Embedding Peer-Implemented Aided AAC Modeling within a Peer Network Intervention for

Students with Complex Communication Needs

By

Elizabeth Erin Biggs

Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Special Education

May, 2017

Nashville, Tennessee

Approved:

Erik W. Carter, Ph.D.

Erin E. Barton, Ph.D.

Victoria F. Knight, Ph.D.

Blair P. Lloyd, Ph.D.

Pat Mirenda, Ph.D.

To my former students with complex communication needs

and their families who inspired me to pursue this dream.

ACKNOWLEDGMENTS

I am appreciative of so many who helped me in this project, as this work would not have been possible without them. I wish to express my gratitude to:

Dr. Erik Carter, thank you not only for your time devoted to this dissertation, but also to my doctoral experience overall. You have had a profound impact on me both professionally and personally. Thank you for your unwavering commitment, constant encouragement, and thoughtful mentorship. I am forever grateful.

Dr. Erin Barton, Dr. Victoria Knight, Dr. Blair Lloyd, and Dr. Pat Mirenda, thank you for serving on my committee. Your support and feedback have been instrumental in my journey. I feel so fortunate to have had the opportunity to learn from each of you.

Jenn Bumble, Kelli Barnes, and Erica Mazur, thank you for your many hours collecting, entering, and checking data. I am so grateful to each of you and could not have brought this to completion without you.

The educators, students, and parents who participated in this project, thank you for your willingness to be a part of this work. I learned so much from each of you.

My family, thank you for everything you have given me during this journey. Isaac, you are an incredible husband and best friend. Thank you for always believing in me. Your steadfast confidence in me enables me to pursue my dreams. Evelyn, you are an incredible source of joy. I am so proud, amazed, and inspired as I watch who you are becoming.

Finally, I am thankful for financial support from the Tennessee Department of Education, Peabody Dean's Fellowship, and department funds through the Melvyn I. Semmel Dissertation Research Award, as this work would not have otherwise been possible.

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CHAPTER I

INTRODUCTION

Communication is a fundamental right for all people (Brady et al., 2016; United Nations, 2008). Everyone needs opportunities, encouragement, and support to develop communication that empowers them to participate in society, express their needs and ideas, and build relationships with others. However, many students with severe disabilities experience considerable difficulties developing strong communication skills. Students for whom verbal speech is insufficient to meet daily communication needs are described as having complex communication needs. The characteristics of these students are diverse, as are the conditions impeding their development of functional verbal speech. Despite their varied characteristics, students with complex communication needs share the challenge of developing effective and efficient communication.

For several decades, researchers have written about what constitutes communicative competence for individuals with complex communication needs who use augmentative and alternative communication (AAC; e.g., Dunst & Lowe, 1986; Light, 1989; Light & McNaughton, 2014), emphasizing two main aspects of communicative competence. First communicative competence addresses the need for students to develop *functional* communication—to be able to interact with natural partners, in natural environments, and in ways viewed as socially important to both students themselves and their communication partners (Light & McNaughton). The Communication Bill of Rights by the National Joint Committee for the Communication Needs of People with Severe Disabilities (NJC) emphasizes functional communication by addressing the importance of teaching students a range of communicative functions, including interacting and building relationships with peers without disabilities (Brady et al., 2016). Although positive

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interactions with peers are critically important, they may be quite limited for students with complex communication needs. Chung, Carter, and Sisco (2012) observed 16 elementary and middle school students who used AAC in general education classrooms. Students rarely interacted with peers and communicated almost exclusively with their paraprofessionals or special educators. There is an enduring need to identify ways to support meaningful, positive interactions among students with complex communication needs and their peers at school.

Second, communicative competence addresses the importance of the *adequacy* of students' communication, which involves having the skills and judgment needed to participate fully within various environments and interactions (Light & McNaughton, 2014). The ability to use symbols when communicating—such as spoken words, graphic symbols, or signs—is one component of the adequacy of students' communication (Browder, Flowers, & Wakeman, 2008). Students who communicate intentionally but rely on pre-symbolic communication (e.g., pointing, vocalizing, eye gaze) are limited to being able to communicate about referents present with them at the time. However, when students build skills to communicate symbolically, they can express ideas and feelings about the future, the past, and things not present in their current setting. Although all students with severe disabilities may not acquire the understanding and use of symbols (Browder et al.), an important goal is to help students develop more advanced communication skills within their zone of proximal development (Alper & McGregor, 2015; Vygotsky, 1978). For many students, an appropriate goal is to help them improve their use of symbolic communication.

To support students in building adequate, functional communication, educators need ways to both improve students' abilities to communicate effectively while also promoting their participation in enjoyable interactions with others, such as their peers. Embedding peer-

implemented aided AAC modeling within a peer network intervention may be an effective way to address both of these considerations.

**Peer Network Interventions**

Students with complex communication needs face many barriers to positive peer interaction and may have few relationships with their peers without disabilities (Webster & Carter, 2007). However, a sizable body of research has shown that interventions can increase and improve the interactions students have with their peers (e.g., Carter, Sisco, Chung, & Stanton-Chapman, 2010; Therrien, Light, & Pope, 2016). Peer network interventions improve social interaction and relationships among students with severe disabilities and their peers by supporting greater integration into social environments (e.g., Carter et al., 2013; Garrison-Harrell, Kamps, & Kravits, 1997; Haring & Breen, 1992; Kamps et al., 2014). The specific components of peer network interventions vary across studies but share three core features: (a) repeated opportunities to interact with peers in meaningful and motivating social contexts; (b) adult facilitation to support interaction during these opportunities; and (c) peer partner instruction to equip them to be positive communication partners.

For example, Haring and Breen (1992) enlisted groups of peers without disabilities to provide ongoing social support throughout the school day for two middle school students with autism or intellectual disability. The intervention involved scheduling opportunities for interaction throughout the school day, teaching peers strategies to initiate interactions, providing focus students opportunity to practice responding to initiations, and developing strategies for peers to help the student respond appropriately to interactions. The peer network met weekly with an adult facilitator to discuss interactions, problem-solve, role-play and model strategies, and reinforce each members' participation. Following the establishment of the peer network,

students interacted more with peers across non-structured contexts during the school day.

In other studies (e.g., Kamps et al., 2014; Kamps et al., 2015; Mason et al., 2014), researchers worked with school staff to implement peer network interventions with young children with autism by creating social groups to teach and practice social-communicative skills. Each peer network session included direct instruction on a social-communicative skill and the opportunity to participate in a shared play activity with peers. During the activities, focus students received prompting from peers to use the targeted social-communicative skill (e.g., "Ask and Share", "Tell about my toys", "Talk nice"). An adult facilitator—typically a speech-language pathologist (SLP), paraprofessional, or teacher—provided reinforcement and feedback. Positive outcomes across the studies included increased overall interactions and initiations with peers.

Asmus et al. (in press), Gardner et al. (2014), and Hochman, Carter, Bottema-Beutel, Harvey, and Gustafson (2015) established peer networks for high school students with autism and intellectual disability during non-instructional times, such as advisory or lunch periods. In all three studies, the intervention involved students engaging in a motivating, shared activity (e.g., playing a game on an iPad, discussing school events, playing a card game). A special educator or paraprofessional served as a facilitator by recruiting peers, orienting peers and the student to the network, and providing and fading support during the meetings. Across the studies, positive outcomes included increased social engagement and interaction, as well as improvements in reported social relationships with peers.

Although strong evidence exists for the effectiveness of peer network interventions to increase students' social engagement, interactions, and relationships, nearly all participants have been students who used verbal speech to communicate. With one study as an exception (i.e.,

Garrison-Harrell et al., 1997), students with complex communication needs who require the use of aided AAC have not been well represented in evaluations of peer network interventions. Garrison-Harrell et al. established peer networks across multiple settings (e.g., lunch, language arts, recess) for students with autism who had limited verbal communication. One component of the intervention involved the investigator training focus students to identify graphic symbols on a communication board through decontextualized, 1:1 teaching sessions. In addition, the investigator taught peers social interaction behaviors, supported the use of communication boards during interactive activities, and facilitated interactions during the peer network meetings. In the study, the investigator implemented the majority of the intervention and acknowledged school staff may experience challenges related to feasibility because of the extensive time dedicated to 1:1 training for the focus student prior to network meetings. Additional research is needed evaluating the effects of peer network interventions for students with complex communication needs while involving school staff in implementing the intervention. Furthermore, this research might explore whether peers' use of specific interaction strategies— such as aided AAC modeling— would be effective to promote students' use of aided AAC and reduce or replace the need for separate 1:1 teaching sessions.

**Aided AAC Modeling**

Aided AAC modeling involves a communication partner using graphic symbols on an aided AAC device— such as a communication book or speech-generating device (SGD)— to encourage the student to do so themselves. Although students with complex communication needs interact with communication partners who use verbal speech, they may rarely see others use aided AAC (Smith & Grove, 2003). This asymmetry between the communication input they receive (i.e., spoken words) and the output they are expected to produce (i.e., graphic symbols on

an aided AAC device) may contribute to the challenges many experience when learning to use aided AAC. Communication partners such as educators or peers may be able to improve students' use of aided AAC by providing salient language models using both speech and the aided AAC device (Romski & Sevcik, 2003; Sennott, Light, & McNaughton, 2016; Smith & Grove).

In a recent systematic review, Biggs, Carter, and Gilson (in review) classified 48 interventions involving aided AAC modeling into three unique approaches to modeling— aided AAC models used (a) within instructional demonstrations, (b) as prompts, and (c) as augmented input. Models within instructional demonstrations are provided during set, relatively brief periods of time, and often in decontextualized settings. This approach is used to introduce a student to aided AAC or to new graphic symbols on an aided AAC device. Aided AAC models as prompts are used directly to elicit a desired communicative response from a student by encouraging the student to imitate the partner's model. Finally, aided AAC models as augmented input involve a communication partner modeling graphic symbols on an aided AAC device during their natural, ongoing interactions with a student. For example, while looking at a book about animals with a classmate with a disability, a peer might point to a picture and then say "*Look at that huge elephant!"* while pressing the icons *LOOK* and *HUGE* on an SGD.

Biggs et al. (in review) identified 10 studies in which peers were involved in implementing aided AAC modeling interventions, including six in which peers provided augmented input by pairing speech with the use of graphic symbols on a communication board, communication book, or SGD during their ongoing interactions with a schoolmate with a disability (i.e., Chung & Carter, 2013; Hunt, Alwell, & Goetz, 1988, 1991a, 1991b; Hunt, Alwell, Goetz, & Sailor, 1990; Trembath, Balandin, Togher, & Stancliffe, 2009). Although the

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other components in these interventions varied, each intervention improved or increased the communication of the student with complex communication needs.

Peers' use of aided AAC modeling as augmented input may improve a student's use of symbolic communication for several reasons. First, having peers use the aided AAC device during their natural interactions may demonstrate to the student that the aided AAC device is a useful and encouraged mode of communication (Romski & Sevcik, 1996). Based on theories of observational and social learning (Bandura, 1986), an important factor to the success of modeling strategies is *who* provides the models. Aided AAC models may be especially salient and effective when provided by peers who a student likes and sees as socially important. Second, peer-implemented augmented input may facilitate language mapping. Language mapping refers to the process of acquiring the meaning of new linguistic information by making a map, or associative paring between a symbol and the referent (Carey & Barlett, 1978). For students learning to use aided AAC, language mapping requires establishing a relationship not only between a referent and its spoken word, but also its representation through a graphic symbol. When peers model aided AAC as augmented input, these models may help a student build connections between spoken words, graphic symbols, and their referents (Drager, 2009; Wood, Lasker, Siegel-Causey, Beukelman, & Ball, 1998).

Despite the empirical and theoretical support for the use of augmented input, few studies have isolated its direct effects from the other strategies used within a larger intervention. Because augmented input has typically been combined and evaluated with other intervention strategies, little is known about the unique impact of augmented input separate from or beyond other intervention components. The few studies either focusing exclusively on or isolating augmented input from other intervention components have included only young children (e.g., Binger &

Light, 2007; Kasari et al., 2014; Romski et al., 2010), and none of these have examined the isolated impact of peer-implemented augmented input. Research is needed investigating the unique and direct effects of peer-implemented aided AAC modeling as augmented input, particularly for school-aged students.

**Research Questions**

The purpose of this study is to focus on the implementation and effectiveness of embedding peer-implemented aided AAC modeling into a peer network intervention for students with complex communication needs who are learning to use aided AAC. The study addresses the following research questions:

1. Does introducing a peer network intervention during a non-instructional time at school increase the frequency of students' (a) overall interaction with peers and (b) non-prompted, symbolic communicative acts to peers in the selected setting?

2. Is peer training (i.e., consisting of oral instruction, modeling, and practice with feedback) and abbreviated coaching (i.e., during two sessions) effective for teaching peers to provide aided AAC models within peer network meetings?

3. Does embedding peer-implemented aided AAC modeling within the peer network increase the frequency of students' non-prompted, symbolic communicative acts to peers during the intervention context?

4. How do students, peers, and educators view the acceptability, feasibility, and impact of the peer network intervention and use of aided AAC modeling strategies?

CHAPTER II

METHOD

**Students with Severe Disabilities**

Participants were four elementary students with complex communication needs who were learning to use aided AAC and had early-emerging use of symbolic communication. To be included, students had to provide parent consent and meet the following criteria: (a) be enrolled in grades 3 through 8; (b) receive special education services under the categories of intellectual disability, autism, or multiple disabilities; (c) be eligible for the state's alternate assessment as a student with a severe disability; (d) use an aided AAC device or be recommended for use by an SLP and/or school or district AAC evaluation team; (e) communicate intentionally using non-symbolic and early-emerging symbolic communication behaviors, as determined by direct observation and teacher ratings on the communication matrix (Rowland, 2008); and (f) demonstrate symbol-referent associations for familiar objects, as determined by performance on a receptive labeling task. Eligible aided AAC included electronic and non-electronic communication aids with capacity to display a minimum of 20 graphic symbols (e.g., communication books, SGDs).

After receiving institutional review board and district approval, we contacted special education coordinators and AAC specialists to identify special educators and speech-language pathologists (SLPs) who worked with students who might meet our inclusion criteria. We then asked teachers and SLPs to share information about the study and consent forms with parents of any students who they identified would likely meet eligibility requirements. After receiving parent consent, we used a combination of informal and formal assessments, observations, and

student file review to (a) determine whether students met inclusion criteria and (b) collect data

about relevant participant characteristics (see Table 1).

Table 1. *Characteristics of Participating Focus Students*

| Name, age, grade | Primary disability | Other diagnoses | Vineland-II[a] | | | | Aided AAC |
| | | | Communication | Daily Living | Socialization | Motor Skills[b] | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sara, 9, 4th | ID | Seizure disorder | 44 <1% | 49 <1% | 57 <1% | 46 | QuickTalker23 |
| Grace, 9, 3rd | Autism | | 62 1% | 65 1% | 60 <1% | 61 | iPad with Proloquo2Go |
| Jeremy, 10, 4th | Autism | Down syndrome | 69 2% | 62 1% | 60 <1% | 59 | QuickTalker23 |
| Joanna, 10, 4th | Autism | Seizure disorder | 62 1% | 63 1% | 71 3% | 75 | Communication book |

*Note.* AAC = Augmentative and alternative communication; ID = Intellectual disability
[a] Standard scores and percentiles from the teacher rating of the Vineland Adaptive Behavior Scales, Second Edition (Sparrow, Cicchetti, & Balla, 2005)
[b] Standard scores for the Motor Skills Domain are estimated for children ages 7:0 and older; therefore, percentiles are not calculated

To determine whether students met the criteria for communicating intentionally using

non-symbolic and early-emerging symbolic communication, we used a combination of ratings on

the communication matrix (Rowland, 2008) and direct observation. The communication matrix

is an informal assessment tool that can be completed online in less than 45 min by a familiar

communication partner. Results are presented using seven levels of communication: levels I-II

are pre-intentional, levels III-IV are intentional pre-symbolic, and levels V-VII are symbolic.

These levels summarize ratings of students' communication across four functions: refusing

things, obtaining things, engaging and social interaction, and seeking information. To meet our

inclusion criteria, results of the matrix had to indicate students had (a) mastered or surpassed pre-

intentional levels and (b) not mastered using a symbolic level of communication (i.e., V-VII) for

more than two of the four functions. Additionally, we screened students by observing during

three to four 30 min segments across different settings in which they had opportunities to communicate. We used these communication samples to confirm students communicated intentionally using non-symbolic and early-emerging symbolic communication (i.e., if they produced, on average across 30 min communication samples, (a) at least one intentional communicative act to any partner in any mode and (b) fewer than 15 non-prompted symbolic communicative acts to any partner (i.e., using speech, aided AAC, or signs).

We used a receptive labeling task (Beukelman & Mirenda, 2013) to determine whether students met the criteria for demonstrating basic symbol-referent associations for familiar objects. We created color computer line drawn symbols for common functional items (e.g., pencil, book) and asked each student's special educator to identify items with which the student was familiar. During 10 trials (i.e., two times each for five items and corresponding symbols), the researcher or teacher placed an array of three symbol choices in front of the student and instructed the student to find the symbol for one of the items. All students correctly identified the corresponding symbol in 80% or more of trials.

**Sara.** Sara was a 9-year-old Hispanic female in the fourth grade who had diagnoses of an intellectual disability and a seizure disorder. At home, Sara's family spoke both English and Spanish, but her mother reported she responded better to English. According to educational records, Sara received a composite standard score of 50 on the Comprehensive Test of Nonverbal Intelligence—Second Edition (CTONI-2). She spent most of the day in a special education classroom and was included in general education for specials (e.g., physical education, art), lunch, recess, and a 15 min morning meeting. Sara received direct support from a paraprofessional whenever she was in a general education setting. Sara primarily used gestures and vocalizations to communicate and had limited functional, intelligible speech that included

"*hello*", "*bye-bye,*" and animal sounds. She used a QuickTalker23, a low-tech SGD, for just over a year, prior to which she used a communication book. The SGD was set-up with one static page displaying 17 color line drawn symbols, of which her teacher reported she used two independently only to request desired activities (i.e., Play-doh, iPad). Although the school district owned the SGD, Sara took it home regularly. Ratings on the communication matrix indicated Sara used single symbols to refuse and obtain things. With prompting, she combined two symbols only to request (e.g., I WANT + PLAY-DOH). She relied primarily on non-symbolic communication (e.g., gestures, vocalizations) to request attention, show affection, and direct attention. Across communication samples taken during lunch, recess, physical education, and in the special education classroom, Sara had an average of 13 communicative acts per 30 min, the majority of which were to adults (71%) and non-symbolic (e.g., gestures, non-word vocalizations; 66%). More than half (62%) of her symbolic communicative acts were prompted, and nearly all occurred in the special education classroom.

**Grace.** Grace was a 9-year-old White/Hispanic female in the third grade who had a diagnosis of autism. Her family spoke English at home. According to educational records, she had not participated in an assessment of intellectual functioning since Kindergarten when scores on the Mullen Scales of Early Learning indicated significant delays across all areas of functioning. Grace spent about two and a half hours each day in a special education classroom and the remainder in her general education classroom, receiving one-to-one paraprofessional support throughout the day. She used gestures, speech, and graphic symbols on an iPad with Proloquo2Go to communicate. Her speech was largely imitative and often with a "sing song" voice. She used Proloquo2Go for approximately two years, and it was programmed with approximately 300 graphic symbols in several folders on "home" and "school" pages. Her

teacher reported she only used five symbols independently at school, only to request desired objects or activities. The school district owned the iPad, but Grace took it home regularly. Ratings on the communication matrix indicated Grace used symbolic communication to refuse and obtain things, which included combining symbols to request, such as saying "*Napkin please"* or I WANT + STARBURSTS using graphic symbols. Her teacher indicated she infrequently communicated for reasons other than requesting or rejecting, although she did use non-symbolic communication to request attention and show affection. Across communication samples during lunch, recess, and art class, Grace had an average of two communicative acts per 30 min, the majority of which were to adults (72%) and non-symbolic (e.g., gestures; 57%). During these observations, Grace frequently did not respond when peers and adults initiated interaction.

**Jeremy.** Jeremy was a 10-year-old White male in the fourth grade who had diagnoses of autism and Down syndrome. According to educational records, he had not participated in an assessment of intellectual functioning since preschool when scores on the Mullen Scales of Early Learning indicated significant delays across all areas of functioning. Jeremy spent about two hours each day in a special education classroom and the remainder in a general education classroom, receiving one-to-one paraprofessional support throughout the day. He used gestures, vocalizations, and speech to communicate; however, his speech was often unintelligible. Jeremy used a QuickTalker23 SGD for four years, but he rarely used it outside of structured language therapy and did not take it home. The SGD had one static communication page displaying 23 color line drawn symbols, but his teacher reported he did not use any symbols independently. Ratings on the communication matrix indicated Jeremy used single words to refuse and obtain things. He relied primarily on non-symbolic communication to request attention, show affection,

and direct attention. Jeremy's teacher identified written language as a strength, indicating he was interested in words, letters, and spelling and could decode grade-level text. However, he did not use functional expressive language in social interactions. Across communication samples during indoor recess, outdoor recess, and lunch, Jeremy had an average of 19 communicative acts per 30 minutes. The majority (84%) was with his peers and non-symbolic (e.g., gestures, non-word vocalizations; 88%). Jeremy was observed to engage frequently in back-and-forth social routines with his peers in which they would take turns imitating one another's non-conventional gestures (e.g., waving both pointer fingers from side to side) and non-word vocalizations (e.g., "oh-cha").

