effectiveness of different instructional conditions on the acquisition of the locative prepositions *in* and *on* by students with autism. All three participants had

significant language deficiencies and were 5 and 7 years old. The students were trained to tact the objects (e.g., can, box, pail) that were used during the instructional sessions to demonstrate the prepositions. To teach the prepositions, the experimenter placed a red circle, cut from felt cloth, inside a tin can and asked the student, "Where is it?" If the student provided the correct answer, the experimenter praised the response and gave a predetermined reinforcer. If the student gave a wrong answer, the experimenter said, "No," gave a 15 second time out, then provided the correct answer. These instructional sessions were presented across two conditions, ambiguous stimuli and nonambiguous stimuli, in an ABAB reversal design. In the ambiguous stimuli condition, the demonstrations of the prepositions were presented with the objects being placed in unusual positions. For example, to demonstrate on, the experimenter turned the can upside down and placed the felt circle on top. Also, in this condition, the same stimulus objects were used to teach both prepositions. Two participants began training in this condition, and after their performance stabilized, they began the nonambiguous condition. In the nonambiguous stimuli condition, the final participant began training with the objects being placed in their expected position and different objects were used to teach each preposition. Once stable performance was achieved, this participant began the ambiguous stimuli condition. Results showed that all three participants had variable performance in the ambiguous condition and high level, stable performance in the nonambiguous condition; these graphed data demonstrate a functional relationship between the nonambiguous condition and the acquisition of prepositions. The authors surmise that participants learned quickly in the nonambiguous condition because of the separate stimulus objects used during the instructional sessions. They also hypothesize

that the order of the instructional conditions may provide a foundation for increased rate of acquisition in the ambiguous sessions. Replication of these results across other children with language deficiencies is necessary before these results can be generalized across children with disabilities.

In a similar study, Frisch and Schumaker (1974) taught three young children, ages 3 to 11, with an intellectual disability to respond to prompts that included prepositions. In this multiple baseline across participants study, the children were taught, using reinforcement procedures, to perform an action after receiving a verbal prompt from the experimenter. For example, the experimenter said, "Put the _____ next to the _____." During the training sessions, the experimenter presented a verbal prompt, and waited for the child to respond. If the child did not respond within 10 seconds, the experimenter physically guided the child through the requested action. If the child responded correctly, the experimenter provided praise and reinforcement. If the response was incorrect, the experimenter said, "No!" and gave the child a 10 second time out before providing the verbal prompt again. The second prompt was followed by physical guidance through the requested action. Once the children achieved five trials without physical guidance, a probe was given. Results showed these children learned to respond to verbal prompts that included prepositions, and the training sessions that included all three prompts was the most effective as far as the performance on the probes that followed. In those sessions, the children were required to discriminate among prepositions and were able to demonstrate stability in their data during probes. The authors identified some differences in participants' performance. Two of the three participants required training in following single verbal prompts before training in

generalization of those prompts. The third participant did not require that sequence of training. In the discussion, the authors state that it may be more efficient to train the discriminations instead of letting the child acquire them naturally; the results support this statement. This direct training prevents children from learning misrules about the generalizations. There are recommendations to extend this research to natural settings to ensure children can perform similarly in generalization settings while acquiring receptive language.

Lee (1981) conducted a study with two children, ages 9 and10, with moderate an intellectual disability and limited speech. The visual stimuli were 80 common objects in the children's environment (e.g., toothbrush, cup, toy), and these objects were presented in sets of two. Prior to baseline, the participants were tested on the tact of each of the 80 items. The participants were taught the labels of all objects that were mislabeled during the assessment. After this assessment, the children were taught to vocalize "on the left" and "on the right" during echoic (i.e., repeating after the instructor) training sessions. In baseline, the children were asked to discriminate the location of one object in relation to the second object. During the training sessions, the experimenter placed the objects in front of the child and asked where one of the objects was. The correct answers were either "on the right" or "on the left." If the child gave the correct answer, he received praise and a token. If he gave an incorrect answer or a nonverbal answer, he was told "no" and was punished by the removal of one token if he had accumulated some. There were a maximum of 20 trials presented to the children during instructional sessions. Results showed that reinforcement of correct verbal responses resulted in the children's acquisition of receptive and expressive language skills.

McGee, Krantz, and McClannahan (1985) compared the effectiveness of two interventions, incidental teaching and traditional training procedures, in teaching prepositions to three children with autism. These children had language deficits or delays, and their ages ranged from six years to eight years of age. The study was a multiple baseline across prepositions with replication across participants. The prepositions were taught in pairs (e.g., on/under, inside/next to) and these pairs were randomly assigned to one intervention or the other. Participants one and three received the same prepositions in the same conditions while participant two received the opposite. In the traditional training intervention sessions, participants worked with the experimenter one on one. A visual stimulus, a highly preferred item, was presented along with another object that served as a point of reference. The experimenter provided a verbal prompt to the participant (e.g., Say, the bear is under the table); specific praise and reinforcement were given for every correct response. In the incidental intervention, the highly preferred items were placed, in sight, on a shelf. Each time the participant requested an item, the experimenter asked him to name the location of that item. Each correct response was praised and reinforced. If the child did not respond but tried to reach for the item, his hands were held at his sides until he answered the experimenter's question. Twenty trials in each condition were conducted. Once the acquisition probes showed 80% or better for both prepositions, a new set of prepositions was moved into the instructional phase. As a generalization activity, the participants were given a 10 minute play session where their preferred items were in view but not accessible. Any request that included a preposition was reinforced immediately by giving the student access to the requested item. If the child requested an item but did not provide a preposition to identify the location of that item, a teacher

prompted the student to be more descriptive about the item's location. Results showed students acquired prepositions in both teaching procedures at approximately the same rate; however, other results showed prepositions trained in the incidental teaching condition generalized more readily and more spontaneously than those trained in the traditional condition. At the end of the study there was a final generalization probe using novel stimuli. In this probe two of the three participants failed to generalize their newly learned prepositions to describe the location of a desired item. The authors note that providing more than two sets of training stimuli might help offset this issue by providing more experience with generalization during the training sessions.

Koegel, Koegel, Green-Hopkins, and Barnes (2010) conducted a study in which they taught three preschool children with autism to ask "where" questions. The purpose of this study was twofold: to improve the children's ability to ask questions and to improve their use of prepositions. During intervention, small, highly preferred items were hidden while the children were watching. The experimenters prompted the children to ask for them by saying, "Can you say, where is it?" Once the child asked the question, the experimenters told them where their requested item was (e.g., under the table). Results of this multiple baseline across children study showed that all three participants demonstrated a clear change in level of unprompted question asking while also demonstrating collateral acquisition of prepositions.

Coventry and Garrod (2004) describe students' use of and response to prepositions as being critical to their survival. Being able to use and respond to prepositions is an important language skill as it could affect how a student follows directions that are given to him. Typically developing students acquire these prepositions

incidentally as their language develops (Internicola & Weist, 2003), but students with an intellectual disability require more explicit instruction to acquire language skills.

## Direct Instruction

### Components of Direct Instruction.

Direct Instruction (DI) dates back to 1968 when DISTAR, a program designed to teach beginning reading and arithmetic written by Siegfried Engelmann and his colleagues, was published and implemented in classrooms (Carnine, Silbert, Kame'enui, & Tarver, 2010). DI is built on carefully designed, explicit instruction that includes not only content but also specific methods of content delivery (Watkins & Slocum, 2003). According to Watkins and Slocum (2003), the purpose of DI is to teach academic content quickly and efficiently as a way to maximize student learning. The three main components of DI are program design, organization of instruction, and student-teacher interactions.

Instructional programs designed under the DI model contain material that has been built upon carefully chosen big ideas that are then supported by concepts, rules, and strategies; this information is then disseminated in an explicit and systematic way that allows for maximum student learning (Watkins & Slocum, 2003). In this program design, several principles are incorporated to further maximize student learning by reducing ambiguity during instruction.

These principles are the wording principle, setup principle, difference principle, sameness principle, and the testing principle (Engelmann & Carnine, 1991; Watkins & Slocum 2003). The wording principle's purpose is to bring as much clarity to the instruction as possible by using the same wording across items to bring the students' attention to the important differences in the information. The setup principle uses

examples and nonexamples that are designed to minimize irrelevant aspects of the concept because, like the wording principle, it allows students to focus on the salient details of the instruction. The difference principle, using examples and nonexamples, demonstrates the range and boundaries of the concept by juxtaposing items to highlight the similarities and differences. The sameness principle shows a range of examples that are different but still fall within the same category. Finally, the testing principle tests for true acquisition of concepts by testing novel, untaught examples and nonexamples.

Once the program has been carefully designed and the instruction has been organized, student-teacher interactions become a crucial component to the success of the instruction. Student-teacher interactions are maintained, in part, by active student participation that occurs during unison responding. Unison responding is important for DI because it gives students many more opportunities to respond, which increases their engagement with academic material. It is also important because with increased engagement comes increased attentiveness to the content, which limits off task behavior and problem behavior (Heward, 1994). Unison responding, which happens at a clear signal, facilitates a quick instructional pace which allows teachers to teach more academic content to student mastery. Unison responding also provides teachers with immediate feedback on student performance, which allows them to correct errors as they occur then provide additional practice on that skill.

Reviews of research. Direct Instruction has a wealth of research supporting its effectiveness for typically developing students as well as those with disabilities. Gersten (1985) examined six DI studies in which participants were children who were at risk, who had learning disabilities, and who had a moderate intellectual disability were taught

language or beginning reading skills. The design of these studies were experimental and quasi-experimental and results of these studies showed that DI programs produced larger educational gains than other methods of instruction, especially for students with moderate disabilities.

In another review of research, Przychodzin, Marchand-Martella, Martella, and Azim (2004) examined DI math studies (e.g., DISTAR Arithmetic I and II, Corrective Mathematics) conducted between 1990 and 2003, including one meta-analysis. Participants in these studies included students in general education classes, students who were at risk for academic failure, and students with disabilities. Of the 12 studies, seven were comparisons between DI and other math programs, and four examined the effectiveness of the DI programs alone. Seven studies were conducted with general education students, two with students with disabilities, and one that included both. Results across studies showed that most (i.e., 11 of 12) demonstrated improvements in math skills across participants and settings. Two points of discussion in this review were that future research should monitor fidelity of implementation of instruction and that social validity measures should be included.

Kinder, Kubina, and Marchand-Martella (2005) conducted yet another review of DI research with students with high and low incidence disabilities. The authors identified 37 studies that examined the effects of DI on students with high incidence disabilities. Twenty-two of the studies were conducted with students with learning disabilities and seven were conducted with students with a range of disabilities including behavior disorders, traumatic brain injuries, and cognitive disabilities. The programs examined included reading, writing, spelling and math. Five studies examined language programs,

and in these studies, the DI programs were compared with other methods of language instruction. The participants in these studies were students with significant language delays. Results of these studies showed that students who were lower performers performed better in the DI condition than in other instructional conditions. In one of the five studies, the students in the DI condition made greater gains in both expressive and receptive language than students in the traditional language instruction condition. Overall in their review, the authors determined that for students with low incidence disabilities, DI programs produced extensive gains.

Direct Instruction reading programs. Sexton (1989) conducted a study to compare the effectiveness of a DI reading program (i.e., DISTAR I) with a basal reading program in developing students' language abilities. Participants in this study were 80 African-American first graders who were randomly assigned to the control or experimental groups. The school in which this study was conducted was designated a low socioeconomic school, and the students, as demonstrated by a pretest, had varying levels of language abilities. The DI reading program was conducted as whole group instruction with approximately 20 students being in one group. With the same numbers, the basal reading program was implemented with a whole group. There were two classes of the experimental condition and two of the control condition. A posttest given after six months of the intervention showed that all students in the experimental condition made statistically significant gains from pre to posttest with p=.001 and $d$=0.64; the gains the control group made were not significant with p=.61. These results demonstrated that this DI reading program was effective in increasing students' language abilities. The author

discusses the need for instructional programs that are effective in reducing language deficits for minority students.

Fallon, Light, McNaughton, Drager, and Hammer (2004) examined the effect of DI sight word reading for students who used augmentative and alternative communication. Participants in this study were five students with developmental disabilities including an intellectual disability, Down Syndrome and cerebral palsy. Each student had limited vocal-verbal abilities and was enrolled in a self-contained classroom. The authors used a multiple probe across subjects design to implement the intervention which was instruction in letter sounds, blending letter sounds into words, and reading vowel-consonant and consonant-vowel-consonant words. Results showed that DI was effective in increasing students' ability to read targeted words as demonstrated through reaching the criterion for mastery. Of the five participants, three were able to generalize their skills to novel words, and all but one were able to generalize their skills to reading words in books.

