TEACHING GRAPHIC SYMBOLS TO CHILDREN WITH COMPLEX COMMUNICATION NEEDS THROUGH VIDEO AND PLAY

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by
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June 2012
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ABSTRACT

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Teaching Graphic Symbols to Children with Complex Communication Needs through Video and Play

Director of Thesis: John W. McCarthy

The use of graphic symbols for communicative purposes is a common form of augmentative and alternative communication (AAC) for children with complex communication needs. However, some of the symbols, which represent important early concepts, are difficult for children to recognize. The study implemented a program using video and play activities paired with a direct instruction approach to teach 10 graphic symbols of important early concepts to children with complex communication needs. A single subject multiple baseline across subjects research design was used. Results indicated that program was effective in teaching the target concepts.

Approved:

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John W. McCarthy

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Finally to my family and dear friends who have listened to me ramble on about this project for the past year, thank you for listening, and thank you for your never-ceasing support, encouragement and love.

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CHAPTER I: INTRODUCTION AND LITERATURE REVIEW

Introduction

Over 3.5 million Americans have communication impairments so severe that their natural speech cannot adequately meet their daily communication needs (Beukelman & Mirenda, 2005). The use of Augmentative and Alternative Communication (AAC) can assist these individuals in their daily communication endeavors. AAC, as defined by the American Speech-Language-Hearing Association (ASHA), is the “area of clinical practice that attempts to compensate (either temporarily or permanently) for the impairment of disability patterns of individuals with severe expressive communication disorders” (Romski, 2001). Underlying causes of severe expressive communication disorders include developmental Apraxia of speech, cerebral palsy, mental retardation, autism spectrum disorders and acquired impairments such as traumatic brain injury and the temporary inability to speak due to surgery or transitory medical conditions (ASHA, 2004).

According to a 2008 ASHA report regarding populations using AAC, 8 to 12 people per thousand experiences a communication disorder requiring the use of AAC. Children comprise a significant portion of this population, with 50% of school-based Speech-Language Pathologists reporting working with nonspeaking children or children who use AAC (ASHA, 2008). Binger and Light (2006) surveyed Speech-Language Pathologists in Pennsylvania to investigate the prevalence of preschool children who use AAC. Results showed that 12% of preschool children enrolled in special education programming in Pennsylvania used and/or needed AAC and 24% of
children on Speech-Language Pathologists caseloads used and/or needed AAC. Findings indicated an increase in the prevalence of children using AAC in the past 10-20 years.

Much research has been conducted in order to make AAC devices more accessible and usable for children. Traditional devices designed for adults are now being altered to better meet children’s developmental needs (Drager, 2004). Early intervention programs are commonly implemented to allow children ample time to obtain successful communication skills—with research showing that children 36 months and younger, with various disabilities, can successfully use AAC (Branson, 2009). Support for the parents and family of a child using AAC is now more prominent, thus enhancing a child’s chance for communicative success (Granlund, 2008). However, since childhood is a time of rapid growth and change, it is necessary that AAC devices designed for children are flexible. Drager (2010) stated that, “Ideally, AAC technologies [should] be initially transparent for children, with minimal learning demands” (p. 1133). Doing so promotes the child using AAC’s ability to learn language in as natural state as possible. The main purpose of AAC is to enhance the communicative experience of the user. Therefore, when considering a child using AAC, it is essential to provide the assistance and tools necessary for learning while keeping in mind that which the child may need to communicate on a daily basis. With rapid changes in technology, solutions that help children use systems as quickly and early as possible can continually be explored (AAC-RERC, 2011). The purpose of the present study was to teach 10 graphic symbol representations of important early
concepts, which previously have been difficult for children to recognize, to children with complex communication needs through video and play activities.

Literature Review

Children who use AAC and children without disabilities have the same basic vocabulary needs (Trembath, 2007). While their peers formulate and expand their personal lexicon on a daily basis through their experiences and surroundings, nonspeaking children using AAC who cannot yet spell experience difficulty formulating their own lexicon. These children must rely upon another person, often an adult, to select the words to be entered into their personal device (Light, 1997). Despite the best of intentions, adults choosing words for children often fail to compile a lexicon that adequately reflects the child’s conversational needs (Trembath, 2007). The vocabulary chosen for the child frequently reflects that which is important in the child’s primary settings. This often leads to a vocabulary that lends itself to the making of requests, but limits a child’s conversational options (Fried-Oken, 1992). In creating a vocabulary pool for a child, it is also important to consider his or her current position in language development.

One prominent alternative strategy requires that users be capable of mapping graphic symbols (e.g. a drawing of a dog), onto known concepts in their minds (e.g. their concept of a dog). For children with disorders such as autism, cerebral palsy or Down Syndrome, who are learning to map these visual representations in concurrence with their language development, the process can be imprecise. Typically, expressive language is limited only to a learner’s inherent abilities and can keep pace with their
The restriction of the available symbols has negative implications regarding receptive language comprehension and expressive language production when using graphic symbols (Sutton, 2002). Certain graphic symbols are relatively easy to identify, they are simply visual depictions of familiar nouns (e.g. a book is represented by a picture of a book). Other symbols, such as verbs, prepositions, adjectives or adverbs are less concrete and consequently, more difficult to represent visually (See Figure 1). While some of these words occur at a high frequency in a child’s daily vocabulary (Fried-Oken, 1992), their functional usability level decreases when translated into a graphic symbol. For example, a green arrow pointing right represents the word *go*. While a typical adult may be able to reason that the color green and arrows often represent action and/or direction, so, this symbol must represent *go*—it is more likely that a child merely sees a green shape. If the child does not give meaning to the symbol, it is unlikely that he or she will map the symbol onto a concept. Generally, this process happens quickly for children without disabilities.

![Figure 1. PCS graphic symbol examples](image-url)
Fast mapping is the process by which children, particularly during the preschool years, accurately and rapidly acquire novel vocabulary based on their ability to sketch partial maps of a word’s meaning after brief exposure. It occurs without explicit instruction and has been credited with fostering the rapid vocabulary acquisition occurring between a child’s first and second birthdays (Wilkinson, 2003). This phenomenon occurs, not only in children without disabilities, but also in individuals with severe language and/or cognitive impairments (Wilkinson & Albert, 2001). Wilkinson and Albert (2001) sought to discover if, based on the principles of fast mapping, learners could be taught unfamiliar symbols that refer to already familiar referents. The procedures set forth contrasted new target words against known words. It was found that the two participants, with cognitive and communication impairments, were able to successfully learn sight words through a fast mapping paradigm (Wilkinson, 2001).

Graphic Symbols and Learning

The foundation for being able to understand and use a symbol referent requires that the individual first realize that the symbol represents something other than itself. A child learning to use graphic symbols for AAC must first master the process of dual representation; the child must view the symbol not only as an object in and of itself, but also as a representation for something else (DeLoache, 1991). Additionally, the relationship between spoken language and graphic symbol representation is not fully understood by researchers. Users of graphic symbols may construct their utterances based on a direct translation from their spoken language, following the intrinsic
constraints of the graphic mode or some combination of these and other strategies (Sutton, 2002). Keeping these factors in mind, it is of increasing importance to provide children who use AAC with as many support systems as possible, giving them the opportunity to increase their word knowledge and achieve their full language potential. Direct instruction is a formalized teaching paradigm that provides learners with explicit instructions in order to ease learning demands.

