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“TWO FRIENDS SPENDING TIME TOGETHER”: THE IMPACT OF VIDEO VISUAL SCENE DISPLAYS ON PEER SOCIAL INTERACTIONS FOR ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

Peer interaction supports adolescents in developing communicative, emotional, and social competence. Social interaction, however, poses many challenges for adolescents with autism spectrum disorder (ASD) and complex communication needs. This study used a multiple-probe across participants design to assess the impact of an intervention using videos with integrated visual scene displays (video VSDs), presented on a tablet-based app, on the communication of four adolescents with ASD and complex communication needs and their peer partners. Following intervention, all four participants demonstrated an increase in communicative turns compared to baseline (Tau-\(U\)=1.0, 95% CI [0.56, 1]), and three of the four increased in modes of communication used (including use of natural speech). All participants with ASD (and their peer partners) expressed an interest in continued use of the video VSD app to support social interaction.

*Keywords*: social interactions, video visual scene displays, partner training, autism spectrum disorder, augmentative and alternative communication
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Chapter 1

Introduction

Many adolescents with autism spectrum disorder (ASD) experience difficulty participating in social interactions with their peers (Humphrey & Symes, 2011; Lasgaard, Nielsen, Eriksen and Goossens, 2010). Adolescents with ASD are five times more likely to describe themselves as “often or always” feeling lonely than are adolescents without ASD (Lasgaard et al., 2010). A combination of developmental and linguistic factors contribute to the challenge of social interaction for adolescents with ASD. As children enter adolescence, communication demands are intensified as spoken exchanges increase in both speed and quantity (Turkstra, Ciccia, & Seaton, 2003). Conversations typically take place in groups of communication partners, and experiences are processed through fast-paced discussion with others (Rubin, Bukowski, & Laursen, 2011; Turkstra et al., 2003). In contrast to the topics of childhood interaction, social exchanges become more complicated during adolescence, as the understanding of (and communication about) one’s self and others intensifies (Smith, 2015).

ASD and Social Interaction

During typical peer interactions, adolescents talk about a topic of shared interest (Bagwell & Schmidt, 2011), make use of specialized vocabulary which helps to define membership in the group (Smith, 2015), and share conversational responsibility by taking turns within the interaction (Turkstra et al., 2003). Deficits in social interaction skills are a defining characteristic of ASD (American Psychiatric Association, 2013), however, and many persons with ASD experience challenges in sharing information about a past or future event (Favot, Carter, & Stephenson, 2019), using relevant vocabulary at appropriate times (Neely, Gerow, Rispoli, Lang,
& Pullen (2016), and taking appropriate conversational turns during interactions with others (Jones & Schwartz, 2009; Paul, Orlovski, Marcinko, & Volmar, 2009).

The challenges of social interaction are further intensified for those adolescents with ASD who also have complex communication needs: that is, their speech does not meet all of their communication needs (Beukelman & Mirenda, 2013). Approximately 30% of children with ASD do not develop speech (or demonstrate only limited speech) by age 9, and many of these individuals continue to experience severe difficulty in using speech during adolescence and adulthood (Tager-Flusberg & Kasari, 2013). Without access to an effective method of communication, these individuals will experience limited opportunities to engage in educational, vocational, and recreational activities, and frequently report feelings of social isolation and depression (Carter et al., 2014; Smith, 2015).

Augmentative and Alternative Communication

For individuals with ASD and complex communication needs, the use of augmentative and alternative communication (AAC), such as sign language, picture communication boards, and AAC apps on mobile technology, can support both expressive and receptive communication (Ganz, Boles, Goodwyn, & Flores, 2014; Ganz et al., 2012). AAC has been demonstrated to be an important support for communication for persons with ASD in a variety of contexts (e.g., Therrien & Light, 2018; Ganz et al., 2012). A majority of the research to date, however, has focused on the communication of needs and wants, with only minimal attention to supporting social interaction (Ganz et al., 2012). At the same time, recent reviews of the literature provide evidence that social communication interventions for adolescents with ASD have not addressed the needs of individuals with ASD who have complex communication needs (Babb, Raulston, McNaughton, Lee, & Weintraub, 2019; Ganz et al., 2012; Therrien & Light, 2016), and there is
only a limited understanding of how AAC might support participation in adolescent conversations.

For adolescents with ASD and complex communication needs, the dual challenges of both peer interaction and the use of AAC may pose three key difficulties: (a) the individual with ASD may require language and cognitive supports to discuss past and future events (i.e., events outside the here and now; Adamson & Bakeman, 2006; Caron et al., 2019); (b) the AAC system may not provide easy access to the specialized vocabulary needed for a specific topic (Holyfield, Caron, & Light, 2019), and (c) the rapid exchanges typical of peer interaction may make it difficult for the individual to recognize and take a communication turn (Rubin et al., 2011; Smith, 2015).

**Video Visual Scene Displays**

Traditionally, AAC systems have been presented as grid-based displays with isolated AAC symbols arranged in rows and columns depicting language concepts outside of the meaningful communication contexts in which they occur. As an alternative, Light and McNaughton (2012) proposed the use of visual scene displays (VSDs). VSDs capture meaningful events within an individual’s life in an integrated scene (i.e., photograph), with language concepts embedded as hotspots within the scene in order to reduce cognitive and linguistic demands (Light & McNaughton, 2012). The VSD (e.g., image or photograph) can be of a motivating activity within the life of the individual with complex communication needs which has been programmed with relevant vocabulary using ‘hotspots’ within the scene. When selected, the hotspots produce recorded speech output of the word or phrase.

For beginning communicators, VSDs are particularly advantageous (Light, McNaughton, & Caron, 2019). First, the picture or image captures social interactions in the context for which
they occur, providing contextual support for beginning communicators as they learn language skills. Second, vocabulary for communication is embedded directly onto the VSD. Often, children have to share joint attention between the activity (e.g., storybook), AAC system, and the communication partner. This approach places additional demands on individuals who use AAC, as they must shift focus between the partner, AAC system, and the activity. Lastly, VSDs support the addition of meaningful, appropriate vocabulary as it occurs in the moment with just-in-time programming (Light et al., 2019).

Video visual scene displays (video VSDs) may provide an appropriate communication support for social interactions for adolescents with complex communication needs (Light, McNaughton, & Caron, 2019). In this approach, first proposed by Light, McNaughton, and Jakobs (2014), personally-relevant videos are programmed (using an app) with VSDs. To create a VSD, the adolescent with complex communication needs views the video with a partner, pausing the video at key moments (i.e., high-interest events). Pausing the video automatically creates a still photo image of the key event as a VSD. Hotspots (i.e., a part of the screen that produces speech output when touched) are added by drawing on the image and recording desired speech output. Once a VSD with one or more hotspots has been added to a video, the video automatically pauses at these key junctures, and the individual has an opportunity to use the hotspots to communicate about the still image that appears. For example, an adolescent with complex communication needs might have a video VSD showing a preferred topic of interest, such as a video clip of someone making pizza. As the adolescent views the video, it would pause automatically wherever a VSD has been made (e.g., a VSD showing the pizza in the oven). When a hotspot is added on the VSD of the pizza, the outline of the hotspot is displayed
momentarily and the adolescent can access the prerecorded phrase (e.g., “It smells great!”) by touching the hotspot (see Figure 1).

**Prior Research**

The limited research to date provides evidence that the use of video VSDs holds potential as a social interaction support for individuals with ASD. Caron, Laubscher, Light, and McNaughton (2019) investigated the use of video VSDs to support social interaction between adolescents with ASD and complex communication needs and adult partners while watching videos. After the introduction of the video VSD app, all five participants demonstrated increases in the number of communicative turns, and in the use of the vocabulary provided through the VSDs.

Although the results are promising, Caron et al. (2019) did not address the use of same-age peers as communication partners – all interactions took place with a skilled adult communication partner. At present, it is unclear what additional supports might be needed for a same-age peer to interact with an adolescent with ASD and complex communication needs using video VSDs. The issue of instruction is a key consideration in social skills interventions: provision of instruction for both the student with disabilities and the peer partner appears to be strongly associated with successful results (Kasari & Smith, 2013; Therrien & Light, 2018; Watkins et al., 2015). It is important, however, to identify supports that require only limited instruction, so as to minimize the role of adults (e.g., teachers, paraprofessionals) during peer interaction (Finke, 2016).

**Present Study**

A video VSD intervention may offer a promising approach to the key challenges of peer interaction for adolescents with ASD, as the Video VSD app (a) provides a context to support interaction about events and activities outside the here and now, (b) supports easy access to needed vocabulary at appropriate times, and (c) provides clear cues for the taking of
conversational turns. It also was hypothesized that because the app is relatively simple to use, that only a relatively brief training (including a small number of video models of its expected use) would contribute to a change in interaction behaviors between adolescents with ASD and peer communication partners. This study, therefore, addressed the following questions: (a) What is the effect of a video VSD intervention on the communication of adolescents with ASD and complex communication needs during interactions with peers with typical development as measured by frequency of communication turns (b) Are the effects generalized to a different communication partner? (c) Are the effects maintained over time post-intervention? The interactions were also analyzed post-hoc to consider the impact of the AAC app with video VSDs on the communication modes used by individuals with ASD, specifically the impact of the app on speech production, either alone or in combination with other modes.
Chapter 2

Methods

Research Design

This study used a single subject, multiple-probe design across four dyads (Kazdin, 2013). In this design, the researcher measures a single target behavior for multiple individuals. After establishing a stable baseline (i.e., minimal to no increasing trend; Smith, 2012) and at least five sessions for each participant, the independent variable is introduced to the first participant while the other participants remain in baseline. When the first participant meets the set criterion for an intervention effect (two consecutive data points at least 25% higher than the highest baseline probe (Caron, Laubscher, Light, McNaughton, 2020) for the activity, the independent variable is introduced to the next participant while the third participant remains in baseline and the sequence continues until the independent variable has been introduced to all participants (Cooper et al., 2007). This design investigates whether the behaviors (i.e., dependent variable) of the participants changed upon introduction of the intervention (the independent variable, in this case, the video VSD technology), thereby showing the relationship between the intervention and the targeted skill (Kazdin, 2013). In this study, participants three and four were yoked together, and therefore entered intervention at the same time. The study involved three phases, baseline, intervention, and maintenance, with two generalization probes conducted during baseline and two during intervention. The independent variable was a multicomponent intervention including the provision of a tablet computer with the video VSD app, and a single training session for each dyad in the use of the app. The primary dependent variable was the frequency of symbolic communicative turns taken by the participants during a 10 min. interaction with a peer partner.

Participants
All participants were recruited from a high school in Pennsylvania. Participants with ASD were eligible for inclusion if they met the following criteria: (a) had a diagnosis of ASD; (b) were between the ages of 13-21; (c) had speech that was inadequate to meet their daily communication needs as described by their teacher or speech language pathologist; (d) used at least 25 spoken words, signs, or graphic symbols to communicate; (e) experienced difficulty interacting with peers without adult support; (f) had sufficient motor control to use direct selection on a touch screen; (g) watched videos on social media sites (e.g., YouTube) (per teacher report); (h) lived in a home in which English was the first language; and (i) demonstrated unimpaired/corrected vision and motor skills and hearing within normal limits per IEP or parental/teacher report.

Peer partners without disabilities were recruited based primarily on teacher recommendation and met the following criteria: (a) were high school students and (b) had adequate vision or hearing (with or without correction). Four participants with ASD and four peers without disabilities were recruited to participate in the study, a total of four dyads. Three of the four dyads were formed based on previous pairings (i.e., school district peer buddy program). The four peer participants were recruited from the same high school as the participants with ASD.

A total of four participants with ASD and complex communication needs participated in the study (see Table 1). All four of the participants had a diagnosis of ASD (described in the IEP as receiving services for students with ASD and corroborated through assessment with the Childhood Autism Rating Scale Second Edition, CARS-2; Schopler, Van Bourgondien, Wellman, & Love 2010, administered by the first author) and scored in the severe range on the CARS-2, Standard Form. All four participants scored below the first percentile for both the Receptive and Expressive One-Word Picture Vocabulary Tests-Fourth Edition (ROWPVT-4,
Participant scores for communication, daily living skills, and socialization as measured by the researcher using the Vineland–3 (Sparrow, Cicchetti, & Saulnier, 2016) ranged from low (Nick, Wayne, and Lexi) to adequate (Deidre).

All four participants communicated primarily for the purposes of requesting per teacher and speech-language pathologist (SLP) report. Each were described as rarely if ever participating in social interactions with peers or staff, and would engage in simple greetings only when prompted to do so. See Supplemental Materials for an extended description of participant communication.