Flores, Shippen, and Alberto (2004) investigated a DI program (i.e., Corrective Reading: Word-Attack Basics, Decoding A; Engelmann, Carnine, & Johnson, 1988) as a way to teach decoding skills to six students with a moderate intellectual disability. The students were between the ages of seven and thirteen and were all enrolled in a self-contained classroom. Over the course of instruction, students required almost ten probes to achieve mastery of the letter sound /mmm/, but this average dropped to below five for the remaining letter sounds. The graphed data across each of the letter sounds indicate a functional relationship between DI and decoding skills. Only one student of the five did not master all of five the letter–sound correspondences. The remaining students met the

criterion for mastery for all letter–sound correspondences, continuous sound blending, and decoding of CVC words. In a generalization measure, all participants were able to decode untaught words. The results indicate that DI is an effective method of teaching decoding skills to students with a moderate intellectual disability.

Riepl, Marchand-Martella, and Martella (2008) examined the effects of Reading Mastery Plus (Engelmann & Bruner, 2002) on fluency measures of six students with intellectual and developmental disabilities. All participants were male and in kindergarten through second grades, and they all received their reading instruction in a resource room separate from that of their peers. The intervention for the kindergarten students lasted for 100 days, and the intervention for the first and second graders lasted for 144 and 133 days respectively. The fluency measure assessed initial sound, phoneme segmentation, nonsense word, and letter naming. In categories where there was a pretest on the fluency measure, all students showed growth. For the kindergarten students, a posttest placed them at some risk or low risk for reading problems which, according to the authors' discussion, is unusual for students in this population. This study provides additional support for using DI with students with an intellectual disability.

Allor, Mathes, Roberts, Jones, and Champlin (2010) examined a DI reading program's effectiveness for students with an intellectual disability. Twenty eight students participated in this study and were randomly assigned to the intervention or control group. The intervention group (n=16) received daily instruction in small groups that lasted 40 minutes per day. The control group (n=12) received typical special education classroom instruction on phonemic awareness, alphabetic knowledge, word recognition and oral language. The intervention was conducted for 1.5 school years. Results showed

the students in the intervention group made statistically significant gains with p=.003 and a medium effect size with *d*=.72 across reading measures compared to the control group as measured by standardized assessments (e.g, Woodcock Language Proficiency Battery). These results add further support to the notion that students with an intellectual disability respond well to Direct Instruction.

Direct Instruction language programs. Lloyd, Cullinan, Heins, and Epstein (1980) examined the effectiveness of a language program, taught using DI materials (i.e., Corrective Reading) on students' acquisition of oral language and reading comprehension. Participants in this study were 23 elementary school students with learning disabilities. These students were randomly assigned to one of three classrooms: two served as experimental groups and one of the classrooms served as the control group for the experiment. The classrooms in the experimental group received daily DI instruction and the control group received teacher-created lessons in small and whole groups. Results showed students in the DI experimental group made statistically significant gains from their pretest to posttest scores on the Slosson Intelligence Test (Slosson, 1971) and on the Gilmore Oral Reading Test (Gilmore & Gilmore, 1968) with effect sizes of *d*=1.26 and *d*=.46.

Benner, et al., (2002) examined the effectiveness of a DI program on increasing receptive language skills. Forty-five kindergarten students, in two classrooms at two schools, participated in this study. One served as the control classroom and the other the experimental classroom. The DI program (i.e., Language for Learning; Engelmann & Osborn, 1999) was implemented over the course of the school year to the experimental group, while the control group got traditional instruction. A standardized language

assessment, the Test of Auditory Comprehension of Language-3 (TACL-3; Carrow-Woolfolk, 1999), was administered as a pretest and posttest and served as a dependent variable in the study. Results of this study showed statistically significant gains with p=.001 from the pretest to the posttest for the experimental group. The control group showed losses on their scores from the pretest to the posttest. As an implication for practice, the authors state the results of their study indicate that explicit instruction is important in developing students' receptive language skills.

Ganz and Flores (2009) conducted a study to evaluate the effects the Language for Learning, a DI program, on oral language skills of three elementary school students with autism. All three participants were male, were ages 10-11, and demonstrated limited language usage. The authors used a changing criterion design and implemented the intervention as it was prescribed in the instructor's manual with minor changes. Concrete representations of materials and more trials were added as necessary scaffolding. The graphed data indicated a functional relationship between the DI program and the students' improved oral language skills. Additional data collected after the completion of the study showed that all three participants maintained their performance over time. The authors recommend that future research further examine the effectiveness of DI in teaching language skills.

Hicks, Stevenson, Wood, Cooke, and Mims (in press) recently examined the effects of DI on the acquisition of prepositions by students with an intellectual disability. Two African-American males, 14 years of age, participated in this study. To be included in the study, participants had to be able to verbalize and identify nouns and prepositions, be able to follow directions given orally by the experimenter, and had to be identified as

having an intellectual disability. The intervention was DI using examples and nonexamples to teach simple locative prepositions (e.g., in, on, under). The design of this study was a multiple baseline across prepositions with replication across students. In the intervention phase, the experimenter modeled five examples (e.g., This is on.) and nonexamples (e.g., This is not on.) of a preposition. Then the students were asked to identify, expressively, seven examples and nonexamples of the preposition. Results showed a functional relationship between DI and the acquisition of prepositions by the participants. Generalization probes conducted at the conclusion of instruction had mixed results. Students were able to follow directions with high accuracy but were unable to produce the target prepositions, expressively, in more than 50% of opportunities to respond. These authors proposed that the use of prepositions by individuals with an intellectual disability could become a behavioral cusp for them; however, there were no data reported in this study to support that idea. A second limitation is individual instruction. Despite the limited duration of instruction required for students to acquire the use and comprehension of prepositions, teachers may not view one-to-one instruction as a viable option given the steady increase in class size and the movement toward educating students with disabilities in inclusive settings. Finally, there was a lack of generalization measures conducted in baseline and intervention. The lack of generalization data makes it impossible to determine whether or not the participants were truly able to generalize the new skills, as there was no evidence to suggest they did not have that skill prior to the intervention.

Direct Instruction has shown to be an effective way to teach reading to typically developing students (Sexton, 1989) and students with an intellectual disability (Allor et

al., 2010; Fallon et al., 2004; Flores et al., 2004). Students with an intellectual disability acquired language skills using DI programs (Benner et al., 2002; Ganz & Flores, 2009). Students in the Hicks et al. (in press) study demonstrated the ability to use and respond to prepositions, a skill that was taught using Direct Instruction.

Summary of Research

Students with an intellectual disability often have limited or delayed language acquisition which can lead to undesirable problem behavior; these undesirable behaviors can be replaced with appropriate language skills (Carr & Durand, 1985; Derby et al., 1997; Willinger et al., 2003). Aside from problem behavior, limited language skills prohibit children's communication with others, but language skills can be taught (Guess & Baer, 1973; Waldron-Soler et al., 2002).

Language use can be a pivotal behavior for individuals, especially those with an intellectual disability, because this skill can have a significant impact on other behaviors (Koegel & Koegel, 1995). Language use could also be, in addition to a pivotal behavior, a behavioral cusp. Koegel and Frea (1993) taught students to increase eye contact during social interactions which could, in turn, give those individuals access to new social reinforcers. Bosch and Fuqua (2001) state that manding could be a behavioral cusp because manding could replace an inappropriate response as a result of not receiving assistance when it was needed.

Because of limited language abilities, some students could use prepositions as a way to access desired reinforcers. Coventry and Garrod (2004) state that describing an object's location is a fundamental survival skill. This combined with a mand as a request for that object would be a behavioral cusp for students. Typically developing students

acquire prepositions as early as one year old (Internicola & Weist, 2003), but students with an intellectual disability often require instruction to acquire language skills. Direct Instruction has been effective in teaching a range of skills to individuals with disabilities (Gersten 1985; Przychodzin-Havis et al., 2005), including academic and language skills to students with an intellectual disability (Benner et al., 2002; Kinder, Kubina, & Marchand-Martella, 2005; Sexton, 1989). Across the literature, there are recommendations to conduct additional research on potential behavioral cusps by collecting data outside the confines of the study (Stokes, Cameron, Dorsey, & Fleming, 2004), to conduct mand training where there is a clear establishing operation (Michael, 1988), to conduct additional DI research on language skills (Ganz & Flores, 2009), and to conduct additional language skills studies across disability categories other than autism (Sailor & Taman, 1972). The present study is planned to address these recommendations.

# CHAPTER 3: METHOD

This study investigated the effects of Direct Instruction (DI) on the acquisition of prepositions by students with an intellectual disability. The independent variable in this study was instruction that followed DI procedures and used examples and nonexamples of the target prepositions. The dependent variables were the cumulative number of correct responses on a 18-item probe that were administered daily. A multiple baseline across behaviors (i.e., preposition use) design with replication across participants was used to analyze the effects of DI procedures on students' use of and response to prepositions.

## Participants

The researcher selected participants from two different special education classrooms in Charlotte-Mecklenburg Schools. There were 3 participants (pseudonyms used throughout) with an intellectual disability in this study who met the following criteria (a) between the ages of 7 and 10, (b) IQ scores between 45 and 60 as measured by standardized IQ assessments (e.g., Stanford Binet, $5^{th}$ edition), (c) were able to repeat a two word phrase that could be clearly identified by the researcher, (d) could identify a range of common nouns in their environment, (e) were unable to respond to at least three verbal prompts (e.g., put the pencil under the shelf) that contained one locative preposition (e.g., on, under, below, beside, against, between), and (f) had signed parental consent and student assent forms.

Table 3.1

*Student Demographics*

| Student | Age | Grade | Disability | IQ | Test |
|---|---|---|---|---|---|
| Lucas | 8 | 4 | Intellectual | 54 | Developmental Profile II |
| Alana | 10 | 5 | Intellectual | 54 | Stanford Binet 5th Edition |
| Brisha | 10 | 5 | Intellectual | 51 | Developmental Profile II |

## Setting

The study was conducted in an elementary school in an urban area in the southeastern United States. The classroom served students with an intellectual disability and was in a school serving students with a low socioeconomic status. The intervention occurred at a round table that was 4 feet in diameter near the wall adjacent to a hallway. The researcher sat facing the classroom and the participants sat facing the researcher.

## Researcher

The researcher and primary data collector for this study was a special education doctoral student with an M.A.T. in special education. At the time of the study she held a General Curriculum license and had 4 years of experience working with students with an intellectual disability. The researcher was employed as a Research Associate at UNC Charlotte with a general curriculum access grant, which was funded through the Institute of Education Sciences.

## Second Observer

There was one second observer for this study, a third year doctoral student with an M.A.T in special education employed as a graduate research assistant with a general curriculum access grant at UNC Charlotte.

## Data Collection Procedures

Data were collected using the results of a daily probe described in the baseline procedures. These data were graphed daily to monitor students' progress, and these data were used to determine students' mastery of the target prepositions. Once the students demonstrated mastery of a preposition and at least five data points were collected during the instructional phase, instruction ceased and the maintenance phase for that preposition began. Data were collected on individually administered daily probes in each baseline session. Once the DI began, a daily probe was administered to individual students at the beginning of each instructional session. This probe lasted approximately 2 min and included all three target prepositions. Once the maintenance phase began for a preposition, data were collected on a schedule that allowed for increasing amounts of time between probes; this schedule allowed the researcher to evaluate participants' ability to maintain preposition use after instruction was discontinued. Generalization data were collected through generalization activities presented before the baseline phase began and after the maintenance phase was complete. These probes measured participants' correct responses during noninstructional activities (i.e., manding a desired reinforcer using a preposition, a scavenger hunt, responding to verbal prompts that included a preposition). The researcher was responsible for collecting data during the daily probes and during generalization activities.

## Dependent Variable

Probes. The dependent variables in this study were the number of correct responses on daily probes and generalization activities. During the probes, students were required to respond to verbal prompts that included the target prepositions and to use the target prepositions to tact the location of an object. The students' responses to prepositions were measured separately from students' use of prepositions on each probe. There were a total of six trials per preposition on each probe: three trials of responding to a preposition and three trials of using a preposition.