Word knowledge develops through encountering words in different contexts, which allows for constraints on possible meaning. When using a direct instruction method, it is important to teach beyond the definition of novel vocabulary terms. By providing multiple examples, or situations in which a word may occur, the learner is more likely to gain a broad and competent understanding of the term. Additionally, whenever possible novel vocabulary should be taught through ‘rich’ instruction. Rich instruction involves learners being actively engaged in the meaning of words—how words can be used in different contexts and using them functionally (Baumann, 2004). According to the word-learning model, proposed by Paul Bloom, a word must be relevant to a child and he or she must have experience with it before the word can be learned and communicated. Pairing these ideas with a supportive, motivating atmosphere as well as an availability of the words that are to be communicated leads to the most effective word learning (Bloom, 2000). Graphic symbols, particularly those depicting more abstract concepts, need not be limited to static representations with current technology.
Video Instruction

Shane (2007) proposed a communication intervention program designed specifically for individuals with Autism—the Visual Immersion Program (VIP). The goal of the VIP was to, using visual supports, teach learners on the autism spectrum how to communicate more efficiently during their daily interactions (Shane, 2007). In this program, a symbol rich environment was created. Visual symbols were used to clarify spoken language, support expressive communication and facilitate learning. One setting that the VIP was used in was the visual setting, which utilized electronic (television or computer) display for the presentation of materials. Through simple videos, the learner was provided with examples of the target concepts (Shane, 2007). While there are still challenges in AAC involving technology matches and graphic symbol representations, the current technology allows for several untapped media instruction methods, along with increasingly accessible and available delivery systems.

A newer instructional medium of increasing popularity in the educational setting is television. According to Shalom M. Fisch (2004), author of *Children’s Learning from Educational Television: Sesame Street and Beyond*, educational television can be effectively utilized in information education. Given that the programming is highly appealing to children, it can supplement formal education in four primary ways: exposing children to topics they might not encounter elsewhere, providing compelling experiences that coax children into spending additional time
learning, encouraging positive attitudes towards academics and motivating children to learn both in and outside the classroom (Fisch, 2004).

In regards to the effects of television programming on first-language acquisition, research has shown that in order for programming to positively contribute to language development, it must contain the features believed to promote language development. This includes the use of child-directed speech, short length utterances, repetition and tying novel concepts to immediate referents (Fisch, 2004). According to the Capacity Model, described by Fisch, when presented with educational television, learning occurs between the processing of the narrative and the processing of the educational content. In order to make the two processes complimentary, rather than competitive, only a small distance between the two should exist; the educational content should be woven tightly into the narrative (Fisch, 2004). A benefit of television as a tool for education is its accessibility, including advancements in technology that have made it possible to access programming through mobile devices.

With the advancements in mobile technology, it is only natural to consider this medium as an assistive tool for AAC. The proliferation of affordable mobile devices available has led to an increased interest in using software application (apps). Mobile technologies, such as the Apple® iPad, have user-friendly interfaces and are widely available, multi-media, mass-market entertainment platforms (AAC-RERC, 2011). Apps create a platform of technologies only constrained by a developer’s imagination. Still, the primary focus of AAC must be the basic desire to help those with complex communication needs express themselves. iDevices are being used with increasing
frequency in AAC, but there is little empirically validated instructional materials available (AAC-RERC, 2011).

It is critical that children with complex communication needs be provided with the supports necessary to learn graphic symbols, if that is to be their primary means for communication. In a conventional, formal education setting, children are not taught visual representations for words. Despite the fact that these symbols could prove vital to successful communication for a child with complex communication needs, one does not typically encounter them in daily life or formal education.

Present Study

The current study was designed with the research objective to develop, implement and evaluate a program to teach 10 graphic symbol representations of important early concepts to children who cannot use their natural speech to communicate these concepts verbally. A simple, fun, interactive method was created, including videos for instruction that could easily be made available for public use. Using a direct instruction approach, it was hypothesized that the learning demands of the participants would be reduced and acquisition of the concepts facilitated.
CHAPTER II: METHODS

Research Design

A single subject multiple baseline across subjects research design was used for the study. Single subject designs are often appropriate for studies involving individuals with complex communication needs because the population is diverse and limited (Schlosser, 2003). Characteristics of this population often require individualized intervention, especially when working with children (Horner et al., 2005). According to Horner and colleagues (2005), a single subject research design can “allow targeted analysis at the unit of the ‘individual,’ the same unit at which the intervention will be delivered” (p. 173). The current study determined the specific effect of a program to teach 10 graphic symbols on children’s acquisition and generalization of the concepts. The 10 symbols taught were *big, down, go, help, in, more, off, on, up, where*. The concepts were chosen because they occur at a high frequency and hold substantial importance in a child’s early developmental vocabulary (Fried-Oken, 1992), but are difficult to depict through line drawings. Horner and colleagues stated that single subject designs “are particularly appropriate when one wishes to understand the performance of a specific individual under a given set of conditions” (p. 172). This type of research design has been used in studies regarding the literacy skills of children with complex communication who use AAC (Fallon et al., 2004; Miller et al., 2004) as well as problem-solving skills (McCarthy, Light & McNaughton, 2007). Schlosser (2003) also reviewed the significant positive contributions of single subject research to the evidence-base in AAC.
Recruitment

After obtaining a waiver of informed consent and authorization from the Institutional Review Board (IRB), a list of potential participants was compiled from clients of the Ohio University Hearing, Speech and Language Clinic. With the assistance of the Coordinator of Clinical Services and the clinic’s Clinical Supervisors, potentially eligible participants were selected and contacted. In conjunction with their service provider and the advisor, interested parents were able to meet with the primary investigator to discuss the study and sign consent forms. Children were chosen based on their ability to meet selection criteria and their availability for the study. Both participants were seen in the Ohio University Hearing, Speech and Language Clinic either before or after scheduled therapy sessions. One child was also seen in her home for half of her sessions.

Participants

Two children were selected to complete the study. The children met the following selection criteria: (a) were between the ages of two years six months and five years, (b) had a developmental disability that limited their ability to use natural speech for communication purposes, (c) were able to select line drawn symbols from a field of four items, (d) had corrected hearing and vision within normal limits, (e) had knowledge of the meanings of the 10 target concepts based on results of the PPVT-III (Peabody Picture Vocabulary Test-3rd Edition) and (f) had no significant knowledge of the PCS (picture communication symbols) used to represent the 10 target concepts.
Participant Demographics

Participant ages ranged from four years, three months to four years, six months at the beginning of the study. One subject was male, the other female. See Table 1 for a summary of demographic information for the two subjects.

Table 1
Demographic Information for Participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>PPVT Standard Score</th>
<th>School Placement</th>
<th>Communication Modality</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>James</td>
<td>4;3</td>
<td>95</td>
<td>Not currently attending</td>
<td>Natural Speech, Gestures, Facial Expressions</td>
<td>Apraxia, Expressive Language Delay, Receptive Language Delay</td>
</tr>
<tr>
<td>Molly</td>
<td>4;6</td>
<td>67</td>
<td>Full-time integrated preschool</td>
<td>Total Communication (Signs and Words/Word Approximations)</td>
<td>Down Syndrome, Expressive Language Delay</td>
</tr>
</tbody>
</table>

James was a four-year-old male diagnosed with severe childhood Apraxia of speech, expressive language delay and receptive language delay. Despite a family history of hearing loss, his hearing was reported within normal limits at his most recent screening in October 2010. James attended speech-language therapy once a
week; this was increased to twice a week during the course of the study. His primary means for communication included natural speech, gestures and facial expressions. His natural speech was highly unintelligible and he therefore relied heavily on gestures and facial expressions. Due to his decreased speech intelligibility, the main focuses of his speech therapy included: increasing comprehension of descriptive concepts, using tactile cues to improve speech sound production and intelligibility, and increasing utterance length to label or describe objects. With a standard score of 95 on the PPVT-III James scored in the 37th percentile, with a normal curve equivalent of 43.