Deidre and Lexi relied on the use of natural speech, but typically only when prompted to do so. Their speech often demonstrated the features of immediate and delayed echolalia (Roberts, 2014). For example, Lexi would repeat speech directed towards her (e.g., repeating back “How are you, Lexi”, when greeted), or repeat lines out of context (e.g., scenes from a favorite movie or TV show). According to reports, low-tech AAC supports had been recommended for Deirdre and Lexi in the elementary grades, but had been discontinued as both were described as making little or no use of these systems. Neither Deidre nor Lexi had AAC supports at the time of the study.

Both Nick and Wayne had been provided with AAC systems for expressive communication (i.e, an iPad with communication apps and a low-tech communication book) and receptive communication (i.e., visual schedules). Both used their expressive AAC systems for requesting, but only when prompted. Visual schedules were used with both Nick and Wayne throughout the day to support their understanding of the daily routine. Nick made some limited use of speech when prompted, primarily for the purposes of requesting. His speech also demonstrated the features of immediate and delayed echolalia. Wayne did not make any use of speech.
The four participants with ASD attended special education classes with one-to-one support throughout the day, and all received speech and language services. Deidre and Lexi participated in general education classes with peers for specials such as cooking, painting, and jewelry making. Nick and Wayne did not participate in any general education classes.

**Setting and Activity**

The study took place in the participants’ high school. The activity occurred across multiple settings (e.g., student’s classroom, common areas) and during typical school hours (e.g., homeroom, break period) due to scheduling and space availability.

**Materials**

**Videos.** Each tablet contained five video clips, each of which were approximately 2 minutes in length. The clips were created from videos downloaded from social media sites (e.g., YouTube). Video clips were selected based on the interests of the participant and the peer, as identified by the results of a Preference Assessment (Cooper et al., 2007) conducted prior to the start of the study. The Preference Assessment included both open-ended (i.e., fill-in-the-blank) and close-ended (i.e., identify preferred topics from a list) options. For participants with ASD, the Preference Assessment was completed with a teacher or parent. The peers completed the Preference Assessment independently and emailed their responses to the researcher. The researcher applied the following criteria for choosing videos based on the participants interests: a) appropriate for use at school; b) three of the five video clips were based on the interests of the participant with ASD, and two video clips were based on the interests of the peer; and c) the main content (e.g., primary purpose of the video) was able to be portrayed in a two minute clip. Preferred videos included popular activities such as: cooking videos, music videos, TV shows, cartoons, and movie clips. The five video clips were uploaded into the video VSD app, and
totaled a minimum of ten min in length. The same five videos were used in all three phases of the study. The video clips were added to the video VSD app prior to the start of the study (See Figure 2).

**Tablet and video VSD app.** A 12-inch Samsung Galaxy Note Pro 7® tablet was provided to each dyad during all sessions of the study. Each tablet contained the EasyVSD app (v. 1.58 created by InvoTek), which was used in the three phases of the study: baseline, intervention, generalization, and maintenance. During all phases, the app provided a vertical menu bar on the left side of the screen with thumbnails representing five videos – touching the thumbnail resulted in the video being played. During intervention, generalization, and maintenance, the video VSD app also included a menu bar with an editing button. The editing button could be used to stop the video, automatically creating a VSD in a video clip (e.g., a fingernail painting tutorial) as follows: 1) press the play button (the arrow located at the top left) to begin watching the video clip; 2) pause the video at key moments of interest (e.g., person displaying their nail design; pausing the video automatically creates a still image to be used as a VSD); 3) add hotspots to the image (e.g., add a hotspot on the image of the person’s nails) and record communication with a message related to the event (e.g., “Beautiful”), that will be spoken when selected; (4) press the play button again to continue watching the video model (e) repeat steps 1 - 4 for the remainder of the video.

In addition, a second menu bar (directly to the right of the first) included thumbnails of specific VSDs within the target video, allowing for navigation between parts of the video. When

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1 Samsung Galaxy Note Pro 7® is an Android tablet computer, developed by Samsung Electronics. [http://www.samsung.com](http://www.samsung.com).

2 EasyVSD is an AAC application developed by InvoTek, Inc. [http://www.invotek.org/](http://www.invotek.org/).
viewed by the participants, the selected video filled 80% the screen of the tablet, while the navigation icons and a play/pause button positioned vertically on the left-hand side of the screen filled the remaining 20% of the screen (as illustrated in Figure 2).

**Procedures**

The study was implemented over an eleven-week period, and the researcher conducted probes between two and three times per week. The probes in all three phases of the study (i.e., baseline, intervention, maintenance) followed the same procedures.

**Probe activities.** All probe activities took place in the dyad’s high school, however the settings (e.g., participant’s classroom, common area) and time of day (e.g., homeroom, break period, peer buddies period) varied depending on participants’ schedules. The participant and the peer were seated next to each other in a quiet area and provided with a tablet that included five 2-min video clips of preferred videos (total of approximately 10 min of videos). Current AAC supports were also available (e.g., low-tech communication books, access to their AAC apps on the iPad) if they had been recommended for the participant. The researcher gave an initial cue at the start of the activity: “Now is a time for you to watch and talk about some videos together. You can watch different videos that have been stored on this tablet. We would like you to do this for 10 minutes.” After 10 minutes had passed, the researcher announced the session was over, and removed the tablet. All sessions were video recorded for data collection purposes. The researcher, a doctoral student with experience working with adolescents with ASD and research experience with AAC technology, conducted each session. A minimum of five baseline sessions and interventions sessions were conducted for each dyad (Kazdin, 2013).

**Baseline.** Prior to the first baseline probe session, the participants viewed a 35 sec point-of-view video model (labelled Tablet Use) depicting how to use the table. The video demonstrated
pressing play/pause and selecting thumbnails to choose videos. The dyads had access to the same
five videos that were used throughout the study for their dyad, however during baseline the
videos did not include VSDs (and hotspots), and the participants did not receive any instruction
in adding VSDs and hotspots.

**Intervention.** Prior to the first intervention probe, the participants in each dyad viewed a
second instructional video together (labelled App Use) that included two segments: Using the
App to Communicate, and Adding Vocabulary to the App.

The Using the App to Communicate segment provided a video model (point of view model)
of using the app with a partner. More specifically, participants in each dyad were directed to (1)
provide wait time for their partner to take a turn, (2) respond to their partner’s turn, and (3)
expand on the turn with an additional question or comment. For each target behavior (i.e., wait,
respond, expand). A brief video example of the behavior was shown, along with a voice
narration describing the behavior. The Adding Vocabulary segment provided a video model of
how to work with a partner to create VSDs and add vocabulary using hotspots. The steps were
summarized by the acronym S.T.A.R.T. (adapted from Caron et al., 2016): S – Stop the video at
an interesting point, T – Talk through where to draw the hotspot and what the hotspot should say,
A – Add a hotspot, R - Record the hotspot, T – Together use the hotspots. The total viewing time
for the App Use video was 3 min and 25 sec. Other than viewing the instructional videos, the
dyads received no additional instruction or directions from the researcher. All participants
viewed each video one time only.

The intervention probe occurred exactly as the probes in baseline, except the dyad had access
to the video VSD app that supported the addition of VSDs and hotspots to the videos. Each dyad
participated in a minimum of five intervention sessions.
**Generalization.** Generalization probes were conducted to determine whether the skills would generalize to a new communication partner. Two generalization probes were conducted during baseline and two during intervention with the participant with ASD and a different peer partner (i.e., a peer from a different dyad) who was at the same phase of intervention (i.e., baseline, intervention). The same peer partner participated in all generalization probes with the participant with ASD. Generalization probes followed the same procedures described for baseline and intervention sessions except that a different partner without disabilities participated in the probe session.

**Maintenance.** Maintenance probes were completed at 2 and 4 weeks after the end of the intervention phase. These probes followed the same procedures as the intervention probes. In order to control the amount of exposure to the video VSD app, the individuals did not have access to the app after the final intervention probe or between sessions.

**Procedural integrity.** To assess procedural integrity, a trained graduate student in communication sciences and disorders (Graduate Student 1) watched videos of (a) the probe sessions, and (b) the video training session (i.e., viewing of the instructional videos) and compared the researcher’s behaviors to procedural checklists. Procedural integrity was measured on a minimum of 30% of randomly selected probes for each of the four dyads in each of the three phases, as well as the training session video for each dyad (Kazdin, 2013). The student was trained in the procedural integrity procedures by scoring randomly selected videos against the procedural standards (i.e., checklist) with the researcher. When agreement exceeded 90%, the student scored 30% of a new sample of randomly selected videos independently. Procedural integrity was calculated with the following formula: number of steps implemented correctly divided by the total number of steps implemented correctly plus steps omitted plus steps
implemented incorrectly. The average procedural reliability for probe sessions was 100% for baseline, 97.5% for intervention (range 90-100%), 95% for generalization sessions (range 90-100%), and 90% for maintenance sessions (range 90-100%). Procedural reliability for instructional sessions was 100% for each training to each dyad.

Data Collection and Analysis

All probe sessions with the dyads were video-recorded by the researcher for data collection purposes. The videos were then viewed in order to code the dependent and collateral variables.

Dependent and collateral variables. The primary dependent variable in this study was the frequency of symbolic communicative turns expressed by the adolescent with ASD during a 10-min interaction with a peer. A behavior was considered a symbolic communicative turn (adapted from Caron et al., 2019) if (a) the individual produced words (either spoken or through speech output from the AAC app), conventional signs, or conventional gestures (e.g., nodding head for “yes”); and (b) the individual was oriented toward the partner or an object of joint attention (as demonstrated by body orientation to the partner or shared activity (i.e., tablet). A turn was judged to have begun when an individual communicated (either via speech, sign/gesture, or activation of a hotspot on the VSD), and was judged to have ended when either the partner began a turn or two seconds passed without communication. Collateral variables were the frequency of symbolic communicative turns expressed by the peer as well as the modes of communication (i.e. speech, speech-generating device, sign/gesture, sign and speech, and speech and speech-generating device) used by the participants with ASD. Speech was defined as the oral expression of language that included the natural production of intelligible words (Millar, Light, & Schlosser, 2006). Expression with a speech-generating device was coded when the individuals used their high-tech AAC devices or the video VSD application. Sign/gesture was coded when manual
signs, approximations, or conventional gestures were used and the partner identified and said the meaning of the sign. Finally, if the individual communicated using a combination of modes within the same turn, this was coded as either speech and sign or speech and speech-generating device.

Coding dependent variables. A trained graduate student in special education (Graduate Student 2) was trained (using videos from a previous study) until reliability in coding dependent and collateral variables was greater than 90% with the standard. Once training was complete, Graduate Student 2 acted as the primary coder for this study, and reviewed and coded the video recordings of all probe sessions. Graduate Student 2 was blind to the goals and conditions of the study, and scored all data in a randomized order post hoc.

Interobserver agreement. Graduate Student 1 was trained using videos from a previous study until reliability in coding dependent and collateral variables was greater than 90% with the researcher. Graduate Student 1 then calculated interobserver agreement for no less than 30% of the probes for each phase of the study (i.e., baseline, intervention, generalization, and maintenance). Interobserver agreement was determined with point-by-point agreement. For a turn to be agreed upon, the time of the turn had to be within one second of the turn originally coded by the blind coder. Reliability was calculated by taking the number of agreements divided by the number of agreements plus disagreements plus omissions and multiplying by 100. Average baseline inter-observer reliability for frequency of turns by the participants was 99% (range 92-100%); 93% for intervention (range 91-97%), 96% for generalization (range 93-98%), and for maintenance data, mean reliability was 94% (range 92-99%).

More specifically, average baseline inter-observer reliability for frequency of turns for Deirdre was 100%; 97% for intervention, 96% for generalization, and 97% for maintenance. For
Nick, average inter-observer reliability for baseline was 99%, 95% for intervention, 100% for generalization, and 90% for maintenance. Average baseline inter-observer reliability for frequency of turns for Wayne was 100%; 95% for intervention, 96% for generalization, and 96% for maintenance. Lastly, for Lexi, average inter-observer reliability for baseline was 96%, 96% for intervention, 98% for generalization, and 100% for maintenance.

For peer participants, average reliability for frequency of turns was 94% in baseline (range 90-98%), 93% in intervention (range 89-98), and 94% in maintenance (range 94-100%). More specifically, for Emma, average baseline inter-observer reliability for frequency of turns was 100%; 94% for intervention, and 94% for maintenance. For Sam, average inter-observer reliability for baseline was 100%, 92% for intervention, and 90% for maintenance. Average baseline inter-observer reliability for frequency of turns for Megan was 100%; 100% for intervention, and 100% for maintenance. Lastly, for Kristen, average inter-observer reliability for baseline was 91%, 93% for intervention, and 94% for maintenance.