**Joanna.** Joanna was a 10-year-old Hispanic female in the fourth grade who had diagnoses of autism and seizure disorder. At home, her family spoke both English and Spanish, and her parents reported she responded equally to both. According to educational records, she received a nonverbal intelligence composite standard score of 59 when evaluated with the CTONI-2 in Kindergarten. Joanna received one-to-one paraprofessional support throughout the day. She spent most of the day in a special education classroom and was included in general education for specials (e.g., physical education, art), lunch, recess, morning meeting, and 1 hr of academic instruction (i.e., language arts and math). Joanna primarily used gestures and speech to communicate; however, her speech was at a low volume and had limited intelligibility to unfamiliar partners. She used line drawn symbols as a communication aid for several years in the special education classroom, and her SLP created a more formal communication book just prior to the start of the study. However, the communication book was frequently misplaced and rarely used outside of structured language therapy with the SLP. Ratings on the communication matrix indicated Joanna used combinations of two or more words to refuse and obtain things and used early-emerging symbolic communication across social and information functions (e.g., greeting,

showing affection, naming things or people, asking questions). Across communication samples during lunch, physical education, and in the special education classroom, Joanna had an average of 10 communicative acts per 30 min. Nearly all (92%) were with adults, and just over one half (58%) were symbolic, using speech.

**Peer Network Facilitators**

Before the start of the study, a school staff member volunteered to be a facilitator of the peer network for each participating focus student. To participate, a facilitator had to consent and be available when the peer network meetings would take place. Sara's facilitator was a special education paraprofessional who supported multiple students throughout the day. She provided support for Sara during lunch and recess. All other facilitators were direct support paraprofessionals who supported students one-to-one throughout the day. Because of her paraprofessional's medical leave during the fall semester, a substitute paraprofessional also worked with Joanna and her peer network during part of the study. All of the facilitators indicated they had not received any training in the last two years related to working with students who use AAC or to supporting interaction between students with disabilities and their peers. Table 2 displays their demographic information.

**Planning Team Members**

Each focus student had a planning team consisting of their network facilitator, special education teacher, speech-language pathologist (SLP), and parent(s). Jeremy's general education teacher also participated. Sara and Joanna had the same special education teacher, and Grace and Sara had the same SLP. Table 2 displays their demographic information.

Table 2. *Characteristics of Planning Team Members for Each Focus Student*

| | Gender | Age | Race/Ethnicity | Education | Years known | Years experience |
|---|---|---|---|---|---|---|
| **Sara** | | | | | | |
| Paraprofessional | Female | 41 | White | Associates | < 1 year | 2.5 years |
| Special educator | Female | 30 | White | Bachelor's | < 1 year | 5 years |
| Speech-language pathologist | Female | 32 | White | Master's | 2 years | 2 years |
| Mother | Female | 44 | Hispanic | High school | | |
| **Grace** | | | | | | |
| Paraprofessional | Female | 61 | White | Bachelor's | 1 year | 17 years |
| Special educator | Female | 28 | Hispanic | Master's | 2 years | 5 years |
| Speech-language pathologist | Female | 32 | White | Master's | 2 years | 2 years |
| Father | Male | 35 | White | Bachelor's | | |
| **Jeremy** | | | | | | |
| Paraprofessional | Female | 46 | White | Bachelor's | 4.5 years | 5.5 years |
| Special educator | Female | 23 | White | Bachelor's | 1 year | 1 year |
| Speech-language pathologist | Female | 26 | White | Master's | 2 years | 3 years |
| General educator | Female | 33 | White | Master's | 1.5 years | 5 years |
| Mother | Female | 51 | White | Some college | | |
| **Joanna** | | | | | | |
| Paraprofessional | Female | 62 | African American | Some college | 2 years | 9 years |
| Substitute paraprofessional | Female | 47 | White/Asian | Some college | < 1 year | < 1 year |
| Special educator | Female | 30 | White | Bachelor's | < 1 year | 5 years |
| Speech-language pathologist | Female | 27 | White | Master's | < 1 year | 3 years |
| Mother | Female | 40 | Hispanic | Some college | | |
| Father | Male | 47 | Hispanic | Some college | | |

*Note.* Education = highest level of education; Years known = number of years the individual had known the focus student prior to the study; Years experience = number of years of experience in current position and similar position

**Peers without Severe Disabilities**

Prior to the start of the peer network, each planning team identified two or more peers to serve as peer network members. Identified peers had to be same-age peers (i.e., within one grade level of the focus student) without severe disabilities who were present in the setting identified for the peer network. We encouraged planning teams to ask students to provide input and identify peers who (a) had consistent school attendance, (b) demonstrated age-appropriate communication skills, (c) had positive interactions with the student in the past and/or were peers the student wanted to be around, (d) got along well with one another, and (e) were likely to enjoy the peer network. Planning teams invited 13 peers to participate, and all provided parent consent and participated. Sara's network included three fourth grade peers: a 9-year-old African American female, a 10-year-old White female, and a 9-year-old White male. The three peers had known Sara for 1-3 years and known each other for 1-2 years. Grace's network included four third grade females who were all 8-years-old. Two were White, one was Asian, and one was Hispanic. They had known Grace for 1-4 years and each other for 4 years. Jeremy's network included three fourth grade peers: a 9-year-old White female, a 9-year-old African American female, and a 10-year-old White male. They had known Jeremy and each other for 1-2 years. Joanna's network included three fourth grade peers: a 9-year-old White female, a 10-year-old White female, and a 10-year-old Middle Eastern female. One peer had known Joanna for 4 years, the others had known her for 1 year, and they had known each other for 1-2 years. Additionally, several other peers who were not formal peer network members regularly joined in the interactions and activities during Jeremy and Sara's network meetings.

**Settings**

Students attended two economically and ethnically diverse elementary schools in the

same urban school district. Sara, Grace, and Joanna attended a school serving over 700 students, of which approximately one third were eligible to receive free or reduced-price meals and over 11% were English language learners. Approximately 58% were White, 24% were African American, 9% were Hispanic, and 9% were Asian. Jeremy attended a school enrolling approximately 600 students, of which one quarter were eligible to receive free or reduced-price meals and 8% were English language learners. Approximately 43% were African American, 42% were White, 11% were Asian, and 4% were Hispanic.

Peer network meetings took place in an inclusive, non-academic setting identified by each student's special education teacher. For Sara, Grace, and Joanna, network meetings took place during students' regularly scheduled 30 min lunch periods. Although network meetings were initially held in the cafeteria, each facilitator opted to find another location because of high noise levels and limited space. Sara and Joanna's networks met at a folding table set up in open lobby space near the cafeteria. Grace's network met in her general education classroom, which is also where the class ate regularly one other day a week as a reward from their general education teacher. Jeremy's network meetings took place during a 25 min indoor recess block in his general education classroom. During indoor recess, 19 students and three adults (i.e., general educator, special education paraprofessional, ASL translator) were present in the classroom.

**Experimental Design and Procedures**

We used a multiple-probe-across-participants design with a baseline and two staggered intervention phases (i.e., A-B-BC phases) to evaluate the effects of the peer network intervention (i.e., "B") and peer network with aided AAC modeling (i.e., "BC") on students' overall interaction with peers and their non-prompted, symbolic communication to peers. Phase change decisions were aligned with each primary research question. For the introduction of the first

intervention phase, we made decisions based on the frequency of overall interaction with peers. Decisions regarding the second intervention phase were based on the frequency of non-prompted, symbolic communicative acts to peers and peer-implemented aided AAC models. We used visual analysis to evaluate evidence of a functional relation between the intervention, the added aided AAC modeling component, and primary dependent variables by examining data for changes in level, trend, and variability while taking into consideration overlap and immediacy of effect. This involved (a) evaluating a stable baseline, (b) examining patterns within phases, (c) assessing an effect by comparing adjacent phases, and (d) integrating information across tiers to determine if a functional relation exists through at least three demonstrations of effect (Kratochwill et al., 2010).

**Baseline phase ("A").** Before introducing the peer network intervention, we observed in the identified setting (i.e., lunch or indoor recess) two to four times per week for each focus student. We instructed students' paraprofessionals and other adults in the setting to continue supporting the focus student as they did before the start of the study. Table 3 displays information about the proximity of students with their peers, with adults, and with their SGD or communication book during the baseline phase. All four students were in proximity to peers the majority of time. Only Sara and Grace were in proximity to their SGDs the majority of time. Jeremy's SGD was available in the classroom during indoor recess but left on a shelf, and Joanna did not bring her communication book into the cafeteria. Paraprofessionals almost never encouraged or supported interaction between the focus students and their peers (see *Procedural Fidelity* for more information about adult and peer behaviors during the baseline phase).

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Table 3. *Descriptive Summary by Participant and Study Phase*

| Variable | Sara | | | Grace | | | Jeremy | | | Joanna | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BL | PN | PN+M | BL | PN | PN+M | BL | PN | PN+M | BL | PN | PN+M |
| Student communication[a] | <1 (0-2) | 18 (6-30) | 22 (15-27) | 4 (0-8) | 13 (6-24) | 17 (9-30) | 12 (0-26) | 31 (9-59) | 40 (15-81) | <1 (0-1) | 28 (13-38) | 37 (23-51) |
|   Independent symbolic | 0 (0-0) | 1 (0-6) | 10 (5-15) | <1 (0-3) | 1 (0-3) | 5 (2-8) | 1 (0-8) | 4 (0-8) | 23 (10-44) | <1 (0-1) | 12 (7-21) | 20 (6-30) |
|   Imitated symbolic | 0 (0-0) | <1 (0-2) | 2 (0-4) | 1 (0-4) | 1 (0-5) | 3 (0-7) | <1 (0-2) | 1 (0-4) | 3 (0-8) | 0 (0-0) | 10 (0-20) | 14 (5-25) |
|   Prompted symbolic | 0 (0-0) | 3 (0-7) | <1 (0-1) | <1 (0-2) | 1 (0-4) | 1 (0-2) | 0 (0-0) | 7 (0-14) | 3 (0-6) | 0 (0-0) | 1 (0-2) | <1 (0-1) |
|   Independent non-sym. | <1 (0-2) | 12 (4-18) | 9 (5-14) | 1 (0-3) | 10 (3-17) | 8 (2-12) | 7 (0-14) | 16 (4-28) | 6 (1-19) | 0 (0-0) | 5 (1-9) | 3 (0-6) |
|   Imitated. non-sym. | 0 (0-0) | 1 (0-4) | <1 (0-1) | 2 (0-6) | 0 (0-0) | 0 (0-0) | 3 (0-12) | 3 (0-6) | 5 (0-10) | 0 (0-0) | <1 (0-1) | 0 (0-0) |
|   Prompted non-sym. | 0 (0-0) | 2 (0-7) | <1 (0-3) | <1 (0-1) | 0 (0-0) | 0 (0-0) | 1 (0-6) | 1 (0-2) | <1 (0-2) | 0 (0-0) | 0 (0-0) | 0 (0-0) |
| Peer behaviors[a] | | | | | | | | | | | | |
|   Peer interaction | 6 (2-8) | 49 (26-71) | 46 (34-59) | 12 (0-22) | 39 (27-53) | 43 (25-57) | 53 (0-78) | 81 (21-117) | 88 (56-137) | <1 (0-2) | 83 (47-115) | 78 (58-100) |
|   Aided AAC models | 0 (0-0) | <1 (0-4) | 26 (12-53) | 0 (0-0) | <1 (0-3) | 10 (4-17) | 0 (0-0) | 3 (0-9) | 17 (5-35) | 0 (0-0) | 9 (0-25) | 17 (6-32) |
| Proximity[b] | | | | | | | | | | | | |
|   Network members | —— | 96 (88-100) | 97 (91-100) | —— | 94 (73-100) | 98 (91-100) | —— | 79 (51-99) | 91 (75-99) | —— | 99 (92-100) | 100 (99-100) |
|   Other peers | 88 (68-99) | 57 (0-100) | 75 (0-100) | 97 (88-100) | 0 (0-0) | 0 (0-0) | 76 (5-100) | 60 (31-92) | 64 (1-96) | 84 (13-100) | 0 (0-0) | 0 (0-0) |
|   Adult support | 68 (33-95) | 80 (55-99) | 82 (60-97) | 97 (90-100) | 91 (50-100) | 74 (26-100) | 18 (0-60) | 71 (19-93) | 75 (40-91) | 95 (79-100) | 99 (95-100) | 96 (85-100) |
|   Aided AAC | 84 (35-100) | 97 (89-100) | 97 (92-100) | 90 (0-100) | 82 (58-99) | 98 (90-100) | 0 (0-0) | 55 (7-91) | 86 (56-100) | 0 (0-0) | 80 (11-100) | 96 (77-100) |
| # of target words[c] | | | | | | | | | | | | |
|   Peer modeled core | —— | <1 (0-1) | 2 (0-5) | —— | 0 (0-0) | 1 (0-2) | —— | <1 (0-2) | 2 (0-5) | —— | 2 (0-3) | 4 (0-6) |
|   Student core | —— | <1 (0-1) | 1 (0-3) | —— | 0 (0-0) | 0 (0-0) | —— | <1 (0-1) | 1 (0-2) | —— | 0 (0-0) | 1 (0-3) |
|   Peer modeled activity | —— | <1 (0-1) | 3 (1-4) | —— | 0 (0-0) | 2 (1-4) | —— | <1 (0-3) | 4 (1-6) | —— | 1 (0-3) | 4 (1-7) |
|   Student activity | —— | <1 (0-1) | 1 (1-3) | —— | 0 (0-0) | 1 (1-3) | —— | <1 (0-2) | 3 (1-5) | —— | <1 (0-1) | 1 (0-3) |
| Quality ratings[d] | | | | | | | | | | | | |
|   Relevance | —— | low | med | low | high | high | low | med | high | —— | high | high |
|   Positive affect | med | high | high | med | high | high | high | high | high | —— | high | high |
|   Balance/reciprocity | low | low | med | low | low | med | low | med | med | —— | med | med |
|   Appropriateness | low | med | med | low | med | med | low | med | med | —— | high | high |
|   Facilitation required | —— | med | med | —— | med | med | med | med | low | —— | low | low |
| Communication modes[d] | | | | | | | | | | | | |
|   Intelligible speech | never | sometimes | sometimes | sometimes | sometimes | sometimes | sometimes | sometimes | often | never | often | often |
|   Aided AAC | never | sometimes | often | never | never | often | never | sometimes | often | never | never | sometimes |
|   ASL | never | never | never | never | never | never | never | never | never | never | never | never |
|   Vocalizations | never | sometimes | sometimes | never | never | never | sometimes | sometimes | sometimes | never | never | never |
|   Unintelligible speech | never | sometimes | sometimes | never | never | never | sometimes | sometimes | sometimes | never | sometimes | sometimes |
|   Gestures | never | often | often | sometimes | often | often | sometimes | often | often | never | sometimes | sometimes |

*Note.* AAC = augmentative and alternative communication; ASL = American Sign Language; BL = baseline phase; PN = peer network intervention phase; PN+M = peer network with aided AAC modeling intervention phase. —— not assessed (proximity and target words) or undiscernible (quality ratings)

[a] Numbers represent means (ranges) of frequency per 30 min session

[b] Numbers represent means (ranges) of percentage of observational time

[c] Numbers represent means (ranges) of unique core or activity-related words used by the focus student on the AAC device or modeled by peers

[d] Median observer rating

**Peer network intervention ("B").** The peer network was a social group involving a focus student and a small number of peers who met regularly during the chosen non-academic time to engage in a fun, shared activity. During the meetings, peer network members learned how to support positive interactions with their group member with a disability, and the facilitator provided regular guidance and feedback. Setting up the peer network involved (a) a collaborative planning meeting, (b) training for the facilitator, and (c) an initial orientation meeting. Formal peer network meetings were held approximately two times per week as allowed by school schedules, and students were also encouraged to interact outside of these meeting times. A member of the research team served as an intervention coach to provide support and feedback to planning teams and facilitators throughout the study.

*Planning meeting.* After establishing a stable pattern of baseline data for a focus student, the intervention coach met with the student's planning team (see *Planning Team Members*) to individualize the peer network intervention. Each meeting was held after school in an empty classroom or conference room; meetings ranged from 55 to 75 min ($M = 63$). Prior to the meeting, the coach asked each team member to gather information through observation and input from the student about activities for peer network meetings that were motivating to the student. The coach attended and facilitated the planning meeting by providing a folder of handouts, explaining each step, offering suggestions, encouraging team members to share input, and keeping everyone on-task. The coach took notes on a planning worksheet (see Appendix A) and shared typed copies with team members following the meeting.

Four main components comprised each planning meeting. First, the coach reviewed and explained the intervention goals to all team members. Second, team members worked together to identify an overarching theme to inform the planning of activities for peer network meetings.

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They did this by brainstorming and listing ideas of activities, materials, or topics that were motivating to the student, might be engaging for same-age peers, and were feasible to do in the intervention setting. After discussing the different ideas, the team selected an overarching theme for the peer network, created a list of specific activities that fit within this theme, and recorded the needed materials (see Table 4). Third, teams identified target vocabulary words and corresponding symbols for the student's aided AAC device. The coach supported each team in selecting 10-20 target words, broken down by activity-related symbols and core symbols (see Table 4). Core symbols corresponded with high-frequency words that could be used across settings and contexts. The coach provided team members a list of sample core vocabulary and guided them in identifying words relevant to the chosen activities. Activity-related symbols corresponded with nouns, verbs, adjectives, and short phrases (i.e., "good job") associated with the chosen theme and/or specific activities. To be selected, target vocabulary words had to be able to be used by peers and the student during the chosen activities and not currently be the target of other instruction for the student. If the student independently said the word with intelligible speech, used a corresponding symbol on the aided AAC device, or used a corresponding ASL sign, teams considered it to be in the student's expressive repertoire and did not choose it as a target word.

Teams listed all symbols for the aided AAC device, including the target symbols as well as other relevant symbols. They also discussed how symbols would be organized and displayed on the device and determined which team member would be responsible for making these changes. For all four students, the SLP volunteered to make the changes. Fourth, teams identified which peers they would invite to be a part of the peer network. An observer assessed implementation fidelity for the planning meeting by completing an adherence checklist (see

Appendix B). Each team completed 100% of the steps comprising the four main components of

the planning meeting (i.e., 100% across teams and steps).

Table 4. *Themes, Activities, and Target Vocabulary Selected for Peer Network Meetings*

| Focus student (*Theme*) | Activities | Core vocabulary | Activity-related vocabulary |
|---|---|---|---|
| Sara (*Animals*) | Animal tangrams | Help | Animal |
| | Play-doh animals | Turn | Puzzle |
| | Books | You | Food |
| | Animal crafts | That | Fun |
| | Animal dominos | Finished | Walk |
| | | Like | |
| | | What | |
| | | Go | |
| | | Not | |
| | | Make | |
| Grace (*Fashion*) | Paper dolls | You | Paint |
| | Making jewelry | That | Leggings |
| | Painting nails | Make | Hair |
| | Fashion stickers | She | Bow |
| | Books and magazines | Is | Magazines |
| | | Can | Jewelry |
| | | Do | Stickers |
| | | Not | Outfit |
| | | Off | Girl |
| | | On | Ribbon |
| Jeremy (*Outer space*) | Planet memory game | More | Planet |
| | Space station set | Want | Moon |
| | Magnetic planets | Need | Star |
| | Books | I | Puzzle |
| | Solar system model | You | Rocket |
| | Space puzzle | Turn | Sun |
| | | Finished | Astronaut |
| | | Like | Solar system |
| | | This | Fun |
| | | Go | |
| Joanna (*Board games*) | Jenga | Same | Scared |
| | Matching game | Different | Game |
| | Kerplunk | Play | Match |
| | Chickyboom | Look | Loud |
| | Go Fish | Like | Fall down |
| | Uno | Top | My turn |
| | | Out | Your turn |
| | | On | Good job |
| | | Again | Happy |
| | | No | Fun |

***Training for adult facilitators.*** Each facilitator met individually with the intervention coach to learn about their roles in facilitating the peer network. Using a binder of materials, the coach (a) reviewed the rationale for the peer network intervention, (b) reviewed team decisions regarding the planning for the peer network, (c) explained how to recruit peers, (d) explained the components of the initial orientation and the responsibilities of the facilitator in leading this meeting, (e) discussed and modeled social facilitation strategies to support interactions (e.g., finding a role in the activity for all students, prompting interaction, reinforcing interaction, sharing information), and (f) answered any questions. The total length of training for a facilitator ranged from 55 to 80 min ($M = 69$) and occurred during one or two sessions held in an empty room before school, after school, or across a few of the facilitator's lunch breaks. An observer assessed implementation fidelity for the facilitator training by completing an adherence checklist (see Appendix B). The intervention coach completed 100% of the steps of the training with each paraprofessional (i.e., 100% across participants and steps).