Molly was a 4-year-old female diagnosed with Down Syndrome and expressive language delay. She had a history of ear infections and her hearing was monitored with regular tests every six months. During her last hearing test, otoacoustic emissions were present at all test frequencies. Molly began therapy at 11 months to treat, now resolved, feeding difficulties. She began speech and language focused therapy at 19 months. During the study she attended speech therapy once a week, which focused on increasing the length of utterances, target phrase productions, increasing intelligibility to familiar and unfamiliar listeners, social routines and language of emotions. She communicated through total communication (signs and words/word approximations). On the PPVT-III, Molly achieved a standard score of 67, placing her in the first percentile, with a normal curve equivalent of four.
Materials

Video

The materials selected to convey the target concepts included short videos that illustrated a target concept in a functional context, with the inclusion of the corresponding graphic symbol (see Figure 2). Each video provided exposure and guidance for teaching the symbol in context. The videos, designed to be fun and entertaining for children, provided reason to spend the necessary additional time learning these symbols alongside standard language development. Only the target concept was presented verbally during each video. Additionally, each time the concept was spoken, a direct reference to the symbol was made. Repetition of the concept occurred throughout the video in an attempt to maximize the participant’s exposure to the concept. Each video contained two scenarios. In the first, the concept was presented in a question/confirmation situation. The second scenario presented the concept as a direct example (See Figure 3 and Appendix A for video scripts). The video’s capitalized on Fisch’s Capacity Model (Fisch, 2004) by ensuring that the educational content (target concepts) was the sole focus of each narrative presented. The videos created narratives only directly related to the target concepts.
Figure 2. Screen shots from video in

- (Show symbol-full screen)
- (A boy walks into shot looking around)
- **In** –
- (Noticing a chest, he opens the top and excitedly climbs inside)
- **In** – (extend symbol towards camera)

Boy holds symbol

- (Boy sits at table with shape sorter)
- (Inserting a shape into the toy)
- **In** –
- (Show symbol-full screen)

Symbol is on table next to shape sorter

Figure 3. Video script in
Procedures

A single subject multiple baseline across subjects research design was used to demonstrate the effectiveness of the instructional program. The procedures for the study included baseline, intervention, generalization and maintenance phases for each participant.

*Dependent variable.* The dependent variable was the participants’ accurate identification of the target concepts. The probe of the dependent variable presented to participants was a field of four symbols: one target concept, one visually similar symbol, one conceptually similar symbol and one symbol selected randomly (See Figure 4 and Appendix B). All symbols were selected from Mayer Johnson Picture Communication Symbols ® (PCS). The dependent variable was measured as follows. Participants were presented with a field of four symbols. The position of the target symbol was randomized and rotated during subsequent tests of the dependent variable to avoid the participant merely learning the position of the target, rather than the actual concept. The participant was asked to identify a target concept when prompted by the researcher (e.g. “Look at the pictures, show me in”). If the child responded verbally, or with an off task action, the researcher repeated the instructions once-giving the child a total of two opportunities to respond. If there was still no appropriate response, this was recorded and the researcher moved onto the next concept. Data were collected on the responses of the child in identifying the concept by pointing to the correct symbol. No feedback was given as to whether a selection was correct or incorrect.
Figure 4. Dependent Variable Probe in

Baseline. The baseline phases were used to ensure that no participant had significant prior knowledge of the symbols taught during intervention. Participants completed regular probes of the dependent variable until a stable baseline was achieved. A stable baseline was one with no upward trend in slope.

Intervention. Intervention occurred across five separate phases. During the first phase the target concepts big, go and in were taught. The second phases included the instruction of the target concepts more, up and on. The remaining four concepts (off, help, down, where) were taught during the third phase. The concepts were taught to a criterion of 80%. During the first three phases, the participant first watched a video illustrating a concept. Directly following the video, the child (with the assistance of the investigator) completed a play activity. The play activity allowed the child to act out a scene of the video—integrating the symbol into a functional context. In the play activity, the participant was presented with a probe of the dependent variable and asked to identify the target concept before play could occur. The researcher modeled
this behavior, than it was performed together (researcher and participant) and finally performed independently by the participant. (See Figure 5 and Appendix C for intervention scripts)

<table>
<thead>
<tr>
<th>(Setup-shape sorter with shapes)</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAY: Look at the shapes, we need to put them IN!</td>
<td></td>
</tr>
<tr>
<td>[Present a probe page] I want IN.</td>
<td></td>
</tr>
</tbody>
</table>

Watch me.
I look… (point to probe page)
[point to in] IN!

I showed you in!
Now we play! [Put a shape in]

<table>
<thead>
<tr>
<th>SAY: Let’s try it together.</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look at the shapes, we need to put them IN!</td>
<td></td>
</tr>
<tr>
<td>[Present probe page] We want IN.</td>
<td></td>
</tr>
</tbody>
</table>

Look here (point to probe page)
Show me in. Let’s do it together.
We look…
[point to in] IN!

We showed IN!
Now we play! [Put a shape in]

<table>
<thead>
<tr>
<th>SAY: Your turn.</th>
<th>Page # ______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look at the shapes, we need to put them IN!</td>
<td>Put an X over actual selection</td>
</tr>
<tr>
<td>[Present a probe page]. Show me in.</td>
<td></td>
</tr>
</tbody>
</table>

[If right] IN! You showed me IN! Now we play! [Put a shape in]
[If wrong] You wanted in. Uh-oh you showed me [actual]
[If no response/inappropriate response] You wanted in. Uh-oh!
Model for wrong/NR/inappropriate: Watch me show you in [point to in] IN! Now we play! [Put a shape in]

*Figure 5. Intervention script in*
The final two intervention phases followed a different script and involved review of all target concepts with feedback not provided during initial phases of intervention. During phase four of intervention, the participant viewed the video for all concepts. For concepts that the participant had demonstrated successful learning of (consistently selecting the correct symbol during previous intervention sessions) their knowledge of the concept was confirmed by correctly identifying the concept three times in a row. For concepts the participants confused with a foil, a match-to-sample paradigm was employed. The target concept and the foil were isolated and the child had to correctly identify the target concept three times in a row before progressing to the field of four. This process was repeated during the fifth phase of intervention. Additionally, the child participated in the play activities from phase one through three once more during the fifth phase. All phases of intervention concluded with a measure of the dependent variable. See Table 2 for an outline of intervention phases.

Table 2

Outline of Intervention Phases

<table>
<thead>
<tr>
<th>Intervention Phase</th>
<th>Concepts Covered</th>
<th>Video</th>
<th>Play</th>
<th>Match-to-Sample</th>
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<tbody>
<tr>
<td>1</td>
<td>big, go, in</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>2</td>
<td>more, up, on</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>3</td>
<td>off, help, down where</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>4</td>
<td>all</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>5</td>
<td>all</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
Maintenance and Generalization. Following the completion of the intervention phases, multiple probes of the dependent variable assessed maintenance of the target concepts learned. Participants also completed probes to assess generalization of the concepts. The generalization task required the child to use target concepts in order to complete novel tasks. Each concept was paired a unique generalization task. During generalization, the child was presented with a scenario in which a toy doll (Sally) needed to complete a task. Participants were told that Sally used pictures to know what to do. The researcher created the scenario so that target concepts helped Sally to complete tasks (See Figure 6 and Appendix D). The participant had access to the 10 target concepts during the generalization task (See Figure 7).

The maintenance probes were completed at two weeks and four weeks following the conclusion of the program. Maintenance probes were identical to the dependent variable probes used throughout the study.