Generalization activities were conducted in a pretest and posttest format. There were three generalization activities (a) a scavenger hunt, (b) a manding activity, and (c) responses to verbal prompt that included a preposition. In the scavenger hunt, there were three opportunities to use the preposition and three opportunities to respond to a verbal prompt that included a preposition. In the manding activity, there were three opportunities to use the preposition, and in the final activity, there were three opportunities to respond to a verbal prompt that included a preposition. All daily probes and generalization activities were administered to participants individually in the classroom.

## Research Design

A multiple baseline across behaviors design with replication across participants (Gast, 2010) was used to examine the effects of DI on the acquisition of prepositions during this study. Students received instruction on one preposition at a time until a change in trend in the graphed data was observed by the researcher. At that time, a

second preposition was introduced to instruction. Once the students demonstrated mastery of a preposition by scoring 100% on two of three consecutive probes, instruction on the preposition ceased. Daily probe data were used to make that determination (see Appendix A for a sample probe data collection form). Instruction continued until all three students demonstrated mastery across all target prepositions. Five maintenance data points were collected for each of the three prepositions.

Materials. The materials necessary for this study were familiar objects participants were able to name without hesitation. These objects were manipulated to demonstrate and test the examples and nonexamples of the prepositional concepts. These objects included a pencil, cup, book, plate, bowl, toothbrush, and fork. These objects were determined by an assessment given to the participants prior to beginning the baseline phase. Props were a second set of objects used to help model and test the concepts. Props remained stationary during the demonstrations of the examples and nonexamples, and these included one box, one empty 16 ounce plastic bottle, one chair, and a table. The props served as the stationary reference point for objects used in modeling and testing.

Generalization activities were conducted with the same objects that were used to model the concepts during instruction and a set of novel objects and props necessary to determine the participants' ability to generalize preposition use. The first activity, the scavenger hunt, used familiar objects and props from the intervention phase. The second generalization activity was a manding activity in which students used prepositions to mand high interest reinforcers (e.g., cookies, crackers, gum). The final activity assessed students' ability to follow directions that included a preposition given in the classroom

setting (e.g., “Put your book beneath your chair.”). Other materials included procedural fidelity checklists (See Appendix C), data collection forms for daily probes (See Appendix A), and data collection forms for generalization probes (See Appendices D-F).

## Assessment

Prior to the baseline phase, the researcher conducted an assessment to identify target prepositions for the intervention. In this assessment, participants were asked to use a total of 17 prepositions to both expressively to tact an object’s location (e.g., “*The pencil is under the shelf*.”) and to respond to verbal prompts containing prepositions (e.g., “Put the pencil beside the book?”). For a preposition to be included in the intervention phase, the student had to make incorrect responses while tacting an object’s location and while responding to verbal prompts (See Appendix B for the initial assessment data collection form). The assessment identified three prepositions that were unknown to all participants: above, beneath, and behind.

## Probe Procedures

Throughout the study participants’ progress was measured by a daily probe that required six responses per preposition for a total of 18 responses and lasted approximately 2 min from beginning to end. The researcher conducted each probe with one student at a round table to the side of the classroom while the remainder of the class was in the cafeteria. During the baseline phase, no instruction was delivered to the participants, and after the probe was complete, the students returned to their desks in the classroom. The researcher conducted probes to measure the participants’ ability to respond to verbal prompts that contained a preposition (e.g., “Put the pencil *under* the shelf.”) and tact the location of an object using a preposition following a prompt given by

the researcher (e.g., “Where is the pencil?) Each probe required six responses per target preposition, responding to verbal prompts (three) and tacts (three), for a total of 18 responses. Expressive responses were counted as correct if participants used the target preposition. Baseline data were collected using these probes until a stable data path was established. The materials for each probe were the same materials used during intervention and maintenance and were the same for each preposition across all probes. Probes took approximately 2 min from beginning to end.

Direct Instruction. The intervention was conducted in a small group format with all three participants. As soon as five stable baseline data points were collected for all students, the intervention phase began. During the intervention phase, the researcher used a DI script for presenting examples and nonexamples of locative prepositions to a small group of participants (see Appendix C for the script). Using the script, the researcher used one object (e.g., ball, pencil, cup) and one prop (e.g., box) during the DI demonstration of a single prepositional concept. The object and props remained constant for the duration of each instructional session.

There were three phases of the intervention for each preposition: (a) modeling examples and nonexamples (Engelmann & Carnine, 1991); (b) testing with novel items; and (c) responding to prepositions. During the first phase, participants received DI on the target locative prepositions (e.g., above, behind, beneath) using examples and nonexamples modeled by the researcher. Following the Engelmann and Carnine (1991) script, there were two nonexamples followed by three examples. For example, “above” was presented to students with two nonexamples (e.g., “This is not above.”) and three examples (e.g., “This is above.”). To present the first nonexample, the researcher held a

pencil three feet away from the box and said, “This is not above.” To present the second nonexample, the researcher held the pencil one inch to the side of the box and said, “This is not above.” To demonstrate the first example of “above,” the researcher positioned the pencil at least two feet above the box and said, “This is above.” The second example was presented by holding the pencil horizontially less than three inches above the surface of the box. The final example was demonstrated by holding the pencil at an angle less than one inch off the surface of the box. Across all instructional sessions of demonstrating the examples and nonexamples, the researcher shifted the position of the pencil above and not above the box for “above” and “not above” to cover a wide range of possibilities for each condition (i.e., object held at different angles and at different distances from the prop). After demonstrating examples and non-examples of “above,” the researcher began testing student knowledge of the prepositional concept. In this part of instruction, the researcher positioned the pencil above or not above the box then asked each participant “Where is it?” Upon receiving a correct answer, the researcher affirmed the answer with “Yes!” then repeated the student’s answer. If the student responded incorrectly, the researcher gave an error correction. During an error correction, the researcher said, “This is above. Where is it?” Once the student answered correctly to that trial, the researcher moved on to the next student. Each student received a different example or nonexample of the preposition during testing for a total of eight trials per student. Expressive responses were counted as correct if participants used the target preposition. Once all participants responded correctly in six of eight opportunities during a session, phase two began, when time allowed, in that same instructional session.

In phase two (testing with novel items), the researcher demonstrated the same number and range of examples and non-examples using known objects that were identified during the initial assessment (e.g. cup, pencil, book). After instruction was complete, those objects were set aside, and novel objects (e.g., ruler, math manipulatives, markers) from the classroom were introduced. The same script was followed, and the student was asked to identify the concept with the new objects. The same instructional format and the same error correction procedures were followed. Expressive responses were counted as correct if participants use the target preposition. After the participant responded correctly in six of eight opportunities during a session, phase three began for that preposition.

In the third phase of instruction (responding to prepositions), students were required to perform an action during testing. The modeling of examples and nonexamples remained the same as in the first two phases, and objects identified in the initial assessment were used. Upon completion of the modeling, the researcher presented a student with a novel object and prop and gave a verbal prompt that included one of the target prepositions. For example, a student was asked to place a ruler beneath the table. Each correct answer was affirmed with "Yes!" The error correction for this phase was different than the first two phases in that the researcher took the object and prop from the student and modeled the preposition for the student. This demonstration was accompanied by "This is beneath." The researcher gave the object and prop back to the student then said, "Put the ruler beneath the table." This phase allowed students to demonstrate comprehension of each preposition by performing the requested action. This phase continued until students scored 100% on two of three consecutive probes for that

preposition and the students had at least five data points per preposition. At that time, instruction ceased on that preposition, and maintenance data collection began according to the predetermined schedule.

The intervention required approximately 6 min to complete when students were receiving instruction on all three prepositions. After the initial intervention session was conducted, subsequent sessions were preceded by the same 18 item probe used in the baseline phase. This probe served as a data collection tool by which progress was measured throughout the intervention. The probes during the intervention phase were conducted individually with the researcher and one participant in the same space where the intervention was conducted. Visual inspections of the graphed data provided information that determined movement of prepositions from baseline into intervention then from intervention into maintenance. Movement from the instructional phases into the maintenance phase was determined by graphed data that showed an increasing trend over at least five graphed data points for all students. After probe data for one preposition showed a change in trend, another preposition was moved into the intervention phase.

Maintenance. The maintenance phase began once all students demonstrated mastery of a target preposition. Mastery for this study was defined as two of three consecutive probes at 100% for the prepositions on which students were receiving instruction. Once participants demonstrated mastery on a preposition, they no longer received instruction on that particular preposition; however, maintenance data collection began on a schedule that allowed for increasing amounts of time between probes. The first maintenance probe of that preposition was conducted five sessions after instruction ceased. The second maintenance probe was conducted twelve days after instruction

ceased, and the remaining probes were conducted with increasing amounts of time in between. Five maintenance probes were administered.

Generalization. Data on three generalization activities were collected in a pretest/posttest format. The pretest activities were administered prior to the beginning of the baseline phase, and the posttest activities were administered after the completion of the final maintenance probe for the preposition "beneath." The purpose of the pretest generalization activities was to ensure the participants were unable to provide correct responses during these activities prior to the intervention.

The first activity was a scavenger hunt where individual participants placed the same objects used during intervention sessions around the classroom by responding to verbal prompts that included each of the target prepositions. A total of three items were placed, which gave each participant three opportunities to respond to verbal prompts. The classroom paraprofessional participated in this activity by attempting to "find" the objects. In this part of the activity, the paraprofessional claimed to be unable to locate the object, and the students provided her with clues that included the prepositions (e.g., "Look beneath the table."). Again, there were three opportunities to respond through naming of objects' locations (see Appendix D). Expressive responses were counted as correct if participants used the target preposition.

In the second generalization activity, individual participants were required to perform a functional task such as manding a desired reinforcer. The classroom teacher was asked to provide a list of reinforcers each student preferred and the researcher conducted a sampling with each participant individually. The researcher placed three reinforcers in front of the student. The student was directed to choose the reinforcer he

wanted. After he made his choice, the researcher removed the remaining two items and replaced them with two more items before asking the participant to choose his desired item again. The researcher continued this process with each reinforcer until the order of preference for the items was established. The reinforcers determined by the preference assessment included chocolate cream cookies, potato chips, and strawberry flavored gum. At the beginning of this activity, participants were presented with two different versions of the same high-preference reinforcer (i.e., chocolate cream cookies and vanilla cream cookies) that were determined by reinforcer sampling prior to the beginning of this generalization activity. They were required to mand the desired version of the reinforcer based upon its location. For example, the chocolate cookies were placed beneath a shelf, and the vanilla cookies were placed behind a book. The participant was required to mand the cookies, using their location (e.g., I want the cookies behind the book.) in order to receive them. After each opportunity to respond, the reinforcers' positions were changed to reflect other prepositions. There were three opportunities to respond during this activity (see Appendix F). Expressive responses were counted as correct if participants used the target preposition and the prop.

In the third generalization activity, the students were required to respond to three verbal prompts that included one preposition each. This activity was conducted in the classroom with the entire group of students during their morning routine. The paraprofessional directed the morning transition time, and she gave all students in the classroom the verbal prompts that included the target prepositions (See Appendix E). These prompts were provided to the paraprofessional by the researcher. The students were directed to put away their belongings and retrieve the materials necessary for the

first academic activity of the day. For example, the paraprofessional gave the students the directive to put their notebooks beneath their chairs. To respond to this prompt, the students had to take their notebooks and place them on the floor beneath their chairs. These directives were given one at a time and students had approximately 30 seconds to initiate a response to the prompt. All of the participants in the study were observed simultaneously. The directives required a response that was obvious to researcher for the purposes of data collection. Each student had three opportunities to respond, one for each preposition, and responses were counted as correct if the student performed the action requested by the paraprofessional.

Procedural fidelity. A second observer collected procedural fidelity data in each phase for the duration of the study. A procedural fidelity checklist (See Appendix C) was completed for at least 41% of the sessions distributed evenly across baseline, intervention, and maintenance phases. Procedural fidelity checklists were also completed for the pretest and posttest generalization activities. These checklists included each step of the probe conducted during baseline, intervention, and maintenance. They also included the scripted steps of the intervention that were conducted only during the intervention phase. Procedural fidelity scores of 90% or higher were acceptable.

Interobserver agreement. Interobserver agreement (IOA) data were collected during each phase of the research. A second observer collected procedural fidelity data as well as data on student responses during the probes for a minimum of 41% of all probes. These results were compared item-by-item, to the researcher's results, and the agreements were calculated by dividing the number of agreements by the number of agreements plus the number of disagreements. The second observer were trained on each

of the data collection forms prior to beginning the study, and training trials were conducted until a minimum of 90% agreement was obtained.