***Orientation for students.*** Each facilitator led an orientation meeting for peers and the focus student during the first peer network meeting. Meetings lasted 25-30 min ($M = 29$). The goals were for students to discuss the goals for the peer network, learn simple strategies to support positive interactions, and practice using these strategies while having fun during a shared activity. During the first half of the orientation, facilitators: (a) encouraged everyone to share about themselves, (b) discussed rationale for the peer network, (c) shared information about the student's aided AAC device, (d) explained the procedures of the network (e.g., information about the chosen theme, possible activities, schedule of meetings, when peers should ask for assistance, and how to talk about the network with their other friends), and (e) answered questions. When sharing information about the AAC device, facilitators supported the student with the disability

in showing the peers the words and symbols and letting each peer have a turn to look at it.

During the second half of the orientation, facilitators used oral description, examples, modeling, and opportunities for practice with feedback to teach peers three interaction strategies. Facilitators also introduced a visual cue card that used text and graphic symbols to display the three strategies (see Appendix C). The first strategy was to "ask each other questions." Facilitators explained a goal was to get everyone in the group talking and having fun, and they could do this by asking questions. Facilitators encouraged peers to ask open-ended questions such as "what" or "who" questions and explained how to modify a question by providing two or three choices if a group member was unable to answer the open-ended question. The second strategy was to "slow down and give everyone a turn to talk." Facilitators encouraged peers use expectant delay (i.e., waiting and looking at their group member to give them time to take a turn to communicate). Third, facilitators taught students to "encourage one another" by using positive language and praise. After introducing the strategies, the facilitator provided students opportunity to practice while engaging in a fun, shared activity. During the activity, the facilitator provided prompting, feedback, and social praise related to peers' use of the strategies. The intervention coach used an adherence checklist (see Appendix B) to assess implementation fidelity of the peer orientation. Facilitators completed 100% of the steps of the orientation meeting with each peer network (i.e., 100% across participants and steps).

***Regular network meetings.*** Following the orientation, peer network meetings occurred approximately two times per week. During each meeting, the focus student and peers participated in one of the chosen shared activities. At the beginning of each meeting, facilitators provided materials for and introduced the activity. They encouraged students to use the three interaction strategies by displaying the visual cue card, providing prompting and reminders, and

offering social praise. Facilitators also supported interactions using other facilitation strategies they learned during their training (see *Procedural Fidelity* for information about facilitation strategies). As peers and the focus student become more comfortable in their interactions, the coach encouraged facilitators to fade back their direct involvement and support.

The intervention coach supported each facilitator throughout the duration of the study. During the first two peer network meetings, the coach attended to observe and provide support by encouraging facilitators to use the facilitation strategies and modeling how to do so. After each meeting attended by the coach, the coach met briefly with the facilitator to talk about what went well, provide feedback, address concerns, and answer any questions. Following these two sessions, the coach only attended meetings to observe and provide coaching when requested by a facilitator, when fidelity dropped below 80%, or when the same item on the fidelity checklist was not implemented for two consecutive sessions (see *Procedural Fidelity*). On an ongoing basis, the coach checked-in with each facilitator approximately once per week to ask how things were going, address any concerns, and answer any questions.

**Peer network with peer-implemented aided AAC modeling ("BC").** The second intervention phase embedded peer-implemented aided AAC modeling into the peer network meetings. The intervention coach led the peer instructional program to teach peers to provide augmented input with the aided AAC device. Peers were not taught to model symbols with the goal of directly prompting their group member with a disability, but rather to use the graphic symbols on the SGD or in the communication book during their ongoing, natural interactions. The coach gave peers three examples of ways to model the aided AAC device: (a) "Tell about me and what I am doing" (i.e., use the aided AAC device to talk about themselves, answer a question, or talk about something they are doing during the activity); (b) "Tell about/ask my

friend" (i.e., use the aided AAC device to talk about what the focus student is doing or looking, or to ask the focus student a question); and (c) "Respond to what my friend says" (i.e., use the aided AAC device to respond to the focus student's communication through aided imitations, expansions, and extensions). The goal for providing these examples was to show peers different ways to provide aided AAC models so the linguistic information they model (i.e., the symbol and its referent) could be salient for the focus student.

Although the intervention coach led the instructional program, the facilitator was present and participated by encouraging peers, asking questions, and modeling examples. The instructional program consisted of (a) an initial training session and (b) prompting, feedback, and reinforcement from the coach for a minimum of two additional peer network sessions. The initial training session took place during lunch or recess on a day a peer network meeting was not taking place. Focus students did not attend the training, which ranged from 22 to 30 min ($M =$ 28). During the first few minutes of the training, the coach provided rationale for peers to use the AAC device and showed peers the symbols, emphasizing which were target symbols. The coach explained that peers could model a symbol immediately before or at the same time they said the word when interacting with the focus student. The coach also explained they did not have to use a symbol on the device for all of the words they say, but they should try to use the device often. In the later part of the training, the coach gave peers a written handout with the three different ways to use the aided AAC device (see Appendix D). The coach explained each one at a time while modeling examples. Then, the peers practiced providing aided AAC models while the coach provided prompting, feedback, and social praise. Before ending the training, the coach asked peers to verbally recall the rationale for why they should model the AAC device and the three different ways to provide models. The coach also answered any of their questions. An

observer used an adherence checklist to assess implementation fidelity of the peer training (see Appendix E). The coach completed 100% of the steps with each group of peers (i.e., 100% across participants and steps).

The coach also attended the two peer network meetings immediately following the training to support peers as they began proving aided AAC models. At the start of each network meeting, the coach reminded peers to use the AAC device, ensured the focus student knew the peers would be using the device as well, and helped students think about how to position the SGD or communication book so it was accessible and visible to all. The coach provided prompting, feedback, and social praise for peers to use each of the three different ways to model aided AAC. During the second network meeting, the coach faded this support and checked-in with peers at the end to answer any questions and tell peers they should continue to use the communication book or SGD in other peer network meetings. The coach reintroduced support for peers if they did not provide models at a rate of 10 per 30 min during the preceding network meeting. An observer used an adherence checklist and rating scale (see Appendix E) to assess implementation fidelity of the coaching for peers. The coach completed both steps for the first coaching session (i.e., explained to the focus student that peers would also be using the AAC device and provided peers prompting, feedback, and reinforcement) for all four peer networks (i.e., 100% across participants and steps). The coach completed all three steps for the second session (i.e., explained that peers would be using the AAC device; provided peers prompting, feedback, and reinforcement; and checked-in with peers at the end of the session) for all four peer networks (i.e., 100% across participants and steps). Observers rated the coach as providing the following levels of support for each peer network across the two sessions: Sara (moderate), Grace (high-moderate), Jeremy (moderate-low), and Joanna (moderate-low).

**Generalization probes.** We assessed the extent to which any increases in overall interaction to peers and use of symbolic communication generalized across partners and settings in non-structured contexts. Generalization probes were conducted two to four times before the baseline phase and after the second intervention phase across each of a student's non-academic school settings. For Sara, Grace, and Joanna, probes took place during lunch and outdoor recess. For Jeremy, probes took place during lunch, indoor recess, and outdoor recess. During generalization probes, peer network meetings did not take place and no instructions were given to students, peers, or adults supporting the students. Peer network members and other peers were present in these settings but were not required to be in proximity to the focus student.

## Observational Data Collection

For each focus student, observations took place in the chosen setting (i.e., lunch for Sara, Grace, and Joanna and indoor recess for Jeremy) two to three times per week during the baseline phase and during each network meeting in both intervention phases. During each observation, observers sat or stood quietly where they could see and hear the focus student, peers, and AAC device. They avoided interactions with students, peers, and adults and used strategies to avoid attracting unnecessary attention to the focus student or themselves (e.g., periodically shifting gaze, scanning the entire setting). Observers collected frequency and durational data about behaviors of interest using live, timed-event behavior sampling with a tablet computer equipped with MOOSES. Additionally, observers recorded descriptive information on secondary variables using pencil-and-paper data collection sheets. Observations lasted the entire duration of lunch or recess for each student, and observers followed operationally defined start and stop rules (e.g., start when the student sits down at the lunchroom table) to ensure consistency across phases. The majority of observations were 30 min ($M = 28$ min, range 18-30 min). We converted frequency

counts to rates per 30 min and durational measures to percentages of time. Measures were adapted from an earlier study (i.e., Biggs, Carter, & Gustafson, 2017). A coding manual with complete operational definitions, examples, and non-examples is in Appendix F.

**Focus student interaction with peers.** Observers recorded the frequency of a student's interaction with peers, defined as (a) verbal or nonverbal communicative acts using any type or combination of communication modes (e.g., speech, aided AAC, gestures, vocalizations, signs) (b) directed to one or more peer(s) that (c) had evidence of a purpose and/or awaited a response. Observers looked for behavioral indicators a student directed a communicative act to peers. For non-symbolic communication (e.g., a gesture), this required coordinated attention between the referent and the partner. For symbolic communication (e.g., speech or aided AAC use), this included the student: looking at a peer before, during, or after the behavior; gaining the peers' attention; showing signs of expecting the peer to respond; persisting with the message and ceasing when a peer responded; or responding directly to a peers' preceding interaction. Interactions with adults were not coded. Although the measurement system was designed to code interactions directed to peers with severe disabilities separately from peers without severe disabilities, students did not interact with other peers with severe disabilities because they were not typically nearby. Verbal and nonverbal behaviors without a clear communicative purpose (e.g., echolalia and scripted speech, repetitive motor movements, non-interactive aided AAC use) were not coded. A separate communicative act was coded each time a student interacted with a peer and (a) more than 5 s passed without any interaction, (b) a communicative turn was taken by a peer, or (c) the student directed the communicative act to a new peer.

Each communicative act to a peer was coded as either *symbolic* or *non-symbolic*. Symbolic acts contained one or more of the following types of symbols in the message:

intelligible verbal words, graphic symbols on the aided AAC device, or conventional signs from American Sign Language (ASL). Non-symbolic acts were comprised of non-word vocalizations, unintelligible speech approximations, or gestures. Each symbolic or non-symbolic communicative act was also further designated as being *prompted*, *imitated,* or *independent.* Prompted acts were responses to peer or adult behaviors used to elicit a specific communicative response, such as telling the student to communicate (e.g., "tell Sam hello") or pointing to a symbol on the aided AAC device. Communicative acts were imitated if the student copied some or all of the immediately preceding interaction within 5 s, without adding anything to it. Communicative acts that were imitations of a prompt were coded as prompted and not imitated. To be coded as independent, communicative acts could not be prompted or imitated. This included if a student imitated a peer's preceding interaction but also added new words or changed communication modes.

**Peer interactions and aided AAC models.** Observers recorded the frequency of peers' communicative interactions with the focus student (i.e., peer verbal or nonverbal behaviors directed to the focus student that had evidence of a purpose and/or await a response). Each separate peer interaction to student was coded, separated by the following rules: (a) more than 5 s passed without any interaction, (b) a communicative turn was taken by the focus student, or (c) a new peer communicated with the focus student. Observers also recorded the frequency of peer aided AAC models. A model was defined as a peer using a graphic symbol on the AAC device to communicate part or all of their message within a peer interaction. A separate aided AAC model was coded for each different symbol used by the peer if (a) more than 5 s passed between instances when the same symbol was modeled or (b) the model occurred within a new interaction.

**Proximity with focus student.** Observers recorded the proximity of the focus student to peer network members, other peers, adult support, and the aided AAC device using toggle switches on MOOSES to capture duration. Proximity to a peer or adult was defined as being oriented toward and close to a person (i.e., within 5 ft) in a way that promoted opportunity for interaction. Proximity to the AAC device was defined as the SGD or communication book being within an arm's reach of the focus student. If the device was not easily accessible (e.g., covered by materials, in a backpack, not working), it was coded as being out of proximity.

**Secondary descriptive measures.** Observers recorded information about several descriptive variables using a paper observation summary sheet (see Appendix G). First, observers marked students' use of three modes of symbolic communication (i.e., intelligible speech, aided AAC, ASL signs) and three modes of non-symbolic communication (i.e., unintelligible speech, vocalizations, gestures) using a rating scale of 0 = *not observed*, 1 = *sometimes observed*  (i.e., less than 5 communicative acts), and 2 = *often observed* (i.e., 5 or more communicative acts). Second, observers completed four ratings addressing the quality of focus students' interactions with peers: (a) relevance of student communication, (b) affect of the student and peers, (c) balance and reciprocity of interactions, (d) appropriateness of interaction, and (e) extent to which adult facilitation was required. Observers used a 3-point rating scale (i.e., *high*, *medium*, *low*) with operational definitions at each level, and they indicated a rating was *undiscernible* if two or fewer interactions occurred between the focus student and peers. Third, observers used a checklist of the student's core and activity-related target symbols to indicate each unique symbol, at any point during an observation session, which was (a) used by the student in a communicative act to a peer or (b) used by the peer in an aided AAC model.

**Observer Training and Interobserver Agreement**

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Four special education graduate students served as observers. Prior to the start of the study, observers participated in three training sessions totaling 7.5 hr addressing the observational data collection manual (i.e., operational definitions, examples, and non-examples for all variables, see Appendix F). During the trainings, observers became acquainted with the computer-based recording system (i.e., MOOSES), discussed modeled examples, and participated in guided practice using verbal/written scenarios and video clips. Between training sessions, observers reviewed the manual, practiced with the computer-based recording system, and met individually with the primary investigator to address questions. Before collecting experimental data, observers were required to meet the following criteria: 90% accuracy on a written test of coding definitions and examples, 90% agreement with a master code across primary variables when coding two videos (totaling approximately 25 min), and 90% agreement with an expert coder across all variables in two consecutive live practice coding sessions. During the course of the study, observers met regularly to discuss coding discrepancies and ensure consistency with the coding manual.

A second observer simultaneously but independently collected data in 33.1% of all observations, balanced across participants and phases. We calculated point-by-point occurrence agreement for time stamped, event-based student and peer behaviors using a 5-s window around the primary observer's coded data (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%). For time-stamped duration variables, we compared codes for each second and calculated overall agreement using the same formula. For secondary descriptive variables (i.e., communication modes, quality of interaction ratings, specific target words used and modeled), we compared individual responses, point-by-point, on the observation summary sheet. Table 5 displays mean IOA percentages for each variable, by participant. There

was little variability in mean IOA for variables across study phases.

Table 5. *Average Interobserver Agreement Percentages by Participant*

| Variable | Sara | Grace | Jeremy | Joanna | Overall |
|---|---|---|---|---|---|
| Communication to peers[a] | | | | | |
|   Independent symbolic | 85.3 | 83.3 | 83.1 | 94.4 | 86.5 |
|   Imitated symbolic | 100.0 | 79.2 | 88.8 | 97.0 | 91.2 |
|   Prompted symbolic | 91.7 | 100.0 | 100.0 | 100.0 | 97.9 |
|   Independent non-symbolic | 88.0 | 83.5 | 76.1 | 96.7 | 86.1 |
|   Imitated non-symbolic | 100.0 | 97.7 | 81.1 | 100.0 | 94.7 |
|   Prompted non-symbolic | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Peer behaviors[a] | | | | | |
|   Peer interaction | 84.6 | 82.4 | 78.5 | 84.9 | 82.6 |
|   Aided AAC models | 90.4 | 86.4 | 85.6 | 98.9 | 90.3 |
| Proximity[b] | | | | | |
|   To peer network members | 97.3 | 97.6 | 98.5 | 100.0 | 98.4 |
|   To other peers | 97.0 | 99.6 | 96.8 | 95.4 | 97.2 |
|   To adult support | 84.1 | 97.3 | 90.8 | 98.5 | 92.7 |
|   To aided AAC | 98.1 | 96.2 | 93.0 | 99.3 | 96.7 |
| Communication modes[c] | | | | | |
|   Speech | 87.5 | 71.4 | 85.7 | 100.0 | 86.2 |
|   Aided AAC | 100.0 | 85.7 | 100.0 | 100.0 | 96.4 |
|   ASL | 87.5 | 100.0 | 100.0 | 100.0 | 96.9 |
|   Gestures | 87.5 | 85.7 | 71.4 | 100.0 | 86.2 |
|   Non-word vocalizations | 100.0 | 100.0 | 71.4 | 100.0 | 92.9 |
|   Unintelligible speech | 87.5 | 85.7 | 100.0 | 100.0 | 93.3 |
| Interaction ratings[c] | | | | | |
|   Relevance of communication | 87.5 | 85.7 | 71.4 | 88.9 | 86.2 |
|   Positive affect | 100.0 | 100.0 | 71.4 | 100.0 | 92.9 |
|   Balance and reciprocity | 62.5 | 85.7 | 85.7 | 100.0 | 83.5 |
|   Appropriateness | 100.0 | 71.4 | 71.4 | 88.9 | 85.7 |
|   Facilitation required | 100.0 | 100.0 | 71.4 | 100.0 | 92.9 |
| Target words and symbols[c] | | | | | |
|   Student core | 96.7 | 100.0 | 90.0 | 100.0 | 96.7 |
|   Peer modeled core | 95.0 | 100.0 | 90.0 | 100.0 | 96.3 |
|   Student activity-related | 96.7 | 100.0 | 77.8 | 95.0 | 92.4 |
|   Peer modeled activity-related | 93.3 | 100.0 | 77.8 | 100.0 | 92.8 |

[a] Point-by-point occurrence agreement (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%) using a 5-s window around the primary observer's coded data

[b] Point-by-point overall agreement (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%) comparing codes for each second

[c] Point-by-point overall agreement (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%) comparing individual responses on the summary sheet

**Procedural Fidelity**

Observers assessed fidelity of core intervention components during all sessions using a pencil-paper fidelity sheet (see Appendix H). The percentages of occurrence of each of the 11 items on the fidelity checklist during each intervention phase are displayed in Table 6. Across participants and intervention phases, session fidelity averaged 96.1%. By participant, average fidelity for each intervention phase was as follows: Sara (95.7%, 97.0%), Grace (92.9%, 89.6%), Jeremy (96.3%, 97.7%), and Joanna (98.6%, 98.7%).

Observers assessed peers' use of the three interactions strategies (i.e., open-ended questions, expectant delay, encouragement/praise) and three ways to model aided AAC (i.e., "tell about me", "tell about/ask my friend," and "respond to what my friend says") using a rating scale of 0 = *not observed*, 1 = *sometimes observed (*i.e., less than 5 instances), and 2 = *often observed* (i.e., 5 or more instances). Average ratings for each intervention phase across participants are displayed in Table 6. To characterize peers' use of the interaction strategies across experimental phases, we calculated the percentage of sessions peers used each during each phase. Averaged across participants, peers asked open-ended questions in 19.9% of baseline phase observations (range by participant, 0.0%-42.9%) and 100% of sessions during both intervention phases; peers used expectant delay in 0.0% of baseline phase observations, 96.4% of sessions during the first intervention phase (range, 85.7%-100%), and 100% of sessions during the second intervention phase; peers gave encouragement or praise in 9.6% of baseline phase observations (range, 0.0%-28.6%), 96.9% of sessions during the first intervention phase (range, 87.5%-100%), and 96.4% of sessions during the second intervention phase (range, 85.7%-100.0%).

Table 6. *Summary of Intervention Fidelity by Participant and Intervention Phase*

| Fidelity item | Sara | | Grace | | Jeremy | | Joanna | |
|---|---|---|---|---|---|---|---|---|
| | PN | PN+M | PN | PN+M | PN | PN+M | PN | PN+M |
| **Fidelity checklist[a]** | | | | | | | | |
| The focus student was present for the entire session | 85.7 | 88.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| The AAC device was present, working, and in proximity for the majority of the session | 100.0 | 100.0 | 100.0 | 100.0 | 87.5 | 100.0 | 100.0 | 100.0 |
| A shared activity was planned with materials provided | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Peers participated in the shared activity appropriately | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| The student participated in the shared activity appropriately | 100.0 | 100.0 | 100.0 | 85.7 | 87.5 | 100.0 | 100.0 | 100.0 |
| The facilitator was present during the session | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| The facilitator encouraged interactions | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 85.7 | 100.0 |
| The facilitator displayed the visual cue card and/or reminded students to use interaction strategies | 100.0 | 100.0 | 87.5 | 100.0 | 100.0 | 87.5 | 100.0 | 100.0 |
| Peers engaged with the focus student as often as each other | 85.7 | 88.9 | 57.1 | 57.1 | 100.0 | 100.0 | 100.0 | 100.0 |
| Peers used each of the three interaction strategies | 100.0 | 100.0 | 87.5 | 85.7 | 87.5 | 100.0 | 100.0 | 100.0 |
| Peers modeled symbols on the AAC device at least 10 times per 30 minutes | – | 88.9 | – | 57.1 | – | 87.5 | (14.3) | 85.7 |
| **Interaction strategies[b]** | | | | | | | | |
| Ask open-ended questions | 2.0 | 1.9 | 1.5 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 |
| Use expectant delay | 2.0 | 1.9 | 1.3 | 1.7 | 1.6 | 1.9 | 1.9 | 2.0 |
| Provide encouragement or praise | 1.6 | 1.4 | 1.4 | 1.3 | 1.3 | 1.9 | 1.7 | 1.7 |
| **Aided AAC modeling strategies[b]** | | | | | | | | |
| "Tell about me" | – | 1.6 | (0.1) | 1.7 | – | 1.1 | (1.0) | 1.3 |
| "Tell about/ask my friend" | (0.1) | 1.6 | – | 0.9 | – | 1.3 | (0.7) | 1.9 |
| "Respond to what my friend says" | – | 0.4 | – | 0.4 | – | 0.4 | – | 0.6 |

*Note.* PN = peer network intervention phase; PN+M = peer network with aided AAC modeling intervention phase. – = not observed. Numbers in parentheses ( ) indicate implementation was not intended during the respective intervention phase

[a] Numbers reflect the percentage of sessions fidelity item was observed in the respective intervention phase

[b] Numbers reflect the average observed occurrence using the following scale: 0 = *not observed*, 1 = *sometimes observed* (i.e., < 5 instances), 2 = *frequently observed* (i.e., 5 or more instances)

Observers also marked each of nine social facilitation strategies used by each paraprofessional at any point during an observation in each phase. During the baseline phase, paraprofessionals never (for Joanna) or rarely (for Sara, Grace, and Jeremy) facilitated interaction with peers; on average, paraprofessionals used fewer than one strategy per observation session. Sara and Grace's paraprofessionals each provided peers information to support interaction in one or two observations (20.0% of observations). Jeremy's paraprofessional used the following facilitation strategies in at least one observation (range, 7.1%-28.6% of observations): prompting the student to interact with peers, prompting peers to interact with the student, praising the student's interaction with peers, praising the peers' interactions with the student, and providing peers information to support interaction. During each intervention phase, paraprofessionals used an average of five different facilitation strategies per session. The strategies used by paraprofessionals in more than half of intervention sessions were: prompting peers to interact with the student (86.6% of sessions), finding a role in the activity for all students (77.6%), prompting peers to use one of the interaction strategies (62.6%), encouraging social interaction within the group (62.3%), and giving information to support interaction (57.5%).