<table>
<thead>
<tr>
<th>In SAY: Look at Sally, she has a piggy bank (Sally looks at bank, holding a coin)</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally says: <em>My bank needs this coin.</em> [present probe page] Show Sally a picture. If needed, prompt—<em>Is there a picture to show Sally what to do?</em></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6. Generalization script in*
Figure 7. Generalization Probe

Data Analysis

The data were graphed and visually inspected for changes in trend and slope within and between phases. The direction of the independent variable was inspected before and after intervention. The meaning of level was determined by examining the range of performance (Richards et al., 1999). The percentage of non-overlapping data (i.e. the percentage of data points in the intervention phases that did not overlap with any data points in the baseline phases) was calculated to measure the effectiveness of the program (Scruggs & Mastropieri, 1998).

Reliability

Written records of the participants’ responses were scored based on the scoring rubric (see Appendix E). Video recordings of the various phases were reviewed to determine procedural and scoring reliability. Based on the 20% of recordings reviewed, both procedural and scoring reliability were maintained throughout the program.
Validity

Internal Validity

A major strength of single subject designs is their ability to control threats of internal validity (Horner et al., 2005), as each subject ultimately serves as his or her own control. Consequently, it is important that conditions remain as consistent as possible within a particular subject. In the current study, James completed all phases in the exact same setting in the Ohio University Hearing, Speech and Language Clinic. Molly completed half of the sessions in a room in the Ohio University Hearing, Speech and Language Clinic and half in her home. Both were quiet settings with a table where most activity occurred. Other threats to internal validity related to history and group equivalents are controlled within a single subject design. The time period was short enough and the subjects were old enough that maturation should be but a minimal threat.

External Validity

External validity is an area where single subject designs have the most vulnerability. Measures of generalization were included in the current study to address issues of external validity.
CHAPTER III: RESULTS

Acquisition of the Target Concepts

The participants’ accurate identification of the target concepts within the probes administered at baseline, during intervention and to measure maintenance and generalization are presented in Figure 8. The average number of concepts correctly identified at baseline for James was three and Molly was two with a range of one and two respectively. Both participants reached criterion (80% accuracy) during the fourth intervention phase. James surpassed criterion following the fifth intervention, while Molly continued to maintain minimum levels. A post-test was administered to obtain another point at or above criterion and ensure a demonstrated knowledge of the target concepts. Both subjects completed three consecutive probes at or above criterion before maintenance and generalization tasks were administered. See Tables 3 and 4 for a summary of the concepts taught and learned for each participant.

For both participants, data from baseline through post-intervention were 66% non-overlapping, supporting the effectiveness of the instructional program. It is important to note that participants did not receive intervention for all target concepts until the conclusion of the third intervention phase. Therefore, participants could not be expected to accurately identify all concepts prior to that phase. The data points at and beyond the fourth intervention phases did not equal or fall below data points at baseline. This strengthens the effectiveness of the program because, after instruction of all concepts, neither participant’s performance returned to baseline.
Figure 8. The number of target concepts correctly identified in response to probes administered during baseline, intervention, maintenance and generalization phases.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Concepts Taught</th>
<th>Concepts Correctly Identified</th>
<th>Concepts Incorrectly Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention 1</td>
<td>big, go, in</td>
<td>go, more, where</td>
<td>big, down, help, in, off, on, up</td>
</tr>
<tr>
<td>Intervention 2</td>
<td>more, up, on</td>
<td>big, down, in more, up</td>
<td>go, help, off, on, where</td>
</tr>
<tr>
<td>Intervention 3</td>
<td>off, help, down, where</td>
<td>in, more, up, where</td>
<td>big, down, go, help, off, on</td>
</tr>
<tr>
<td>Intervention 4</td>
<td>all</td>
<td>big, down, help in, more, off, up, where</td>
<td>go, on</td>
</tr>
<tr>
<td>Intervention 5</td>
<td>all</td>
<td>big, down, go help in, more, off, on, where</td>
<td>n/a</td>
</tr>
<tr>
<td>Post</td>
<td>n/a</td>
<td>big, down, help in, more, off, on, where</td>
<td>in, go</td>
</tr>
<tr>
<td>Maintenance 1</td>
<td>n/a</td>
<td>big, help, in more, off, on up, where</td>
<td>down, go</td>
</tr>
<tr>
<td>Maintenance 2</td>
<td>n/a</td>
<td>big, down, go help in, more off, on, up, where</td>
<td>n/a</td>
</tr>
</tbody>
</table>
### Table 4

Outline of Concepts Taught and Learned—Molly

<table>
<thead>
<tr>
<th>Phase</th>
<th>Concepts Taught</th>
<th>Concepts Correctly Identified</th>
<th>Concepts Incorrectly Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention 1</td>
<td>big, go, in</td>
<td>big</td>
<td>down, go, help, in, more, off, on, up, where</td>
</tr>
<tr>
<td>Intervention 2</td>
<td>more, up, on</td>
<td>big, on, up</td>
<td>down, go, help, in, more, off, where</td>
</tr>
<tr>
<td>Intervention 3</td>
<td>off, help, down, where</td>
<td>big, help, on more</td>
<td>down, go, in, off, up, where</td>
</tr>
<tr>
<td>Intervention 4</td>
<td>all</td>
<td>big, down, help in, off, on, up, where</td>
<td>go, more</td>
</tr>
<tr>
<td>Intervention 5</td>
<td>all</td>
<td>big, down, help in, off, on, up, where</td>
<td>go, more</td>
</tr>
<tr>
<td>Post</td>
<td>n/a</td>
<td>big, down, go help in, on, up, where</td>
<td>more, off</td>
</tr>
<tr>
<td>Maintenance 1</td>
<td>n/a</td>
<td>big, down, go help, more, on, up, where</td>
<td>in, off</td>
</tr>
</tbody>
</table>

### Generalization

Each participant’s performance on the generalization probes indicated generalization of the target concepts to novel scenarios. At baseline neither participant was able to generalize any of the target concepts. After intervention James was able to
generalize the five concepts go, down, off, in and where. Molly correctly generalized the three concepts big, in and go.

Maintenance

Additional probes were administered to determine the participants’ ability to identify the target concepts two and four weeks post intervention. James achieved criterion at two weeks post intervention and exceeded criterion with 100% accuracy at four weeks post intervention. Molly achieved criterion at two weeks post intervention, and it was not possible to obtain a data point at four weeks post intervention.

Time Between Phases

The average time between baseline sessions was six days for James with a range of two and 10 days for Molly with a range of seven. For both participants, the average time between intervention phases was five days with a range of 12. The longest time between intervention sessions was 14 days, which occurred once with James due to unavoidable scheduling conflicts. The generalization probe was administered one week after the final post-intervention probe.

Length of Phases

The average length of baseline phases was five minutes for both participants. Intervention one and two, when three symbols were taught, lasted an average of 10 minutes. Intervention three (four symbols taught) lasted an average of 15 minutes. Intervention four and five lasted between 15 and 20 minutes. Generalization lasted an average of 10 minutes.
CHAPTER IV: DISCUSSION

Acquisition of the Target Concepts

The study showed that the video and play activities utilized were effective in facilitating the acquisition of the PCS representations of the targeted concepts big, down, go, help, in, more, off, on, up and where for children with complex communication needs. The direct instruction approach was successful when paired with the video and play activity learning tools. The teaching sequence allowed for repetition of concepts, maximizing the participants’ success potential. While the participants initially engaged in error-free learning, the addition of the match-to-sample paradigm for clarification of incorrectly identified concepts proved beneficial. Both participants increased the number of target concepts correctly identified when provided with feedback.