## Data Analysis

Data analysis was conducted using visual inspection of graphed data across prepositions and participants. The data for this intervention were graphed by participant and preposition in the baseline and DI phases. In the baseline phase, five data points were graphed. These data paths were stable and at a low level with no trend; this served as prediction of students' future performance with constant conditions. Once the intervention began, data were collected on daily probes until a clear trend was observed in the data path and all students met the criteria for mastery of each preposition. Verification of the baseline condition for each preposition occurred with similar data paths demonstrated for the remaining prepositions. Replication of the experimental effects was accomplished as the data paths of the remaining prepositions followed a similar trend to that of the initial preposition.

Social validity. Social validity data were collected using a short questionnaire (see Appendix G) that was administered to the stakeholders in the participants' lives (e.g., teachers, caregivers). The first part of this two-part questionnaire measured opinions about participants' ability to use and understand prepositions as well as the stakeholders' beliefs about the generalization of the participants' preposition use to areas of their lives beyond the intervention sessions. Additionally, the questionnaire asked a question regarding participants' increased access to new reinforcers or environments as a way to determine if preposition use may become a behavioral cusp for them. The second part of the questionnaire was completed by the classroom teacher to measure their opinions

about the practicality of this intervention and their interest in implementing it in their classroom.

# CHAPTER 4: RESULTS

Results for interobserver agreement and treatment fidelity are presented below followed by the results for each research question.

## Interobserver Agreement

### Students' Correct Use of and Response to Prepositions

Daily probes. The second observer collected interobserver agreement data on student responses during 47% of the baseline probes for the first two dependent variables (i.e., correct use of and response to prepositions on a daily probe) using item-by-item scoring. Overall interobserver agreement was 100% during baseline. During instruction, interobserver agreement data were collected on 37% of probes and the agreement ranged from 94% to 100% with a mean of 99.4%. In the maintenance phase, interobserver agreement data were collected on 49% of probes, and agreement was 100%.

Generalization. The second observer collected interobserver agreement data on student responses during 100% of the generalization activities (e.g., manding, scavenger hunt, classroom observation) prior to baseline and postinstruction. Overall interobserver agreement was 100% across these activities.

## Procedural Fidelity

Instructional Sessions. To ensure the intervention was implemented as planned, procedural fidelity data were collected on 50% of all instructional sessions by the second observer. A procedural fidelity checklist was used with each step of the instructional

sequence listed in the order in which it was implemented. Data collection was distributed evenly across the 14 sessions, and procedural fidelity was 100% across all sessions.

### Daily Probes

To ensure the daily probes were conducted as planned, procedural fidelity data were collected on 37% of probes by the second observer. Data collection was distributed evenly across the 19 sessions. The daily probe data collection form was used by the observer to collect data on the order in which the probe was given as well as the consistency of the implementation procedures. The procedural fidelity for the daily probes was 100% across all sessions.

## Dependent Variables

Research Question 1: What are the effects of DI on participants' correct use of prepositions during an eighteen-item daily probe?

Research Question 2: What are the effects of DI on participants' correct responses to prepositions during an eighteen-item daily probe?

Results for each participant are presented in Figures 4.1 to 4.3. Each graph shows participant results across baseline and Direct Instruction. Data for students' use of and response to prepositions are reported cumulative number correct across probes. Results indicated a functional relationship between Direct Instruction and students' correct use of and response to prepositions.

Lucas. During baseline, Lucas' performance on the daily probe was stable at a low level. On all baseline probes for the prepositions "above" and "behind," Lucas responded with zero correct throughout the phase. For the preposition beneath, he scored

one correct when responding to the preposition and zero correct when using the preposition.

During Direct Instruction, Lucas' data showed an increasing trend across sessions across the target prepositions. On the first probe after instruction on the preposition "above," he scored one correct when responding to "above" and two correct when using the preposition. After the fourth probe, Lucas consistently scored three correct when responding to "above" across the remaining probes. After the third probe, he consistently scored three correct when using the preposition across the remaining probes. He reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the eighth probe, and at that point, instruction ceased. The second preposition, "behind," was added after the fourth probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition "behind," Lucas scored zero correct when responding to the preposition behind and zero correct when using the preposition. After the second probe, Lucas consistently scored three correct when responding to "behind" across the remaining probes. After the third probe, he consistently scored three correct when using and responding to "behind" across the remaining probes. Lucas reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the seventh probe, and at that point, instruction ceased. The third preposition, "beneath," was added after the fourth probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition "beneath," Lucas scored zero correct when responding to the preposition "beneath" and zero correct when using the preposition. After the sixth probe, Lucas consistently scored three correct when

responding to “beneath” across the remaining probes. After the fifth probe, he consistently scored three correct when using “beneath” across the remaining probes. After the third probe, he consistently scored three correct when using the preposition across the remaining probes. Lucas reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the eighth probe, and at that time, instruction ceased. Lucas’ graphed data are presented in Figure 4.1

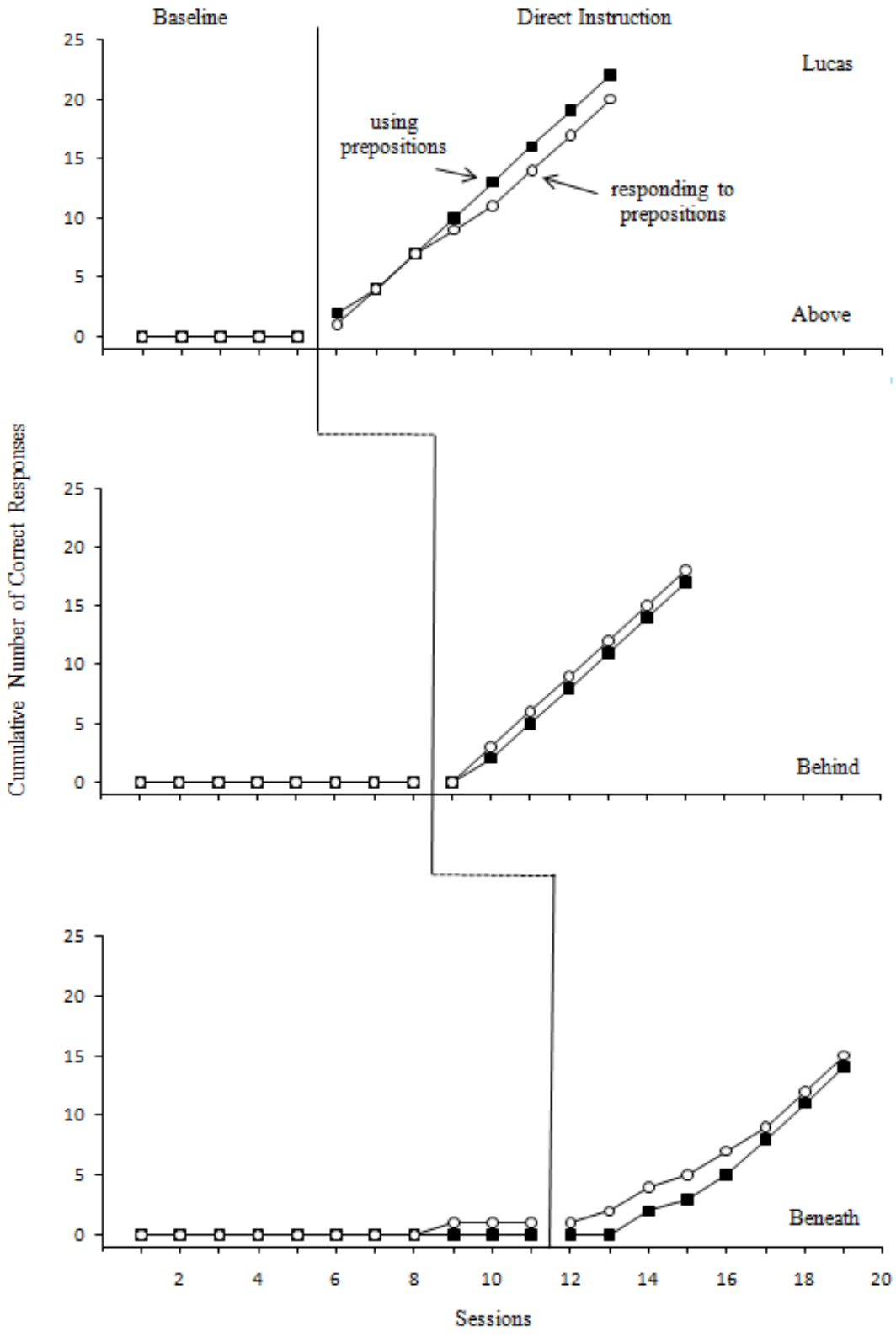


Figure 4.1. Lucas' Cumulative Correct Responses Across Prepositions

Alana. During baseline, Alana's performance on the daily probe was stable at a low level. Specific scores for the target prepositions will be reported cumulatively. On all baseline probes for all target prepositions, Alana responded with zero correct throughout the phase. During Direct Instruction, Alana's data showed an increasing trend across instructional sessions of the target prepositions. On the first probe after instruction on the preposition "above," she scored two correct when responding to "above" and three correct when using the preposition. After the fourth probe, Alana consistently scored three correct when responding to "above" across the remaining probes. After the first probe, she consistently scored three correct when using the preposition across the remaining probes. After the third probe, Alana consistently scored three correct when using the preposition across the remaining probes. She reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the eighth probe. The second preposition, "behind," was added after the third probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition "behind," Alana scored one correct when responding to the preposition "behind" and three correct when using the preposition. After the second probe, Alana consistently scored three correct when responding to "behind" across the remaining probes. After the first probe, she consistently scored three correct when using "behind" across the remaining probes. Alana reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the seventh probe, and at that point, instruction ceased. The third preposition, "beneath," was added after the fourth probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition “beneath,” Alana scored zero correct when responding to the preposition and zero correct when using the preposition. After the third probe, Alana consistently scored three correct when responding to “beneath” across the remaining probes. After the fifth probe, she consistently scored three correct when using “beneath” across the remaining probes. Alana reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the eighth probe, and at that time, instruction ceased. Alana’s graphed data are presented in Figure 4.2.