**Data analysis.** To assess the impact of the intervention on the frequency of symbolic communication turns by adolescents with ASD during peer interactions, the researcher graphed the frequency of communication turns for each participant and peer in each condition (i.e., baseline, intervention, generalization and maintenance). The researcher conducted a visual analysis of the data for changes in trend, slope, variability, immediacy of effect, and overlap to examine the effects of the video VSD app on symbolic communication turns (Kazdin, 2013). Additionally, effect sizes were calculated for each participant using Tau-\(U\) (Vannest, Parker, Gonen, & Adiguzel, 2016). Tau-\(U\) is an effect size measure that calculates nonoverlapping data with baseline, controls for baseline trend, and has effect sizes that range from 0 to 1. Tau-\(U\)
effect sizes are typically interpreted as small (0 to 0.19), moderate (0.20 to 0.59), large (0.60 to 0.79), and very large (above 0.80) (Vannest & Ninci, 2015).

**Social Validity**

The social validity of the goals, methods, and outcomes (Schlosser, 1999) was assessed with both the direct (i.e., adolescents with ASD, peers) and indirect stakeholders (teachers, school speech-language pathologist [SLP]) of the intervention. Social validity for the participants with ASD was assessed via a Talking Mats procedure (Murphy, Gray, van Achterberg, Wyke, & Cox, 2010). In the Talking Mats procedure, the participant was given photographs representing familiar activities, events, or items and asked to sort the items into three areas labelled with symbols representing “like”, “not sure”, and “don’t like”. The participants’ teachers provided examples of known likes and dislikes in order to confirm that the participants were making appropriate use of the Talking Mats technique. Each participant placed known dislikes (e.g., spiders, loud noises, vegetables) into the ‘dislike’ category and placed known likes (e.g., trampoline, music, soda) into the ‘like’ category. Two pictures representing the study and intervention were included in the selection process (i.e., picture of the participant and their peer partner with the tablet, and a picture of the tablet showing a VSD on the screen).

Social validity for peers, teachers, and an SLP was assessed using social validity questionnaires (Schlosser, 1999). At both baseline and following intervention, peers completed a five-item social validity questionnaire addressing the importance and effectiveness of their communication with their buddy. Following the intervention, the peer partners also completed an additional 17-item social validity questionnaire. The participants’ teachers and SLP completed a 16-item social validity questionnaire after viewing a minimum of one pre-intervention video and
one post-intervention video for their student(s), chosen at random from all probe videos. See Supplemental materials for social validity questionnaires.
Chapter 3

Results

This study investigated the impact of a video VSD intervention on the frequency of communicative turns by adolescents with ASD and complex communication needs during social interaction with a peer. Increases from baseline to intervention were observed for all four participants, with each demonstrating an increase in the number of communication turns following the introduction of the video VSD app (see Figure 3). The four typically developing peer partners also increased the frequency of their symbolic communicative turns following the introduction of the app. Furthermore, the interactions following intervention were “balanced”: the numbers of turns taken by the two participants in each dyad were close to equal per visual analysis for three of the four dyads. The results provide evidence that the use of video VSDs (a) supported the participants in social interaction during shared interest video viewing, (b) provided the participants with access to effective communication supports, (c) enabled both the participant and the peer to take an approximately equal number of turns in the interaction, and (d) required only minimal instructional via video modeling support (approximately 4 minutes) to teach participants to use the app to support their interactions.

Frequency of Symbolic Communicative Turns by Participant with ASD

All four participants took significantly more turns in intervention probes than in baseline probes. For each participant, interaction at baseline was minimal (if interaction occurred at all). Deidre increased from 0 turns during all sessions at baseline, to an average of 47 (range: 18-70) during the probes at intervention. Nick increased from an average of 6 turns (range: 0-12) during baseline, to an average of 48 (range: 28-65) during the probes at intervention. Wayne took 0 turns during all sessions during baseline and increased to an average of 17 during intervention
(range: 7-24). Lexi had an average of 14 turns (range: 9-18) during baseline and increased to a mean of 58 turns (range: 39-69) during intervention (See Table 2).

There was evidence of an immediate increase in the number of communicative turns with continued gains over sessions during intervention for each of the four participants. There was no overlap for any participants between baseline and intervention phases. Data in the intervention phase had an increasing trend for each participant, with some variability between interventions sessions, suggesting learning that occurred overtime. Furthermore, all four participants continued to maintain their higher than baseline levels of communication at both two- and four-week maintenance probes. For each participant with ASD, an increase in the frequency of communicative turns was also observed during the generalization probes (i.e., during interactions with a different peer partner). During generalization Deidre increased from a mean of 3 turns at baseline to 63.5 turns at intervention, Nick from 6.5 turns to 40.5, Wayne from 0 to 24.5, and Lexi from 7.5 to 58 turns at intervention. Turns frequently included both the use of existing hotspots and of newly created hot spots to express a message. Both existing and newly created hotspots provided access to contextually relevant vocabulary. In addition, the creation of new hotspots provided the participant with ASD with opportunities to establish and develop new topics of interest.

Effect size, calculated using Tau-U, indicated strong effects for the video VSD intervention for all four participants with ASD (Vannest et al., 2016). The Tau-U effect size for communicative turns for each participant was 1.0. Each participant had a weighted Tau-U score of 1.0, p = .000 with a 95% CI [0.56-1.0] indicating a large effect.

**Communication Modes**

Each symbolic turn was coded for the mode in which it was communicated, and all
participants demonstrated both an increase in the number of different modes used, as well as an increase in the number of turns taken using each of the modes in their repertoire (see Table 2). All participants that used speech in baseline demonstrated increased use of speech in intervention (i.e., an increase in symbolic turns using speech). All participants also demonstrated an increase in turns using the speech-generating device during intervention. More specifically, Deidre averaged 0 symbolic turns using speech in baseline and 27 during intervention as well as 2 turns using speech and sign. Nick averaged 9 turns using speech in baseline and 32 in intervention, and Lexi averaged 13 symbolic turns with speech in baseline and increases to an average of 31 in intervention. The participant that did not communicate using speech symbolically in baseline (Wayne), also did not use speech during intervention, but did demonstrate increases in symbolic turns with the support of the video VSDs in intervention. Additionally, all participants made use of the speech-generating device (e.g., use of VSDs) during intervention. Small changes were observed for one participant (Deidre) in the use of signs and gestures, and signs and gestures used in combination with speech. No participants made combined use of speech and the video VSD within a single communicative turn.

**Frequency of Communicative Turns by Peers**

The frequency of communicative turns for all four peer partners also increased between baseline and intervention. Similar to the participants with ASD, the peers also demonstrated very low levels of participation at baseline, with sharp increases immediately following intervention. Emily (Deidre’s peer), increased her frequency of turns from a mean of 0 turns (range – 0) in baseline to an average of 54 (range: 33-72) in intervention. Sam (Nick’s peer) averaged a frequency of 7 turns (range: 2-13) in baseline, and increased to 58 (range: 46-73) in intervention. Megan (Wayne’s peer) averaged 4 turns (range: 0-9) at baseline and increased to an average of
22 (range: 10-29) turns during intervention. Lastly, Kristen, (Lexi’s peer), increased frequency of turns from an average of 27 (range: 23-49) during baseline to 81 (range: 72-97) during intervention.

Social Validity

Following the intervention, all participants with ASD provided information on the perceived impact of the intervention. Using the Talking Mats procedure, all participants placed the two photographs of the intervention (as described above) in the “like” category rather than ‘don’t like’ or ‘not sure’. During baseline, the average rating for peers on their effectiveness of communication with the partner with ASD was 1.8 (range = 1-2) (on a 5-point scale where 1 = strongly disagree and 5 = strongly agree). Each peer also rated the communication effectiveness of their partner with ASD with the mean rating of 1.5 (range = 1-2). After intervention, peer rated their communication effectiveness with their partner as a mean of 4.8 (range = 4-5) and their partner’s communication effectiveness as a mean of 4.3 (range = 4-5). For the additional social validity questionnaire, each peer rated the intervention positively (e.g., My buddy and I communicated more after the training) with an average score of 4.8 (range= 3-5). Further, each peer indicated that they enjoyed and learned from the video training (mean = 4.8; range = 4-5), and that the use of the app improved their communication as well as their partner’s communication (mean = 5). Responses to the open-ended questions on the benefits of the intervention focused on the usefulness of the app for supporting interaction (see online materials). Examples included, “Before this project, I would ask her questions and she wouldn’t answer me. Now, we are able to talk about lots of things!” (Emily). “It inspired conversation that wouldn’t have happened otherwise; we were able to communicate together- before this, we didn’t talk” (Megan). Only one peer stated a specific challenge in response to a question about
the challenges of using the app - Megan stated that when her buddy wasn’t feeling well, it was hard to get him to participate in the activity and he didn’t always seem to enjoy the activity on those days.

After viewing randomly selected pre/post videos, each of the four staff members (blind to the conditions of the study) strongly agreed that having a way to communicate and interact with peers is an important goal (mean= 5), that the activity was age-appropriate for their student as well as their peer (mean= 5), and that the intervention was effective, efficient, and appropriate to support communication (mean= 4.8; range = 4-5). Staff members rated the intervention positively with an average score of 4.8 (range= 4-5). In response to the open-ended questions about the benefits, the staff members stated they believed the participants enjoyed the activity, that they would implement the intervention with others in the future, and that they wished to continue the activity after the conclusion of the study. As stated by one teacher, “I felt like it brought the students together in a way that they could communicate without it feeling forced. The videos took a lot of the awkwardness out of the interaction and it really ended up being two friends spending time together.” In response to open-ended questions about concerns, two staff members identified no concerns, and two staff members asked how the interactions could be continued after the study ended. See Supplemental materials for raw data.

Following the conclusion of the study, all three teachers and the SLP expressed interest in continuing the intervention. The first author met with staff members (e.g., teachers, speech-language pathologists, and paraprofessionals) to provide training in the use of a commercially
available video VSD app, Go Visual\(^3\), and identified strategies for implementation in the future with additional peer partners across various settings. Additionally, at the end of the study, the app and commercially available options (e.g., GoVisual by Attainment) were discussed with the participants’ school teams and families. A two-day in-service training in the use of the technology was also provided by the research team for the participants’ teachers, speech language pathologists, and paraprofessionals.

\(^3\) GoVisual is an AAC application created by Attainment Company

https://www.attainmentcompany.com/govisual
Chapter 4
Discussion

Social interaction with peers is essential to the quality of life for all individuals, however these interactions often pose significant challenges for adolescents with ASD and complex communication needs (Ganz et al., 2012; Smith, 2015). The results of this study provide evidence that a video VSD approach may be of assistance in addressing three key challenges for adolescents with ASD and complex communication needs: discussion around a shared topic of interest (Bagwell & Schmidt, 2011), access to specialized vocabulary pertaining to specific interests (Smith, 2015), and a shared conversational responsibility among the communication partners (Turkstra et al., 2003). The introduction of a video VSD app (with a brief video training) resulted in an increase in the number of communicative turns taken by adolescents with ASD and complex communication needs during interactions with peer partners. In addition, the intervention was viewed as an appropriate support to social interaction by both adolescents with ASD, their typically developing peers, and teachers and speech-language pathologists. Four factors may have contributed to the success of the video VSD intervention, and are discussed next.

Establishing and Maintaining a Shared Topic of Interest

Many adolescents with ASD experience difficulty in discussing past and future events (Favot, et al., 2019). Caron et al (2018) suggested that these individuals may lack a strong symbolic schema of events, people, and items events that are outside the here and now. The videos in the video VSD app provided the participants with a concrete shared context (Siegal & Cress, 2002) to support their interaction, and reduce the linguistic and cognitive demands of the activity.
Additionally, although adolescents with ASD may present with a restricted range of interests (American Psychiatric Association, 2013), the inclusion of these interests within intervention supports positive outcomes in social skills interventions (Ninci, Rispoli, Burke & Neely, 2018). In past social skills interventions with adolescents with ASD, there have been reports of both participants with ASD (e.g., Stauch, Plavnick, Sankar, Gallagher, 2018), as well as their peers (e.g., Schmidt and Stitcher, 2012), losing interest in the intervention and declining further involvement. The use of videos on preferred topics (identified from the interests of participants and peers) may have contributed to the positive response to this intervention, both in the moment and across the duration of the intervention. All participants with ASD and all peers reported that they enjoyed the intervention, and all peers (in response to a question asked as part of the social validity procedures) stated that they would participate in the intervention again.