Inter-observer agreement for procedural fidelity variables was collected during the same sessions as agreement for primary variables and calculated point-by-point (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%). Average overall IOA across fidelity checklist items was 95.8% (range by participant, 87.8%-100.0%), ratings of peer interaction strategies was 89.0% (range, 79.2%-100.0%), ratings of peer aided AAC modeling strategies was 93.4% (range, 86.5%-100.0%), and adult facilitation behaviors was 95.4% (range, 89.6%-100.0%).

**Peer Interaction Ratings and End of Study Social Validity**

During the course of the study (i.e., once at the end of each of the two intervention phases), peers completed an interaction rating sheet addressing how they perceived interactions with their group member with a disability (see Appendix I). The rating sheet included five items for peers to respond to on a 4-point, Likert-type scale (i.e., *not really, sometimes, most of the time, all of the time*).

Additionally, we assessed social validity by asking peer partners, focus students, and facilitators to share their views using questionnaires at the end of the study. For focus students, a paraprofessional or special educator read the questions aloud and recorded the student's answers (i.e., gestures, aided AAC, or speech) as either yes, no, I don't know, or unclear (i.e., the student did not clearly communicate a response; see Appendix J). Peers responded to questions using a 5-point, Likert-type scale (i.e., 1 = *strongly disagree,* 2 = *disagree,* 3 = *neutral,* 4 = *agree,* 5 = *strongly agree*) and completed open-ended questions about their experience either in a brief interview or on the written questionnaire (see Appendix K). Facilitators responded to questions using the same 5-point scale and answered open-ended questions on the written questionnaire (see Appendix L).

CHAPTER III

RESULTS

The primary focus student variables of interest were the frequency of: (a) all interaction with peers and (b) non-prompted, symbolic communicative acts to peers. All interaction with peers comprised the total sum of communicative acts to peers across the two types (i.e., symbolic and non-symbolic) and three levels of independence (i.e., prompted, imitated, independent). Non-prompted, symbolic communicative acts comprised symbolic acts that were independent or imitated, but not prompted. Table 3 displays descriptive information for primary and secondary variables across participants and study phases.

**Did the Peer Network Intervention Increase Overall Interactions with Peers?**

Figure 1 displays the frequency per 30 min of overall student interactions with peers and peer interactions with the focus student. There was evidence of a functional relation between the peer network intervention and increased interaction with peers. Across all focus students, data trends were stable with a flat trend in baseline, with two primary patterns related to level. Sara and Joanna almost never interacted with peers at lunch, and their peers rarely interacted with them. For both students, the mean number of interactions with peers during the baseline phase was less than one per 30 min (range, 0-2; see Table 3). Compared to Sara and Joanna, Grace and Jeremy interacted more with their peers during the baseline phase at lunch (Grace) and indoor recess (Jeremy), and their peers interacted more with them. Grace's mean number of interactions during the baseline phase was four per 30 min (range, 0-8), and Jeremy's was 12 (range, 0-26).

The introduction of the peer network intervention corresponded to increases in student interaction with peers, as well as reciprocal peer interaction with the student. Sara's interactions showed an immediate increase in level with an increasing trend and no overlapping data points

with the baseline phase. Her mean number of interactions increased to 18 per 30 min (range, 6-30). Grace showed a more modest change in level and trend with data points from two sessions overlapping with the baseline phase (28.5%). Her mean number of interactions increased to 13 per 30 min (range, 6-24). Jeremy showed a steep increasing trend with variability; three data points overlapped with the baseline phase (37.5%). His mean number of interactions increased to 31 per 30 min (range, 9-59). Joanna showed an immediate and substantial level change with a decrease in the second session followed by an increasing trend. There were no overlapping data points with the baseline phase, and her mean number of interactions increased to 28 per 30 min (range, 13-38).

There was not evidence of a functional relation between the peer network intervention and increased non-prompted, symbolic communication to peers. Only Joanna showed an increased level of non-prompted, symbolic communication to peers. For the other three students, increases in overall interaction with peers were marked by increases primarily in independent non-symbolic communication (i.e., gestures, non-word vocalizations, unintelligible speech), and a small proportion of their overall communication was symbolic (see Table 3).
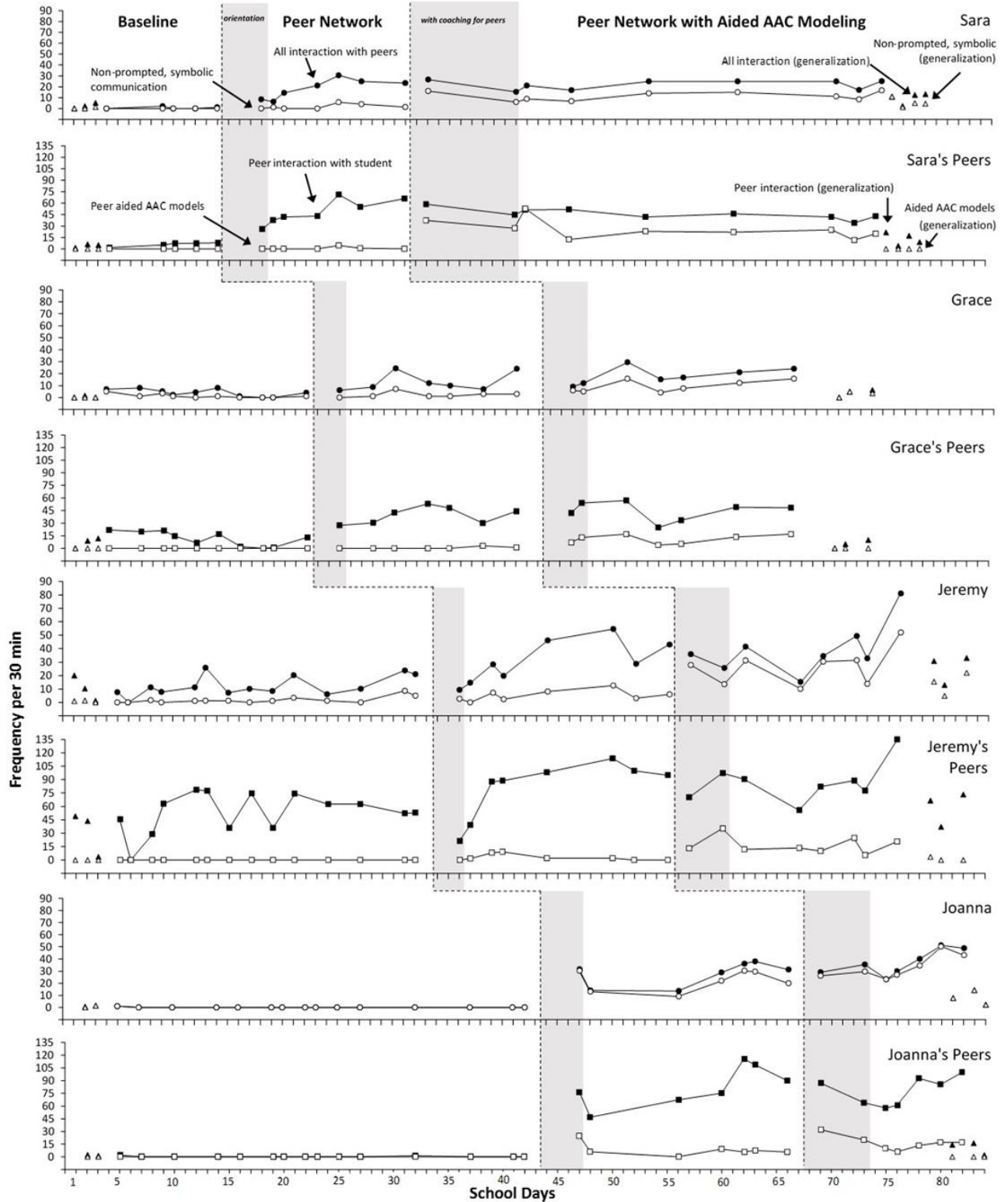
Figure 1. *Frequency of all interaction with peers (filled circles), non-prompted, symbolic communicative acts to peers (open circles), peer interaction (filled squares), and peer aided AAC models (open squares) across study phases.*

**Was the Peer Instructional Program Effective for Teaching Peers to Provide Aided AAC Models?**

Figure 1 displays the frequency per 30 min of peer aided AAC models across study phases. During the baseline phase, peers never modeled symbols on the aided AAC device. During the initial orientation at the start of the first intervention phase, each facilitator introduced peers to the AAC device; however, peers were not told or shown how to model symbols on the device. Peer aided AAC models remained at a low level and stable during the first intervention phase for peers interacting with Sara, Grace, and Jeremy. Mean numbers of peer models during the first intervention phase were less than one per 30 min for Sara and Grace (range, 0-4) and three for Jeremy (range, 0-9). During the few sessions when peers did model graphic symbols, they almost never (with Sara and Grace) or never (with Jeremy) used the symbols within natural interactions as augmented input (see Table 6 for observer ratings). Instead, peers used models to prompt the focus student to use the AAC device. For example, one of Sara's peers said, "*Say animal"* while pressing *ANIMAL* on the SGD. Table 3 displays information about the frequency of prompted symbolic communication. Unlike the peers interacting with the other focus students, Joanna's peers did provided aided AAC models as augmented input throughout the first intervention phase. Peers modeled symbols 25 times per 30 min during the orientation meeting, with a decrease in the second peer network meeting followed by a flat trend with little variability, consistently providing 6-9 aided AAC models per 30 min throughout the first intervention phase (i.e., with the exception of only one session).

The introduction of the peer partner instructional program corresponded with immediate increases in the level of peer aided AAC models as augmented input for peers interacting with Sara, Grace, and Jeremy. Mean numbers of peer aided AAC models increased to 26 per 30 min

for Sara (range, 12-53), 10 for Grace (range, 4-17), and 17 for Jeremy (range, 5-35). There was no overlap in data points with the first intervention phase for Grace and Sara, and one data point (12.5%) overlapped for Jeremy. For Joanna's peers, there was an immediate increase in the number of aided AAC models when peers received coaching, followed by a lower level with stability when coaching ceased. Due to the high level of peer aided AAC models before they received instruction, nearly all (85.7%) data points from the second intervention phase overlapped with the first. Peers interacting with all four students frequently used "tell about me" and "tell about/ask about my friend" models (i.e., 93.3% and 92.9% of sessions respectively), but less frequently used models to "respond to what my friend says" (45.5% of sessions). Table 6 displays information about observer ratings for peers' use of each type.

Peers in all four networks received support from the intervention coach and facilitator beyond the single training and two coaching sessions, which precluded the determination of whether the peer instructional program as it was designed would have been sufficient. Although the paraprofessionals serving as intervention facilitators were not instructed to do so, they regularly encouraged peers to use the aided AAC devices by modeling symbols on the device themselves, giving verbal prompts, and offering praise when peers provided aided AAC models. Support from the facilitator for peers to provide aided AAC models occurred in 100% of sessions in the second intervention phase for Sara ($n = 9$), 71.4% of sessions for Grace ($n = 5$), 87.5% of sessions for Jeremy ($n = 7$), and 42.9% of sessions for Joanna ($n = 3$). In addition, the intervention coach reintroduced support for peers one time for each peer network when peers provided aided AAC models fewer than 10 times per 30 min during the preceding network meeting.

**Did Embedding Peer-Implemented Aided AAC Modeling Increase Students' Non-Prompted, Symbolic Communicative Acts to Peers?**

There was evidence of a functional relation between the addition of peer-implemented aided AAC modeling and increased non-prompted, symbolic communication to peers (see Figure 1). Sara, Grace, and Jeremy had low levels of non-prompted, symbolic communication with flat trends and little variability during the first intervention phase. Sara's mean number was two per 30 min (range, 0-6), Grace's was 13 (range, 6-24), and Jeremy's was five (range, 0-13). Joanna's peers provided aided AAC models as augmented input during the first intervention phase, which interfered with having systematic control of the introduction of the added component to the peer network. Her non-prompted, symbolic communication was at a high level with a flat trend and little variability during the first intervention phase, with a mean number of 22 communicative acts per 30 min.

Sara, Grace, and Jeremy demonstrated increases in levels of non-prompted, symbolic communication when peers began using aided AAC modeling, with the change being more modest for Grace than for Sara and Jeremy. Sara's mean number of non-prompted, symbolic communicative acts increased to 11 per 30 min during the second intervention phase (range, 6-17), with no data points overlapping with the first intervention phase. Grace's increased to 17 per 30 min (range, 9-30), with three data points overlapping with the first intervention phase (42.9%). Jeremy's increased to 26 per 30 min (range, 10-52) with one data point overlapping with the first intervention phase (12.5%). Students' overall interaction with peers during the network meetings did not increase; instead, there were substantial changes in the proportion of their overall interaction that was non-prompted and symbolic (see Table 3). Across the two intervention phases, changes in the percentage of students' overall interaction that was non-

prompted and symbolic was from 10% to 52% for Sara, 18% to 52% for Grace, and 18% to 64% for Jeremy. The majority of non-prompted, symbolic communication was independent for all three students, but Grace had more imitated communicative acts than the other two students (see Table 3). The majority of Joanna's interactions with peers were non-prompted, symbolic communicative acts during the first intervention phase and there was no meaningful change during the second intervention phase.

**Peer Modeling and Student Use of Target Symbols**

Table 3 displays the average number of different core and activity-related target symbols that were modeled by peers and used by students. On average, Joanna's peers modeled the greatest number of different target symbols per session ($n = 8$), followed by Jeremy's peers ($n = 6$), Sara's peers ($n = 5$), and Grace's peers ($n = 3$). Figure 2 displays the percentage of sessions during the second intervention phase each target symbol was used and modeled. In general, activity-related symbols were modeled and used more than core symbols. Sara's peers modeled 13 of her 15 target symbols, which included five activity-related (100%) and eight core (80%). Sara used 10 of these in at least one session, which included five activity-related and five core symbols. Grace's peers modeled nine of her 20 target symbols, which included five activity-related (50%) and four core (40%). Grace used four of these, all of which were activity-related. Jeremy's peers modeled 17 of his 19 target symbols, which included nine activity-related (100%) and eight core (80%). Jeremy used 13 of these, which included eight activity-related and five core symbols. Joanna's peers modeled 17 of her 20 target symbols, which included nine activity-related (90%) and eight core (80%). Joanna used eight of these, which included four activity-related and four core symbols.
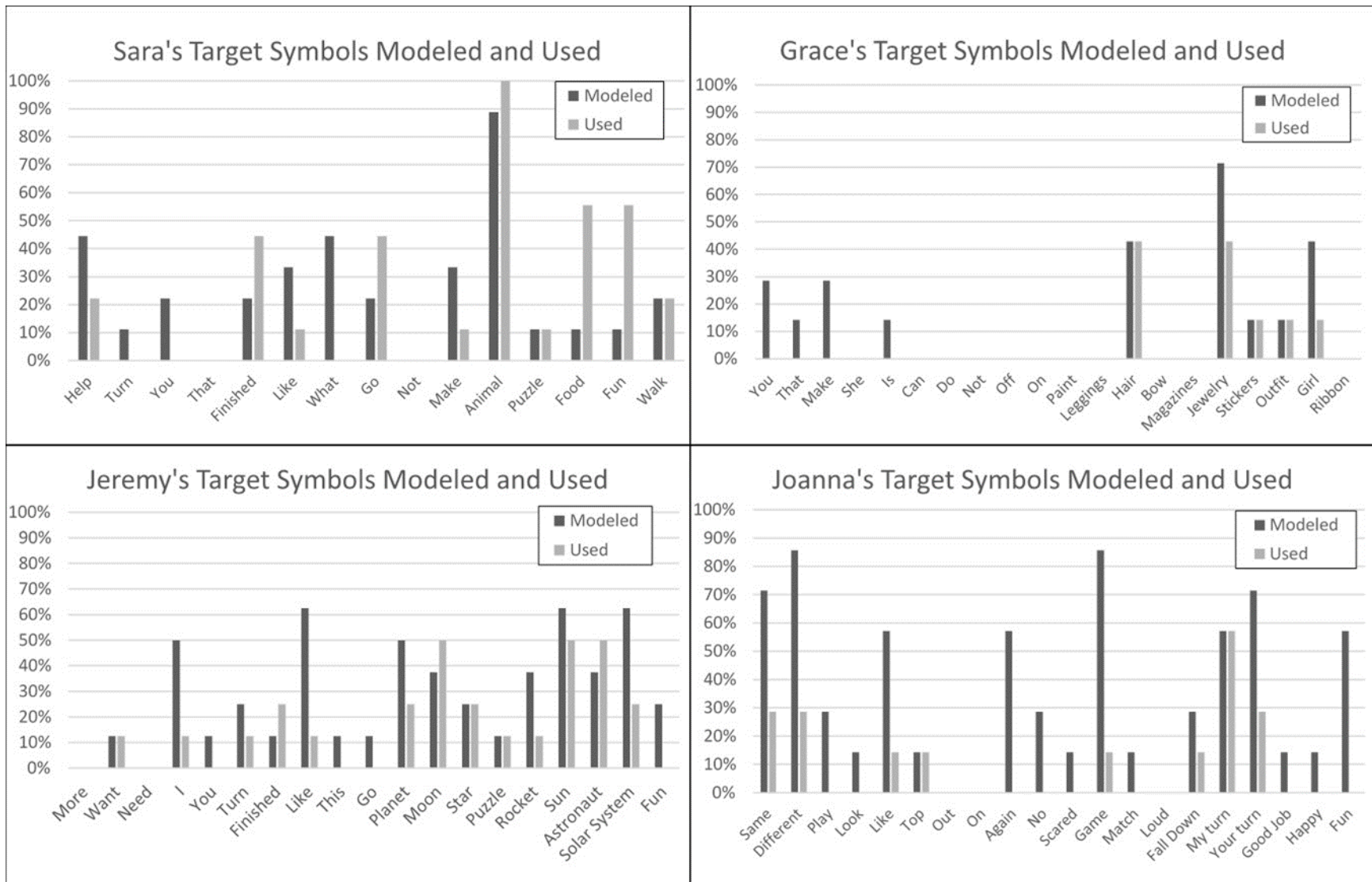
Figure 2. *Percentage of Sessions During the Second Intervention Phase Each Target Symbol was Modeled by Peers and Used by the Focus Students*

**Quality of Interaction Ratings by Observers and Peers**

Table 3 displays observer ratings of five aspects of the quality of interactions across participants and study phases. Ratings for the relevance of student communication were low or undiscernible (i.e., too few interactions for observers to complete a rating) in the baseline phase and improved in both intervention phases, although ratings for the relevance of Sara's interactions were lower than the other participants. Affect ratings were medium to high in the baseline phase and either improved or remained high throughout both intervention phases. Ratings for balance/reciprocity and appropriateness were low or undiscernible for all students in the baseline phase. During the two intervention phases, observers rated interactions as low to medium for balance/reciprocity and medium to high for appropriateness. The amount of facilitation required either stayed comparable (Sara, Grace, Joanna) or decreased (Jeremy) over the duration of both intervention phases. Observers rated interactions for Jeremy and Joanna as requiring less facilitation than Sara and Grace.

Table 7 displays information about how peers perceived their interactions with their group member with a disability at the end of each intervention phase. All peers rated their interactions as enjoyable in both phases. Ratings addressing how well (a) peers could understand the focus student, (b) the focus student could understand peers, and (c) the focus student's interactions were relevant were higher for Sara, Jeremy, and Joanna than for Grace across both intervention phases. Peers interacting with Sara, Jeremy, and Joanna generally indicated they felt it was easy to talk with their group member with a disability. Grace's peers indicated this was "*not really*" true during the first intervention phase and "*sometimes/most of the time*" true during the second intervention phase.