Dependent Variable Probes

The dependent variable probes were designed to limit the potential for pure visual discrimination and to isolate the learning of a specific symbol. A challenge with the probe was that no feedback could be offered and early confusions were inadvertently reinforced through a lack of correction. The effectiveness of the match to sample intervention supports this idea.

An aspect of intervention that may have aided concept learning was the presentation of the stimuli. Both children maintained interest throughout the study in using the iPad®. Molly frequently became distracted and resisted responding to the probes, but was always actively engaged when watching the videos. Both participants
interacted with the videos by pointing and touching the screen, even though no physical interaction with the iPad® device was required. James often traced the general shape of the PCS symbols when they were shown full screen during the video. During the final two phases of intervention, both participants repeatedly identified the target concepts verbally while viewing the videos. The participants also expressed general interest in the iPad®, including pressing icons to retrieve the videos and playing with other applications after completion of a session.

Throughout the study, both participants habitually confused certain target concepts with the conceptually similar foil. Both participants repeatedly identified the target concept go as across. Other instances of this included identifying on as put, off as away, and in as pour (See Figure 9). These confusions suggest that the visual representations for the target concepts are not only difficult for children to map, but also that the symbols do not accurately reflect children’s understanding of the concepts.

Molly also consistently confused the target concept more with the random foil medal (See Figure 10). This confusion persisted throughout intervention and maintenance, despite repeated feedback. It is possible that the symbol for medal was merely more visually appealing to the participant and she consequently chose to select it whenever available.
Figure 9. Target concept symbols and the conceptually similar foil

Figure 10. Commonly confused symbols for Molly

Generalization

The results indicated that both participants were able to generalize some, but not all, target concepts—with James generalizing five concepts (go, down, off, in, where) and Molly generalizing three (big, in, go). This could be due to several factors. The generalization task required the participants to not only have fully grasped the meaning of target concepts and their PCS representations, but also apply the symbols to novel and more communicative situations. In order to do so, the children had to understand what concept was being solicited in the novel scenario. Additionally, the initial teaching sequence may have needed to contain more exemplars, that bridged
into more functional use in a more cohesive play scenario, in order for generalization to occur.

James was able to generalize the concepts go, down, off, in and where correctly. Additionally, for the scenarios targeting the concepts big and off, James selected an alternative symbol that could have completed the scenario. For the concept big, the participants were told “Look at Sally, she has two cars.” One car was big and one car was small. Sally then gestured to both cars asking “this one or this one?” When prompted to show Sally a picture, James selected in. As Sally could only get in one car, it is possible that James wanted Sally to select the car she could get in. For the concept off, the participants were told “Look at Sally, she is wearing a jacket.” Sally then said, “It’s too hot inside to wear my jacket.” When prompted to show Sally a picture, James selected help. Despite the fact that the scenario intended to elicit the response off, help does complete the scenario because Sally needed help taking off her jacket.

Molly was able to generalize the concepts big, go and in. She struggled to maintain attention during this task and only provided a response for five of the probes. It is possible that being provided with a field of 10 symbols proved overwhelming for Molly, resulting in her lack of attention.

Maintenance

Results indicate that both participants were able to maintain knowledge of the ten target concepts at two weeks post intervention. James maintained criterion level
performance at four weeks post intervention as well. It was not possible to collect a data point at four weeks post intervention for Molly.

At maintenance two weeks post intervention, James maintained criterion level performance, correctly identifying 8 of the 10 target concepts. For the two concepts incorrectly identified (on and go), he displayed visual and verbal confusion. During both trials, after initial selection, he pointed to a second symbol (the target concepts conceptually similar foil), verbally labeling both as the target concept (“both go”, “on, on”). During the final maintenance phase, four weeks post intervention he was able to accurately identify all 10 target concepts. However, for both go and on he selected each concepts conceptually similar foil and subsequently labeled the correct symbol as “go from the movie” and “on from the movie.” This demonstrated that he did indeed learn the PCS representations for the target concepts through the present study, though he still had reservations regarding how accurately the selected symbols represent the concepts.

Molly also met criterion at two weeks post intervention. The participant’s incorrectly identified concepts (off and in) were concurrent with her performance throughout intervention.

Clinical Implications

Several important clinical implications can be taken from the present study. First, results of the study suggest that a direct instruction approach paired with video and play activities such as that used in the study can successfully teach the PCS for the targeted concepts to children with complex communication needs. The appeal of the
video instruction was effective in capturing and maintaining the children’s attention. These videos, which were simple and relatively inexpensive to create, could be replicated and expanded upon in order to create a maintainable, easily accessible database of instructional media.

Results also suggest that pairing examples of actions related to the meanings of targeted concepts with the symbol may facilitate symbol acquisition. The present study utilized the direct association between the symbols and the meanings of the concept to effectively teach the symbols within the context of the program.

Additionally, the study suggests that a direct instruction approach, paired with video and play activities may be effective in teaching PCS for other concepts to children with complex communication needs. Since the instructional program developed for the study was effective in teaching the 10 targeted concepts, it may be effective in teaching other concepts as well.

The videos also offer alternative and potentially more instructional, yet fun, content for mobile devices. Although more and more children are using mobile devices with communication apps, the temptation of accessing other non-communication apps is strong. The current study suggests a venue for providing more educational affirmative content.

Limitations of the Study

Certain limitations should be considered when interpreting the results of the study. Both participants were four-years-old and working on similar goals. Results may differ in younger children and/or children with other types of disabilities resulting
in complex communication needs. Children in the current study were also able to construct two and three word phrases. Children with more limited syntax may have different outcomes.

Directions for Future Research

Future research should replicate the study with a larger group of subjects. Replication should be conducted with a more diverse group to determine the effectiveness of the program in children of different ages, language skills and disabilities. Future research should also include a replication of the study with increased feedback during initial intervention stages to determine the effect on maintenance and generalization skills, as well as overall probe scores.

Conclusion

The ubiquitous nature of multimedia is an opportunity much more than it is a distraction. The technology though is only truly useful with empirical testing and a solid evidence base.
REFERENCES


APPENDIX A: VIDEO SCRIPTS

**Big**

- (Show symbol—full screen)
- (A girl holds/looks at a small pumpkin)
- Big? –
- (A boy enters struggling to carry much bigger pumpkin)
- (Realizing that the second pumpkin is much bigger)
- Big – (said together)
  - Symbol located on table in scene
- (Show symbol—full screen)
- (Girl sitting on the floor looks up at boy, not fully in shot)
- (Looking surprised, gestures to ‘big’ person/symbol)
- Big – (as camera pans up)
- (Show symbol-full screen)
  - Symbol held by ‘big’ person

**Down**

- (Show symbol-full screen)
- (A girl stands on a high chair next to a boy standing on the ground)
- (Girl looks down/around)
- Down? –
- (Boy lifts girl down to ground)
- (Both gesture to sign)
- Down – (said together)
  - Symbol located on wall behind scene
- (Show symbol-full screen)
- (Boy on slide, slides down)
- Down –
- (Show symbol-full screen)
  - Symbol is held during slide

**Go**

- (Show symbol-full screen)
- (A girl sits on a chair reading a book)
- (A clearly impatient boy enters)
- Go? –
- (Girl waves off boy who continues to bother)
- (Giving in, the girl closes her book and rises from chair)
- Go – (said together as they go)
  - Symbol held by impatient boy
- (Show symbol-full screen)
- (Boy with racing car ramp presses button releasing cars)
- Go –
- (Show symbol-full screen)
  - Symbol is on table, behind car ramp