Using Appropriate Vocabulary

Adolescents with ASD and complex communication needs are typically not included in social skills interventions (Babb et al., 2019), despite the fact that approximately 30% of individuals with ASD will not acquire the use of speech and require AAC supports throughout their lives (Tager-Flusberg & Kasari, 2013). The provision of AAC can assist individuals with ASD in communicating more successfully, however AAC is sometimes withheld in the mistaken belief that it will suppress use of natural speech (Romski & Sevik, 2005). As in past research, this study provides additional evidence that AAC does not hinder the use of speech (Millar, Light, & Schlosser, 2006). For those individuals who demonstrated at least some speech in baseline (Nick, Lexi), and even for one individual who did not make use of speech in baseline (Deidre), the introduction of the video VSD app resulted in strong increases in speech during intervention, maintenance, and generalization.
There are a number of possible reasons why the use of the video VSD intervention may have resulted in increased use of vocabulary, not only with speech but with other modes as well, for all participants in the study. First, the videos may have provided contextual support for the interaction – for those individuals struggling with displaced talk, the videos assisted them in establishing a clear topic (Caron et al, 2018). Second, the hotspots in the video VSDs provided clear examples of appropriate vocabulary that may have served as models for the use of speech – at least some of the speech turns taken by the participants were imitations of the speech output of the device. Third, the hotspots provided a natural prompt (the video automatically pauses and the hotspot temporarily appears on the screen) to use the vocabulary at the appropriate time.

**Participating in Social Interactions**

There is evidence from past research that often peers typically take a disproportionate number of the communication turns in social interactions with students with disabilities. This is especially true when the participant with ASD has complex communication needs, and this imbalance is often maintained (or even increased) even after a social interaction intervention has been provided (Babb et al., 2020; Hughes et al., 2002). In contrast to past research, the peers in 3 of the 4 dyads in the current study, took approximately the same number of turns as the individuals with ASD. However, it is important to note that both the peer and the person with ASD took only a very small number of turns at baseline – the numbers are close to equal because the numbers are close to zero for both partners. The video VSD intervention resulted in strong increases in the number of turns for both the participants and the peers in the dyads, but also maintained (for at least three of the dyads) approximately equal levels of participation for the participant with ASD and the peer partner in each dyad.
It is interesting to note that although all four of the peers were competent speakers, and three of the four participants made use of speech as their primary method of communication, few turns were taken by either member of the dyad at baseline. There are a number of possible explanations for the limited interaction observed at baseline, and the increases following intervention. Although directed to “Hangout as you would with a friend”, it is possible that both the peers (and the participants with ASD) were unsure of how to interact during a video watching activity and perceived the task expectation to be one of ‘viewing videos together’ rather than talking about the videos together. Both participants and peers, however, demonstrated dramatic increases in the number of turns taken following the introduction of the video VSD and the brief training. This finding suggests that a combination of factors including 1) access to preferred videos providing a context for the interaction, 2) the provision of AAC (the video VSDs with hotspots), and 3) video training with models of individuals with disabilities and peers may have played an important role in the increase of communication turns. Alternatively, the intervention may have simply changed the peers’ task expectations rather than actually teaching new skills. As highlighted in past reviews of partner training, it is possible that training for both the individual with complex communication needs, and their partners, is critical for successful AAC intervention (Kent-Walsh, Murza, Malani, & Binger, 2015).

In addition, the pausing provided in the video VSD app may have provided a useful structure for the interaction. Individuals with ASD often play a responsive role within interactions and have been described as passive communicators (Jones & Schwartz, 2009; Paul et al., 2009). One possible reason for the increases observed in this study may be that the hotspots both marked a clear cue for taking a turn (the video automatically pauses and the hotspot temporarily appears on the screen), and provided needed communication supports for the participant with ASD at this
time (Caron et al., 2018; Chapin et al., 2019). In a video VSD approach, the needed vocabulary is embedded within the activity (i.e., the video), providing immediate access to relevant vocabulary, and eliminating the need for individuals to shift their attention between their AAC system, the activity at hand, and their communication partner (Smith, 2015). Finally, the opportunity to easily add vocabulary during an ongoing activity may have contributed to the increase in communication turns observed for all participants. The activity of adding vocabulary ‘just-in-time’ provided something for the dyad to do together, rather than passively watching the videos (Schlosser et al., 2016). This ‘activity’ may have played a role in the results by providing the participants something to do together, as well as something to talk about.

**Minimizing Complexity in Social Interaction Interventions**

Social interaction interventions require training both for the individual with a disability and the communication partner (Kasari & Smith, 2013; Therrien & Light, 2018; Watkins et al., 2015). Especially in the case of interventions with adolescents, however, it is important to minimize the complexity of interventions and reduce the role of adults so as to maintain the authenticity of the interaction (Chung, Carter, & Cisco, 2012; Finke, 2016; Rubin et al., 2011). There are at least three possible reasons why this intervention resulted in meaningful changes in peer interaction following the introduction of the video VSD app, and with less than 4 minutes of training. One possible explanation is that the video VSD app was easy to use. Adding hotspots required only a small number of steps, and the pausing of the video when hotspots appeared during the interaction served as natural cues for interaction. Another possible explanation is the intervention made use of an existing activity (i.e., watching preferred videos) that not only made use of key interests of both the individual with ASD and the partner (Ninci et a., 2018), but is also a common shared activity for adolescents (Mazurek & Wenstrup, 2013). Finally, the video
training, although brief, appeared to be effective in providing models of appropriate interaction for all four dyads. The introduction of a five-step strategy and multiple models of expected use, as portrayed in a short (less than 4 minute video) may have contributed to changes in interaction behavior for both the participants and the peers without disabilities.

Limitations and Future Research

This study provides initial evidence that a video VSD approach may have a positive impact on communication for adolescents with ASD and complex communication needs during social interaction with peers. There are limitations to consider, however, when interpreting the results. First, the population of individuals with ASD is heterogeneous, and the current study included a small sample size ($n=4$). The small sample size limits the generalizability of the results, and future research should investigate a larger number of individuals with varying communication skills and learning abilities. Second, generalization was only assessed with one additional partner (a peer who had also watched the instructional video and was a part of the study) and did not assess generalization across different settings, to untrained peers, or other activities such as using the hotspots during a recreational or functional activity (e.g., capturing videos and programming hotspots while making a pizza with a friend). These data are important to determine the value of the intervention within the real world (Schlosser & Lee, 2000). Third, when peer interaction interventions include training for a peer, one concern is that individuals with ASD will always require access to trained peers in order to communicate successfully (Therrien & Light, 2018). Although each dyad was trained separately in this study, it is possible that the intervention could be taught to an entire class or group. Future research should investigate the impact of the intervention as a classroom or grade wide implementation. Finally, the brief training may have provided important models of expected participation for both the
participant and the peer, so that following the training the participant made increased use of existing modes of communication (e.g., speech and sign). Additional research is needed to analyze the training and assess which components were most effective.

Conclusion

Social interaction is a key to quality of life, but is often challenging for individuals with ASD, and particularly challenging for adolescents with ASD and complex communication needs. This study adds to the growing body of research that has demonstrated positive communication gains for individuals with ASD and complex communication needs when provided with video VSD supports designed to maximize communication and participation in important activities of daily life (e.g., Babb, Gormley, Light, & McNaughton, 2018; Caron et al., 2019; O’Neill, Light, & McNaughton, 2018).

The findings of this study provide evidence that a video VSD intervention can increase the number of communication turns taken by individuals with ASD and complex communication needs during interactions with peers. Perhaps most importantly, however, the resulting social interactions were valued both by the adolescent with ASD as well as their peer partner. The importance of the provision of communication supports for adolescents with ASD was emphasized in a quote from one of the peer partners, “I was going to ask for a new buddy at the end of this year. I was going to ask for a buddy that could talk, but after this, I am not. I have learned how to talk with my buddy, and she has learned how to talk with me.”
Compliance with Ethical Standards

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** It was obtained from all individual participants included in the study.
References


Holyfield, C., Caron, J.G., Drager, K., & Light, J. (2018). Effect of mobile technology featuring visual scene displays and “just-in-time” programming on the frequency, content, and function of communication turns by pre-adolescent and adolescent beginning communicators. *International Journal of Speech Language Pathology, 21*, 201-211. doi:10.1080/17549507.2018.1441440


## Appendix A

### Tables

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age/gender</th>
<th>Communication modes and supports</th>
<th>CARS – 2 ST raw score (severity)</th>
<th>Vineland-3 ABC standard score (adaptive level)</th>
<th>ROWPVT percentile score</th>
<th>EOWPVT percentile score</th>
<th>Peer, age, and gender</th>
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<td>Deidre</td>
<td>16/F</td>
<td>Delayed echolalia; limited speech</td>
<td>35 (severe)</td>
<td>96 (adequate)</td>
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<td>&lt;1</td>
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<td>16/M</td>
<td>iPad with communication apps (Proloquo2go, Assistive Express); low-tech communication book; immediate and delayed echolalia; visual schedules</td>
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<td>57 (low)</td>
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<td>&lt;1</td>
<td>Sam/17/M</td>
</tr>
<tr>
<td>Wayne</td>
<td>17/M</td>
<td>iPad with communication apps (Proloquo2go, Assistive Express); low-tech communication book; visual schedules</td>
<td>45 (severe)</td>
<td>55 (low)</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Megan/15/F</td>
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<tr>
<td>Lexi</td>
<td>18/F</td>
<td>Immediate and delayed echolalia; limited speech</td>
<td>37.5 (severe)</td>
<td>78 (moderately low)</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Kristen/17/F</td>
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</table>

*Note. CARS-2 ST Childhood Autism Rating Scale-Second Version-Standard Form; ROWPVT Receptive One-Word Picture Vocabulary Test, EOWPVT Expressive One-Word Picture Vocabulary Test.*
Table 2

Average Number of Communication Turns, and Use of Communication Modes, during Baseline and Intervention

<table>
<thead>
<tr>
<th></th>
<th>Deidre Baseline</th>
<th>Deidre Inter.</th>
<th>Nick Baseline</th>
<th>Nick Inter.</th>
<th>Wayne Baseline</th>
<th>Wayne Inter.</th>
<th>Lexi Baseline</th>
<th>Lexi Inter.</th>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
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<tr>
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<td>18</td>
<td>13</td>
<td>58</td>
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</table>
Appendix B

Figures

Figure 1. An example of a custom display created within EasyVSD. The large right area is the location where videos with visual scene displays are displayed. The left menu includes options for navigating to different videos, pausing/playing videos, and editing visual scene displays. At key moments of interest (e.g., pizza cooking in the oven), a VSD can be embedded within the video and programmed to include hotspots with messages related to the event (e.g., ‘It smells great!’).
Figure 2. An example of a custom display created within EasyVSD. The large right area is the location where the videos with visual scene displays (VSDs) are displayed. The left menu includes options for navigating to different videos, pausing/playing videos, and adding new hot spots to the VSDs. At key moments of interest (e.g., person displaying their nail design), the video can be paused, automatically creating a still image as a VSD, and hotspots can be added with vocabulary related to the event (e.g., ‘Beautiful!’).
Figure 3. Frequency of communicative turns taken by participants with ASD and peer partners in 10-min interactions during baseline, intervention, generalization, and maintenance.
Appendix C

Supplemental Materials

Participant Communication

The four participants with ASD varied in terms of communication and use of AAC. Deidre and Lexi made use of speech, while Nick and Wayne primary made use of AAC. Additional details below are reported based on teacher and speech-language pathologist reports.

Deidre made use of speech to communicate (1 to 4 word phrases) primarily for purposes of requesting items, responding to others (when prompted to do so), and for immediate and delayed echolalia. Deidre would often repeat excerpts from her favorite commercials or television shows quietly. She made use of gestures (e.g. pointing at/towards an item or immediately accessing a desired activity/item) and would occasionally use natural speech to express a want or need. Deidre rarely used facial expressions to indicate if she was happy or sad. Her teacher reported that she did not typically communicate to express social closeness and most frequently communicated to express her wants and needs. She rarely if ever greeted peers or staff members without prompting.

Lexi made use of speech (1 to 4 word phrases) primarily for purposes of requesting items, responding to others, and for immediate and delayed echolalia. Lexi used speech to echo what was said to her or phrases she was prompted to say (e.g., ..ten minutes until it’s time to go home). Lexi made use of gestures (e.g. pointing at/towards an item or immediately accessing a desired activity/item) and would occasionally use natural speech to express a want or need. Lexi also used facial expressions to indicate if she was happy or sad. To express her interest in a person or item, she would stand in very close proximity to the person/item. Her teacher reported
that she did not typically communicate to express social closeness and most frequently
communicated to express her wants and needs.