Table 7. *Descriptive Summary of Peers' Ratings of the Quality of Interactions across Intervention Phases and Participants*

| Interaction feedback items | Sara | | Grace | | Jeremy | | Joanna | |
|---|---|---|---|---|---|---|---|---|
| | PN | PN+M | PN | PN+M | PN | PN+M | PN | PN+M |
| I enjoy spending time and talking with [my peer] during the network meetings. | 4.0 | 4.0 | 3.8 | 3.8 | 4.0 | 4.0 | 3.7 | 4.0 |
| I can understand what [my peer] tells me. | 3.7 | 4.0 | 2.3 | 2.5 | 3.7 | 3.5 | 3.0 | 3.0 |
| I feel like [my peer] understands the things I say. | 3.0 | 4.0 | 2.8 | 2.5 | 3.3 | 3.0 | 3.7 | 3.0 |
| The things [my peer] says are related to the things we do or talk about during the network meetings. | 3.7 | 4.0 | 2.5 | 2.5 | 3.3 | 3.0 | 2.3 | 3.0 |
| I feel like it is easy to talk with [my peer] | 4.0 | 4.0 | 1.0 | 2.5 | 3.3 | 3.7 | 3.7 | 3.7 |

*Note.* Numbers reflect mean of responses on a 4-point scale: 1 = *not really,* 2 = *sometimes,* 3 = *most of the time,* 4 = *all of the time.*

**Generalization**

Across participants, there was not evidence for the generalization of student interaction with peers across non-academic school settings when the peer network did not take place (see Figure 1 and Table 8). Students had fewer interactions with peers during the generalization probes than during the intervention phases. However, (a) the mean frequency of overall interaction with peers was higher and (b) a greater proportion of overall interaction was non-prompted and symbolic during post-intervention generalization probes than during pre-baseline probes and the baseline phase for all students. Grace, Jeremy, and Joanna were in proximity to both peer network members and other peers during post-intervention generalization probes, and interactions occurred with both types of peers. Sara was rarely in proximity to peer network members during the probes, and most interactions took place with other peers who had occasionally joined in activities during peer network but were not formal members. Although the paraprofessionals who facilitated the peer networks were present, they never actively facilitated interactions between the focus students and peers during the generalization probes.

Table 8. *Descriptive Summary of Generalization Data from Pre-baseline and Post-intervention Probes*

| | Sara | | Grace | | Jeremy | | Joanna | |
|---|---|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Focus student behaviors[a] | | | | | | | | |
|   Overall interaction with peers | 2 (0-5) | 10 (2-13) | <1 (0-2) | 4 (0-6) | 10 (1-20) | 26 (13-33) | <1 (0-1) | 8 (2-14) |
|   Non-prompted, symbolic | <1 (0-1) | 5 (1-11) | 0 (0-0) | 3 (0-5) | <1 (0-1) | 14 (5-22) | <1 (0-1) | 8 (2-14) |
| Peer behaviors[a] | | | | | | | | |
|   Peer interaction | 4 (1-6) | 13 (4-21) | 7 (0-11) | 5 (0-10) | 32 (4-50) | 60 (37-73) | 2 (1-2) | 11 (2-16) |
|   Aided AAC models | 0 (0-0) | 0 (0-0) | 0 (0-0) | 0 (0-0) | 0 (0-0) | 1 (0-3) | 0 (0-0) | 0 (0-0) |
| Proximity[b] | | | | | | | | |
|   Network members | —— | 8 (2-13) | —— | 66 (0-100) | —— | 82 (45-100) | —— | 45 (0-97) |
|   Other peers | 60 (24-99) | 77 (73-87) | 83 (62-98) | 96 (91-100) | 86 (65-98) | 79 (59-92) | 28 (16-41) | 52 (2-97) |
|   Adult support | 61 (5-96) | 52 (14-89) | 51 (14-100) | 69 (10-100) | 19 (8-31) | 24 (7-47) | 66 (43-89) | 66 (0-100) |
|   Aided AAC | 6 (0-13) | 26 (0-94) | 38 (0-100) | 67 (0-100) | 0 (0-0) | 20 (0-59) | 0 (0-0) | 0 (0-0) |
| Peer interaction strategies[c] | | | | | | | | |
|   Ask open-ended questions | —— | Sometimes | —— | Sometimes | —— | Often | —— | Sometimes |
|   Use expectant delay | —— | Sometimes | —— | Never | —— | Often | —— | Sometimes |
|   Provide encouragement/praise | —— | Never | —— | Never | —— | Sometimes | —— | Never |

*Note.* AAC = augmentative and alternative communication; —— not assessed

[a] Numbers represent means (ranges) of frequency per 30 min session

[b] Numbers represent means (ranges) of percentage of observational time

[c] Median observer rating

**Social Validity**

When asked to respond to yes/no questions in any communication mode, Jeremy and Joanna indicated they (a) liked spending time with their peer network members, (b) liked it when their peers also used their aided AAC device, (c) considered their peer network members to be their friends, and (e) wanted to keep spending time with their peer network members. Sara and Grace's responses were unclear.

Peers felt positively about their experiences (see Table 9). They expressed enthusiasm about the peer network, such as one peer from Grace's network who said, "I wake up really early in the morning because I am excited about [the network]." When asked what went well, peers from every network shared the intervention helped them and the focus student become better friends. For example, one peer said, "[Grace] has more friends and we have more friends now." Another shared, "[Joanna] has more friends that she can trust, and she feels more comfortable." Peers also talked about what helped them interact well with the focus students. Peers from every network shared they enjoyed and thought it was helpful to learn to model the aided AAC device, including one peer from Sara's network who shared his favorite part was "using the talker while playing." Two of Jeremy's peers talked about how interaction strategies helped them. For example, one peer said the most helpful thing was "giving [Jeremy] time to say the thing he's going to say." When asked what could have been better, most peers responded "nothing" or "I don't know." One peer from Grace's network wanted to have more variety of activities, and one from Jeremy's group wanted to limit who could participate because it became crowded when everyone at recess wanted to play. Two of the peers from Jeremy's group talked about wanting to have a peer network with Jeremy when they went to middle school the following year.

Overall, paraprofessionals who facilitated the peer networks felt positively about the effectiveness and feasibility of the intervention (see Table 9). They described the peer networks as "fun for peers" and said they were impressed by the "enthusiasm of peers". Sara's facilitator shared the peer network helped peers see Sara "in a different light," saying, "Now she is more socially accepted by her peers. Hearing that they all came to her birthday party and that one girl even had a sleepover at her house is pretty amazing… Sara really enjoyed it all." Jeremy's facilitator said, "Now I feel more confident guiding peers on how to communicate with the student. I have a better understanding of how to encourage him to use the communication device, and the benefit it can provide." When asked what could have been better, both Grace and Sara's facilitators thought that lunch was difficult and that it would have been easier to engage the student at a different time. Jeremy's facilitator expressed it was difficult and overwhelming when many different peers came to join in activities, and Joanna's facilitator did not identify anything.

Table 9. *Social Validity Ratings from Peer Network Members and Facilitators*

| Social validity items | Sara | Grace | Jeremy | Joanna | *M* |
|---|---|---|---|---|---|
| **Peer network members** | | | | | |
| At first, I was excited to become a peer network member. | 5/5/5 | 5/5/5/3 | 5/5/5 | 5/4/5 | 4.8 |
| I had enough help from an adult during the peer network. | 5/5/4 | 5/5/5/4 | 4/5/4 | 5/5/5 | 4.7 |
| I know how to interact with [student]. | 5/5/5 | 5/3/4/3 | 5/5/4 | 4/4/4 | 4.3 |
| [Student] became better at communicating when I showed him/her words on the communication device. | 5/5/5 | 5/5/4/3 | 5/4/5 | 5/4/4 | 4.5 |
| I enjoyed learning to use the communication device when I talk to [student]. | 5/5/5 | 5/5/5/5 | 5/5/4 | 5/4/5 | 4.8 |
| Other students in the school should also do this. | 5/5/5 | 3/5/4/4 | 3/5/4 | 5/4/5 | 4.4 |
| I would be a peer network member again in the future. | 5/5/5 | 5/5/5/5 | 5/5/5 | 4/4/5 | 4.8 |
| Our school should have more peer networks. | 5/5/5 | 5/5/5/5 | 4/5/4 | 5/4/5 | 4.8 |
| [Student] met new people and/or became better friends because of the network. | 5/5/5 | 5/5/5/4 | 5/5/5 | 4/3/5 | 4.7 |
| [Student] is my friend. | 5/5/5 | 5/5/5/5 | 5/5/5 | 4/4/5 | 4.8 |
| I would recommend being a peer network member to my other friends. | 5/5/4 | 3/5/5/3 | 3/5/5 | 4/4/5 | 4.3 |
| I had fun being a peer network member | 5/5/5 | 5/5/5/5 | 5/5/5 | 4/4/5 | 4.8 |
| **Peer network facilitators** | | | | | |
| The amount of time required for planning and training was reasonable. | 4 | 4 | 4 | 5 | 4.3 |
| I would need ongoing consultation to continue implementing these strategies. | 2 | 3 | 3 | 2 | 2.5 |
| Having peers model the communication device helped the student use it more. | 4 | 4 | 5 | 3 | 4.0 |
| I could use what I learned to teach others to model the communication device. | 4 | 4 | 4 | 4 | 4.0 |
| I am motivated to continue using what I learned in this project. | 3 | 2 | 4 | 4 | 3.3 |
| The peer network intervention fits well within this school. | 4 | 3 | 3 | 3 | 3.3 |
| I would know what to do if asked to implement a peer network again. | 4 | 4 | 4 | 4 | 4.0 |
| [Student] has benefitted socially from the peer network intervention. | 5 | 4 | 4 | 4 | 4.3 |
| [Student] has more friends and/or got to know friends better. | 4 | 3 | 3 | 3 | 3.3 |
| [Student] became better at communicating through the intervention. | 5 | 4 | 3 | 4 | 4.0 |
| The peers without disabilities benefitted socially from being a peer partner. | 5 | 4 | 4 | 4 | 4.3 |
| Overall, I enjoyed participating in this project. | 4 | 3 | 5 | 4 | 4.0 |

*Note: M* = mean across participants; Numbers reflect responses on a 5-point scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, 5 = *strongly agree*.

CHAPTER IV

DISCUSSION

Building the social and communicative competence of students with complex communication needs requires helping them gain adequate, functional communication while supporting their opportunities to participate in enjoyable interactions with others, such as peers. For many students with complex communication needs, positive interactions with peers at school are infrequent or even altogether absent without careful planning and support (e.g., Chung et al., 2012). We evaluated the effectiveness of a peer network intervention to increase the interactions students had with peers. We also examined the additional impact of embedding peer-implemented aided AAC modeling into the intervention to increase students' use of symbolic communication. Our findings extend the research literature by addressing (a) the effectiveness of peer networks for students who use aided AAC, (c) components of effective communication partner instruction for peers, (c) the effectiveness of peer-implemented aided AAC modeling, and (d) the feasibility and acceptability of this intervention.

**Peer Network Interventions**

The first goal of this study was to evaluate whether establishing a peer network intervention during non-academic times at school would increase the interactions students with complex communication needs had with their peers. For all four students, the intervention resulted in increased interactions in these settings. This finding is consistent with earlier studies involving peer networks, both at the elementary level (Garrison-Harrell et al., 1997; Kamps et al., 2014; Kamps et al., 2015; Mason et al., 2014), as well as middle and high school (Asmus et al., in press; Gardner et al., 2014; Haring & Breen, 1992; Hochman et al., 2015). Peer network

interventions can help students with complex communication needs participate fully in and increase interactions during non-academic, social contexts at school. Findings from this study connect with those from previous studies and extend the literature by offering information related to a group of students who were not well represented in earlier investigations—specifically, students learning to use aided AAC.

Prior to the intervention, students had varied patterns of interactions during lunch and recess. Although in proximity to other students, Joanna and Sara almost never interacted with peers, and their peers almost never interacted with them. Grace's peers initiated interactions with her somewhat frequently, but Grace did not respond to the majority of interactions and almost never continued beyond one communicative turn. Jeremy and his peers engaged frequently in back-and-forth social routines with one another (e.g., imitating one another's non-conventional gestures and non-word vocalizations). Both Jeremy and his peers seemed to enjoy these interactions, but they did not appear to know how to interact with one another in more conventional ways. Furthermore, Joanna and Jeremy were never in proximity to their aided AAC devices in these settings. Even though Sara and Grace were in proximity, they never used their SGDs to interact with peers. These observational data provide rich insight into the similarities and differences of the social-communicative experiences of these four students with complex communication needs. Additional research might further explore whether these portraits of interactions are representative of other students with complex communication needs, and what factors (e.g., student-related factors, peer-related factors, environmental/support-related factors; Carter, Bottema-Beutel, & Brock, 2014) might be influencing these variations across students.

The extent to which the peer network intervention increased overall levels of interaction with peers may have been related to these differences during the baseline phase. Sara and

Joanna—the students who almost never interacted with peers during the baseline phase—demonstrated more substantial and defined increases in peer interaction than Grace and Jeremy. Nevertheless, all four students benefited from the peer network with increases in their overall interactions with peers and improvements in observer ratings of the quality of these interactions. A number of different components to the peer network intervention may have accounted for these positive outcomes. During the intervention, motivating, shared activities provided a common context for interactions, paraprofessionals began actively encouraging and facilitating interactions, and peers learned new strategies to support positive interaction. Additional research should continue to explore which of these factors, or others, are the most salient in improving the quantity and quality of social interaction among students with complex communication needs and their peers.

**Communication Partner Instruction for Peers**

The second goal of this study was to evaluate the effectiveness of a peer instructional program involving a single training and two sessions with coaching to teach peers to model AAC as augmented input. Although peers in all four networks were successful in providing aided AAC models, we cannot speak to whether the single training and abbreviated coaching alone would have been effective. Peers in all four networks also received ongoing support from the facilitators who regularly encouraged them to use the aided AAC device by giving verbal prompts, modeling symbols themselves, and offering praise. Furthermore, peers in each network had at least one session when they did not provide aided AAC models at a rate of at least 10 per 30 min session, which prompted the intervention coach to reintroduce support in the following session. Although it is not possible to determine that this level of coaching and support was *necessary* for peers' success, this study does provide evidence that training combined with

ongoing encouragement and support from adults can be effective in teaching peers to model AAC as augmented input. Other studies have also addressed the importance of coaching and follow-up support to changing the behavior not just of peers, but also adults (e.g., Kretlow & Bartholomew, 2010). Additional research is needed to learn more about what kind and how much guidance peers need to be successful using and maintaining the use of interaction strategies such as aided AAC modeling.

Interestingly, peers in each of the four networks occasionally used the aided AAC devices before the intervention coach trained them and encouraged them to do so. During the peer orientation, each facilitator introduced the peers to either the SGD or the communication book, but they did not share information about aided AAC modeling. Before they received training on aided AAC modeling, Joanna's peers began independently using symbols in the communication book throughout their natural interactions. However, peers interacting with Sara, Grace, and Jeremy rarely used the SGDs, and when they did it was almost always to prompt the focus student (e.g., "*Say animal"* while pressing *ANIMAL* on the SGD), rather than as a part of their own natural interactions. Why did peers in the different groups respond differently? Perhaps it was because of characteristics of the peers themselves, or because of the differences in technology between the communication book and the SGDs. Or, perhaps because the communication book was relatively new to Joanna as well as the peers, it may have seemed less like it was a means of communication just for her and more like a "shared means of communication" for everyone in the group (von Tetzchner, Brekke, Sjøthun, & Grindheim, 2005).

In addition to aided AAC modeling, peers also learned three other interaction strategies—asking questions, using expectant delay, and offering encouragement. Prior to the peer network

intervention, peers rarely asked open-ended questions or provided encouragement and never used expectant delay. Without support, peers may not know how to interact well with a schoolmate with complex communication needs in order to support his or her active participation in the interaction. Teaching peers these strategies was likely important to the success of the intervention. For example, Jeremy's peers commented at the end of the study that they liked learning to give Jeremy more time because it helped him say more things. This study adds to earlier evidence that peers across age levels are able to learn new strategies to use when interacting with a schoolmate who is learning to use aided AAC— including preschool-aged peers (e.g., Trembath et al., 2009; Therrien & Light, 2016), elementary-aged (e.g., Hunt et al., 1991b; Trottier et al., 2011), and middle and high school-aged (e.g., Hunt et al., 1991a; Chung & Carter, 2013).

**Peer-Implemented Aided AAC Modeling**

The third goal of this study was to evaluate whether embedding peer-implemented aided AAC modeling within the peer network would increase students' non-prompted, symbolic communicative acts to peers. For Sara, Grace, and Jeremy, the introduction of aided AAC modeling resulted in increased use of symbolic communication that sustained throughout the remainder of the intervention. Joanna's peers had begun independently providing aided AAC models as augmented input during the first intervention phase. Her non-prompted, symbolic communication comprised the majority of her overall interaction during each peer network meeting, and it did not increase during the second intervention phase. Although a small number of other studies have also explored the impact of peer-implemented aided AAC modeling (e.g., Hunt et al., 1988, 1991a, 1991b; Trembath et al., 2009), none have isolated its impact from other intervention components. By having systematic, experimental control of the addition of the aided

AAC modeling for three of the four participants, we were able to demonstrate the unique effects of modeling beyond the other components of the peer network intervention.

This study also provides information about salient patterns between the target symbols that peers modeled and students used in these interactions. All core and activity-related target vocabulary were symbols students did not use expressively with speech, aided AAC, or signs prior to the intervention. The only new target symbols students began using on their AAC devices were the same symbols peers modeled. In a way, it is unsurprising that students never began using the activity-related or core symbols that peers did not also use during these interactions. For example, it would be difficult to imagine any child successfully beginning to use a word they had never before heard spoken in that same language. Having a graphic symbol available to a student on a communication aid is unlikely to be sufficient for them to begin using it. However, findings from this study support the idea that students can build connections between graphic symbols, their spoken words, and what they represent when peers use these symbols within their own interactions with the student (Drager, 2009; Wood et al., 1998). This provides initial evidence students are able to acquire the meaning of graphic symbols and the skills to use them to communicate within the context of meaningful, natural interactions with peers and without relying on decontextualized, 1:1 teaching sessions (c.f. Garrison-Harrell et al., 1997).

However, students did not begin using all of the target symbols modeled by peers. While Sara and Jeremy used more than three quarters of the target symbols peers modeled, Grace and Joanna used about half. Students began using a greater percentage of their activity-related target symbols than core symbols, and Grace did not use any of the core symbols throughout the intervention. What factors might influence whether and how quickly students begin using new

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symbols that peers or other communication partners model? Future research is needed to explore

questions about the characteristics of students, graphic symbols, the nature of their referents, and

the types of models that influence the likelihood that students will begin using new symbols that

are modeled.

**Acceptability and Feasibility**

The fourth goal of this study was to explore how peers and educators viewed the

acceptability and feasibility of the intervention. Each of the peers indicated they enjoyed being a

peer network member, enjoyed learning to use the SGD or communication book, would be a peer

network member again in the future, and thought their school should have more peer networks.

Peers' satisfaction may be critical to the success of the intervention because students are more

likely to stay invested and engaged if they enjoy what they are doing and find it personally

rewarding. For Jeremy and Sara, other peers quickly became interested in the peer network and

began regularly joining in the activities and interactions. When this occurred, we observed the

peer network members offer them suggestions about using the interaction strategies and

modeling symbols on the SGD. Many of these other peers were successful using the interaction

strategies and providing aided AAC models only from the support and encouragement they

received during the network meetings, without being a part of the initial orientation or the peer

partner instructional program.

Although the enthusiasm of the facilitators was more tempered than that of the peers,

each indicated the time investment was reasonable and they would know what to do if asked to

implement a peer network again. Although a member of the research team served as a coach and

offered support throughout the study, researchers did not carry out the primary responsibilities

for planning and implementing the peer network. Planning teams consisting of educators,

paraprofessionals, SLPs, and parents were successful in individualizing the peer network theme, activities, and target vocabulary for each focus student. Each of the paraprofessionals who served as a facilitator was successful in leading the initial orientation, planning network meetings, and facilitating interactions during the network. The primary exception was that a member of the research team did take the primary role as the intervention coach in training and coaching peers to provide aided AAC models. We designed the study in this way to maximize experimental control of the added component to the intervention. Therefore, additional research is needed to investigate whether school personnel would also be successful in providing this training and coaching for peers. We did observe that after participating in the peer partner instruction, each of the facilitators themselves began providing aided AAC models when interacting with the focus students both with and outside of the peer network meetings. Furthermore, all facilitators indicated they could use what they learned to teach others to model aided AAC.

**Limitations**

Several limitations of the study warrant consideration and suggest avenues for future research. First, the challenges of using timed-event behavior sampling in live observations limited our ability to collect detailed information about students' communication. Although we were able to reliably code distinctions between the type (i.e., symbolic or non-symbolic) and level of independence (i.e., prompted, imitated, or independent) of each communicative act, we did not collect data at the level of each communicative act regarding communication modes or symbols used. The descriptive summary-level data we did collect provide useful but limited information, and in future studies researchers might pursue the possibility of coding from video recordings instead of live observations.