**Help**

- (Show symbol-full screen)
- (A girl struggles to lift a heavy chest)
- (After struggling, addresses boy also in shot)
- Help? –
- (Together boy and girl lift chest)
- Help – (said together as they carry chest off)
  - Symbol located atop the chest
- (Show symbol—full screen)
- (Boy struggles to get the top off a clear container with a ball in it)
- (After struggling, addresses girl in shot)
- Help –
- (Girl removes top and hands ball to boy who is now happy)
- (Show symbol-full screen)
  - Symbol is on table in between boy and girl

**In**

- (Show symbol-full screen)
- (A boy walks into shot looking around)
- In? –
- (Noticing a chest, he opens the top and excitedly climbs inside)
- In – (extend symbol towards camera)
  - Boy holds symbol
- (Show symbol—full screen)
- (Boy sits at table with shape sorter)
- (Inserting a shape into the toy)
- In –
- (Show symbol-full screen)
  - Symbol is on table next to shape sorter
More

- (Show symbol-full screen)
- (A boy building a pyramid notices that pieces are missing)
- More?
- (A girl enters with more blocks)
- More – (said together as they complete the pyramid)
  - Boy holds symbol
- (Show symbol—full screen)
- (A boy begins dancing/playing as balls fall from above)
- (The balls stop)
- More –
- (Boy dances/plays as balls fall once again)
- (Show symbol-full screen)
  - Boy holds symbol

Off

- (Show symbol-full screen)
- (A boy sits on a chair with a pot on his head)
- (A girl enters and notices his silly headwear)
- Off?
- (Boy agrees, takes pot off head)
- Off – (said together)
  - Girl holds symbol
- (Show symbol—full screen)
- (A boy sitting on a bike gets off)
- Off– (gestures to symbol)
- (Show symbol-full screen)
  - Symbol is on wall behind bike

On

- (Show symbol-full screen)
- (A boy enters scene takes note of two objects on the floor)
- On?
- (Boy tries to stand on unstable surface, falls)
- (Boy stands on stable surface and extends symbol towards camera)
- On –
  - Boy holds symbol
- (Show symbol—full screen)
– (Boy has sticker that he puts on shirt)
  – On –
  – (Show symbol-full screen)
    ▪ Boy holds symbol

**Up**

– (Show symbol-full screen)
– (A girl tries to climb on chair but realizes she needs help)
– (After struggling, addresses boy also in shot)
  – Up? –
– (Boy lends a hand to girl who climbs up)
– Up – (said together as girl extends arms up)
  ▪ Symbol located on wall behind scene
– (Show symbol—full screen)
– (Boy climbs up a set of stairs)
– Up –
– (Show symbol-full screen)
  ▪ Boy holds symbol

**Where**

– (Show symbol-full screen)
– (A boy holding a box looks for a place to put it)
  – Where? –
– (Struggles to find an open spot)
– Where – (finds open spot and places box)
  ▪ Symbol located on wall behind scene
– (Show symbol—full screen)
– (A boy enters carrying umbrella, wearing poncho and one rain boot)
– (Notices missing boot)
– Where – (finds boot and puts it on)
– (Show symbol-full screen)
  ▪ Symbol located on wall behind scene
## APPENDIX B: DEPENDENT VARIABLE PROBES

<table>
<thead>
<tr>
<th>Big</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>big</td>
<td>down</td>
</tr>
<tr>
<td>tall</td>
<td>dig</td>
</tr>
<tr>
<td>Big</td>
<td>Down</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Go</th>
<th>Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>go</td>
<td>help</td>
</tr>
<tr>
<td>drive</td>
<td>together</td>
</tr>
<tr>
<td>Go</td>
<td>Help</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In</th>
<th>Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>over</td>
</tr>
<tr>
<td>pour</td>
<td>add</td>
</tr>
<tr>
<td>In</td>
<td>More</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In</th>
<th>More</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>more</td>
</tr>
<tr>
<td>pour</td>
<td>add</td>
</tr>
<tr>
<td>In</td>
<td>More</td>
</tr>
</tbody>
</table>
Off

On

Up

Where
APPENDIX C: INTERVENTION SCRIPTS

**BIG**

<table>
<thead>
<tr>
<th>Setup-present one big ball, one small ball) SAY: Look at the two balls, we need the one that is BIG! [Present a probe page] I want BIG. Watch me. I look… (point to probe page) [point to big] BIG! I showed you big! Now we play! [Take big ball, roll back and forth]</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAY: Let’s try it together. Look at the two balls, we need the one that is BIG! [Present probe page] We want BIG. Look here (point to probe page) Show me big. Let’s do it together. We look… [point to big] BIG! We showed BIG! Now we play! [Take big ball, roll back and forth]</td>
<td>Notes:</td>
</tr>
<tr>
<td>SAY: Your turn. Look at the two balls, we need the one that is BIG! [Present a probe page]. Show me big. [If right] BIG! You showed me BIG! Now we play! [Take big ball, roll back and forth] [If wrong] You wanted big. Uh-oh you showed me [actual] [If no response/inappropriate response] You wanted big. Uh-oh! Model for wrong/NR/inappropriate: Watch me show you big [point to big] BIG! Now we play! [Take the big ball, roll back and forth]</td>
<td>Page # ______</td>
</tr>
<tr>
<td>Repeat after model for wrong/NR/inappropriate</td>
<td></td>
</tr>
</tbody>
</table>

Put an X over actual selection

|  |  |  |  |  |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
**DOWN**

(Setup—have child sit on tall chair, if they don’t want to sit on it yourself)

**SAY:** Look you’re/I’m on the tall chair, I/you need to get DOWN!
[Present a probe page] I want DOWN.

**Watch me.**
I look… (point to probe page)
[point to down] DOWN!

I showed you down!
**Now we play!** [Excitedly get down off chair/help child down]

**SAY:** Let’s try it together.
Look you’re/I’m on the tall chair, I/you need to get DOWN!
[Present probe page] We want DOWN.

**Look here** (point to probe page)
Show me down. Let’s do it together.
We look…
[point to down] DOWN!

We showed DOWN!
**Now we play!** [Excitedly get down off chair/help child down]

**SAY:** Your turn.
Look you’re/I’m on the tall chair, I/you need to get DOWN!
[Present a probe page]. Show me down.

[If right] DOWN! You showed me DOWN! Now we play! [Get down off chair/help child off chair]
[If wrong] You wanted down. Uh-oh you showed me [actual]
[If no response/inappropriate response] You wanted down. Uh-oh!
Model for wrong/NR/inappropriate: Watch me show you down
[point to down] DOWN! Now we play! [Get down off chair/help child down]

Repeat after model for wrong/NR/inappropriate
**GO**

(Setup-racetrack with cars)
SAY: *Look at the racetrack, we need it to GO!*
[Present a probe page] *I want GO.*

**Watch me.**
I look… (point to probe page)
[point to go] *GO!*

*I showed you go!*
Now we play! [Press button, starting racetrack]

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
</table>

| SAY: Let’s try it together.  
Look at the racetrack, we need it to GO!  
[Present probe page] *We want GO.*  
Look here (point to probe page)  
Show me go. Let’s do it together.  
We look…  
[point to go] *GO!*

*We showed GO!*
Now we play! [Press button, starting racetrack]  

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
</table>

| SAY: Your turn.  
Look at the racetrack, we need it to go!  
[Present a probe page]. *Show me go.*  
[If right] *GO! You showed me GO! Now we play!* [Press button, starting racetrack]  
[If wrong] *You wanted go. Uh-oh you showed me [actual]*  
[If no response/inappropriate response] *You wanted go. Uh-oh!*  
*Model for wrong/NR/inappropriate: Watch me show you go [point to go] *GO! Now we play!* [Press button, starting racetrack]  
Repeat after model for wrong/NR/inappropriate  

| Page # ______  
Put an X over actual selection |
| --- |
### HELP

(Setup-show child container with ball that they cannot get out)

**SAY:** Look at the ball stuck in the container, we need HELP!

[Present a probe page] I want HELP.