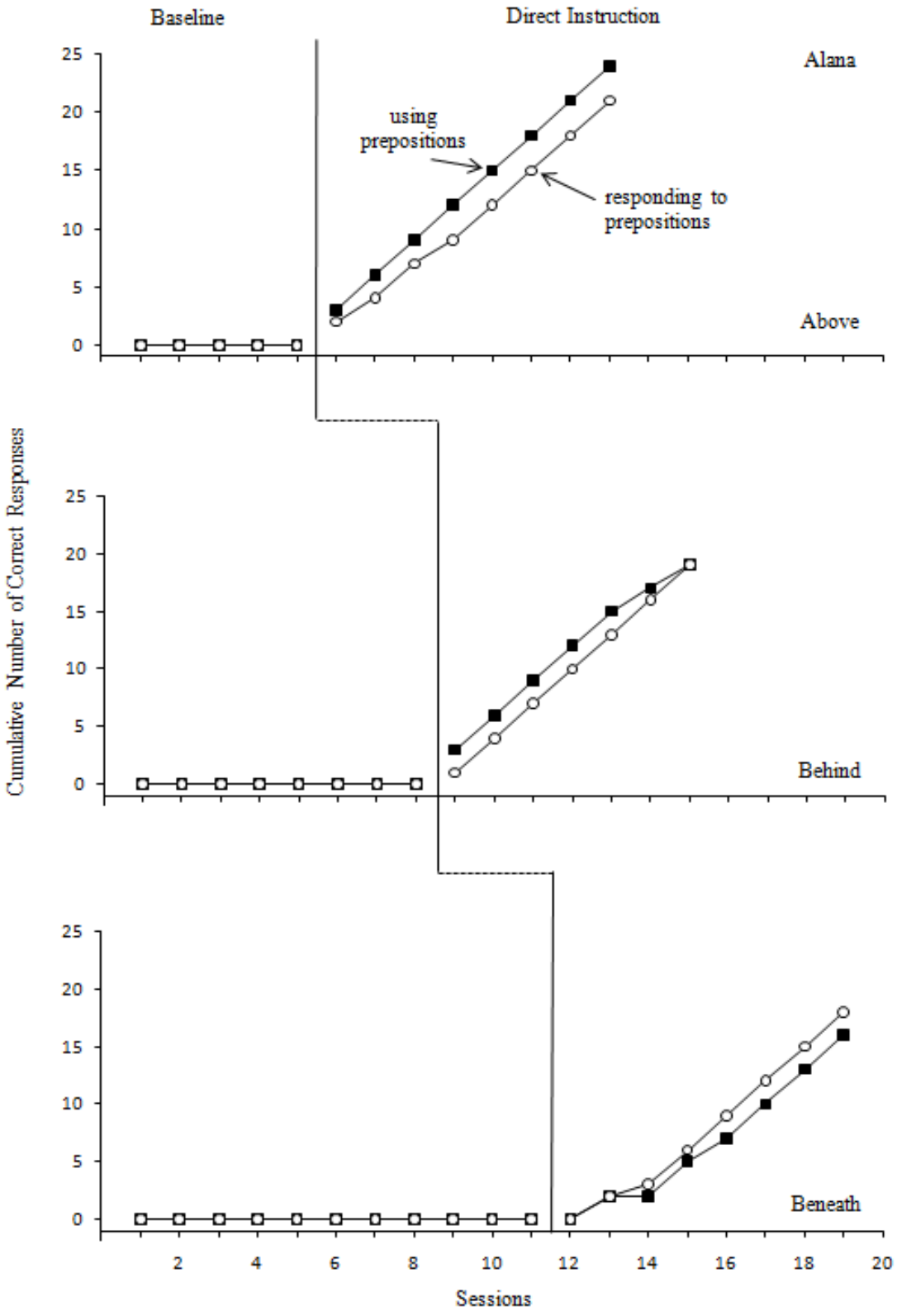


Figure 4.2. Alana's Cumulative Correct Responses Across Prepositions

Brisha. During baseline, Brisha's performance on the daily probe was stable at a low level. Specific scores for the target prepositions will be reported cumulatively. On all baseline probes for the target prepositions, Brisha responded with zero correct throughout the phase. During Direct Instruction, Brisha's data showed an increasing trend across instructional sessions of the target prepositions. On the first probe after instruction on the preposition "above," she scored one correct when responding to "above" and two correct when using the preposition. After the first probe, Brisha consistently scored three correct when responding to and using "above" across the remaining probes. She reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the seventh probe, and at that point, instruction ceased. The third preposition, "beneath," was added after the fourth probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition "behind," Brisha scored one correct when responding to the preposition "behind" and three correct when using the preposition. After the first probe, Brisha consistently scored three correct when responding to and using "behind" across the remaining probes. Brisha reached the criterion for mastery (e.g., two of three probes at 100%) on this preposition after the seventh probe, and at that point, instruction ceased. The third preposition, "beneath," was added after the fourth probe when the data demonstrated an increasing trend.

On the first probe after instruction on the preposition "beneath," Brisha scored zero correct when responding to the preposition and zero correct when using the preposition. After the fourth probe, Brisha consistently scored three correct when responding to and using "beneath" across the remaining probes. She reached the criterion

for mastery (e.g., two of three probes at 100%) on this preposition after the eighth probe, and at that time, instruction ceased. Brisha's graphed data are presented in Figure 4.3.

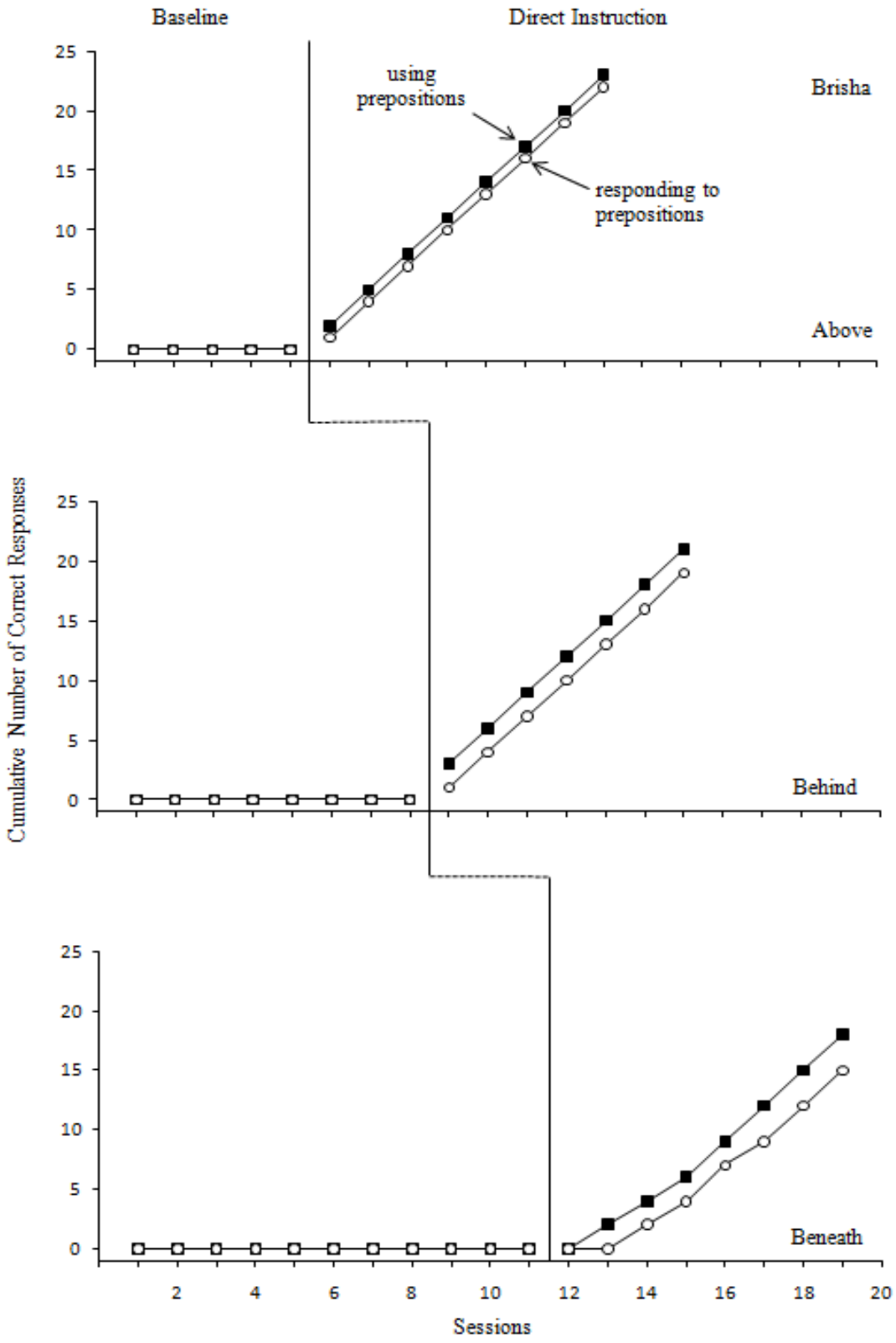


Figure 4.3 Brisha's Cumulative Correct Responses Across Prepositions

Research Question 3: What are the effects of DI on participants' correct use of prepositions during generalization activities?

Research Question 4: What are the effects of DI on participants' correct responses to prepositions during generalization activities?

Results for the generalization activities conducted in the baseline phase and after the maintenance phase are presented in Table 4.1.

Table 4.1

*Generalization Data*

| | Lucas | | Alana | | Brisha | |
|---|---|---|---|---|---|---|
| Activity | Pretest | Posttest | Pretest | Posttest | Pretest | Posttest |
| Manding | 0 | 3 | 0 | 3 | 0 | 3 |
| Scavenger Hunt | | | | | | |
| Responding | 0 | 3 | 0 | 3 | 0 | 3 |
| Using | 0 | 2 | 0 | 3 | 0 | 3 |
| Following Directions | 0 | 3 | 0 | 3 | 0 | 3 |

*Note: Each score included in this table was out of a possible three correct.*

Lucas. During the three generalization activities (e.g., manding, scavenger hunt, observation), Lucas scored zero correct across all activities prior to DI. In the activities conducted after DI was complete, Lucas scored three of three correct on the manding activity. During the scavenger hunt, Lucas responded correctly in two of three opportunities when responding to the prepositions, and he responded correctly in three of three when using the prepositions. In the classroom observation, Lucas responded correctly in three of three opportunities.

Alana. During the three generalization activities (e.g., manding, scavenger hunt, observation), Alana scored zero correct across all activities prior to Direct Instruction. In the activities conducted after DI was complete, Alana scored three of three correct on the manding activity. During the scavenger hunt, she responded correctly in three of three opportunities when responding to the prepositions, and she responded correctly in three of three when using the prepositions. In the classroom observation, Alana responded correctly in three of three opportunities.

Brisha. During the three generalization activities (e.g., manding, scavenger hunt, observation), Brisha scored zero correct across all activities prior to Direct Instruction. In the activities conducted after DI was complete, Brisha responded correctly in three of three opportunities during the manding activity. During the scavenger hunt, she responded correctly in three of three opportunities when responding to the prepositions, and she responded correctly in three of three when using the prepositions. In the classroom observation, Brisha responded correctly in three of three opportunities.

Research Question 5: To what extent will students maintain their use of and response to prepositions over time?

For each preposition, maintenance data were collected on a regular schedule based upon distance from instruction (e.g., 5, 12, 20, 35, and 56 days).

Lucas. See table 4.2 for all maintenance probe data. For “above,” at 5, 12, and 20 days from instruction, Lucas scored three correct when responding to the preposition and at 35 and 56 days from instruction he scored two correct. When using “above,” Lucas scored three correct on each maintenance probe. For “behind,” at 5 and 20 days from instruction, he scored three correct when responding to “above,” and at 12, 35, and 56

days from instruction he scored two correct. When using the preposition, Lucas scored three correct on each maintenance probe. For "beneath," Lucas scored two correct when responding to the preposition across all maintenance probes, and when using the preposition, Lucas scored three correct across all maintenance probes.

Table 4.2

*Maintenance Data for Lucas*

| Days from instruction | Above | | Behind | | Beneath | |
|---|---|---|---|---|---|---|
| | VP | Tact | VP | Tact | VP | Tact |
| 5 | 3 | 3 | 3 | 3 | 2 | 3 |
| 12 | 3 | 3 | 2 | 3 | 2 | 3 |
| 20 | 3 | 3 | 3 | 3 | 2 | 3 |
| 35 | 2 | 3 | 2 | 3 | 2 | 3 |
| 56 | 2 | 3 | 2 | 3 | 2 | 3 |

*Note*. VP = verbal prompt. For each condition, there were three opportunities to respond for each preposition.

Alana. See Table 4.3 for all maintenance probe data for Alana. For "above," Alana scored three correct when responding to the preposition across all maintenance probes. When using "above," at 5, 35, and 56 days from instruction, Alana scored three correct on maintenance probes. At 12 and 20 days from instruction, she scored two correct. For "behind," at 5, 35, and 56 days from instruction, she scored three correct when responding to the preposition, and at 12 and 20 days from instruction she scored two correct. When using the preposition, at 5 days from instruction, Alana scored two correct on each maintenance probe, and on the remaining probes, she scored 3 correct. For "beneath," Alana scored three correct when responding to the preposition across all maintenance probes, and when using the preposition, Alana scored two correct on the first probe then three correct across all remaining probes.

Table 4.3

*Maintenance Data for Alana*

| Days from instruction | Above | | Behind | | Beneath | |
|---|---|---|---|---|---|---|
| | VP | Tact | VP | Tact | VP | Tact |
| 5 | 3 | 3 | 3 | 3 | 3 | 2 |
| 12 | 3 | 2 | 2 | 2 | 3 | 3 |
| 20 | 3 | 2 | 2 | 2 | 3 | 3 |
| 35 | 3 | 3 | 3 | 3 | 3 | 3 |
| 56 | 3 | 3 | 2 | 3 | 2 | 2 |

*Note*. VP = verbal prompt. For each condition, there were three opportunities to respond for each preposition.

Brisha. See Table 4.4 for all maintenance probe data for Brisha. For "above" at 20 days from instruction Brisha scored two correct when responding to the preposition. On all remaining maintenance probes, she scored three correct. When using "above," Brisha scored three correct on all maintenance probes. For "behind," she scored three correct for all maintenance probes when responding to and using the preposition. For "beneath," Brisha scored three correct when responding to the preposition on the maintenance probes conducted 5, 12, and 56 days from instruction. When using the preposition, Brisha scored two correct on the probe conducted 5 and 20 days from instruction then three correct on the remaining probes.