Second, we were unable to isolate the impact of the peer-implemented aided AAC modeling for Joanna. Because her peers used aided AAC modeling as augmented input independently before the peer partner instructional program, we did not have experimental control of its introduction. Non-prompted, symbolic communication comprised most of Joanna's overall interaction with peers throughout each of the peer network meetings. However, we are unable to determine if this is because of differences in student-related characteristics (e.g., more developed skills related to using symbolic communication prior to the study), because she benefitted immediately from the peer aided AAC modeling in the first intervention phase, or because of other factors.

Third, the peer network focused on increasing interactions within the context of a single identified non-instructional time (i.e., lunch, recess), limiting information about the extent to which it influenced student communication outside of this context. During generalization probes, we did not find evidence that student outcomes generalized across non-structured and non-academic contexts. However, gaining a reliable estimate of students' generalized tendencies to interact or use symbolic communication is complex because these behaviors are greatly influenced by context. Although our generalization observations were ecologically valid (i.e., took place in a naturally occurring context), their non-structured nature—and the significant contextual variations this creates across observations—increases the probability that we would conclude the outcomes do not generalize when there actually is an impact (Yoder & Symons, 2010). In the future, researchers might consider structuring the measurement context in order to reduce variability due to differences in contextual factors, such as the opportunity students have to interact.

**Conclusion**

Findings from this study add to the significant and growing literature on the effectiveness and feasibility of peer network interventions to increase interactions with peers at school, including for students with complex communication needs. Furthermore, results demonstrate embedding peer-implemented aided AAC modeling within the peer network can help students build connections between spoken words, graphic symbols, and referents and begin to use the symbols to communicate with their peers. Peers not only were capable of but also shared they enjoyed learning to provide aided AAC models during the peer network meetings. This intervention holds promise to help students move toward communicative competence while supporting their participation in enjoyable interactions with their peers.

APPENDIX A

Peer Network Intervention Planning Worksheet

**Identifying Activities for the Peer Network**

| |
|---|
| **Brainstorm:** What does [Student] love to do? What are [Student's] favorite things to look at or play with? <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • <br><br> • |
| **Chosen Theme:** <br><br><br><br><br><br><br><br><br><br><br> |

**Activities and Materials for the Peer Network Meetings**

| | Activity | Materials |
|---|---|---|
| Meeting 1 | | |
| Meeting 2 | | |
| Meeting 3 | | |
| Meeting 4 | | |
| Meeting 5 | | |
| Meeting 6 | | |
| Meeting 7 | | |
| Meeting 8 | | |

**Communication Device Set-up**

| What words/symbols does [Student] already have in his/her expressive repertoire that will be helpful during the peer network? |
| --- |
|  |

| What words/symbols that are not in [Student's] expressive repertoire might be good as target words? *(after brainstorming, circle 5-10 target words in each category)* | |
| --- | --- |
| **Core Symbols** | **Activity-related Symbols** |
|  |  |

**What changes need to be made to the aided AAC device?**

**Who will be responsible?**

Adherence Checklist for Pre-intervention Planning Meeting, Facilitator Training, and Peer Orientation

**Planning Meeting Adherence Fidelity Checklist**
Intervention Coach: _____ Facilitator: _____

Student ID Code:_____ Date: _____ Start/End Time: _____

Team members present:

_____

**Fidelity Checklist for Team Planning meeting**
Step 1. Introduction and Overview
- ☐ Coach provides templates of note-taking sheets for each component of the planning meeting
- ☐ Coach provides an overview of agenda for the planning meeting and facilitates introductions of team members
- ☐ Coach describes the procedures and steps of the intervention, providing a rationale for the overarching and specific goals of the intervention

Step 2. Identifying a Theme and Activities
- ☐ Coach facilitates a brainstorming session to identify an overarching theme/ activity to inform the planning of peer network meetings
    - ☐ Explains the purpose of the overarching theme/activity and that it should (a) inform the planning of the intervention, (b) be feasible, and (c) be motivating and fun for the student and a group of same age peers
    - ☐ Encourages each team member to share input about ideas
    - ☐ Guides the team in coming to a decision about one overarching theme/activity
- ☐ Coach facilitates the team to record (i.e., write down formally) activities and the materials needed for peer network meetings within this overarching idea

Step 3. Identify Target Vocabulary and Discuss Changes to Aided AAC
- ☐ Coach provides support for the team to identify and list target vocabulary
    - ☐ Explains requirements for selecting target vocabulary
    - ☐ Explains the importance of core vocabulary and provides examples
    - ☐ Explains the importance of activity-related vocabulary and provides examples
    - ☐ Facilitates the team in listing 5-10 activity-related and 5-10 core vocabulary words meeting the requirements
- ☐ Coach provides support for the team to discuss changes to vocabulary on the AAC device
    - ☐ Team identifies who is responsible for making the changes
    - ☐ Team talks about vocabulary and arrangement of vocabulary on the device

Step 4. Identify Peers and Answer Questions
- ☐ Coach facilitates the team to think of names of peers who would likely enjoy being a part of the network and are present during the identified intervention time
- ☐ Coach offers time for discussion/ questions/ describing next steps

**Comments:**_____

**Adult Facilitator Training Adherence Fidelity Checklist**

Intervention Coach: _____ Facilitator: _____

Student ID Code:_____ Date: _____ Start/End Time: _____


**Fidelity Checklist for Facilitator Training**

☐ Intervention coach provides an overview of agenda for the training and gives the facilitator the printed manual

☐ Coach reviews the rationale and procedures for the peer network intervention

☐ Coach reviews the plan for peer network meeting

 ☐ Reviews the overarching activity identified by the planning team, needed materials, and expectations for the facilitator to prepare for each network session

 ☐ Reviews the vocabulary on the AAC device and ensures the programming changes have been made

☐ Coach discusses strategies for recruiting peers, and indicates where these materials are found in the printed manual

☐ Coach explains the orientation meeting for peers

 ☐ Describes the expectations for the facilitator during the peer orientation

 ☐ Describes the role the intervention coach will play during the peer orientation

 ☐ Carefully explains each of the steps, indicating where the materials are found in the coaching manual

 ☐ Provides an opportunity for the facilitator practice talking through each of the steps, while providing prompting and encouragement

 ☐ Provides opportunity for the facilitator to ask questions about the peer orientation

☐ Coach explains and models social facilitation strategies to be used during network meetings, and indicates where these materials are found in the printed manual

☐ Coach offers time for discussion/ questions/ describing next steps

**Comments:**_____

Intervention Coach: _____Facilitator: _____

Student ID Code:_____ Date: _____ Start/End Time: _____

Names of peers present:_____

**Fidelity Checklist for Peer Orientation**
- ☐ Facilitator encourages all students to introduce themselves
- ☐ Facilitator shares a rationale for the peer network intervention
- ☐ Facilitator shares/ supports the focus student in sharing information about the AAC device
    - ☐ Demonstrates how the student uses the device to communicate
    - ☐ Describes and shows peers vocabulary, including target vocabulary
    - ☐ Gives peers opportunity to look at the device/symbols
    - ☐ Provides opportunity for peers to ask questions about the AAC device
- ☐ Facilitator explains the procedures of the peer network, including:
    - ☐ The overarching activity/theme
    - ☐ The expectations for peers and the student during the activities
    - ☐ When peers should ask for assistance
    - ☐ Confidentiality and respectful language
- ☐ Facilitator introduces, explains, and gives examples of the three interaction strategies
    - ☐ Shows peers the visual cue card for the three strategies
    - ☐ Names, explains, and gives examples for "Ask questions and encourage each other to interact" (i.e., encourage peers to ask open-ended questions)
    - ☐ Names, explains, and gives examples for "Slow down and give each other time to respond" (i.e., encourage peers   to shorten communicative turns and use expectant delay with pause time and eye contact)
    - ☐ Names, explains, and gives examples for "Encourage each other" (i.e., encourage peers to use positive language and provide encouragement/ praise statements to one another)
    - ☐ Provides opportunity for peers to ask questions about the interaction strategies
- ☐ Facilitator provides prompting, feedback, and reinforcement while students practice using the interaction strategies during a shared activity
- ☐ Facilitator offers time for discussion/ questions/ describing next steps

**Did the facilitator require prompting to complete any steps of the peer meeting? If so indicate steps where the coach provided support by marking with a star on the checklist above.**

**Comments:**_____

APPENDIX C

Visual Cue Card of Interaction Strategies



Ask questions — 1. Ask each other questions

Give turns — 2. Slow down and give everyone a turn to talk

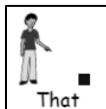Encourage — 3. Encourage each other with positive language

Aided AAC Modeling Handout for Peer Partner Instructional Program
**It is Fun to Use the Quick Talker!**

## 1. I can use the Quick Talker <u>to tell about me and what I am doing.</u>
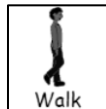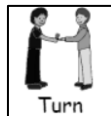
   "I can make an animal!"

   "I like that."

   "This is fun!"

## 2. I can use the Quick Talker <u>to tell about or ask my friend.</u>

   "Sara, you are making the animal walk!"

   "Sara, do you want a turn?"

   "What animal do you like, Sara?"

## 3. I can use the Quick Talker to <u>respond to what my friend says.</u>

*Sara points to the picture of the animal.*      "Animal."

*Sara touches PLAY DOUGH on the talker.*      "Yeah! Playdough is fun!"

Adherence Checklists for Peer Instruction Program to Teach Peers to Model AAC

**Peer Instructional Program Adherence Fidelity Checklist**

Intervention Coach: _____ Facilitator: _____

Student ID Code:_____

**Initial Training Session**           Date: _____           Start/End Time: _____

**Fidelity Checklist for initial training session**
- ☐ Intervention coach provides rationale for teaching peers to model the AAC device
- ☐ Coach shows peers the vocabulary on the AAC device
    - ☐ Shows peers all vocabulary related to the peer network activities
    - ☐ Gives peers a list of target vocabulary (i.e., core vocabulary and activity-related words)
- ☐ Coach explains how to provide an AAC model
    - ☐ Explains they can model symbols immediately before or at the same time they say a word when interacting with their classmate
    - ☐ Explains they do not have to use a symbol for all the words, but that they should try to use the device as often as they can
    - ☐ Provides multiple examples of AAC models, demonstrating each using the device
    - ☐ Gives peers opportunities to imitate each example with prompting, feedback, and reinforcement
    - ☐ Coach tells peers to model target vocabulary as often as they can, and reviews the target vocabulary words
- ☐ Coach explains three ways to model the AAC device
    - ☐ Gives the peers a handout with the three examples
    - ☐ Explains, gives examples of, and models "Tell about me and what I am doing"
    - ☐ Explains, gives examples of, and models "Tell about/ask my friend"
    - ☐ Explains, gives examples of, and models "Respond to what my friend says"
- ☐ Coach gives peers opportunity to practice each type of modeling while providing prompting, feedback, and reinforcement with social praise
- ☐ Coach asks peers to recall (a) the rationale for modeling the AAC device, and (b) the three examples of ways to provide models
- ☐ Coach offers time for discussion/ questions/ describing next steps

**Comments:**_____

**Peer Instructional Program Fidelity Checklist**

Intervention Coach: _____ Facilitator: _____

Student ID Code:_____

**Peer Coaching Session #1 during Network Meeting**          Date: _____

- ☐ Intervention coach/facilitator talks to the focus student about how peers will be using the AAC device too and reminds peers to provide models
- ☐ Coach provides prompting, feedback, and reinforcement for peers to model AAC

Circle the amount of support the coach provided for peers (i.e., through prompting, feedback, and reinforcement).
    *Low*          *Moderate*      *High*

    *Low:* Peers required very little support from the coach to model the AAC device appropriately; peers modeled the AAC device spontaneously and independently most of the time.
    *Moderate:* Peers required moderate support from the coach to model the AAC device appropriately; on several occasions, peers needed prompting or encouragement to model the device, but at other times they provided appropriate models spontaneously and independently.
    *High:* Peers required extensive support from the coach to model the AAC device appropriately; peers rarely modeled the AAC device spontaneously and independently.

**Peer Coaching Session #2 during Network Meeting**          Date: _____

- ☐ Intervention coach/facilitator talks to the focus student about how peers will be using the AAC device too and reminds peers to provide models
- ☐ Coach provides and fades prompting, feedback, and reinforcement for peers to model AAC
- ☐ Coach checks-in with peers at the end of the session to provide opportunity to answer questions and encourage peers to continue modeling the device, even though the coach will not be there to help them

Circle the amount of support the coach provided for peers (i.e., through prompting, feedback, and reinforcement).
    *Low*          *Moderate*      *High*

Coding Manual

**Aided AAC Modeling within Peer Network Interventions**
**Coding Manual**
Overview of Observational Codes

## A. MOOSES/Lily (real-time measure using timed event sampling)

| | Focus Student Communicative Acts to Peers | |
|---|---|---|
| Focus Student Behaviors | ▪ Independent symbolic communicative act | Frequency |
| | ▪ Imitated symbolic communicative act | |
| | ▪ Prompted symbolic communicative act | |
| | ▪ Independent non-symbolic communicative act | |
| | ▪ Imitated non-symbolic communicative act | |
| | ▪ Prompted non-symbolic communicative act | |
| | *Each of these six behaviors is also coded separately when directed to a peer with a severe disability | |
| | **Peer Communicative Acts to the Focus Student** | |
| Peer Behaviors | ▪ Peer interaction | Frequency |
| | ▪ Peer interaction from peer with a severe disability | |
| | ▪ Aided AAC model | |
| | **Proximity** | |
| Proximity to Student | ▪ AAC device | Duration |
| | ▪ Peers network member | |
| | ▪ Peer with a disability | |
| | ▪ Other peer | |
| | ▪ Adult support | |

## B. Observational Summary Sheet (descriptive measure)

- Number of peers and adults present in the intervention setting
- Specific activity and materials
- Student communication modes (from a checklist with rating scales for frequency)
- Observer ratings of the quality of the interactions (i.e., relevance of student responses, positive affect, balance and reciprocity, appropriateness, facilitation required)
- Student use of individually selected target vocabulary words (from a checklist—if the word was used or not at any point)

## C. Observer Fidelity Sheets

- Adult facilitation strategies used at any point (from a checklist)
- Peers' use of interaction and modeling strategies
- Core component checklist

# A. Observational Codes

## Focus Student Behaviors

Focus student communicative acts to peers are verbal or nonverbal, symbolic or non-symbolic communicative behaviors directed toward a classmate. Communicative acts directed solely to another peer with a severe disability (i.e., a student with autism, intellectual disability, or multiple disabilities eligible for alternate assessment) will be coded, but will be coded as separate variables from communicative acts to peers without disabilities. Students' interactions directed to adult facilitators or other adults in the intervention setting will not be coded. To be coded as a communicative act to a peer, the communicative behavior may be with any type of or combination of communication modes (e.g., speech, speech approximations, aided AAC, gestures, vocalizations, signs), but must be *intentional communication*.

*Intentional communication to a peer* is (a) a vocal or motoric act (b) directed toward a peer that (c) has a purpose and/or awaits a response. Therefore, to determine if a communicative act to a peer occurred, the answer to three questions must be "yes":

1. **Did the student do something (i.e., gesture/sign, use AAC, vocalize, speak)?**
   *See definitions for each in the discussion of symbolic and non-symbolic below.*

2. **Was the behavior directed to a peer?**
   *The clearest way to show the behavior is directed to a peer is that the student looks at the peer and displays coordinated attention between the referent (i.e., object of communication) and partner. Coordinated attention between the referent and partner is demonstrated through alternating or shifting eye gaze, body orientation, or movement. Any non-symbolic communicative act must involve coordinated attention to be coded as intentional. For symbolic communication, the referent is not always present in the setting. Therefore, other criteria may be used instead of or in addition to coordinated attention to determine the behavior was directed to a peer. These include: (a) looking at the peer immediately before, during, or after the behavior, (b) doing something to gain the peers' attention, (c) waiting for or showing signs of expecting the partner to respond to the behavior, (d) persisting with the message and ceasing when the peer responds, or (e) responding directly to a peers' preceding interaction.*

   *Interactions with teachers, paraprofessionals, or other adults are not coded as communicative acts to peers. If an adult is present, but the students' communicative behavior is clearly directed to both the adult and a peer, the behavior can be coded as a communicative act to a peer. If both an adult and peers are present, but the behavior is directed only to the adult, do not code it. In other words, in a group setting, a behavior is coded as a communicative act to a peer when there is a compelling reason to think the student intended to share a message with or elicit a response from a peer. This is discerned by considering the context of the interaction, the persons whom the student is looking at or in proximity with, and the context of the activity.*

*Facilitated communication (when someone controls the hand of the student with the disability to use the AAC device) is not coded because there is no evidence the student is the one directing the behavior to another person.*

3. **Was the purpose of the communication clear?**

   *Students may communicate for behavioral regulation (e.g., requesting, protesting), joint attention (i.e., directs attention to share the focus on an entity or event; e.g., commenting), or for social interaction (i.e., to get the partner to focus on them; e.g., greeting). A behavior is coded when the observer can discern evidence of any communicative purpose (i.e., behavioral regulation, joint attention, or social interaction). <u>Sometimes, students may vocalize, verbalize, or gesture without a clear communicative purpose (e.g., echolalia, motoric movements), and these behaviors should not be coded as communicative acts to peers.</u>*

<u>**Verbal and Non-Verbal Behaviors that are NOT Intentional communication**</u>

Some behaviors, including using speech and the AAC, may not be intentional communication because an observer cannot answer "yes" to each of the three questions above. For example:

- <u>Scripted speech:</u> The student is using rote speech that does not have evidence of being intentional communication, including babbling, humming, singling, making repetitive noises, or scripting phrases from movies/tv/songs that are unrelated to the present situation. The child says the script to himself/herself, not socially directed to a peer. Scripted speech may be accompanied by stereotypy (flapping, jumping, etc.), but stereotypic movements does not necessarily mean the speech is scripted.

- <u>Non-interactive AAC use:</u> The student activates the AAC device in a non-social, non-communicative way, including but not limited to (a) pushing the same button in a repetitive, non-functional way, (b) pressing multiple buttons as if perusing or playing with the device or listening to hear what a symbol is, not using it to communicate, (c) pressing buttons or navigating across pages while being unengaged with a partner/materials/activity, (d) accidentally touching buttons (e.g., with non-dominant hand, with pinky or other part of the hand when touching another button or reaching for a desired button).

- <u>Reading aloud:</u> The student or peer is reading printed words, either by themselves, or in a group or partner setting. We will not code the reading as intentional communication. However, if the reading is accompanied by another behavior (symbolic or non-symbolic) that does meet the definition of intentional communication, then we would code this other behavior (e.g., commenting on what is read, pointing to a picture that accompanies the text in order to draw a partner's attention to the picture).

- <u>Tickling:</u> We will not code a communicative act or a peer interaction if a student or peer is tickling one another. However, if the tickling is accompanied by another behavior (symbolic or non-symbolic) that does meet the definition of intentional communication, then we would code this other behavior (e.g., saying, "tickle, tickle").

**Segmenting Rules**

Each separate student communicative act to a peer is coded, regardless of its length. Communicative acts are separated by any of the following rules: (a) more than 5 seconds passes without any interactive behaviors, (b) a communication turn is taken by a communication partner (e.g., peer), or (c) the communicative act is directed to a new communication partner (e.g., a new peer).

> *Segmenting Tip:* Code a communicative act (and peer interaction) at the onset (beginning) of the act. In this way, if the interaction is longer, there will not be disagreements between observers because one codes at the beginning and the other at the end of the interaction.

> *Segmenting Tip:* Sometimes, when a communicative act involves the AAC device, it may take a long time for the student to locate the desired symbols. If a student (or peer) begins an interaction and 5 seconds passes within that interaction but during this time they are looking for the right symbol on the device, do not count time spent locating the symbols as separating communicative acts. You can judge whether the time passing is because of looking for symbols using the eye gaze and orientation of the student.

> **Segmenting Tip:** It is important to be able to accurately identify when 5 seconds passes between interactive behaviors. You will want to practice doing this while continuing to carefully observe and code (e.g., by counting in your head or tapping your toe). You will not be able to watch the timer because then your attention is diverted from the observation.

## Types of Focus Student Communication to Peers

Each student communicative act to a peer is coded according to its type (i.e., symbolic or non-symbolic) and level of independence (i.e., prompted, imitated, independent).

**Symbolic:** A communicative act is coded as symbolic when graphic symbols, manual symbols (i.e., signs), or spoken words represent the meaning for the message. A student's communicative act is coded as symbolic when it involves the use of: (a) intelligible verbal words, (b) graphic symbols on the aided AAC device, or (c) conventional signs from American Sign Language (ASL). If any part of the communicative act involves one of these three forms of symbolic communication (with communicative intent), the act should be coded as symbolic (even if non-symbolic communication is also used).

> Intelligible verbal words: Intelligible words or phrases convey meaning (communicative intent) using verbal speech. To be coded as intelligible, a word or phrase does not need to be pronounced entirely correctly, but it must be able to be understood by an unfamiliar partner or observer (e.g., contain at least one accurate sound in the correct position and the same number of syllables as the intended word, a common diminutive of the word such as "sketti" for spaghetti; Warren & Yoder, 2002).