Watch me.
I look… (point to probe page)
[point to help] HELP!

I showed you help!
Now we play! [Take ball out and play]

**SAY:** Let’s try it together.

Look at the ball stuck in the container, we need HELP!

[Present probe page] We want HELP.

Look here (point to probe page)
Show me help. Let’s do it together.
We look…
[point to help] HELP!

We showed HELP!
Now we play! [Take ball out and play]

**SAY:** Your turn.

Look at the ball stuck in the container, we need HELP!

[Present a probe page]. Show me help.

[If right] HELP! You showed me HELP! Now we play! [Take ball out and play]

[If wrong] You wanted help. Uh-oh you showed me [actual]
[If no response/inappropriate response] You wanted help. Uh-oh!
*Model for wrong/NR/inappropriate: Watch me show you help [point to help] HELP! Now we play! [Take ball out and play]*

Repeat after model for wrong/NR/inappropriate

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</table>
**IN**

(Setup-shape sorter with shapes)  
SAY: Look at the shapes, we need to put them IN!  
[Present a probe page] I want IN.

**Watch me.**  
I look… (point to probe page)  
[point to in] IN!

I showed you in!  
Now we play! [Put a shape in]

**Notes:**

| SAY: Let’s try it together.  
Look at the shapes, we need to put them IN!  
[Present probe page] We want IN.  

Look here (point to probe page)  
Show me in. Let’s do it together.  
We look…  
[point to in] IN!  

We showed IN!  
Now we play! [Put a shape in]  

**Page # ______**  
Put an X over actual selection

| [If right] IN! You showed me IN! Now we play! [Put a shape in]  
[If wrong] You wanted in. Uh-oh you showed me [actual]  
[If no response/inappropriate response] You wanted in. Uh-oh!  
Model for wrong/NR/inappropriate: Watch me show you in [point to in] IN! Now we play! [Put a shape in]  

Repeat after model for wrong/NR/inappropriate
**MORE**

(Setup—block tower with missing blocks)  
SAY: Look at the tower, we need MORE!  
[Present a probe page] I want more.

**Watch me.**  
I look… (point to probe page)  
[point to more] MORE!

I showed you more!  
Now we play! [Finish block tower]

**Notes:**

<table>
<thead>
<tr>
<th>SAY: Let’s try it together.</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look at the tower, we need MORE!</td>
<td></td>
</tr>
<tr>
<td>[Present a probe page] We want more.</td>
<td></td>
</tr>
</tbody>
</table>

Look here (point to probe page)  
Show me more. Let’s do it together.  
We look…  
[point to more] MORE!

We showed MORE!  
Now we play! [Finish block tower]

**Notes:**

<table>
<thead>
<tr>
<th>SAY: Your turn.</th>
<th>Page # ______</th>
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</thead>
<tbody>
<tr>
<td>Look at the tower, we need more!</td>
<td>Put an X over actual selection</td>
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</tbody>
</table>

[Present a probe page] Show me more.

[If right] MORE! You showed me MORE! Now we play! [Finish block tower]  
[If wrong] You wanted more. Uh-oh you showed me [actual]  
[If no response/inappropriate response] You wanted more. Uh-oh!  
Model for wrong/NR/inappropriate: Watch me show you more 
[point to more] MORE! Now we play! [Finish block tower]

Repeat after model for wrong/NR/inappropriate
**OFF**

(Setup-put silly hat on head)  
SAY: **Look at my silly hat, we need to take it OFF!**  
[Present a probe page] **I want OFF.**

**Watch me.**  
**I look...** (point to probe page)  
[point to off] **OFF!**

**I showed you off!**  
**Now we play!** [Exaggeratedly take off hat]

**Notes:**

| SAY: Let’s try it together.  
| Look at my silly hat, we need to take it OFF!  
| [Present probe page] **We want OFF.**

**Look here** (point to probe page)  
**Show me off. Let’s do it together.**  
**We look...**  
[point to off] **OFF!**

**We showed OFF!**  
**Now we play!** [Exaggeratedly take off hat]

**Notes:**

| SAY: **Your turn.**  
| Look at my silly hat, we need to take it OFF!  
| [Present a probe page]. **Show me off.**

[If right] **OFF! You showed me OFF! Now we play!**  
[Exaggeratedly take off hat]  
[If wrong] **You wanted off. Uh-oh you showed me [actual]**  
[If no response/inappropriate response] **You wanted off. Uh-oh!**  
**Model for wrong/NR/inappropriate:** **Watch me show you off [point to off] OFF! Now we play!** [Exaggeratedly take off hat]

Repeat after model for wrong/NR/inappropriate
(Setup-present stickers)
SAY: Look at the stickers, we need to put them ON!
[Present a probe page] I want ON.

Watch me.
I look… (point to probe page)
[point to on] ON!

I showed you on!
Now we play! [Put stickers on]

Notes:

SAY: Let’s try it together.
Look at the stickers, we need to put them ON!
[Present probe page] We want ON.

Look here (point to probe page)
Show me on. Let’s do it together.
We look…
[point to on] ON!

We showed ON!
Now we play! [Put stickers on]

Notes:

SAY: Your turn.
Look at the stickers, we need to put them ON!

[Present a probe page]. Show me on.

[If right] ON! You showed me ON! Now we play! [Put stickers on]
[If wrong] You wanted on. Uh-oh you showed me [actual]
[If no response/inappropriate response] You wanted on. Uh-oh!
Model for wrong/NR/inappropriate: Watch me show you on [point to on] ON! Now we play! [Put stickers on]

Page # ______
Put an X over actual selection

Repeat after model for wrong/NR/inappropriate
<table>
<thead>
<tr>
<th>(Setup-chair)</th>
<th>Notes:</th>
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</thead>
<tbody>
<tr>
<td>SAY: Look at the chair, we need to get UP! [Present a probe page] I want UP.</td>
<td></td>
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<tr>
<td>Watch me. I look… (point to probe page) [point to up] UP!</td>
<td></td>
</tr>
<tr>
<td>I showed you up! Now we play! [Stand up on chair/help child up]</td>
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<tr>
<td>SAY: Let’s try it together. Look at the chair, we need to get UP! [Present probe page] We want UP.</td>
<td>Notes:</td>
</tr>
<tr>
<td>Look here (point to probe page) Show me up. Let’s do it together. We look… [point to up] UP!</td>
<td></td>
</tr>
<tr>
<td>We showed UP! Now we play! [Stand up on chair/help child up]</td>
<td></td>
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<tr>
<td>SAY: Your turn. Look at the chair, we need to get UP! [Present a probe page]. Show me up.</td>
<td>Page # ______</td>
</tr>
<tr>
<td>[If right] UP! You showed me UP! Now we play! [Stand up on chair/help child up]</td>
<td>Put an X over actual selection</td>
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<tr>
<td>[If wrong] You wanted up. Uh-oh you showed me [actual]</td>
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<tr>
<td>[If no response/inappropriate response] You wanted up. Uh-oh! Model for wrong/NR/inappropriate: Watch me show you up [point to up] UP! Now we play! [Stand up on chair/help child up]</td>
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<tr>
<td>Repeat after model for wrong/NR/inappropriate</td>
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</tbody>
</table>
**WHERE**

(Setup—wear one rain boot, hide other)

**SAY:** Look at the boot, the other one is...WHERE?!

[Present a probe page] I want WHERE.