Table 4.4

*Maintenance Data for Brisha*

| Days from instruction | Above | | Behind | | Beneath | |
|---|---|---|---|---|---|---|
| | VP | Tact | VP | Tact | VP | Tact |
| 5 | 3 | 3 | 3 | 3 | 3 | 2 |
| 12 | 3 | 3 | 3 | 3 | 3 | 3 |
| 20 | 2 | 3 | 3 | 3 | 2 | 2 |
| 35 | 3 | 3 | 3 | 3 | 2 | 3 |
| 56 | 3 | 3 | 3 | 3 | 2 | 3 |

*Note*. VP = verbal prompt. For each condition, there were three opportunities to respond for each preposition.

Research Question 6: To what extent do educators and caregivers report a difference in participants' use of and response to prepositions?

This study also assessed the social validity of the intervention and outcomes based on parent and teacher perceptions. The questionnaire was separated into two parts: questions 1-4 and 5-8. The first part (i.e., questions 1-4) was completed by parents/caregivers, teachers, and paraprofessionals and was designed to assess their perceptions of the students' ability to use and respond to prepositions. The final question in the first section assessed the parent/teachers' perception of students' access to reinforcers as a result of students' preposition use. The teachers completed the second section of the questionnaire (i.e., questions 5-8). This section measured the teachers' perception of the DI format used to teach prepositions to the students. Results of the social validity survey are reported in Table 4.5.

Table 4.5

*Social Validity Data*

| Statement | SA | A | DK | D | SD |
|---|---|---|---|---|---|
| Teachers/Caregivers | | | | | |
| 1.Student is able to use the target prepositions. | | 2 | 3 | | |
| 2. Student is able to follow directions that include the target prepositions. | | 2 | 3 | | |
| 3. Student has asked for specific things using prepositions. | | 3 | 1 | | 1 |
| 4. Student has access to many more things as a result of using the target prepositions. | 1 | 4 | | | |
| Teachers | | | | | |
| 5. The teaching format is time efficient. | | | 2 | | |
| 6. This would be a simple way to teach prepositions. | | | 2 | | |
| 7. Students who do not know prepositions could learn through this format. | | | 2 | | |
| 8. I would use this format with my students. | | | 1 | 1 | |

*Note*. SA = strongly agree, A = agree, DK = don't know, D = disagree, SD = strongly disagree.

# CHAPTER 5: DISCUSSION

The purpose of this study was to investigate the effects of Direct Instruction on the response to and use of prepositions by students with an intellectual disability. A multiple-probe across prepositions design with replication across students was used to determine the effects of the independent variable (i.e., Direct Instruction) on the dependent variables (i.e., students' response to and use of prepositions). The DI format was implemented with three students, one third grader and two fifth graders with an intellectual disability. Results of this study indicated a functional relationship between the DI format and the students' increased response to and use of prepositions. All three students demonstrated some maintenance of the skills up to eight weeks from instruction. Also, students were able to generalize their responses to and use of prepositions to three different untaught activities.

Finally, parents, teachers and paraprofessionals believed the students were able to respond to and use prepositions to some extent in the students' everyday lives, and that the use of the target prepositions gave the students access to items they would not have had otherwise. The classroom teacher indicated the instructional format was efficient, and that she would consider using it in the future to teach prepositions. The teacher of record for the third participant agreed the format was time efficient but did not know if she would use it to teach prepositions. Findings and discussion points are presented in this

chapter organized by research questions, and finally, limitations of the study, suggestions for future research, and implications for practice are discussed.

## Effects of Direct Instruction on the Dependent Variables

Research Question 1: What are the effects of DI on participants' correct use of prepositions during an eighteen-item daily probe?

Research Question 2: What are the effects of DI on participants' correct responses to prepositions during an eighteen-item daily probe?

The graphed data from this study indicated a functional relationship between DI and students' responses to and use of prepositions. For the prepositions "above" and "behind," the data showed a steep increasing trend within the first two probes for all three students. The data for the preposition, "beneath," also showed an increasing trend for each student; however, the number of sessions required for the data path to match the trend of the other two prepositions ranged from three to five.

The students received the intervention in a small group format, so the number of probes required for them to demonstrate mastery of the prepositions was the same when. In examining specific aspects of student data, for the preposition, "above," all three students were able to use the preposition to identify the location of an object more readily than they were able to respond to a verbal prompt using that preposition. For "behind," Alana and Brisha were able to use the preposition in three of three opportunities on the first probe after instruction, but both scored one of three correct when responding to a verbal prompt that included that preposition. For "behind," Lucas scored zero of three correct when responding to and using the preposition on the first probe after instruction.

During the second probe, he scored three of three correct when responding to “behind” and maintained that score through the final instructional probe.

The preposition “beneath” was challenging for all three students. During the initial assessment, Alana and Brisha responded correctly to “under” when given a verbal prompt; however, neither of these two students appeared to identify the connection between beneath and under. All three students scored zero of three correct when responding to and using the preposition during the first probe after instruction. Lucas’ performance on the second probe after instruction was only marginally improved over the first. He scored one correct when responding to a verbal prompt and zero correct when using the preposition. Alana scored two of three correct when responding to and using the preposition. Brisha scored zero of three correct when responding to the preposition, and two correct when using it. One of the probe items for this preposition was a verbal prompt to place a toothbrush beneath a box, and all three students had difficulty with this initially. It could have been because the prompt was illogical to them, because a person would not typically place a toothbrush beneath a box. Another possible explanation could be that the box was difficult to manipulate. Ultimately, the specific reason is unclear.

The results of this study support the use of DI with students with an intellectual disability by demonstrating similar results as other studies (Allor, et al., 2010; Fallon, et al., 2004; Flores, Shippen, & Alberto, 2004; Gersten, 1985; Kinder, Kubina, & Marchand-Martella, 2005; Rieple, Marchand-Martella, & Martella, 2008). These studies found DI to be effective in teaching such skills as reading, writing, math, and spelling to students with an intellectual disability. More specifically, the results support the use of DI in teaching expressive and receptive language skills to this population of students by

showing comparable results to other DI studies that targeted language skills (Benner, et al., 2002; Ganz & Flores, 2009; Hicks, et al., in press; Lloyd, et al., 1980).

The students in this study acquired both receptive and expressive language skills through a DI instructional format. Coventry and Garrod (2004) stated that describing where objects are and locating them is a fundamental survival skill for individuals, and that using and comprehending prepositions is a vital precursor to these skills. Additionally, Internicola and Weist (2003) found that typically developing children were able to use and comprehend locative prepositions between one and two years; however, students with disabilities acquire language skills much later (Fowler, Gelman, & Gleitman, 1994; Westling & Fox, 2000). The participants in the current study were 8, 10 and 11 years old and had not mastered the locative prepositions above, behind, and beneath. Given the results of this study, presumably students could be taught to use and respond to prepositions at an earlier age, possibly building a foundation for increased language skill development.

Sailor and Taman (1972) conducted a study in which students with an intellectual disability learned to use prepositions. Frisch and Schumaker (1974) taught locative prepositions by providing students with a verbal prompt for the student to place an object in a specific location. Correct responses were praised and incorrect responses were punished. In both cases the students were successful with expressive or receptive acquisition of locative prepositions. The current study demonstrated success in teaching prepositions expressively (i.e., using prepositions) and receptively (i.e., responding to prepositions) quickly and efficiently with only praise for correct responses. Instructional sessions lasted approximately 2 min per preposition. A typical session included 30

seconds of modeling the preposition and 1.5 min of testing the preposition. In sessions where all three prepositions were in the instructional phase, the time required was less than 7 min, which included transition time between instructional activities. As the graphed data demonstrate, students acquired the expressive and receptive use of each of the three prepositions within only a few instructional sessions. The cumulative instructional time students received across prepositions was approximately 15 min, which demonstrates the efficiency of this method of language instruction in a small group format.

This study adds to the overall literature for teaching prepositions to students with disabilities (Frisch & Schumaker, 1974; Koegel, et al., 2010; Lee, 1981; McGee, Krantz, & McClannahan, 1985; Sailor & Taman, 1972) and without disabilities (Casasola & Wilbourn, 2004; Fisher, Klingler, & Song, 2006; Tranel & Kemmerer, 2004). More importantly than a simple contribution to the literature, this study further supports DI as an effective way to teach an expressive and receptive language skill to students who traditionally experience significant language delays.

Research Question 3: What are the effects of DI on participants' correct use of prepositions during generalization activities?

Research Question 4: What are the effects of DI on participants' correct responses to prepositions during generalization activities?

In each of the three generalization probes, students demonstrated the ability to use and respond to the target prepositions. All three students scored three of three correct during the manding and observation activities, and Lucas and Brisha scored five of six correct during the scavenger hunt activity. These activities were conducted upon the

conclusion of all maintenance probes, and these results were similar to those from the maintenance probes. During each generalization activity where the students were asked to respond to a verbal prompt that included one of the target prepositions, all students took several more seconds to respond than they did when they were asked to use the preposition. The reason for this delay is unclear, but it was consistent with their performance during the daily and maintenance probes.

As well as demonstrating maintenance of their new skills, the students also demonstrated generalization of those skills to untaught activities. This demonstration was observed during structured activities and through student interaction with other students and classroom teachers. After the sixth intervention session, Lucas began quizzing his classmates by holding his pencil above his desk and asking them to tell him where it was. When they were unable to answer, he provided the answer to them. Alana corrected a classmate who was instructed to put his folder beneath his chair. The student placed it inside his desk, and Alana crossed the room and moved it to the correct position. When the paraprofessional asked her what she was doing, Alana reminded the paraprofessional that she had instructed the student to put the folder beneath his chair. These anecdotal notes demonstrate the students' ability to generalize the use of and responses to prepositions to everyday classroom activities as well as structured generalization activities.

Students with an intellectual disability have difficulty generalizing newly acquired skills (Bergeron & Floyd, 2006; Drew & Hardman, 2007; Steere, Pancsofar, Powell, & Butterworth, 1989); however, the results of this study contradict this notion. The use of general case programming combined with multiple exemplar training in the

intervention may be the key to the students' performance on generalization measures. Tennyson, Tennyson, and Rothen (1980) stated that providing students with an appropriate range of examples of a concept allows students to generalize the concept independently. The intervention in this study also included nonexamples which helped students build an increased understanding of the concept through demonstrations of what the concept did not include. According to Engelmann and Carnine (1991), concept acquisition is demonstrated by generalization across examples, and to do this appropriately, students must be able to discriminate. The examples and nonexamples in the current study were modeled using the same objects and props for the entire demonstration. This allowed the students to focus on and discriminate between the differences in the position of the objects as a way to build understanding of the prepositional concepts. Including minimally different examples and nonexamples is well supported in literature (Carnine, 1980; Tennyson, 1973; Tennyson, Steve, & Boutwell, 1975)

This presentation of stimulus variations used in the current study is also referred to as multiple exemplar training, and it has been used successfully to teach individuals with an intellectual disability new skills including social skills (Hughes, Harmer, Killian, & Niarhos, 1995) and safety skills (Winterling, Gast, Wolery, & Farmer, 1992). In addition to helping students with an intellectual disability acquire new skills, multiple exemplar training has been shown to support generalization of skills to new settings or situations (Cooper et al., 2007; Pancsofar & Bates, 1985). Students in the current study demonstrated the ability to generalize the use of and response to the target prepositions to stimuli and activities that were outside the scope of their instruction, meeting Stokes and

Baer's (1977) criteria for generalization. These criteria state that no additional teaching is necessary in order for the students to demonstrate the same skill across settings, people or time. Because the students applied their skills across activities and people, requiring no additional instruction to do so, generalized behavior change can be claimed across each of the three students. The demonstrated generalization was a critical aspect to the implications for practice in this study. If the students were unable to generalize their skills beyond the confines of a structured intervention session, there would be no functional application of the skills in their daily lives.

Building on multiple exemplars, the current study also used a form of general case programming to teach the prepositional concepts. In this type of instruction, particular attention is paid to selecting stimuli with common characteristics then presenting them in a carefully sequenced order; this increases the likelihood the students will generalize the skill to untaught activities or settings as a result of the instruction (Engelmann & Carnine, 1991; O'Neill, 1990). General case programming has been used over time to teach community-based skills such as grocery shopping (McDonnell, Horner, & Williams, 1984), restaurant skills (Steere, Strauch, Powell, & Butterworth, 1990), and vending machine skills (Sprague & Horner, 1984), but there is some support for using general case programming to teach communication skills to students with disabilities (Chadsey-Rusch, Drasgow, Reinoehl, Halle, & Collet-Klingenberg, 1993; Drasgow, & Halle, 1995). In this study, generalization of the target skills was not taught explicitly, and extending the work of Hicks et al. (in press), generalization probes were conducted during the baseline and maintenance phases to determine if any generalization of the target skill occurred. The students generalized their skills, and it was likely the result of

the general case programming combined with the examples and nonexamples; however, according to Cooper et al. (2007) it could have been the result of the target skill having a naturally occurring contingency of reinforcement. In this case, it could be that reinforcement occurred when students were able to follow directions that included a preposition, therefore, gaining the teacher's approval as well as getting to move into a desired activity more quickly. In the manding generalization activity, the students gained access to a highly desired reinforcer (e.g., cookies, chips, book) as a result of using the target prepositions correctly.