> Graphic symbols: Communicative acts using graphic symbols involve conveying meaning (communicative intent) by selecting icons on an aided AAC device. In the case of a speech-generating device (SGD), an icon must be pressed to produce voice output to be considered

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selected. In the case of non-electronic aided AAC (e.g., communication board or book), an icon is selected when it is pointed to.

Conventional ASL signs: ASL signs involve using hand movement and location in accordance with ASL conventions to convey meaning (communicative intent). If a student knows and uses conventional signs, observers will be informed before beginning observations with that child.

**Non-Symbolic:** A communicative act is coded as non-symbolic if it does not involve the use of any words or symbols to represent meaning within the message. A student's communicative act is coded as non-symbolic if it does not involve any use of: (a) intelligible verbal words, (b) graphic symbols on the aided AAC device, or (c) conventional ASL signs. If a communicative act involves any of these three forms of symbolic communication (with communicative intent), the act should be coded as symbolic (even if non-symbolic communication is also used. Therefore, non-symbolic communication is comprised of (a) non-word vocalizations, (b) unintelligible word approximations using speech sounds, and/or (c) gestures or unconventional signs.

Non-word vocalizations: Non-word vocalizations are conventional and unconventional sounds that are used to convey meaning (communicative intent) but do not make a word (e.g., "ahh", "mmmm").

Unintelligible speech approximations: Unintelligible word approximations are combined speech sounds used to convey a meaning (communicative intent) when the word is not intelligible to an unfamiliar partner or observer (see earlier described examples for determining intelligibility).

Gestures or unconventional signs: Gestures or unconventional signs involving using hand, body, facial, or eye movement to convey meaning (communicative intent) when the movement is not used as a conventional ASL sign. They include conventional gestures that have a shared, typical meaning (e.g., pointing, nodding head, waving, a "thumbs up"), contact gestures (e.g., touching something), and distal gestures (e.g., pointing something far away).

**Prompted:** A communicative act is coded as prompted if it is a response to a peer or adult behavior designed to elicit the specific behavior. A communicative act is coded as coded as prompted if it is *directly elicited or prompted* by any of the following peer or adult behaviors:
  (a) Verbally telling the student to communicate (e.g., "tell Sam hello")
  (b) Using a gesture to directly encourage the student to communicate (e.g., pointing to the AAC device to indicate the student should take a turn, pointing to the symbol on the device they want the student to press)
  (c) Using an aided AAC model to directly elicit the same symbol from the student
  (d) Using physical prompting (e.g., guiding the students arm toward the AAC device)

*Coding Tip:* Remember, facilitated communication (i.e., a peer or adult controls the hand or arm of the student) is not coded at all as communication by the focus student.

*Coding Tip:* Just because a communicative act follows an AAC model, does not mean it is prompted (see imitated). A communicative act is coded as imitated not prompted when it follows and imitates a model that was provided within the partners natural interaction, not as a direct prompt (i.e., a prompt is given explicitly to get the student to respond by imitating the same behavior). To discern this, put yourself in the shoes of the peer providing the model.

<u>Imitated:</u> A communicative act is coded as imitated if the focus student (a) imitates all or part of the immediately preceding partner interaction (b) within 5 seconds of the preceding interaction and (c) does not add anything to it. If the child adds words or changes the mode (i.e., partner used speech only, student used AAC), it is coded as independent not imitated. If the communicative act is imitated using the AAC and occurs more than 5 seconds <u>when the SWD is actively searching for symbols for those five seconds,</u> still code as imitated.

<u>Independent:</u> To be coded as independent, a communicative act must be non-prompted and non-imitated. This includes if a child imitates a partner's immediately preceding interaction but also adds words or changes modes.

## Examples and Non-Examples of Focus Student Communicative Acts to Peers
Combinations of the definitions above options produce the following four coded student communicative acts to peers:

### 1) Independent Non-Symbolic Communicative Acts (INS)
*Examples:*
- A student points to the door while alternating a short glance between the peer and the door.
- A student responds to a peer's communicative act with unintelligible speech sounds.
- A student responds to a peer's question by shaking his head no.
- A student initiates a high-five with his peer.
- After a student tries to take the cap off a marker, he gives it to a peer to ask for help.

*Non-Examples:*
- A student waves good-bye to a peer after another peer tells her, "*Say good-bye to Sally.*" (PNS)
- A student vocalizes to himself while engaging in hand flapping (no code, no evidence of being intentional communication)

- A student says hello to a peer by waving and pressing the graphic symbol HELLO on their AAC device (IS)
- A student uses the conventional ASL sign for more (IS)
- A student laughs after a peer tells a joke (no code, emotional responses not accompanied by other communicative behavior should not be coded as a communicative act)

## 2) Imitated Non-Symbolic Communicative Acts (IMNS)

*Examples:*
- A peer initiates a high five and the student responds by giving the high five.
- A peer points to a picture and says "look at that truck!" and the student responds within 5 seconds by pointing to the same picture (here the student repeats part of the peers interaction with the point but does not add anything new or change the mode of communication)

*Non-Examples:*
- A student waves hello to a peer after another peer tells her, "*Say hi to Mark*" (PNS)
- A student scripts to himself, saying "up, up, up, and away!" while engaging in hand flapping (no code because scripted speech, no evidence of being intentional communication)

## 3) Prompted Non-Symbolic Communicative Acts (PNS)

*Examples:*
- A student says something to a peer with unintelligible speech after a peer tells him, "*tell Mark what you ate for lunch*"
- A student waves hello to a peer when the paraprofessional says "*say hi to Maria*"

*Non-Examples:*
- A student presses the graphic symbol I WANT after a peer points to the AAC device to encourage the student to use it (PS)
- A student responds to a peer's question by shrugging to indicate he doesn't know (INS)

## 4) Independent Symbolic Communicative Acts (IS)

*Examples:*
- When a peer holds up a poster she made and asks the student, "What do you think?" the student says, "I like it!"
- A student presses the graphic symbol THANK YOU and vocalizes after a peer gives them a complement.
- A student uses the ASL sign for finished and pushes his chair away from the table.
- A student presses the graphic symbol LOOK and gestures to her shirt to show her peer her new shirt.

*Non-Examples:*

- A student repeatedly presses multiple graphic symbols on the AAC device without looking up at the peer, gaining the peer's attention, or responding to peers' communication (no code because no evidence of communicative intent)
- A student responds to her peer's question by nodding her head (INS)
- A student presses the graphic symbol THANK YOU after a peer points to it to encourage her to say it (PS)
- A peer asks a choice question while modeling two symbols, saying "Should we color this YELLOW or RED?" The student responds RED. (IMS because the student repeats part of the peer's interaction but does not add anything new or change the mode of communication

## 5) Imitated Symbolic Communicative Acts (IMS)

*Examples:*

- A peer asks the student a question, saying, "Do you want a sticker?" The student responds verbally, saying "Sticker"
- A peer tells the student, "I went to math class, did you" and presses the icons WENT and CLASS on the AAC device as he said the words *went* and *class.* The student responds by pressing the symbol for CLASS.
- A peer asks the student, "Do you like the lunch today?" and points to the graphic symbol LIKE on the communication board as she says the word *like.* The student responds by pointing to LIKE.

*Non-Examples:*

- A peer asks the student a choice question, saying, "Should we read the book or the magazine." The student uses the AAC device to say BOOK (IS because changes mode)
- A peer says, "Say hello" and models the symbol by pressing HELLO. The student presses HELLO. (PS because not just imitating the model but elicited by the direct prompt).
- A peer asks the student, "Have you seen the movie Spiderman?" while modeling the symbol MOVIE on the AAC device. The student responds, pressing the symbols I LIKE + SPIDERMAN. (IS because adds words)

## 4) Prompted Symbolic Communicative Acts (PS)

*Examples:*

- A student presses the graphic symbol HELLO after a peer points to the AAC device to encourage the student to use it (PS)
- A student points at his peer Mike's shoes (INS). Another peer tells him, "*You should use your ipad to tell Mike you like his shoes.*" The student presses the graphic symbol LIKE.

*Non-Examples:*
- A student gives his peer a thumbs up after his peer gave him a thumbs up (IMNS)
- A student says, *"pizza"* when a peer asks her, "*what did you eat for lunch?"* (IS)

**Note:** *The four types of focus student communicative acts to peers are coded separately if they are coded (a) to peers without severe disabilities or (b) to peers with severe disabilities. The definitions for each are the same, with the only difference being the partner to whom the behavior is directed. If a communicative behavior from a focus student is directed to two (or more) peers, one with and one without severe disabilities, do not code the behavior as both a communicative act to a peer and to a peer with a disability (PWD) Instead, default as a communicative act to a peer. Only code as a communicative act to a PWD when an interaction is directed only to a PWD and not a peer without a disability.*

# Peer Behaviors

Peer communication to the focus student includes verbal or nonverbal communicative behaviors directed to the focus student. If a peer directs communication to a group of students that includes the focus student, the interaction will be coded as a communicative act to the focus student if the peer's interactive behaviors are clearly directed toward or include the focus student. If a peers' communication is directed only to other peers and does not include the focus student, the act should not be coded.

## 1) Peer Interaction (PI)
A peer interaction is a vocal or motoric act of a peer without a severe disability directed toward the focus student that has a communicative purpose and/or awaits a response (see the three questions to determine communicative intent on p. 2-3).

### Segmenting Rules
Each separate peer interaction to the focus student is coded, regardless of its length. Peer interactions are separated by any of the following rules: (a) more than 5 seconds passes without any interactive behaviors or (b) a communication turn is taken by the student.

**Segmenting Tip:** Code a peer interaction near onset (beginning) of the act. In this way, if the interaction is longer, there will not be disagreements between observers because one codes at the beginning and the other at the end of the interaction.

**Segmenting Tip:** Sometimes, when a peer interaction involves the AAC device, it may take a long time to locate the desired symbols. If a peer begins an interaction and 5 seconds passes within that interaction while they look for the right symbol on the device, do not count time

spent locating the symbols to separate communicative acts. You can judge whether the time passing is because of looking for symbols using the eye gaze and orientation of the student (or peer).

**Segmenting Tip:** It is important to be able to accurately identify when 5 seconds passes between interactive behaviors. You will want to practice doing this while continuing to carefully observe and code (e.g., by counting in your head or tapping your toe).

*Examples:*
- A peer says to the focus student, "Hey!"
- A peer asks a group of students, including the focus student, "Are any of you coming to the dance tonight?"
- A peer waves to the focus student.
- A peer offers to help the focus student and says, "Would you like me to show you how to do that?"
- A peer says, "great job!" to the focus student.
- A peer says "Can I have that maker" to the focus student and simultaneously models the symbols HAVE + THAT on the AAC device (also coded as 2 Aided AAC models, see below)

*Non-Examples:*
- A peer is talking to the adult facilitator and the focus student is looking at the peer (not coded).
- A peer laughs at a joke that the focus student tells (not coded; emotional responses not accompanied by other communicative behavior should not be coded as a communicative act)
- A peer says to himself, "Shoot, I forgot my permission slip" (not coded; not directed to the focus student).

## 2) Peer Interaction from a Peer with a Severe Disability (PIPWD)
A peer interaction from a peer with a severe disability is a vocal or motoric act from a peer with autism, intellectual disability, or multiple disabilities (see definition below) directed toward the focus student that has a communicative purpose and/or awaits a response (see the three questions to determine communicative intent on p. 2-3). **Segmenting rules and examples/non-examples follow those of other peer interactions (see above).**

*Note: A peer with a severe disability is a peer with autism, intellectual disability, or multiple disabilities who is eligible for the alternate assessment (does not include peers who receive special educations for other disability labels, such as a learning disability). Prior to*

*observations, the team will identify whether there are other peers with severe disabilities in the observation/ intervention setting and make sure they can be identified by observers.*

### 3) Peer Aided AAC Model (MODAAC)

A peer aided AAC model is when a peer models a symbol on the AAC device to communicate part or the entire intended message within a peer interaction. To be coded as an AAC model, the peer must complete the *entire behavior that is appropriate for the AAC device* (if needed, this definition will be individualized for students' devices). For example, if the device is a speech-generating device (SGD), a peer's behavior is coded as an AAC model only if the peer presses the symbol and causes the device to produce speech output. In this example, if a peer points to a symbol on the device but does not press it to produce speech output, the behavior would not be coded as an AAC model. If the device is a communication board or book, the peer behavior is coded as an AAC model if the peer identifies a single symbol (e.g., by touching it when pointing, or by moving a single symbol to the front of the book). In this example, if a peer moves several symbols to a sentence strip and reads them but does not point to isolate single symbols, the behavior would not be coded as an AAC model.

### Segmenting Rules

A separate AAC model is coded (a) for each different symbol modeled by the peer on the AAC device, (b) if more than 5 seconds passes between instances when the same symbol or interaction is modeled, or (c) if a model occurs within a new peer interaction.

> *Coding Tip:* Whenever a peer interaction involves one or more aided AAC models, code each model during or immediately after the precise timing of the model (i.e., when the peer presses or touches the symbol). In this way, there will not be disagreements between observers because of coding the timing of the interaction and models an interaction involves. An AAC model should always occur within a peer interaction (i.e., the peer interaction should be coded first).

> *Coding Tip:* Modeled symbols, or modeled interactions (i.e., multiple symbols within one interaction), that are repeated by the peer should only be coded once, unless more than 5 seconds passes between each modeled symbol or the whole modeled interaction.

*Examples:*
- A peer says to the focus student, "Hello!" while simultaneously pressing the symbol HELLO (1 AAC model).
- A peer laughs with the group when something funny happens and presses symbols THAT + FUNNY (2 AAC models).
- A focus student is looking at a national geographic magazine with pictures of animals. A peer presses symbols LIKE + ANIMALS and asks his classmate, "Do you like animals?" (2 AAC models)
- A student points to a peer on the other side of the table. Another peer presses the symbol with the picture of the peer and her name MARY, saying "that's Mary." (1 AAC model)

- Two peers and the student are talking about monster trucks while looking at pictures of them on an iPad. The student vocalizes and points. The peer says "look at this one!" while pressing the symbol LOOK. (1 AAC model)

*Non-Examples:*
- A peer says "hello" to the focus student and points to the AAC device (PI).
- A peer tries to get clarity on who the focus student was talking about when he was using speech approximation. The peer says, "Did you mean Mary or Sarah?" While asking the question, he points to each symbol on the speech-generating device but does not press them. (PI)

# Answers to Questions about Focus Student and Peer Interactive Behaviors

### How do you address non-communicative behavioral responses?

Only code behaviors from peers or students that are clearly intentional communication (see the three criteria on p. 2-3). Do not code behaviors from peers or students that are behavioral responses (i.e., an action, not intentional communication) to requests or commands from the other person. For example, imagine a student requests a marker by pressing the MARKER symbol on his AAC device. If the peer simply responds to this request by handing the student a marker, do not code this as an interaction. However, if the peer says "here you go", or asks "which color?", it should be coded as an interaction. Similarly, if a student responds with an action (but not a communicative behavior) to a peer, it should not be coded as a communicative act.

### How do you address group conversations?

Because students will be interacting in groups, there will be times when several people are talking within one conversation. In group settings, code as peer interactions all communicative acts directed clearly to the focus student. If a peer in the group responds to another peer (but does not direct the communication to the focus student), do not code this. You can help discern this by putting yourself in the shoes of the focus student. If you would feel the interaction was directed to you, this is a good indication it should be coded.

> Example: (2 peers and the student are just arriving)
>
> Focus student: (*waves)*, HI (presses symbol) [independent symbolic]
> Peer 1: "Hi! How are you guys?" [peer interaction]
> Peer 2: (*looking at peer 1),* "I'm good. I just got a new video game." [not coded]
> Peer 1: (*looking at peer 2),* "Really? Which one?" [not coded]
> Peer 2: (*looking at peer 1),* "Super Mario"[not coded]
> Peer 1: (*looking at peer 2 ),* "That's awesome" [not coded]
> Focus student: COOL (presses symbol) [independent symbolic]

### What if a student or peer interrupts or interjects?

If a second person (peer or student) interjects while a first person is talking, code an interaction from the person who interjected but **do not** code the original speaker again **if** the original speaker continues their interaction as if the second person hadn't said anything. **Do** code another interaction from the original speaker if they stop talking and restart talking, or if the second part of their interaction somehow changes because of or reflects the interjector's comment.

### What if a focus student directs a communicative behavior to a peer with a disability and a peer without a disability at the same time?

If a communicative behavior from a focus student is directed to two (or more) peers, one with and one without severe disabilities, do not code the behavior as both a communicative act to a peer and to a PWD. Instead, default as a communicative act to a peer. Only code as a communicative act to a PWD when an interaction is directed only to a PWD and not a peer without a disability.

## What if someone says something like "mmhmm"?

Do not code social behaviors that are just acknowledging behaviors (i.e., gestural or vocal behaviors that simply demonstrate attention to the conversation). If you could replace the social behavior with eye contact or head nodding to confirm attention, it should not be coded. During conversation, a "listener" may say "yeah," "uh-huh,", "mmmhmm", etc. to show they are listening. If this occurs just to show the listener is paying attention, do not code them. However, sometimes comments may be similar in nature but framed in a way they add to the interaction. For instance if a student says "Math is hard" and the peer responds "yeah", the "yeah" would count as a peer interaction because it is showing the peers' agreement to the student's comment. Likewise, if a "mmhmm" or "yeah" answers a question, they are coded as interactive behaviors. For example, if a peer asks the student, "did you have fun today?" and the student nods and says "mmhmm", the behavior would be coded as an (independent non-symbolic) communicative act to a peer.

## What if a student repeatedly presses the same symbol on the AAC device?

First, check to see if the behavior is clearly intentional communication (i.e., can you answer "yes" to all three questions on p. 2-3?). Sometimes students may press symbols on the AAC device without clear communicative intent. If there is evidence the behavior is intentional communication directed to a peer, it should be coded. Follow the segmenting rules carefully (i.e., five seconds passes without interactive behavior, a peer takes a communicative turn, or to a new peer) and only code students' actions as separate communicative acts according. For example, if a student presses the symbol HELLO three times in a row with 2 or 3 seconds between each press (and it was directed to a peer with a clear purpose), only code it as one communicative act. Also remember, if a student is actively engaged with symbols on the AAC device to locate them, consider this time as interactive behavior and do not count it as the possible 5 seconds that would separate interactions.

## What if a student communicates with the AAC device and speech, but the spoken word comes after the AAC device?

If both behaviors (speech and AAC) are clearly intentional communication (i.e., can you answer "yes" to all three questions on p. 2-3?), follow segmenting rules carefully. Only code this as one communicative act, unless more than five seconds passes without any interactive behavior.

## What if a single peer talks for a long time?

Remember interactions are coded regardless of their length. Always follow segmenting rules carefully, and be especially careful if a peer has the tendency to string utterances together with pauses of a few seconds between them. If less than 5 seconds passes between them (and no one takes a communicative turn), a peers' utterances are only coded as one interaction. It is important to find a way to reliability keep track of the seconds between interactive behaviors (e.g., counting in your head, tapping your toe). Although there is a timer on the computer recording system, watching it could cause you to miss other occurring interactive behaviors.

# Proximity

Observers will code proximity to each of the following using toggle switches on the computer-based recording system to record duration. Proximity is not mutually exclusive, and more than one (or none) of the options can be toggled on at any time. It is possible for the focus student to be in proximity to none, one, more than one, or all of the options at any time.

**Proximity to Peer Network Member:** The body orientation, distance, and position of the focus student and at least one consented peer network member promotes easy interaction with the focus student (i.e., no more than 5 ft and oriented in a way—such as facing one another—that might promote interaction).

**Proximity to a Peer with a Severe Disability:** The body orientation, distance, and position of the focus student and a peer with a severe disability (i.e., a student with autism, intellectual disability, or multiple disabilities who is eligible for alternate assessment) promotes easy interaction with the focus student (i.e., no more than 5 ft and orientated in a way—such as facing one another—that might promote interaction).

**Proximity to Other Peer:** The body orientation, distance, and position of the focus student and a peer who is not (a) consented as a peer network member or (b) a peer with a severe disability promotes easy interaction with the focus student (i.e., no more than 5 ft and oriented in a way—such as facing one another or next to/behind one another in line—that might promote interaction).

> *Note: Do not code a student as in proximity to peers if they are running past each other briefly (e.g., two students running at different speeds, students passing one another briefly while playing). However, we will code a student as being in proximity to peers if they stay close to each other as the move around (e.g., running next to each other at approximately the same speed).*

**Proximity to Adult Support:** The body orientation, distance, and position of the focus student and an adult (i.e., adult facilitator, adult providing support for the student) promotes easy interaction with the focus student (i.e., no more than 5 ft and oriented in a way—such as facing one another—that might promote interaction).

**Proximity to AAC device:** The focus student is within an arm's reach of their AAC device. To be coded as in proximity, the device must be accessible (i.e., not covered with other materials) and in working condition.

# B. Observational Summary Sheet

Observers will record information about descriptive, secondary measures using an observational summary sheet. Observers should independently complete the sheet immediately following each observational session, in all phases of the study. They may make notes on the sheet throughout the

observation if needed to remind them about how events or behaviors throughout the observation should be recorded.