At the present time, both Deidre and Lexi relied completely upon natural speech – AAC supports
had been recommended for both participants in elementary grades but were described as making
limited use of the systems. Therefore, therapy was discontinue, as will many individuals
with ASD who make frequent use of speech.

Per teacher report, Nick made use of speech primarily for the purposes of requesting
items and immediate and delayed echolalia. Nick mostly communicated to express wants and
needs using one to two word phrases (e.g., juice; juice please) and would repeat phrases when
prompted by staff members (e.g., social etiquette routines such as greetings). He used an iPad
with communication apps and a low-tech communication book for requesting. Nick made use of
gestures (e.g. pointing at/towards or leading a staff member to a desired activity/item), would
laugh and smile when he was happy, and emitted loud vocalizations and crying to express anger
and frustration. He was also provided with visual schedules. To express his interest in a person, Nick
would touch their hands and request “squeezes” or for his head or back to be scratched. According to Nick’s
speech-language pathologist, he responded to his name, engaged in joint attention and made
intentional eye contact during activities.

Wayne’s teacher reported that he did not use natural speech to communicate. Wayne
primarily used his AAC system to express wants and needs using single words. He also made use
of gestures (e.g. pointing at/towards or leading a staff member to a desired activity/item), sign
approximations (e.g., go, eat, all done) and made use of an iPad with communication apps and a
low-tech communication book for requesting. Typically, Wayne would independently obtain
desired items instead of initiating interaction to obtain the item. He also used some vocalizations,
gestures, and facial expressions to indicate when he was happy or angry. He also made use of visual schedules. He did not communicate to express social closeness, share information, or participate in social etiquette routines unless prompted to do so (i.e., told to wave “goodbye” and “hello” to the researcher). Similar to Nick, according to Wayne’s speech-language pathologist, he responded to his name, engaged in joint attention, and made intentional eye contact during activities.
Social Validity Results

Table 1

*Participant Social Validity*

<table>
<thead>
<tr>
<th></th>
<th>I like it</th>
<th>I don’t like it</th>
<th>I don’t care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deidre</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nick</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wayne</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lexi</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2

*Peer Social Validity Five-item Questionnaire and Responses: Number of Participant Responses during Baseline (in parentheses) and Following Intervention*

<table>
<thead>
<tr>
<th>Questionnaire item</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is important for peer buddies to be able to interact with each other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(4) 4</td>
</tr>
<tr>
<td>It is important for me to be able communicate effectively with my peer buddy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(4) 4</td>
</tr>
<tr>
<td>I have effective strategies to help my peer buddy understand me.</td>
<td>(1) 0</td>
<td>(3) 0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>My peer buddy has effective strategies to help me understand him/her</td>
<td>(2) 0</td>
<td>(2) 0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>I am able to communicative effectively with my peer buddy</td>
<td>0</td>
<td>(4) 0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 3

Peer Social Validity Questionnaire and Responses

<table>
<thead>
<tr>
<th>Questionnaire item</th>
<th>Number of responses per category (scale of 1 to 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>Watching videos with a friend is a preferred activity for me</td>
<td>0</td>
</tr>
<tr>
<td>I liked the training</td>
<td>0</td>
</tr>
<tr>
<td>I learned from the training</td>
<td>0</td>
</tr>
<tr>
<td>My buddy and I communicated more after the training</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for me to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for me to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way for me to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for my peer buddy to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for my peer buddy to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way to assist my peer buddy in communicating during the activity</td>
<td>0</td>
</tr>
<tr>
<td>I <strong>enjoyed</strong> participating in the activity</td>
<td>0</td>
</tr>
<tr>
<td>My peer buddy <strong>enjoyed</strong> participating in the activity</td>
<td>0</td>
</tr>
<tr>
<td>I would participate in this activity in the future</td>
<td>0</td>
</tr>
</tbody>
</table>
## Table 4

**Peer Social Validity Responses (Open response items)**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If someone asked you about this intervention, what would you say?</td>
<td>What would you say was a major challenge to the intervention?</td>
<td>What do you feel was the major benefit of the intervention?</td>
<td>Is there anything else you would like to add?</td>
</tr>
<tr>
<td>Emma</td>
<td>It was fun. I am so glad I did it. Before this, it was really hard for my buddy and I to communicate, but it has gotten so much better with this.</td>
<td>Getting the hang of using the tablet.</td>
<td>My buddy and I can definitely communicate a lot better. She use to not say anything to me, I didn’t think she wanted to talk to me. Now we have a relationship, we are friends.</td>
<td>I was going to ask for a new buddy at the end of this year. I was going to ask for a buddy that could talk, but after this, I am not. I have learned how to talk with my buddy and she has learned how to talk with me. No.</td>
</tr>
<tr>
<td>Sam</td>
<td>Um, I would say that I participated in a Penn State research study with a special ed program, and I was able to communicate effectively with some of my peers in the special ed program.</td>
<td>Um, I think just getting all of the tools down and like making sure that my buddy was comfortable with me. That was my hardest part because I felt like we clicked, but I didn’t know if that was gonna happen.</td>
<td>Definitely just getting close with all of the students. Working with each and every single one. I definitely got close, it felt more like an environment that I would love to be in.</td>
<td></td>
</tr>
<tr>
<td>Megan</td>
<td>It inspired conversation that wouldn’t have happened otherwise.</td>
<td>When [the participant] wasn’t feeling well, it was harder to get him to participate. He didn’t always seem</td>
<td>We communicated together. Before this, we didn’t talk together.</td>
<td>I would do it again, with different videos! At first, I was really unsure and not</td>
</tr>
</tbody>
</table>
to enjoy it on those days.

Kristin: I would say it was really helpful, and I think me and my buddy both enjoyed it. It was a great way for us to communicate. I know it can be difficult for my buddy to always get engaged. When she seems really engaged in the activity, it was easy to start conversations. Watching the videos, it created a way to communicate and something to communicate about, that both of us were interested in.

A major challenge was a first, whenever we were first watching the videos with no interaction. I know my buddy would sometimes shut down, and honestly fall asleep during it, and she wouldn’t be paying attention. She would be off in her own world, but once we started getting engaged, it was better, but I think that the beginning was a little rough, trying to get her to watch the videos.

Being able to communicate and keeping her engaged because at the beginning, it wasn’t like that, at all. Then having that engagement and having her have that, forcing her to have those conversations, “what do you want to say about this one?” Forcing her to think about what she wanted to say, circle it, and say it. That was a big benefit of having the interaction part of it.

Being able to communicate and keeping her engaged because at the beginning, it wasn’t like that, at all. Then having that engagement and having her have that, forcing her to have those conversations, “what do you want to say about this one?” Forcing her to think about what she wanted to say, circle it, and say it. That was a big benefit of having the interaction part of it.

I would feel like I would do this in the future, just even on our free time. I think my buddy, loves the nails videos and the food videos. I think, I think she definitely enjoyed it. That is something we would do in the future. I think she loves watching nail videos is what I learned from the experiences.
### Table 5

**Staff Social Validity Questionnaire and Responses**

<table>
<thead>
<tr>
<th>Questionnaire item</th>
<th>Number of responses per category (scale of 1 to 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>It is important for students to have a way to interact with peers</td>
<td>0</td>
</tr>
<tr>
<td>Learning to communicate with others is an important goal</td>
<td>0</td>
</tr>
<tr>
<td>Watching videos with peers is an age appropriate activity for the student(s)</td>
<td>0</td>
</tr>
<tr>
<td>The student’s communication skills improved as a result of the intervention during interactions with their peer buddy</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for the peer to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for the peer to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way for the peer in communicating within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for the student to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for the student to communicate within the activity</td>
<td>0</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way to assist the student in communicating during the activity</td>
<td>0</td>
</tr>
<tr>
<td>The student(s) <strong>enjoyed</strong> participating in the activity</td>
<td>0</td>
</tr>
<tr>
<td>I would implement this intervention/suggest it to others in the future</td>
<td>0</td>
</tr>
</tbody>
</table>
### Table 6

**Staff Social Validity Responses (Open response items)**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If someone asked you about this intervention, what would you say?</td>
<td>What would you say was a major challenge to the intervention?</td>
<td>What do you feel was the major benefit of the intervention?</td>
<td>Is there anything else you would like to add?</td>
</tr>
<tr>
<td>Staff 1</td>
<td>It was a great opportunity for our students and for their peers. I feel like they were both learning.</td>
<td>Finding time that works for the student and their peer.</td>
<td>I felt like it brought the students together in a way that they could communicate without it feeling forced. It took a lot of the awkwardness out of the interaction and it really ended up being two friends spending time together.</td>
<td>I really liked the peer training component. That is something we are always looking for more of and looking for ways to help the peers who spend time with our students.</td>
</tr>
<tr>
<td>Staff 2</td>
<td>The video aspect made it so that they kind of had a way to interact without having to force it. It was much more natural, much more engaging and motivating. It gave them something to talk about instead of having to come up with things on their own, which is especially challenging for our students.</td>
<td>How to continue in the future after the study is over</td>
<td>It was great to see our students communicating and enjoying their peers company. They were actually enjoying the interaction and answering their peer.</td>
<td>We are always looking for ways to encourage peer interactions and peer relationships and this was exactly what we needed.</td>
</tr>
</tbody>
</table>
Staff 3: I saw the results of slowing things down. Concentrating on making those little steps, so that there could be an interaction, so I saw a good result of that, but also, as an instructor watching it was a good reminder to slow that down and pay attention to those steps, and it’s okay. You think maybe we’re not doing something big enough when we slow it way down, but actually it’s big to slow it down to the basic stuff, so I think that those are the biggest things.

Well, for our students, I think the biggest challenge is finding things that are interesting enough to them, and them adjusting to something new, so making that adjustment and them getting used to this is what we do. Just seeing that they can adapt to that, and that it does create a nice interaction for them, and that they do seem to enjoy the benefit of like we said in the first question. Slowing it down, to really concentrate on making it an interaction, seeing the benefit of it is the biggest reward because they did seem to enjoy it, and they were interacting as much as they do.

Well, I would have to say at first, I was like what’s the big deal. It’s just videos, but when you are working with children with difficulty communication needs, and you scale it way back, it is a really big deal. Paying attention to all those details and taking the time to create the interaction, and you come down to really analyzing it, and talking about it, and seeing the results of it was rewarding.

Staff 4: I would say it is an amazing tool that could be used by nonverbal kids to verbal kids as a way of interacting with their peers.

To this intervention is having a peer willing to do it. Seeing the need to do it, taking the bull by the horns, and doing it. Learning it I think that helped immensely, and I think it’ll open doors for more, and I think these kids would even, if the kids themselves had iPad or had access to iPad, maybe they would sign one out for just the back and forth communication. I mean it may not mean a whole lot to the real low nonverbal kids, but it still teaches them the back and forth, and I think it means a lot to the
which is so important at this stage in their lives, period. but wants to do it. I think it’s an amazing tool, and I think if anyone is a best buddy, they’re already open to training, new things with these kids so.

the weekend, and used it as if they were going to the movies or going to hang out or something. best buddy. To be able to connect on some level.
Appendix D

Review of the Relevant Literature

There are three areas of research relevant to the present study: social interactions for adolescents with ASD, augmentative and alternative communication (AAC) adolescents with ASD, and the use of video visual scene displays (video VSDs) to support communication for individuals with complex communication needs.

Adolescents with ASD – Social Interactions

Positive social interactions with peers are critical to the quality of life for all individuals, but are especially important during the adolescent years (Allen & Bowles, 2012; Rubin, Bukowski, & Laursen, 2011). These interactions are an important part of the developmental process and impact not only success and well-being during the school years, but in adult life as well (Wentzel, Donlan, & Morrison, 2012). It is through interactions with peers that important communication skills are learned and a personal identity is formed (Rubin et al., 2011; Turkstra, 2000); relationships with peers support the development of cognitive, emotional, and social competence (Bagwell & Schmidt, 2011).