This satisfied the suggestion of Petsursdottir et al. (2005) which stated that there should be a clear establishing operation in place to encourage the appropriate use of mands. An establishing operation increases the effectiveness of a particular reinforcer (Cooper et al., 2007). For example, hunger increases the effectiveness of an edible reinforcer. During the manding activity, the edible reinforcers may not have been as effective if the students had just eaten a large breakfast; however, the activity was conducted prior to breakfast, so there was an establishing operation in place as the students had not eaten anything yet that morning. Generalization of the skill was not directly observed by the researcher outside of the confines of the planned activities; however, some generalization was reported by teachers and caregivers in the survey administered at the conclusion of the study.

Research Question 5: To what extent will students maintain their use of and response to prepositions over time?

Maintenance data were collected for each of the three participants on a predetermined schedule that allowed for increasing amounts of time from instruction. The

first data point was collected 5 days out from instruction and the last was 56 days out. Lucas' performance on the maintenance probes was consistent across each of the five probes when he was asked to tact an object's location. He scored three of three correct on each probe for each preposition; however, his performance when following verbal prompts was less consistent, but he still scored a minimum of two out of three correct. Alana and Brisha scored higher overall on the maintenance probes, but unlike Lucas, neither of them demonstrated a perfect performance on either the use of or response to the prepositions. There was no discernible pattern to incorrect responses on probes collected during the maintenance phase. For the preposition "beneath," Lucas scored two of three correct on each of the five probes when responding to a verbal prompt, but across the probes, he failed to respond correctly to each of the three different prompts at least once. This same thing was true for Alana and Brisha as well. There was no obvious pattern to their incorrect responses across probes.

These students maintained their use of and responses to the three target prepositions for 8 weeks after instruction ended. As with generalization skills, students with an intellectual disability often have difficulty maintaining skills after instruction ends because of poor memory (Bergeron & Floyd, 2006; Drew & Hardman, 2007). The performance of these students on maintenance probes may be the result of multiple exemplar training (i.e., multiple examples and nonexamples). This is instruction that uses a selection of stimuli and stimulus conditions to "ensure the acquisition of desired stimulus control" (Cooper et al., 2007, p. 700). The students in this study were shown a range of five examples and nonexamples of each preposition using a variety of stimuli during each instructional session. The repeated observations of modeled examples and

nonexamples as well as repeated opportunities to use and respond to the target prepositions could be one reason for the target skill maintenance.

Another possible explanation of the students' maintenance probe performance could be observational learning. Observational learning is defined as students' ability to learn new information through the observation of that information as it is being taught to others in the group (Collins, Gast, Ault, & Wolery, 1991). Gast, Wolery, Morris, Doyle, and Meyer (1990) conducted a study in which students with moderate disabilities were taught different sets of sight words in a small group format. Results of the study showed each student acquired sight words across the different sets, not only their own. In the current study, all students received instruction on each of the three target prepositions simultaneously; however, in the testing phase of each instructional session, students were tested individually while the others observed. This gave each student the opportunity to observe 16 additional examples and nonexamples per preposition complete with error corrections when necessary. The students' performance during the maintenance probes could be the result of the additional modeling of the prepositional concepts they observed during the instructional sessions.

Research Question 6: To what extent do educators and caregivers report a difference in participants' use of and response to prepositions?

The results of the survey administered to teachers, the paraprofessional, and caregivers indicated that respondents believed the students could use the target prepositions correctly as well as follow directions that included prepositions. Two parents and the classroom paraprofessional stated their student(s) had asked for a specific item by using a preposition, and all respondents believed the students had access to more things

as a result of their ability to use or respond to prepositions. When responding to the questions regarding the teaching procedure, the classroom teachers agreed the Direct Instruction format would be an effective and efficient way to teach prepositions to students with moderate disabilities. They also indicated it would be a format they would consider using in the future with students who did not have those skills.

The results of this survey indicate that the ability to use and respond to prepositions may either be a behavioral cusp for these students or may become one. A behavioral cusp is defined as "any behavior change that brings the organism's behavior into contact with new contingencies that have even more far-reaching consequences" (Rosales-Ruiz & Baer, 1997, p. 533). In order to demonstrate that their new skills had developed into a behavioral cusp, the students would have to use their new skills to request items they were unable to access previously or to access new environments. Three respondents had witnessed this behavior from their student(s). As students gain more language skills in the future, teachers may observe them using prepositions to gain access to new reinforcers; however, at this time, only two parents and the paraprofessional have observed this behavior. The results of these social validity surveys indicate the need for more direct observation with the collection of empirical evidence of students' use of and response to prepositions in their daily environments as a way to determine whether or not this skill is a behavioral cusp for them.

The classroom paraprofessional reported observing increased preposition use from the students. Because of this, it is possible that the ability to use and respond to prepositions may evolve into a pivotal behavior for one or more of the students. Pivotal behaviors are "behaviors that, once learned, produce corresponding modifications or

covariations in other untrained behaviors" (Cooper et al., 2007, p. 59). These students have demonstrated the ability to use and respond to prepositions in an instructional setting, and pivotal behaviors can serve as a foundation for other behavior changes. It is possible these students may be able to use their knowledge of their three target prepositions to build a larger repertoire of prepositions through incidental learning or through a direct request for information. At this point, it is pure conjecture, but the possibility exists.

## Limitations and Suggestions for Future Research

This study has several limitations and implications for future research to consider. First, three students participated in this study, which is consistent with single-subject research. Because of the small number of participants, there is limited generalization of these results as opposed to group experimental research where generalization of results is presumed due to large numbers of participants via statistical inference; however, future research on Direct Instruction of language skills should be conducted with additional students of varying ages and disabilities as well as populations in different geographic locations as a way to increase the research base. Successful, systematic replications will build generalization of results by demonstrating that the same results can be achieved with different interventionists and across students with a range of disabilities and ages (Gast, 2010; Kennedy, 1979). Although statistical inference will still be absent, multiple replications of the intervention will strengthen the external validity of the intervention and allow consumers of the research to confidently generalize the results to students with varying attributes.

Additional studies may serve to support DI as an evidence-based practice for teaching students to use and respond to prepositions. Horner et al. (2005) state that for broad generalization of results, there must be a minimum of five replications across at least three settings, 20 participants, and three different researchers. Additionally, these replications must demonstrate documented experimental control and meet minimum criteria for experimental methods.

A second limitation for this study was that the researcher served as the interventionist, and this limitation is shared by similar studies (Frisch & Schumaker, 1974; Lee, 1981; McGee, et al., 1985; Sailor & Taman, 1972). Although the teachers indicated they would consider using the instructional format to teach students to use and respond to prepositions, there are no data to suggest teacher implementation of the intervention would show the same success. This limitation may negatively influence teachers' decision to use this instructional format. Future research should include studies in which the classroom teacher implements the intervention as part of the daily classroom routine as a way to demonstrate the effectiveness of the instructional format.

The final limitation is that there was no direct observation or long-term data collection of students' ability to use or respond to prepositions that was not a contrived activity. A direct observation by the researcher may have revealed different outcomes than those reported by teachers and caregivers. Even though the survey respondents did not report observable use of prepositions to gain access to new reinforcers, there may be instances where students used the target prepositions with individuals who were not surveyed. No known studies present any empirical data that the trained behavior became a behavioral cusp, but several provide compelling anecdotal evidence (Esbenshade &

Rosales-Ruiz, 2001; Ingvarsson et al., 2007; Stokes et al., 2004). Future research that examines language use as a behavioral cusp should include a long-term data collection schedule of direct observations so that a broader picture of student behavior may be recorded. The target data in these observations would reveal a behavior change that results in the student having access to more reinforcers or environments as a consequence of learning a new behavior. While the observations would most likely result in qualitative data, there is the possibility of producing quantitative data as well. Frequency counts of an individual's access to new reinforcers or environments could be recorded and graphed as a way to visually assess the outcomes.

## Implications for Practice

The results of this study indicate several implications for practice. First, it is well documented that students with an intellectual disability struggle with language acquisition (Fowler, Gelman, & Gleitman, 1994; Tager-Flusberg & Sullivan, 1998; Westling & Fox, 2000). These results demonstrated that students with moderate an intellectual disability acquired the ability to use and respond to prepositions with only 15 instructional minutes per preposition in a small group setting. The instructional format used in this study may provide teachers with an efficient way to teach prepositions and other expressive and receptive language skills to students. Overall, DI, through a published curriculum (e.g., Corrective Reading, Language for Learning), has been shown to be effective for teaching language skills (Benner et al., 2002; Ganz & Flores, 2009; Lloyd et al., 1980), but often teachers have limited access to these curricula. This DI format has been shown to be effective in teaching receptive and expressive language skills to students with an intellectual disability when taught one to one (Hicks et al., in

press) and in small groups in the current study. Using this format, teachers could conduct short lessons that would help students acquire critical language skills in a timely manner.

Second, the current study addressed the limitation of one-to-one instruction from the work of Hicks et al. (in press) by demonstrating similar outcomes through the use of small group instruction. Traditional special education services have been delivered individually to students with moderate to severe disabilities, but small group instruction allows for more efficient use of the teacher's instructional efforts as well as the more typical form of instruction found in inclusive settings (Collins et al., 1991). With evidence to support the use of small groups for the delivery of special education services for students with moderate or severe disabilities, teachers may have more flexibility in their decision-making about their use of instructional time. The use of small group instruction in earlier grades and with students at earlier ages may increase the number of skills teachers are able to teach, and this could provide a stronger foundation for more complex skills as students move into higher grades.

Third, the intervention in this study used scripted Direct Instruction lessons. The script ensured that the lesson was organized and delivered the same way for each instructional session. Also, the script required student responses that increased students' active engagement in the instructional sessions. Active student response (ASR) has been shown to increase student learning when used with students with mild to significant disabilities (Barbetta, Heron, & Heward, 1993; Horn, Schuster, & Collins, 2006; Randolph, 2007; Sterling, Barbetta, Heward, & Heron, 1997). These active responses facilitate increased learning because students engage more frequently with the content of the lesson (Heward, 2009; Heward, Courson, & Narayan, 1989). The quick pace of

testing and the feedback given with each trial across students allowed all three of them to engage more frequently with the content in a limited amount of time. This is different than the traditional method of the teacher presenting the material then calling on one student at a time at a much slower pace. In the current study, the researcher gave feedback after every trial in the testing phase of daily instruction; this immediate feedback is a defining attribute of ASR (Heward, Cavanaugh, Courson, Grossi, & Barbetta, 1996). Additionally, active student response allows the teacher to assess progress with the lesson content in real time (Heward et al., 1996). Assessment conducted within the confines of content delivery allows teachers to adjust instruction to meet the needs of the students as she is delivering it. In the current study, the script included progress monitoring for each session during which the researcher was able to quickly determine student progress toward mastery of the content as well as when mastery was achieved. These components give classroom teachers a framework within which they could teach any number of prepositions while incorporating critical features of instructional design without having to devote already scarce time to lesson planning efforts.