**Watch me.**
I look... (point to probe page)
[point to where] WHERE!

I showed you where!
Now we play! [Look for/find other boot, put it on]

**SAY:** Let’s try it together.
Look at the boot, the other one is...WHERE?!

[Present probe page] We want WHERE.

Look here (point to probe page)
Show me where. Let’s do it together.
We look...
[point to where] WHERE!

We showed WHERE!
Now we play! [Look for/find other boot, put it on]

**SAY:** Your turn.
Look at the boot, the other one is...WHERE?!

[Present a probe page]. Show me where.

[If right] WHERE! You showed me WHERE! Now we play!
[Look for/find other boot, put it on]

[If wrong] You wanted where. Uh-oh you showed me [actual]
[If no response/inappropriate response] You wanted where. Uh-oh!
Model for wrong/NR/inappropriate: Watch me show you where
[point to where] WHERE! Now we play! [Look for/find other boot, put it on]

Repeat after model for wrong/NR/inappropriate
### APPENDIX D: GENERALIZATION SCRIPTS

| SAY: This is Sally  
(Show Sally)  
Pictures show Sally What to do |  
| --- |--- |
| **Big**  
SAY: Look at Sally, she has two cars  
(Sally looks at each car) |  
Sally says: *Hmm…this one or this one?*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do?  
Notes: |
| **Down**  
SAY: Look at Sally, she is playing here  
(on table)  
(Sally waves down from a higher location) |  
Sally says: *I want to play there*  
(points to floor)  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do?  
Notes: |
| **Go**  
SAY: Look at Sally, she has her car  
(Sally looks around) |  
Sally says: *I am ready to drive to the store.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do?  
Notes: |
| **Help**  
SAY: Look at Sally, she is stuck behind the block tower  
(Sally struggles to get out) |  
Sally says: *I can’t get out by myself.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do?  
Notes: |
| **In**  
SAY: Look at Sally, she has a piggy bank  
(Sally looks at bank, holding a coin) |  
Sally says: *My bank needs this coin.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do?  
Notes: |
<table>
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<tr>
<th>More</th>
<th>SUN</th>
<th>Notes:</th>
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</table>
| SAY: Look at Sally’s car, it stopped moving  
(Sally looks at car)  
Sally says: *My car is out of gas.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do? |  |  |

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<thead>
<tr>
<th>Off</th>
<th>SUN</th>
<th>Notes:</th>
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| SAY: Look at Sally, she is wearing a jacket  
(Sally fans herself)  
Sally says: *It’s too hot inside to wear my jacket.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do? |  |  |

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<tr>
<th>On</th>
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<th>Notes:</th>
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| SAY: Look at Sally, she has the lid to the container  
(Sally, holding lid sees container)  
Sally says: *What now?*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do? |  |  |

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<tr>
<th>Up</th>
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<th>Notes:</th>
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</table>
| SAY: Look at Sally, she wants to play  
(Sally looks up and sees a ball)  
Sally says: *I want the ball.*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do? |  |  |

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<tr>
<th>Where</th>
<th>SUN</th>
<th>Notes:</th>
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</table>
| SAY: Look at Sally’s car, it is behind the ________  
(Sally looks around for car)  
Sally says: *What do you say when you can’t find something?*  
[present probe page] Show Sally a picture.  
If needed, prompt—Is there a picture to show Sally what to do? |  |  |
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<tr>
<th>SAY: Look at the pictures</th>
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APPENDIX F: CONSENT FORM

Ohio University Parental Consent Form

Title of Research: Teaching Graphic Symbols for Augmentative and Alternative Communication Through Video and Practical Application
Researchers: Andrea E. Huist, John McCarthy PhD, CCC-SLP

You are being asked permission for your child to participate in research. For you to be able to decide whether you want your child to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your child’s personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your child’s participation in this study. You should receive a copy of this document to take with you.

EXPLANATION OF STUDY

Purpose of the research: This study is being conducted in order to test a program to teach ten visual representations of important early concepts to children who cannot use their natural speech to communicate verbally. A common augmentative aid used to supplement natural speech is the use of drawings as symbols for words. The task of mapping these drawings to actual words can be slow. While some symbols are easy to identify—they are simply visual recreations of familiar objects (i.e. a book is represented by a picture of a book), other symbols (i.e. verbs, prepositions, adjectives, adverbs) are more difficult to represent visually. The goal of this project is to create an intervention that will teach the visual representations of ten words, which have vague visual representations, but are important to a child’s early vocabulary.

Procedures: If you agree to allow your child to participate, your child will be asked to watch a series of short videos, which introduce the target concepts. After viewing a video, your child will recreate the scene with the researcher. Your child will then be asked to identify a target symbol out of a field of four symbols. The target concepts will be paired with Mayer Johnson Communication Symbols so that your child learns the symbol for the concept. After your child has mastered the target concepts, they will partake in a structured play activity to determine if your child can carry over the concepts in different scenarios. Sessions can be at your home, your child’s school (with the school’s permission) or on Ohio University’s campus in Grover Center.
**Duration/Time:** Children who participate in the study will do so during 30-45 minute sessions with no more than one week between each session. The total number of sessions may vary depending on how quickly your child learns the concepts, but an estimated 10-20 sessions are needed.

**Additional Information:** The researcher will obtain background information regarding your child’s speech and language skills by asking you to complete a communication checklist. Your child will also be given a language test, the results will be shared with you. The research will use information included on your child’s most recent Evaluation Team Report to provide information on your child’s speech and language skills. Your child’s information will be kept in a secure location in a locked filing cabinet. Only the researcher and her advisor will have access to the information. Information will be destroyed after all data has been collected and analyzed.

**Risks and Discomforts**

This is a minimal risk study involving risks no greater than those encountered in everyday living. Whether or not you choose to allow your child to participate in this study will not affect your status or relationship with your child’s school or speech and language pathologist.

**Benefits**

The benefits for your child include exposure to visual representations for important early vocabulary concepts. The activities are designed to be fun for young children. The benefits to society include helping to implement a new intervention method for teaching graphic symbols. Further, it is believed that the videos used in this study will be able to be made publicly available to help establish a community of videos for children around the world as more and more people use and contribute content.

**Confidentiality and Records**

All information collected on your child will remain confidential. All hard copies of personal or identifying information will be kept in a locked file. Computer-based information will be kept on a password protected computer in a locked room.

Additionally, while every effort will be made to keep your child’s study-related information confidential, there may be circumstances where this information must be shared with:
* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU;
Compensation

There is no compensation for participating.

Contact Information

If you have any questions regarding this study, please contact:

- John McCarthy, CCC-SLP, PhD
  - Ohio University—Communication Sciences and Disorders
  - Grover Center W242
  - Phone: 740.597.1764
  - E-mail: mccarthj@ohio.edu

If you have any questions regarding your child’s rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740)593-0664.

By signing below, you are agreeing that:

- you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
- you have been informed of potential risks to your child and they have been explained to your satisfaction.
- you understand Ohio University has no funds set aside for any injuries your child might receive as a result of participating in this study
- you are 18 years of age or older
- your child’s participation in this research is completely voluntary
- your child may leave the study at any time. If your child decides to stop participating in the study, there will be no penalty to your child and he/she will not lose any benefits to which he/she is otherwise entitled.

Parent Signature ___________________________ Date __________

Printed Name ______________________________

Child’s Name ________________________________

Where would you prefer your child’s sessions be held? (Please circle one)

- Grover Center at Ohio University
- In my home

Version Date: 11/09/11