During adolescence, there are increased demands for communication as social networks are formed around mutual interests (Raghavendra, Olsson, Sampson, Mcinerney, & Connell, 2012; Bagwell & Schmidt, 2011). Conversations typically occur at a fast rate and within a group of peer communication partners, as teenagers create a better understanding of their life experiences by discussing them with others (McLean, 2005; Rubin et al., 2011; Turkstra, Ciccia, & Seaton 2003). The nature of this communication is considerably different from the social exchanges observed with young children; interactions become complicated, and the understanding of ones’ self and others intensifies (Davis, Boon, Cihak, & Fore, 2010).
Meaningful participation during adolescent interactions necessitates the ability to interpret and use nonverbal skills (e.g., body orientation, eye contact), respond contingently, and engage in threaded reciprocal conversation (Turkstra et al., 2003). Adolescence is also a time of change and challenge for peer relationships (Rubin et al., 2009), as these formative years are critical to establishment of personal identity, and those who struggle with peer relationships are more likely to report feelings of loneliness and depression in adult life (Wentzel et al., 2012).

The challenges of social interactions in the adolescent years are compounded for adolescents with autism spectrum disorder (ASD) and may be particularly difficult for those with complex communication needs – that is, individuals for whom speech does not meet all of their communication needs (Carter et al., 2014; Smith, 2005). Deficits in social skills are a defining characteristic of ASD (American Psychiatric Association, 2013), and many persons with ASD experience challenges in interpreting non-verbal cues, initiating interactions and responding to others, and maintaining a topic in an ongoing conversation (Jones & Schwartz, 2009; Paul, Orlovski, Marcinko, & Volmar, 2009). In addition, although some individuals with ASD make use of speech to interact with others, approximately 50% of children with ASD do not develop speech (or demonstrate only limited speech) by age 9 (Anderson et al., 2007), and many of these individuals continue to demonstrate complex communication needs into adolescence and adulthood (Wodka, Mathy, & Kalb, 2013). These individuals face additional challenges such as social isolation, difficulty creating and maintaining social networks, and limited opportunities to engage in typical adolescent vocational and recreational activities (Light et al., 2019; Smith, 2005).

Although individuals with ASD may attend public schools, social interactions are often limited between the students with disabilities and their typically developing peers (Feldman,
Carter, Asmus, & Brock, 2015). According to the U.S. Department of Education (2011), three-fifths of adolescents with ASD spend 40% or more of their day in the general education setting. However, a survey by the National Autistic Society (Barnard, Prior, & Potter, 2000), provides evidence that 21% of children with ASD included in classes with typically developing peers described feeling excluded by peers at school, while only 1.2% of their peers without ASD described similar experiences.

Peer interactions may be even more challenging for students with ASD and complex communication needs. Chung, Carter, and Cisco (2012) observed 16 learners with severe disabilities in general education classrooms for over 50 hours, and reported that two of the four adolescents with ASD and complex communication needs never interacted with peers, even when they were in close physical proximity. The authors concluded that unless peer interactions were specifically planned for and supported by educational staff, students with ASD and complex communication needs interacted with peers infrequently, if at all.

Social skill interventions for young children with ASD have received substantial research attention. Recent systematic reviews suggest that interventions that address the behavior of both the child with ASD and their typically developing peer can produce positive outcomes (Chapin, McNaughton, Boyle, & Babb, 2018; Watkins et al., 2015). Recently, Gates, Kang, and Lerner (2017) conducted a meta-analysis of group-based social skill interventions for youth with ASD, and reported that the interventions (typically conducted in clinic settings) were moderately effective. Ke, Whalon and Yun (2018) also reported positive findings in their review of social skills interventions for youth and adults with ASD, however they found mixed results in regards to generalization of social skills.
Although both of these reviews provide evidence of the benefits of social skill intervention, there are important questions related to social skills interventions for adolescents with ASD in public school settings that have not been addressed. For example, both Gates et al (2017) and Ke et al (2018) included studies occurring outside of a typical school setting (e.g., intervention clinic). Ke et al (2018) excluded participants with moderate or severe intellectual disability, however, La Malfa, Lassi, Bertelli, Salvini and Placidi (2004) estimated that 50-70% of individuals with ASD also have an intellectual disability. Finally, Gates et al. (2017) excluded single-case design studies (a frequently used approach in applied settings for individuals with low-incidence disabilities; Gast, Lloyd, & Ledford, 2018; What Works Clearinghouse, 2014).

A recent literature review by Babb, Raulston, McNaughton, and Weintraub (2019), identified single-case research studies of social skill interventions for adolescents with ASD in order to assess the impact of social skills instruction for adolescents with ASD in public school settings. The review resulted in the identification of 26 single-case design articles. The 26 studies included between one and seven participants with ASD, for a total of 69 participants with ASD. The mean participant age in years was 15:7 (years: months), with a range from 13 to 21 years of age. Fifty-four participants were male (78%) and fifteen were female (22%). The majority of participants had either a sole diagnosis of ASD (n = 35; 51%) or ASD with a comorbid diagnosis (i.e., intellectual disability; n = 25; 36%), and 9 were described as having milder forms of ASD (e.g., Asperger’s; 13%). Twelve participants (17%) were described as having complex communication needs or exhibiting severe limitations in speech; the remaining 57 participants (83%) were described as having the ability to use speech during interactions with others.

Three intervention categories were identified: peer-directed interventions, learner with ASD-directed interventions, and combined-approach interventions. In Peer-directed
interventions, typically developing peers were the initial focus of the intervention, and they were trained or encouraged to model and prompt desired social skills for students with ASD (e.g., Chan et al., 2009). Studies were coded as learner with ASD-directed interventions ($n = 7, 27\%$) when an adult, typically a teacher or researcher, either (a) provided direct teaching or instruction to the participants with ASD, or (b) provided social assistance to the learner with ASD to promote interaction (e.g., assisted the learner with ASD in joining a social group, provided limited assistance in running of social group). Combined-approach interventions ($n = 11, 42\%$) included instruction for both peers and the participant with ASD.

**Participant Characteristics.** The social interaction interventions produced generally large effects across a diagnoses and communication characteristics. Peer interactions with typically developing adolescents often feature a rapid exchange of information, primarily using speech, with quick changes in topic and speaker (Turkstra et al., 2003). The interventions reviewed here produced large Tau-U values both for participants with complex communication needs and participants who made use of speech. As previous studies have suggested the need for more research on successful social interaction interventions for individuals with complex communication needs (Chung et al., 2012), these results provide preliminary evidence that individuals with ASD and complex communication needs can benefit from social skills interventions. The results should be interpreted carefully, however, as only a small number of participants ($n = 8$) were identified as having complex communication needs in studies for which Tau-U analyses were performed.

It is of concern to note that while approximately 30-50% of individuals with ASD do not develop speech and should have access to an alternative means of communication (Wodka et al., 2013), only one of the participants identified as having complex communication needs was
reported to use any form of AAC (Hochman, Carter, Bottema-Beutel, Harvey, & Gustafson, 2015). The other participants with complex communication needs may have benefitted from AAC intervention, especially to support a wider range of communication acts (e.g., initiating topics, requesting information; Light et al., 2019). The positive impact of AAC intervention on social interaction has been reported for younger individuals with ASD. For example, Trottier, Kamp, and Mirenda (2011), taught two young children with ASD to increase their communicative acts using a speech generating device while playing a game with a peer. Peer partners were trained to model the use of the speech generating device and then prompt the participant with ASD to activate the device. In an intervention with preschool children, Therrien and Light (2018) provided an AAC app and training in turn taking to four learners with ASD and their peers, and reported an increase in communicative turns for both the child with ASD and the peer during storybook interactions.

Additionally, despite adult-directed interventions having the flexibility to be individualized to the participant, no modifications were made to these interventions for students who may have needed additional supports. Though all participants engaged in an increased number of social interactions, one participant with limited speech showed lower levels of increase than the participants who made use of speech. Plavnick et al. (2015) suggested that due to unique communication needs, the participant may have benefited from an individualized intervention.

**Intervention Characteristics.** Each type of intervention (i.e., peer-directed, learner with ASD-directed, and combined-approach) was effective in increasing social interactions for participants with ASD. Of the eight peer-directed interventions, three provided brief training in social supports; for these interventions, peers were given a relatively short training (e.g., one
orientation meeting) and directed to interact with the learners with ASD. For example, Hughes et al., (2002) provided peers with a verbal prompt to hang out with the participant with ASD. No additional instruction or training was provided; however, with only a single prompt and being in close proximity, the participant with ASD increased conversation acts.

The remaining five studies in the peer-directed category provided organized instruction that included ongoing monitoring, feedback, and opportunities for modeling and practice for peers. In Carter et al., (2005), peers were taught social interaction strategies and received ongoing monitoring and feedback. Hughes and Harvey et al., (2013) was successful in increasing interactions for three participants with ASD by training peers to interact with the participants and to set goals for the number of interactions that the partner would engage in each day.

Previous research suggests that an advantage of peer-mediated interventions is the minimal time needed to train peers to implement the intervention (Carter, Moss, Hoffman, Chung, & Sisco, 2011; Hochman et al., 2015). For the studies in this review, social interactions among participants increased despite the minimal training and direction provided to the participating peers. Unfortunately, when solely relying on peers to implement the intervention, participating peers may lose interest and not perform the skills consistently over time. For example, Schmidt and Stitcher (2012) reported that the target peer “lost interest” (p. 109) and stopped engaged the individual with autism. To address this challenge, Carter et al. (2005) recommended targeting groups of peers for training instead of a single peer buddy.

In the seven interventions directed at learners with ASD, each of the 18 participants demonstrated increases after the implementation of the intervention. It is possible that the participants included in these studies benefited from components of direct instruction and/or adult facilitation to teach social skills (Owen-DeSchryver et al., 2008). Four studies provided
direct teaching or instruction and used instructional techniques such as social stories (Scattone, Tingstrom, & Wilczynski, 2006), charts/cards (Davis et al., 2010), and video instruction (Plavnick, Kaid, & MacFarland, 2015). Koegel et al. (2012) and Koegel et al. (2013) found increases in both initiations and engagement by providing minimal assistance to the learner with ASD by facilitating clubs based on the participants’ interests.

A combined-approach intervention (i.e., one that provided training for both the peer partner and the student with ASD) was used in a majority of the studies (n=11), with evidence of the benefit of this approach seen in a variety of settings (e.g., cafeteria, common space, classroom) and with a range of partners (i.e., peers ages 13 – 21 year old). After instruction is provided, combined-approach interventions allow adults to take on a less intrusive role during the intervention, with the peer partners taking on new communication roles. By using elements of specific social skill instruction for the learner with ASD, combined with the presence of peers and adults in supportive roles, students may be more likely to acquire and generalize skills to other settings and persons (Carter, 2014). It is interesting to note that though each study used peers and direct instruction/adult facilitation, the direct instruction strategy varied for most studies. For example, studies used instructional techniques such as explicit instruction (Reilly et al., 2014), cue cards/communication books (Bambara et al., 2016; Hughes et al., 2011), and video instruction (Halle et al., 2016). The variation in the social skill instruction among the studies suggests that a variety of approaches can be used, as long as they provide adequate support for the learning of the target skills.

In a novel approach Hughes et al. (2013) taught a peer to act as a peer trainer. The peer trainer then provided instruction in the use of a communication book to both the peer and the learner with ASD. This approach was effective in increasing both initiations and responses for all
five participants with ASD. This adds to the growing body of evidence that peer interactions will be most rich when adults provide arrangements for the interaction but then draw back to a more facilitative role (Carter et al., 2014).

Findings from this review indicate that interventions were effective across a variety of settings (e.g., cafeteria, special education classroom, or general education classroom) as well as across intervention types. In recognition of the value of inclusionary practices (Ballard & Dymond, 2017; Olson, Leko, Roberts, 2016), recent research has focused on the development and evaluation of interventions within community public schools (Kasari & Smith, 2013; Walton & Ingersoll, 2013). Studies where the intervention primarily occurred in general education classes seemed to have less observable change than interventions conducted in other settings. General education academic classes at the middle and high school level may offer limited opportunities for social interactions and engagement, as the main focus of the class is on academics, and conversation not directed towards the content of class is often discouraged (Carter et al., 2005). Locations such as the cafeteria or common spaces may prove to be more successful areas for social interaction interventions as there are naturally more opportunities for social interactions to occur (Haring & Breen, 1992; Hughes et al., 2011; Reilly et al., 2014). Similarly, these settings are typically more accepted contexts for social interactions with peers to take place and may increase chances for the generalization of skills (Hochman et al., 2015). The differential impact observed for settings may suggest an advantage to conducting interventions in the locales in which social interactions are most typically observed (Reilly et al., 2014).