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# APPENDIX A: PROBE DATA COLLECTION FORM

Student ID:_____ Session #:____2nd Observer:_____ IRR:_____

| Props & Nouns | Preposition | Verbal Prompts | Proc Fid + or - | Resp + or - | Tacts | Proc Fid + or - | Resp + or - |
|---|---|---|---|---|---|---|---|
| Table<br><br>Cup | | Put the cup above the table. | | | Where is the cup? | | |
| Box<br><br>Pencil | | Put the pencil above the box. | | | Where is the pencil? | | |
| Bottle<br><br>Fork | | Put the fork above the bottle. | | | Where is the fork? | | |
| Table<br><br>Bowl | | Put the bowl behind the bottle. | | | Where is the bowl? | | |
| Box<br><br>Plate | | Put the plate behind the box. | | | Where is the plate? | | |
| Chair<br><br>Book | | Put the book behind the box. | | | Where is the book? | | |
| Table<br><br>Pencil | | Put the pencil beneath the table. | | | Where is the pencil? | | |
| Box<br><br>Toothbrush | | Put the toothbrush beneath the box. | | | Where is the toothbrush? | | |
| Bottle<br><br>Book | | Put the book beneath the bottle. | | | Where is the book? | | |
| | | Total | /9 | /9 | | /9 | /9 |
| | | | | | Overall Total | /18 | /18 |
| | | | | | | | |

# APPENDIX B: INITIAL ASSESSMENT DATA COLLECTION FORM

Student ID:_____ Session #:_____ 2nd Observer:_____ IRR:_____

| Use of Preposition (Where is the pencil?) | Student Response + or – | Student Response to verbal prompts including prepositions (Put the cup ____.) + or - | Procedural Fidelity + or - | Tact Nouns | Student Response + or - |
|---|---|---|---|---|---|
| Above | | | | Book | |
| Against | | | | Bottle | |
| Behind | | | | Bowl | |
| Below | | | | Box | |
| Beneath | | | | Chair | |
| Beside | | | | Cup | |
| Between | | | | Fork | |
| Beyond | | | | Keys | |
| In | | | | Pencil | |
| Inside | | | | Plate | |
| Near | | | | Spoon | |
| Next to | | | | Table | |
| On | | | | Toothbrush | |
| Outside | | | | | |
| Over | | | | | |
| Under | | | | | |
| Underneath | | | | | |
| Upon | | | | | |
| | | | | | |
| | | | | | |

Above – over

Against – in contact with

Behind – on the farther side of

Below – lower than

Beneath – lower than

Beside – at the side of

Between – in the space separating

Beyond – on the farther side of

Inside – indicates inclusion in a space

In – indicates inclusion in a space

Underneath – below the surface of

Upon – on; being supported by

Near – at, to, or within a short distance of

Next to – adjacent to

On – being supported by

Outside – beyond the confines of

Over – above in place

Under – lower than

# APPENDIX C: PHASE ONE INSTRUCTIONAL FORMAT AND DATA COLLECTION FORM

Session #:_____2nd Observer:_____ IRR:_____

| Model<br>Phase: 1 | Proc Fid + or - | | Model<br>Phase: 1 | Proc Fid + or - | | Model<br>Phase: 1 | Proc Fid + or - |
|---|---|---|---|---|---|---|---|
| This is not above. | | | This is not behind. | | | This is not beneath. | |
| This is not above. | | | This is not behind. | | | This is not beneath. | |
| This is above. | | | This is behind. | | | This is beneath. | |
| This is above. | | | This is behind. | | | This is beneath. | |
| This is above. | | | This is behind. | | | This is beneath. | |
| Test | | | Test | | | Test | |
| (not above)<br>Where is the cup? | | | (not behind)<br>Where is the pencil? | | | (not beneath)<br>Where is the book? | |
| (above)<br>Where is the cup? | | | (behind)<br>Where is the pencil? | | | (beneath)<br>Where is the book? | |
| (not above)<br>Where is the cup? | | | (not behind)<br>Where is the pencil? | | | (not beneath)<br>Where is the book? | |
| (not above)<br>Where is the cup? | | | (not behind)<br>Where is the pencil? | | | (not beneath)<br>Where is the book? | |
| (above)<br>Where is the cup? | | | (behind)<br>Where is the pencil? | | | (beneath)<br>Where is the book? | |
| (not above)<br>Where is the cup? | | | (not behind)<br>Where is the pencil? | | | (not beneath)<br>Where is the book? | |
| (above)<br>Where is the cup? | | | (behind)<br>Where is the pencil? | | | (beneath)<br>Where is the book? | |
| (above)<br>Where is the cup? | | | (behind)<br>Where is the pencil? | | | (beneath)<br>Where is the book? | |
| Total | /13 | | Total | /13 | | Total | /13 |

# APPENDIX D: SCAVENGER HUNT DATA COLLECTION FORM

Student ID:_____ 2nd Observer:_____ IRR:_____

| Noun | Researcher: | Resp + or - | Proc Fid + or - | Student Prompts Given to Para | Resp + or - | Proc Fid + or - |
|---|---|---|---|---|---|---|
| Bowl | Put the bowl beneath the chair. | | | Look beneath the chair. | | |
| Pencil | Put the pencil above the shelf. | | | Look above the shelf. | | |
| Cup | Put the cup behind the box. | | | Look behind the box. | | |
| | Total Correct Responses | /3 | /3 | Total Correct Responses | /3 | /3 |
| | | | | | | |
| | | | | Procedural Fidelity Total | | /6 |

# APPENDIX E: RESPONDING TO VERBAL PROMPTS GENERALIZATION DATA COLLECTION FORM

Pretest/Posttest:_____ 2nd Observer:_____ IRR:_____

| Verbal Prompt | Student 1 Response + or - | Student 2 Response + or - | Student 3 Response + or - |
|---|---|---|---|
| 1. Above<br>Hang your pencil bag on a hook above the blue shelf. | | | |
| 2. Behind<br>Put your library books in the tub behind the math notebooks. | | | |
| 3. Beneath<br>Put your books beneath your chairs. | | | |

# APPENDIX F: MANDING GENERALIZATION DATA COLLECTION FORM

Student ID:_____ Pre/Post:_____ 2nd Observer:_____ IRR:

We are going to show you what we want you to do. Here are two different_____ _____. I'm going to put one under the shelf. I am going to put the other between the boxes. Now I am going to ask Chris to tell me which chips he wants. Chris, which chips do you want. "I want the chips between the boxes." Chris told me which chips he wanted using his words.

Now, I want you to use your words to tell me which chips you want, okay? Put your hands in your lap and let's get started.

| Props & Reinforcer | Prep | Placement of reinforcer | Proc Fid + or - | Direction and Mand | Proc Fid + or - | Resp + or - |
|---|---|---|---|---|---|---|
| Above the door<br><br>Behind the chair | Above<br><br>Behind | Reinforcer 1:<br><br>Reinforcer 2: | | *Tell me which you want?* | | |
| Behind the box<br><br>Beneath the table | Behind<br><br>Beneath | Reinforcer 1:<br><br>Reinforcer 2: | | *Tell me which you want?* | | |
| Beneath the table<br><br>Above the door | Beneath<br><br>Above | Reinforcer 1:<br><br>Reinforcer 2: | | *Tell me which you want?* | | |
| | | Total | /3 | | /3 | /3 |
| | | | | Overall Total | /6 | /3 |

# APPENDIX G: SOCIAL VALIDITY QUESTIONNAIRE

Student Name:_____ Role: (parent/teacher/para):_____
Please rate the following on a scale of 1 (strongly disagree) to 5 (strongly agree).

| | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Do not know | 4<br>Agree | 5<br>Strongly Agree |
|---|---|---|---|---|---|
| Parents/Teachers/Paraprofessionals | | | | | |
| 1. This student can use the preposition above, behind, or beneath correctly. | | | | | |
| 2. This student can follow directions that include the preposition above, behind, or beneath. | | | | | |
| 3. This student has asked for specific things using the preposition above, behind or beneath. | | | | | |
| 4. This student has access to many more things he/she wants because he/she can use the preposition above, behind, or beneath. | | | | | |
| Teachers/Paraprofessionals | | | | | |
| 5. The teaching procedure is time efficient. | | | | | |
| 6. This would be a simple way to teach prepositions. | | | | | |
| 7. Students who do not know how to use prepositions could learn through this practice. | | | | | |
| 8. I would use this format with my students. | | | | | |

# APPENDIX H: PARENTAL CONSENT


The University of North Carolina at Charlotte

9201 University City Boulevard

Charlotte, NC 28223

Informed Consent for a dissertation study titled:

Using Direct Instruction to Teach Students with Intellectual Disabilities

to Use and Respond to Prepositions

(Parent Consent for 2010-2011 school year)

## Project Purpose

The purpose of this study will be to examine the effectiveness of Direct Instruction on the use of prepositions (on, below, above) by students with intellectual disabilities. This study will examine expressive use of prepositions to label locations of objects and comprehension of the phrases determined by the participant. Direct Instruction is instruction that uses a script and a specific sequence to teach a skill.

## Investigator

Christy Hicks, Doctoral Candidate, UNC Charlotte

## Eligibility

Students are eligible for the study if (a) can repeat a 2 word phrase that can be clearly identified by the researcher, (b) have the ability to identify a range of common nouns in their environment, (c) be unable to respond to verbal prompts (e.g., put the pencil under the shelf) containing at one common locative preposition (e.g., on, under, below, beside, against, between), and (d) have signed parental consent and student assent forms. Students are ineligible if they have (a) inability to identify basic nouns in their environment, (b) ability to demonstrate understanding of positional concepts, (c) parent consent is not attained, or (d) student assent is not attained.

Overall Description of Participation

Students will be asked to engage in Direct Instruction in a small group with the researcher for approximately 15-20 minutes per day during each scheduled school day. The times of instruction will be arranged in advance with the classroom teacher to minimize disruption to the school day. Instruction will focus on positional prepositions (e.g., on, in, under), and the student will shown and asked to identify a variety of objects in various locations (e.g., on the book, under the book).

Length of Participation

This study will take place from mid October until March 2011. The researcher will work with your child every school day (i.e. 5 days a week) unless other scheduled school events interefere. The study will last approximately 3-4 months; training sessions will occur daily and last approximately 20-30 minutes. After the study is complete, the researcher will work with your child several more times through March 2011.

Risks and Benefits of Participation

There are no expected risks to participants as part of this study. Participants will be observed during all teaching sessions and activities. Individual participation will remain confidential. The most immediate benefit that may be a possible result of this study would be acquisition of four new positional prepositions. Additional benefits may be increased receptive and expressive communication skills, which may lead to increased availability of reinforcement throughout the students' lives.

Volunteer Statement

You and your child are volunteers. The decision for your child to participate in this study is completely up to you. If you decide to allow your child to participate in the study, you may stop at any time. You or your child will not be treated differently if you decide not to allow their participation in the study or if you stop once you have started.

*Confidentiality vs. Anonymity*

Confidentiality Statement

Any information about your child's participation, including his or her identity, is completely confidential. The following steps will be taken to ensure this confidentiality: All data will be kept confidential by using pseudonyms in any presentations or reports occurring that reflect the study's findings. Data will be kept confidential by keeping all identifying information (including a list of participants, daily recording sheets, and probe data) in a locked filing cabinet in the Project RAISE office. Electronic data will be stored on a password protected USB drive and placed in the same locked filing cabinet.

Statement of Fair Treatment and Respect

UNC Charlotte wants to make sure that you and your child are treated in a fair and respectful manner. Contact the university's Research Compliance Office (704-687-3309) if you have questions about how your child is treated as a study participant. If you have any questions about the actual study, please contact Dr. Charles Wood 704-687-8395, clwood@uncc.edu.

Videotape and Photography

Your child may be videotaped or photographed during teaching sessions. These videotapes will be kept in a locked filing cabinet just like the other information collected from your child. These videos will be shown only to teachers and other education professionals.

Parental Consent (for participants younger than age 18)

I have read the information in this consent form. I have had the chance to ask questions about this study and about my child's participation in the study. My questions have been answered to my satisfaction. I am at least 18 years of age, and I agree to allow my child to participate in this research project. I understand that I will receive a copy of this form after it has been signed by me and the principal investigator of this research study.

_____

Child's Name (PLEASE PRINT)

_____ _____

Parent's Name (PLEASE PRINT) DATE

_____

Parent's Signature

_____ _____

Investigator Signature DATE

Approval Date

This form was approved for use on _____for use for one year.

APPENDIX I: STUDENT ASSENT

The University of North Carolina at Charlotte

9201 University City Boulevard

Charlotte, NC 28223-0001

Student ASSENT

Using Direct Instruction to Teach Students with an Intellectual Disability

to Use and Respond to Preposition

"My name is Christy Hicks and I am a student just like you. I wanted to know if you would want to help me with a study that will help you learn prepositions such as on, below, or above. You do not have to help me if you don't want to. It will not change your grades. It is your choice and no one will be mad at you if you do not want to. During the study I will show you some prepositions and ask you to use prepositions. Sometimes I might videotape you while we are working together. I will only show the videos to other teachers. Would you like to be in my study?"

An adult has read this to me. My choice is:

| YES | NO |
| --- | --- |
|  |  |

| _____ | _____ | _____ |
|---|---|---|
| Student Name | Student Signature | Date |

---

Researcher's Signature Date

*This form was approved for use on _____, and will be good for one year.*