**Number of peers and adults:** Observers will record the number of consented peer network members, other peers, and adults (including but not limited to the consented adult facilitator) present in the intervention setting. If some of the peers are peers who also have a severe disability (i.e., receive special education services under the categories of autism, intellectual disability, or multiple disabilities and are eligible for the state's alternate assessment), the observer will indicate as appropriate.

**Activity:** Observers will record the activity going on in the intervention setting. If baseline, record the activity the student is engaged in and the activity other peers in the setting are engaged in, if different than the focus student. If during the intervention, describe the shared activity selected for the intervention context.

**Materials:** Observers will record any materials related to the activity that are present and/ or that the student engages with.

**Communication Modes:** Using the rating scale provided (i.e., never observed, <5, ≥5 communicative acts involving that mode), observers should indicate how often the focus student used each of the different communication modes *during interactions coded as communicative acts directed to peers* (i.e., with communicative intent and directed to peers at any level of independence).

> Intelligible verbal words: Intelligible words or phrases convey meaning (communicative intent) using verbal speech. To be coded as intelligible, a word or phrase does not need to be pronounced entirely correctly, but it must be able to be understood by an unfamiliar partner or observer.

> Graphic symbols: Communicative acts using graphic symbols involve conveying meaning (communicative intent) by selecting icons on an aided AAC device. In the case of a speech-generating device (SGD), an icon must be pressed to produce voice output to be considered selected. In the case of non-electronic aided AAC (e.g., communication board or book), an icon is selected when it is pointed to.

> Conventional ASL signs: ASL signs involve using hand movement and location in accordance with ASL conventions to convey meaning (communicative intent). If a student knows and uses conventional signs, observers will be informed before beginning observations with that child.

> Non-word vocalizations: Non-word vocalizations are isolated sounds that are used to convey meaning (communicative intent).

Unintelligible speech approximations: Unintelligible word approximations are when students combine speech sounds to convey a meaning (communicative intent), but the word is not intelligible to an unfamiliar partner or observer.

Gestures: Gestures or unconventional signs involve using hand, body, facial, or eye movement to convey meaning (communicative intent) when the movement is not used as a conventional ASL sign. Examples include waving, shrugging, pointing, giving a "thumbs-up", or initiating a high-five.

**Quality of Focus Student Communication and Overall Interaction:** Observers should rate the quality of focus student communication with peers and/or their overall interaction with peers during the observed session. Ratings of low, medium, or high are defined for each item below. When completing these items, observers should base their codes on the interactions students had with peers without severe disabilities (including peer network members or other peers).

**Relevance of Student Communication**

High: Most, or nearly all, of the focus student's communication with peers was related to the topics discussed, activities going on, or questions asked.

Medium: The majority of the focus student's communication with peers was related to the topics discussed, activities going on, or questions asked, but there were some incidences in which the focus student talked about unrelated topics or produced unrelated responses.

Low: Much of the focus student's communication with peers was not related to the topics discussed, activities going on, or the questions asked.

Undiscernible: The focus student communicated two or fewer times with peers, so it was not possible to discern the relevance of their communication.

**Positive Affect**

High: Both the focus student and the peers demonstrated behaviors indicating they enjoyed the interaction (e.g., smiles, attentive body language)

Medium: Most of the interaction exchanges between the focus student or peers were accompanied with neither positive nor negative affect, or interactions from either the focus student or peers were accompanied with neither positive nor negative affect.

Low: Either the focus student or peers demonstrated behaviors indicating negative affect during interaction exchanges (e.g., anger, verbal/physical aggression, displeasure)

Undiscernible: The focus student and peers interacted very rarely (i.e., two or fewer interactions total from the student or peers to the student), so it was not possible to discern affect.

**Balance and Reciprocity:**

> High: Overall, interactions were reciprocal and balanced (i.e., both the focus student and peers initiated and responded somewhat equally)

> Medium: Peers typically initiated more frequently than the focus student. The focus student initiated less often but still responded most of the time to peers' initiations.

> Low: Peers were the primary initiators and/or communicators overall. The focus student rarely initiated and/or infrequently responded to peers initiations.

> Undiscernible: The focus student and peers interacted very rarely (i.e., two or fewer interactions total from the student or peers to the student), so it was not possible to discern balance and reciprocity.

**Appropriateness of Content and Interaction**

> High: Overall, the content of the interactions were similar to and would be appropriate if occurring within a different group of same-age peers.

> Medium: The content of the interactions was a mix of what would be appropriate and inappropriate topics, conversations, and interaction styles if occurring with a different group of same-age peers.

> Low: Most of the content of the interactions would be inappropriate topics, conversations, or interaction styles if occurring with a different group of same-age peers (e.g., not age appropriate content or interaction styles, looks more like a "tutoring" interaction than a social one between peers)

> Undiscernible: The focus student and peers interacted very rarely (i.e., two or fewer interactions total from the student or peers to the student), so it was not possible to discern the appropriateness of the content and interaction.

**Facilitation Required**

> High: The focus student and peers required extensive support from the adult facilitator (e.g., prompting, feedback, filling in quiet pauses, posing questions to the group) to talk with and engage with one another.

> Medium: The focus student and peers required some support from the adult facilitator to talk with and engage with one another well, but there were some times in the network meeting that either peers or the student "took the lead" well, or when the interaction seemed to flow more naturally.

Low: The focus student and peers required very little support or no support from the adult facilitator to talk with and engage with one another well; most of the time, either the peers or the student "took the lead" well, or the interaction seemed to flow naturally.

Undiscernible: Little interaction between the student and peers, or little or no facilitation occurred (i.e., facilitator's attention or focus was not on facilitating interactions most of the time), so it was not possible to discern how much facilitation would have been required.

**Target words used by focus students:** Observers will record which, if any, target words were used by the student during interactions with peers. Checking the box next to a word indicates the word was used at least once during an interaction with peers.

**Target words modeled by peers:** Observers will record which, if any, target words were modeled using the aided AAC device by peers. Checking the box next to a word indicates the word was modeled at least once by at least one peer during an interaction with the focus student.

# C. Observer Fidelity Sheet

Observers will record information about procedural fidelity of specific adult facilitator and peer related behaviors, as well as core indicators of fidelity using the observer fidelity sheet. Observers should independently complete the sheet immediately following each observational session, in all phases of the study. Alternatively, observers may also check these off in an ongoing fashion as they occur in an observed session.

**Facilitation Support Behaviors:** Observers will indicate by checking the box for any of the following strategies they observed the adult facilitator (or during baseline, an adult providing support) doing to support the focus students' communication with peers.

> Encourage or prompt the student to interact with peers: The adult facilitator (or during baseline, an adult providing support) uses verbal or nonverbal prompts or cues to encourage the focus student to interact with peers.

> Encourage or prompt peers to interact with the student: The adult facilitator (or during baseline, an adult providing support) uses verbal or nonverbal prompts or cues to encourage peers to interact with the focus student.

> Directly prompt or teach peers to use one of the interaction strategies: The adult facilitator (or during baseline, an adult providing support) explains, models, or uses verbal or nonverbal prompts or cues to encourage or teach peers to either (a) use open ended questions when interacting with the focus student, (b) use expectant delay when interacting with the focus student, or (c) use praise, social praise, or encouraging statements when interacting with the focus student.

> Teach the student a particular social-communicative skill: The adult facilitator (or during baseline, an adult providing support) explains, models, or uses verbal or nonverbal prompts or cues to encourage or teach the focus student any particular social-communicative skill. Examples of social-communicative skills may include but are not limited to initiating a conversation with a peer, maintaining eye contact, or directing body orientation toward a peer when talking with them.

> Directly encourage or prompt the student to use the AAC device: The adult facilitator (or during baseline, an adult providing support) uses verbal or nonverbal prompts or cues to encourage the focus student to use the AAC device (e.g., pointing to the device or a symbol on the device, using a verbal cue to tell students to use the device).

> Praise/reinforce the student's interaction with peers: The adult facilitator (or during baseline, an adult providing support) uses nonverbal or verbal social praise to reinforce the student for interacting with peers.

Praise/reinforce peers' interaction with the student: The adult facilitator (or during baseline, an adult providing support) uses nonverbal or verbal social praise to reinforce peers for interacting with a focus student.

Give advice or information to support interaction: The adult facilitator (or during baseline, an adult providing support) tells peers or the student something (i.e., sharing information, not a prompt) that would allow them to interact better (e.g., "When Dylan rocks back and forth, it's his way of letting you know that he is anxious and needs some space")

Find and facilitate a role in a shared activity for the focus student and/or peers: The adult facilitator (or during baseline, an adult providing support) offers a suggestion or directs peers and/or the student to have particular roles within a shared activity or game.

Encourage social interaction within a group: The adult facilitator (or during baseline, an adult providing support), encourages social interaction by using a facilitation strategy with the group of students (i.e., peers and the focus student). Examples of facilitation strategies include filling lengthy silences or pauses in interaction, posing a question to the group, or highlighting shared interests or commonalities among students).

**Prompting/ reinforcing of peers' use of aided AAC modeling:** Observers will indicate by checking the box if the adult facilitator (not the intervention coach) at any time directly prompted or reinforced peers to provide an aided AAC model for their classmate with a disability.

**Peer Interaction Strategies** Observers will use the rating scale to indicate how often they observed peers using any of the following interaction strategies. Observers should indicate *"never"* if peers (i.e., any peer) did not ever use that particular interactive strategy with their classmate with a disability during the observed session; *"rarely"* if peers used that particular interactive strategy fewer than 5 times (i.e., total, across different peers); *"often"* if peers used that particular interactive strategy 5 or more times (i.e., total, across different peers)

Ask open ended questions: Peers directly as the focus student, or a group of students including the focus student, an open-ended question. Open-ended questions are defined as those that cannot be answered with a "yes" or "no" answer, and they are typically questions that start with "wh" words (e.g., what, where, who). For our purposes, open-ended questions also include "choice" questions where peers present two or more choices to the student.

Use expectant delay: After presenting their classmate with a disability an opportunity to communicate (i.e., they ask their classmate a question, they comment to their classmate), a peer inserts a pause or "wait time" of a few seconds, during which they make eye contact or look at their classmate, waiting for them to respond.

Provide encouragement/praise: Peers use encouraging comments or verbal/nonverbal praise when interacting with their classmate with a disability, and as a group with each other (e.g., "great job!", a high five)

**Peer Aided AAC Modeling Strategies** Observers will use the rating scale to indicate how often they observed peers using each of three aided AAC modeling strategies. Observers should indicate *"never"* if peers (i.e., any peer) did not ever use that particular interactive strategy with their classmate with a disability during the observed session; *"rarely"* if peers used that particular interactive strategy fewer than 5 times (i.e., total, across different peers); *"often"* if peers used that particular interactive strategy 5 or more times (i.e., total, across different peers).

> <u>"Tell about me and what I am doing"</u>: Peers provide an aided AAC model during an interaction when they are talking about themselves, answering a question about themselves, or talking about something they are doing or interested in during the shared activity.
>
> <u>"Tell about/ask my friend:"</u> Peers provide an aided AAC model during an interaction when they are commenting about something their classmate with a disability is looking at, likes, might say, or is doing during the shared activity; or, when they provide an aided AAC model when asking their classmate a question.
>
> <u>"Respond to what my friend says"</u>: Peers provide an aided AAC model during an interaction when they are responding to a communicative act of their classmate. This might include an imitation (i.e., saying the same thing as their classmate did in the preceding communicative turn), expansion/extension (i.e., adding to what their classmate communicated), or a "turn-about question" (i.e., asking a question about the topic of their classmates communicative turn that encourages their classmate to talk more.)

**Core Fidelity Checklist:** Observers will check if each item occurred during the observation session.

Observational Summary Sheet

**Peer Network Observation Summary Sheet**

Student ID Code: _____ Primary/ IOA Observers: _____/_____ Date: _____
Start/End Time: _____
**Number of:**
Peer Network Members: _____          Adults: _____

Other peers (indicate if any also have severe disabilities): _____

**Activity:** _____

**Materials:** _____

**How often did the student use the following modes within peer interactions?**

| Symbolic Communication Modes | *Never* | *Rarely (i.e., <5 CAs)* | *Often (i.e., ≥5 CAs)* |
|---|---|---|---|
| Intelligible verbal speech | ❑ | ❑ | ❑ |
| Aided AAC | ❑ | ❑ | ❑ |
| Conventional ASL Signs | ❑ | ❑ | ❑ |
| **Non-symbolic Communication Modes** | | | |
| Non-word vocalizations | ❑ | ❑ | ❑ |
| Unintelligible speech/ speech approximations | ❑ | ❑ | ❑ |
| Gestures | ❑ | ❑ | ❑ |

**Rate the Quality of Interactions (See coding manual for definitions)**

| | | | | |
|---|---|---|---|---|
| Relevance of student communication | ❑ *Undiscernible* | ❑ *Low* | ❑ *Medium* | ❑ *High* |
| Positive affect | ❑ *Undiscernible* | ❑ *Low* | ❑ *Medium* | ❑ *High* |
| Balance and reciprocity | ❑ *Undiscernible* | ❑ *Low* | ❑ *Medium* | ❑ *High* |
| Appropriateness of content/interaction | ❑ *Undiscernible* | ❑ *Low* | ❑ *Medium* | ❑ *High* |
| Facilitation required | ❑ *Undiscernible* | ❑ *Low* | ❑ *Medium* | ❑ *High* |

*Indicate which, if any, of the following target words/symbols were used by the student or modeled by peers during any coded interaction*

| Target Words Used and Modeled | | | | | |
|---|---|---|---|---|---|
| Student | Peer | **Core Vocabulary Words** | Student | Peer | **Activity-Related Words** |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |
| ❑ | ❑ | | ❑ | ❑ | |

Observer Fidelity Sheet

**Observer Fidelity Sheet**

Student ID Code: _____ Primary/ IOA Observers: _____/_____ Date: _____

*Indicate which, if any of the following strategies the adult facilitator used at any time*

| Facilitation Support Behaviors | *How often did peers use the* |
|---|---|
| ❑ Encourage or prompt the student to interact with peers | |
| ❑ Encourage or prompt peers to interact with the student | |
| ❑ Directly prompt or teach peers to use one of the interaction strategies (i.e., open ended questions, expectant delay, provide encouragement/praise) | |
| ❑ Directly encourage or prompt student to use the AAC device | |
| ❑ Praise/reinforce the student's interaction with peers | |
| ❑ Praise/reinforce peers' interaction with the student | |
| ❑ Give advice or information to support interaction | |
| ❑ Find and facilitate a role in a shared activity for focus student/ peers | |
| ❑ Encourage social interaction within a group (e.g., fill lengthy silences or pauses in interaction, pose question to the group, highlight commonalities) | |
| ❑ Other: _____ | |

*following interaction strategies?*

| | *Not observed* | *Rarely (i.e., <5 times)* | *Often (i.e., ≥ 5 times)* |
|---|---|---|---|
| Ask open ended questions | ❑ | ❑ | ❑ |
| Use expectant delay | ❑ | ❑ | ❑ |
| Provide encouragement/ praise | ❑ | ❑ | ❑ |

**Modeling Strategies**

| | | | |
|---|---|---|---|
| "Tell about me and what I am doing" | ❑ | ❑ | ❑ |
| "Tell about/ask my friend" | ❑ | ❑ | ❑ |
| "Respond to what my friend says" | ❑ | ❑ | ❑ |

**Indicate which, if any, of these items occurred during the observation session**

❑ Was the focus student present for the entire peer network intervention session?
❑ Was the AAC device present, working, and in proximity to the student/ peers for the majority of the session?
❑ Was a shared activity planned, and the required materials provided?
❑ Did the peers participate in the shared activity appropriately?
❑ Did the focus student participate in the shared activity appropriately?
❑ Was the facilitator present at least part of the time?
❑ Did the facilitator encourage the student and peers to interact (e.g., encourage discussion, use facilitation supports as needed to keep the shared activity and conversation moving along)?
❑ Did the facilitator ensure the visual cue for the interaction strategies was displayed and/or remind students about the interaction strategies?
❑ Did peers talk with and engage directly with the focus student, as often as they did with each other?
❑ Did peers use the three general interaction strategies throughout the session (i.e., were all checked as occurring 5 or more times)?
❑ Did peers model core or activity-related vocabulary at least 10 times throughout the session?

**Did the facilitator provide prompting, feedback, or reinforcement for peers to model AAC?**
❑ *Yes*   ❑ *No*
**Did the coach provide prompting, feedback, or reinforcement for peers to model AAC?**
❑ *Yes*   ❑ *No*

APPENDIX I

Peer Network Member Interaction Feedback Sheet

## Interaction Feedback Sheet for Peer Network Members

Name: _____     School: _____

Thank you for being a peer network member! We want to know more about how you feel things are going when you spend time with your classmate with a disability. Please read each of the following statements and circle the answer that best reflects how you feel.

| | | | | | |
|---|---|---|---|---|---|
| 1. | I enjoy spending time and talking with my classmate during the peer network meetings. | Not really | Sometimes | Most of the time | All of the time |
| 2. | I can understand what my classmate tells me. | Not really | Sometimes | Most of the time | All of the time |
| 3. | I feel like my classmate understands the things I say. | Not really | Sometimes | Most of the time | All of the time |
| 4. | The things my classmate says make sense in response to the things we do or talk about during the peer network meetings. | Not really | Sometimes | Most of the time | All of the time |
| 5. | I feel like it is easy to talk with my classmate. | Not really | Sometimes | Most of the time | All of the time |

Focus Student End of Study Social Validity Questionnaire

# Peer Network Intervention for Students who use AAC
## Student Social Validity Questionnaire

Student: _____     School: _____

Date: _____ Completed by: _____

Please read each of the following questions to the student with a disability. **Circle** the answer that best reflects their response. Add any notes below if the student elaborates on their response.

| | | | | |
|---|---|---|---|---|
| 1. Do you like spending time with _____ [names of peer network members]?<br><br>Comments: | Yes | No | Unsure | Unclear |
| 2. Did you like when your friends used your _____ [word student uses for their AAC device] to talk with you?<br><br>Comments: | Yes | No | Unsure | Unclear |
| 3. Are _____ [names of peer network members] your friends?<br><br>Comments: | Yes | No | Unsure | Unclear |
| 4. Would you like to keep spending time with _____ [names of peer network members]?<br><br>Comments: | Yes | No | Unsure | Unclear |

Circle "unsure" if the student communicates he or she is not certain of the answer. Circle "unclear" if the student did not clearly communicate his or her perspective.

Peer Network Member End of Study Social Validity Questionnaire

## **Peer Network Member Social Validity Questionnaire**

Name: _____          School: _____

Thank you for being a peer network member! We want to know your thoughts about the project. Please read each of the following statements and **circle** the answer that best reflects your views. This information will help us improve the project experience for future students.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | At first, I was excited to become a peer network member. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 2. | I had enough help from an adult during the peer network. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 3. | I know how to interact with [student]. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 4. | [Student] became better at communicating when I showed her things on her communication device. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 5. | I enjoyed learning to use the communication device when I talk to [student]. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 6. | Other students in the school should also do this. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 7. | I would be a peer network member again in the future. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 8. | Our school should have more peer networks. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 9. | [Student] met new people and/or became better friends because of the peer network. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 10. | [Student] is my friend. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 11. | I would recommend being a peer network member to my other friends. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 12. | I had fun being a peer network member. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

**Continue On the Back of This Page**

**Think about your experience as a peer network member this semester, including when you learned to show your classmate things on their communication device. Answer the following questions:**

What went really well?

What could have been better?

What helped you the most to learn different ways to interact with [Student]?

What (if anything) has changed for you as a result of being a peer network member?

What (if anything) has changed for [Student] as a result of having a peer network?

**Thank you for taking the time to complete this questionnaire and for participating in this project!**

Facilitator End of Study Social Validity Questionnaire

# Peer Network Adult Facilitator Social Validity Questionnaire

Name: _____     School: _____

Thank you for your contributions to this project! We want to know your thoughts about being a peer network facilitator. Please read each of the following statements and **circle** the answer that best reflects your views. This information will help us improve the project experience for the future.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | The amount of time required for planning and training was reasonable. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 2. | I would need ongoing consultation to continue implementing these strategies. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 4. | Having peers model the student's communication device helped the student use it more to communicate. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 5. | I could use what I learned to teach other peers or adults how to model the student's communication device. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 6. | I am motivated to continue using what I have learned in this project. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 7. | The peer network intervention fits well within this school. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 8. | I would know what to do if I was asked to implement a peer network intervention again. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 9. | The student with a disability benefitted socially from the peer network intervention. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 10. | The student with a disability has more friends and/or got to know friends better as a result of this project. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 11. | The student with a disability became better at communicating as a result of this project. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 12. | The peers without disabilities benefitted socially from being a peer partner. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 13. | Overall, I enjoyed participating in this project. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

**Continue On the Back of This Page**

**Think about your experience setting up a peer network this semester. Answer the following questions:**

What went really well?

What could have been better?

What (if anything) has changed for the student with a disability as a result of being in this project?

What (if anything) has changed for the peers as a result of being in this project?

What (if anything) has changed for you as a result of being in this project?

**Thank you for taking the time to complete this questionnaire and for participating in this project!**

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