**Outcome Characteristics.** Twenty-two studies examined the impact of intervention on the number of initiations \((n = 14)\) and/or responses \((n = 8)\) made by the participant with ASD. Though research has found that initiating interactions is an especially challenging skill for
individuals with ASD (Shabani et al., 2002), interventions to increase initiations had positive results, particularly interventions that made use of a combined-approach (e.g., Hughes et al., 2011). The benefit of a combined-approach is made clear by a comparison of results with peer-directed interventions: when only peers were provided with training, peers typically dominated the resulting interactions, producing almost all of the initiations (more than 90% of initiations in Hughes et al., 2002). This imbalance in conversational reciprocity left the learner with ASD in primarily a responsive role, with little input as to the topic of conversation. A more balanced interaction, in which both partners contribute new topics and respond to the interests of the partner, is an important intervention goal.

Only 13 studies measured higher-level social skills such as follow-up questions, other-focused conversation, engagement, and commenting. Despite this, the current analysis revealed that in studies in which these skills were measured, each yielded medium-large Tau-$U$ means. At present, research has focused on the most easily measured aspects of interactions (e.g., frequency of initiations and responses; Walton & Ingersoll, 2013). There has been limited research on more nuanced elements of social interaction, such as partner-focused questions and other-oriented comments that have been found to be critical to successful interaction during adolescence and into adulthood (Smith, 2005). In Stauch et al., (2018), higher order skills such as joining or extending a conversation were targeted for the four participants, however the participants had previously participated in a 4-month study in Plavnick & Duanus (2018), and therefore were deemed to have the necessary prequisite skills (e.g., asking social questions, commenting, and complimenting peers).

A number of skills deemed important for social interactions have received limited attention to date including: showing empathy, conversing about other’s interests, compromising
with others, and moving from one topic to another (Vineland Adaptive Behavior Scales – Third Edition; Sparrow; Cicchetti, Saulnier, 2016). The studies in this review focused primarily on more basic discrete skills such as initiating conversation or responding during an interaction. However, if authentic interactions between adolescents with ASD and their peers is the goal, interventions must target higher-level social skills (Reilly et al., 2014). At present, there is only limited information to develop interventions that would address the sophisticated communication behaviors observed in typical adolescent conversation.

Another critical element for successful social interactions is the ability to generalize skills across places and people. Only 15 of the 26 studies assessed generalization: two reported successful outcomes and 13 reported mixed or null results. Both of the successful interventions programmed for generalization (Schlosser & Lee, 2000) at the start of the study (e.g., pre-teaching skills, fading the supports in the intervention phase). Additionally, both studies evaluated combined-approach interventions (included peers and instruction for participants) and took place outside of the special education classroom (Hughes et al., 2011; Hughes & Bernstein, 2013). Previous studies with young children with ASD have also revealed that generalization was more likely to occur when peers were involved in the process (Krasny et al., 2003) For two studies in which mixed to null results were reported, minimal training was provided to either participants or peers (Koegel et al., 2013; Hochman et al., 2015). Including both the student with ASD and peers in social skill interventions, training beyond initial acquisition of the skills to levels of fluency, and conducting interventions where social interactions typically occur appear to be strongly associated with stronger generalization effects (Kasari & Smith, 2013; Owen-DeSchryver et al., 2008; Watkins et al., 2015).
Although this research provides evidence that social skills can be explicitly taught, there is only limited evidence that the learner with ASD-directed interventions produce generalized responding (Bellini & Akullian, 2007; Krasny, Williams, Provencal, & Ozonoff, 2003). In the learner with ASD-directed interventions in this review, three studies reported mixed to minimal generalization results, one study reported the skills did not generalize, and two studies did not measure generalization. Davis et al., (2010) measured generalization across a different setting as well as with a different communication partner. Generalization was effective for two of the three participants for which it was measured. Three studies (Koegel et al., 2013; Plavnick et al., 2015; Plienis et al., 1987) measured generalization across settings. Generalization is most likely to occur when skills are taught to levels of fluency and practiced in a variety of environments (Stokes & Baer, 1977) – additional research is needed to better understand the intensity and variety of training needed to support generalization.

**Social Validity.** A comprehensive view of social validity includes consideration of the acceptability of the treatment to the participants, the outcomes achieved, and the perceived value of the intervention (Wolf, 1978). Although the majority of individuals had positive comments in regards to the intervention, a small number of learners with ASD rated the interventions unfavorably or provided statements of neutrality regarding the outcomes or necessity of instruction (Bambara et al., 2016; Carter et al., 2017; Davis et al., 2010; Stauch et al., 2018). For example, in Stauch et al., (2018), two of the four participants said they would not like to participate in the intervention again – one was disinterested and one said that everyone talked to much. In the future, consideration should be given to the interests of the learner and aim to incorporate motivating activities into the social interaction.
Despite variation in participant and intervention characteristics, when averaged across studies and participants, medium to large treatment effects were found for participants with three different diagnoses, for three types of interventions, as measured by seven different outcome variables. This review provides evidence that social interaction interventions can have a positive impact on social interactions for adolescents with ASD. Future research should consider programming for generalization throughout the study as part of the intervention, as a primary goal of social interaction interventions is that the skills can be generalized across settings and persons. Further investigation is also needed to determine which social outcome measures are the most important for this age group, as key social skills for older students may be different from those targeted for younger students (Walton & Ingersoll, 2013). Social interactions are complicated at any age, and adolescence may pose special challenges that require sophisticated skills (Smith, 2005). These challenges are typically greater for adolescents with ASD who also have complex communication needs. Research is needed for this population in order to identify interventions that are effective for increasing social interactions for adolescents with ASD who may also require AAC supports.

**Adolescents with ASD – Augmentative and Alternative Communication (AAC)**

Challenges in social and communication skills are a defining characteristic of the ASD diagnosis (American Psychiatric Association, 2013). Typically, these challenges continue to persist across a person’s lifespan. More than 10% of high school students with disabilities who participate in alternative assessments were identified as having no formal means of symbolic communication (Kleinert et al., 2015). Social and communication skills are critical for adolescents with ASD who also may present with complex communication needs and benefit from Augmentative and Alternative Communication (AAC).
The need for effective interventions for adolescents with ASD and complex communication needs is made clear by recent observational studies. Chung, Carter, and Cisco (2012) observed learners with severe disabilities in general education classrooms, and reported that in more than 51 hours of observation, two of the four adolescents with ASD and complex communication needs never interacted with peers, even when they were in close physical proximity. Chung and colleagues also found that unless peer interactions were specifically planned and supported by teachers and/or staff, students with ASD and complex communication needs interacted with peers infrequently, if at all.

Results from a parent survey as part of the National Longitudinal Transition Study-2 revealed that 51% of youth with ASD (ages 13-17) had never received an invite to another youth’s social event in the past year, 44% never saw friends outside of school, and 84% never or rarely received phone calls from friends (Wagner, Cadwallader, & Marder, 2003). Additionally, Biggs and Carter (2016) studied the quality of life among adolescents with ASD and developmental disabilities. Parents consistently gave the lowest ratings to social support from friends and peer relationships. Unfortunately, lack of friendships and social relationships typically continues into adulthood. Data from the National Core Indicator (2011-2012) reveal that at least 41% of adults with ASD receiving public services reported having no friends or social relationships with people outside of family and paid staff members.

Lack of interaction may be influenced lack of appropriate communication supports. It is estimated that approximately 50% of individuals with ASD will not develop sufficient speech to meet daily communication needs (Anderson et al., 2007; Wodka, Mathy, & Kalb, 2013). For individuals with ASD and complex communication needs, the use of AAC, such as sign language, picture communication boards, and AAC apps on mobile technology, has demonstrated
to be beneficial in supporting both expressive and receptive communication (Foley & Staples, 2003; Ganz, Boles, Goodwyn, & Flores, 2014; Sigafoos et al., 2004; Ganz et al., 2012). AAC provides a means to support effective communication with others (i.e., expressive communication) as well as to support communication from others (i.e., receptive communication; Mirenda, 2001). Additionally, having access to appropriate AAC technology is only part of the communication process. Successful use of AAC also depends on competent communication partners (e.g., educators) who are able to create communication opportunities and provide scaffolded levels of support (Light & Drager, 2007).

Moreover, many individuals with ASD and AAC have limited vocabularies that tend to focus on needs and wants as opposed to commenting and sharing. Recent reviews have found that the majority of research including individuals with ASD who make use of AAC, has focused primarily on requesting or protesting, with few studies addressing communication acts such as answering questions or social commenting (Ganz et al., 2012; van der Meer & Rispoli, 2010). Moreover, although many of the studies were conducted in school settings, interactions were mainly directed towards adults rather than peers (van der Meer & Rispoli, 2010).

To participate in social interactions, many adolescents with ASD and complex communication needs will need communication supports. AAC supports using traditional AAC technology have been successful in supporting the social interactions of individuals with ASD (e.g., Trottier et al., 2011), however, these systems may lack the vocabulary needed to communicate an individual’s area of interest (Johnson et al., 2006). For example, people may abandon their systems because the provided vocabulary does not meet their individualized needs, or does not provide sufficient variety of communicative functions (Johnson et al., 2006). In summary, although there is evidence of the successful use of AAC under certain controlled
conditions, these devices may pose challenges during social interactions with peers where specific vocabulary related to individual topics of conversations may not be programmed into the system.

**Video Visual Scene Displays**

Traditionally, AAC systems have been presented as grid-based displays with isolated AAC symbols arranged in rows and columns depicting language concepts outside of the meaningful communication contexts in which they occur. As an alternative, Light and McNaughton (2012) proposed the use of visual scene displays (VSDs). VSDs capture meaningful events within an individual’s life in an integrated scene (i.e., photograph), with language concepts embedded as hotspots within the scene in order to reduce cognitive and linguistic demands (Light & McNaughton, 2012). The VSD (e.g., image or photograph) can be of a motivating activity within the life of the individual with complex communication needs which has been programmed with relevant vocabulary using ‘hotspots’ within the scene. When selected, the hotspots produce recorded speech output of the word or phrase. For example, an adolescent or adult with ASD and complex communication needs entering a job site, might have a VSD of themselves and their supervisor at the work site. Activating the hotspot would allow the individual to greet their supervisor and let them know they are ready to begin work.

For beginning communicators, VSDs are particularly advantageous (Light, McNaughton, & Caron, 2019). First, the picture or image captures social interactions in the context for which they occur, providing contextual support for beginning communicators as they learn language skills. Second, vocabulary for communication is embedded directly onto the VSD. Often, children have to share joint attention between the activity (e.g., storybook), AAC system, and the communication partner. This approach places additional demands on individuals who use AAC,
as they must shift focus between the partner, AAC system, and the activity. Lastly, VSDs support the addition of meaningful, appropriate vocabulary as it occurs in the moment with just-in-time programming (Light et al., 2019).

There are a number of AAC apps (e.g., GoTalk NOW1, SnapScene2) that utilize VSDs with still images (e.g., photographs). VSDs provide a means to capture social interactions in context, include images of actual events experienced by the individual, and present language concepts within those familiar events (Light & McNaughton, 2012). Recent research with VSDs has demonstrated positive results in applications with preschoolers, preadolescents, adolescents, and young adults with complex communication needs in increasing in the frequency of communication turns (Drager et al., 2019; Holyfield, Caron, Drager, & Light, 2018; Therrien & Light, 2018). Therrien and Light (2018) conducted a study which provided dyads of children with ASD and peers with typical development with VSDs portraying pages from preferred storybooks on a tablet. As the dyads engaged with the storybooks together, they selected hotspots embedded within each VSD to produce words related to the stories. The AAC system provided a shared context for interaction while relevant communication opportunities were embedded directly within this context, reducing the need to shift attention between the activity (a book) and the communication system. This facilitated fast and easy access to language. An increase in communicative turns was observed for both the participant as well as the peer partner.

Although investigations indicate that VSDs result in increases in communication for individuals with complex communication needs (e.g., Light & Drager, 2007; Beukelman, Hux, Dietz & Weissling, 2015), VSD technologies support the integration of only static photo VSDs. These static VSDs do not capture the dynamic routines that require communication within real-world vocational and community activities.
Because videos capture dynamic routines to a greater degree than static photos, it was hypothesized that videos with integrated VSDs might better facilitate participation and communication within daily activities. To support the learning of new skills, as well as provide supports for communication for individuals with complex communication needs, Light, McNaughton, Jakobs, and Hershberger (2014) proposed the use of videos with integrated visual scene displays (i.e., video VSDs). Video VSDs combine elements of video prompting with the communication supports of VSDs. Video VSDs are videos that capture dynamic life events that can be paused at key junctures in the event to create a VSD with programmed hotspots of relevant vocabulary concepts. Using the hotspots, the person with complex communication needs can either use the speech output of the AAC device (Babb, Gormley, McNaughton, & Light 2018) to communicate with others, or use the speech output of the AAC device as a cue for the use of their own speech (O’Neill, Light, & McNaughton 2017) in the interaction.

Two previous studies have explored the use of video VSDs as support for participation in pre-vocational activities. O’Neill et al., (2017) reported that the introduction of video VSDs resulted in immediate increases in both completion of the target activities (e.g., performing clerical duties, riding public transportation) and communication for a 16-year old girl with ASD. Babb et al., (2018) utilized video VSDs to support an adolescent with ASD in the successful completion of three work tasks (i.e., checking in books, putting books away, making dye cuts) during a vocational experience in an elementary school library. The participant completed both the motor and communication opportunities within each task, requiring only a small number of intervention sessions to reach levels of independence. Video VSDs may offer an integrated approach to supporting both communication and participation for persons with complex
communication needs in employment and volunteer settings (Light, McNaughton, & Caron, 2019).

Video VSDs have also been used to facilitate social interactions. Caron, Laubscher, Light, and McNaughton (2020) investigated the use of video VSDs to support social interaction between adolescents with ASD and complex communication needs and adult partners during a shared interest activity (watching YouTube videos): all five participants took minimal communicative turns in baseline and demonstrated increases in the number of communicative turns after the introduction of the video VSD app. Another study by Chapin, McNaughton, Light, McCoy, and Caron (2018) implemented a single-case experimental design to determine the effects of video VSDs on the communication turns of four preschoolers with ASD as they watched preferred videos. During baseline the preschoolers took few communication turns. When introduced to the video VSDs, each participant increased their number of turns. GoVisual3 is currently the only commercially available application that supports video VSDs.

Particularly for adolescents, video VSDs offer a promising approach to the key challenges of adolescent interaction, including the need to incorporate motivating interests, embed communication into the activity, and support just-in-time addition of relevant vocabulary. First, video VSDs are able to capture videos related to the interests of the learner, including high interest videos from the internet. Identified as an activity of high interest for many individuals with ASD, and frequently used by typically developing adolescents, videos may be an ideal activity to support social interactions and communication skills through the sharing and discussing of videos with communication partners. Like individuals with ASD, for many typically developing adolescents, watching YouTube and other forms of video streaming services (e.g., Netflix) is a high preference activity. A survey study by Trendera (2017) recently
reported that teenagers spend approximately 34% of their leisure time watching videos on YouTube.

Secondly, communication opportunities are inserted directly into the preferred video. With the ability to add hotspots to the video content, video VSDs provide a way to embed vocabulary into the activity, providing easy access to relevant vocabulary for the individual with complex communication needs. The video automatically pauses at key segments within the activity, prompting the individual who uses AAC to the opportunity for communication as the VSD provides vocabulary for that segment. Adolescents with complex communication needs who use AAC often struggle to keep up with the pace of the conversation, as the quickness of the interactions may make it difficult to contribute (Smith, 2015). This is particularly true if the individuals have to shift their attention between their AAC system, the activity at hand, and their communication partner (Smith, 2015). Video VSDs however, eliminate this problem, as the needed vocabulary is embedded within each video, effectively providing access to the related vocabulary needed to discuss events as they are presented.

Lastly, video VSDs support just-in-time programming of hotspots. Just-in-time programming allows the addition of vocabulary as it is needed in the moment (Schlosser et al., 2016). Creating additional vocabulary in ‘real time’ is advantageous because it may increase the individuals’ engagement in the selection of vocabulary as well as the programming process. Communication supports should provide access to needed vocabulary to both label and comment on the video being watched, and should be readily available to the individual. For example, a peer partner can support an individual who uses AAC to program additional hotspots onto a video as interesting moments in the video occur. This method provides a means to alter, adapt, or expand vocabulary according to the individual’s interests.
Notes

1 GoTalk NOW is an AAC application created by Attainment Company

https://www.attainmentcompany.com/gotalk-now

2 Snap Scene is an AAC application created by Tobii Dynavox

http://mytobiidynavox.com/Store/SnapScene

3 GoVisual is an AAC application created by Attainment Company

https://www.attainmentcompany.com/govisual
References


Babb, S., Gormley, J., McNaughton, D., & Light, J. (2018). Enhancing independent participation within vocational activities for an adolescent with ASD using AAC video visual scene displays. *Journal of Special Education Technology* *34*, 120-132. doi:0162643418795842


Holyfield, C., Caron, J.G., Drager, K., & Light, J. (2018). Effect of mobile technology featuring visual scene displays and “just-in-time” programming on the frequency, content, and function of communication turns by pre-adolescent and adolescent beginning communicators. *International Journal of Speech Language Pathology, 21*, 201-211. doi:10.1080/17549507.2018.1441440


training program for adolescents with autism spectrum disorder and intellectual disability.


doi:10.1177/10883576060210040201

doi:10.1080/07434610012331279074


Appendix E

Training Materials

Teaching Script and Probes: Video VSD- Partner Sharing Study

The instructor’s verbal instructions are written in bold.

The instructor’s actions are written in italics and indented.

Opening: “We are interested in ways to support teenagers in talking and hanging out together. We would like to ask you to hang out for 10 minutes and watch some videos. We will ask you to do this a number of times.”

<table>
<thead>
<tr>
<th>Probe</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline session</td>
<td>Participant and peer are seated next to each other.</td>
</tr>
<tr>
<td></td>
<td>“Now is a time for you to watch and talk about some videos together.</td>
</tr>
<tr>
<td></td>
<td>You can watch different videos that have been stored on this tablet.</td>
</tr>
<tr>
<td></td>
<td>We would like you to do this for 10 minutes.”</td>
</tr>
<tr>
<td></td>
<td>Researcher places tablet on table in front of the students.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instruction 1</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce the activity</td>
<td>“First, we are going to learn how to use this tablet.”</td>
</tr>
<tr>
<td>First video is a video model on how to use the tablet (e.g., pressing play/pause, choosing videos, selecting thumbnails).</td>
<td>Put tablet in front of the dyad.</td>
</tr>
<tr>
<td></td>
<td>“Let’s look at the video.”</td>
</tr>
<tr>
<td></td>
<td>Press “play” button to show model video.</td>
</tr>
<tr>
<td></td>
<td>Prompt participant and/or peer to pay attention if needed (e.g., watch the video, look here)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instruction 2</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce the task</td>
<td>“Now we are going to learn how to watch and talk about the videos.”</td>
</tr>
<tr>
<td>Review the video –</td>
<td>Put tablet in front of the learner</td>
</tr>
<tr>
<td>Second video is a video model of a wait, respond.</td>
<td>“First let’s look at the video.”</td>
</tr>
</tbody>
</table>
**expand.** Examples are provided via a dyad using the app while watching videos.

<table>
<thead>
<tr>
<th>Instruction 3</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce the task</td>
<td>“<strong>Now we are going to learn how to add hotspots to the videos.</strong>”</td>
</tr>
</tbody>
</table>
| Review the video – Just-in-time training | **Put tablet in front of the learner.**

Video is a video model of demonstrating how to create VSDs and add hotspots.

“**First let’s look at the video.**”

**Press “play” button to show model video.**

**Prompt participant and/or peer to pay attention if needed (e.g., watch the video, look here).** |

<table>
<thead>
<tr>
<th>Probe</th>
<th>Script</th>
</tr>
</thead>
</table>
| Intervention session | Participant and peer are seated next to each other.

“**Now is a time for you to hang out and watch some videos together. You can watch different videos that have been stored on this tablet. We would like you to do this for 10 minutes.**”

Research places tablet on table in front of the students.
Script: Wait, Respond, Expand Instructional Video

The instructor’s verbal voice over is written in bold.

Video model actions are written in italics and indented.

Opening: Now you will learn how to watch and talk about the videos. You will learn to wait, respond, and expand.

<table>
<thead>
<tr>
<th></th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait</td>
<td>The first step is wait. After you play a video clip, wait for a few seconds so your partner has a chance to comment. Your partner might touch a hotspot, speak, or sign.</td>
</tr>
<tr>
<td></td>
<td>• Video model example</td>
</tr>
<tr>
<td>Respond</td>
<td>The next step is to respond. When your partner says something, respond to what they say. You can respond by confirming what they say. For example, you might say, “You liked the part where they scored the touchdown? Me too!”</td>
</tr>
<tr>
<td></td>
<td>• Video model example</td>
</tr>
<tr>
<td>Expand</td>
<td>The last step is to expand. After you respond, expand on the topic by asking a question or providing another comment.</td>
</tr>
<tr>
<td></td>
<td>• Video model example</td>
</tr>
</tbody>
</table>
Script: S.T.A.R.T Instructional Video

**The instructor’s verbal voice over is written in bold.**

**Video model actions are written in italics and indented.**

Intro:
- Still shot of K and S holding the tablet.
- Voice over: *Now that we have learned how to watch and talk about the videos, we are going to learn how to add hotspots to the videos. This will help support communication in the moment, while you watch videos with your friend.*

Step 1:
- Voice over: *The first step is to Stop the video.* (Still shot below). Stop the video at an interesting point in the clip by pressing the pause button.

<table>
<thead>
<tr>
<th>Stop the video</th>
<th>Stop the video at an interesting point in the clip by pressing the pause button.</th>
</tr>
</thead>
</table>

- Video model example: K and S watching a video (Mario).
  - [laughter] *K pauses the video. K says, “I liked the part when they________. Did you?”*

Step 2:
- Voice over: *The next step is to Talk it through.* (Still shot below). Seek your friend’s input for where to draw a hotspot. Provide a choice of two. You can have your friend point to where they want to create a hotspot.
  - Then, decide what the hotspot should say. For example, Should it say “Watch out!”? Or “Ahh”? Provide a choice of two.

<table>
<thead>
<tr>
<th>Talk it through</th>
<th>Seek your friend’s input for where to draw a hotspot.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Should we draw a hot spot on ____ or ____?” (provide a choice of two). You can have your friend point to where they want to create a hotspot.</td>
</tr>
<tr>
<td></td>
<td>Decide what the hotspot should say. E.g., Should we add cheering? Or say touchdown?</td>
</tr>
<tr>
<td></td>
<td>“Should it say____ or ____?” (provide a choice of two)</td>
</tr>
</tbody>
</table>

- Video model example: K and S watching a video (Mario).
  - K asks, “Should we draw a hot spot on Mario or the jump?”
  - S points to Mario
  - K asks, “Should it say Woo or Go Mario!”?
  - S says “Woo!”
Step 3:
- Voice over: **Now you will add the hotspot.** To add a hotspot select the orange icon and draw a circle on the photo. (Still shot below).

<table>
<thead>
<tr>
<th>Add a hotspot</th>
<th><img src="image.png" alt="Add a hotspot" /></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Select icon and then draw a circle on the photo</em></td>
</tr>
</tbody>
</table>

- Video of K and S sitting together – K selects the icon and draws a circle on the photo.

Step 4:
- Voice over: **Then you will record the message.** (Still shot below) Select the green icon to start recording and the red icon to stop. To delete or re-record a hotspot, click on the X button.

<table>
<thead>
<tr>
<th>Record a message</th>
<th><img src="image.png" alt="Record a message" /></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Green to start recording, red to stop</em></td>
</tr>
<tr>
<td></td>
<td><em>To delete or re-record a hotspot click the button</em></td>
</tr>
</tbody>
</table>

- Video model of K and S sitting together
  - K asks S to help him record it? ‘Wanna help me? Let’s say, “woo!’ together”
  - K selects the green icon, records “woo” and then presses the red icon to stop recording.

Step 5:
- Voice over: **The last step is to use the hotspots together.** (Still shot below). Use the recorded hotspot and ask a question or make a comment about the video. Don’t forget to wait, respond, expand! Each session, continue to add more and more hotspots!

<table>
<thead>
<tr>
<th>Together- Use the hotspots</th>
<th>Together use the recorded hotspot and ask a question or make a comment about the video. -and wait, respond, expand! Each session, continue to add more and more hotspots!</th>
</tr>
</thead>
</table>

- Video model of K and S sitting together with tablet
  - S activates the hotspot (voice output of ‘watch out’)
  - K asks her a question – ‘Do you like it when Mario goes off the jump?’
  - S shakes her head ‘yes’
  - K says, “Me too. Let’s see what happens next.”
Supporting communication in the moment can be easy. 
First watch the video. Then S.T.A.R.T!

<table>
<thead>
<tr>
<th><strong>Stop the video</strong></th>
<th>Stop the video at an interesting point in the clip by pressing the pause button.</th>
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<tbody>
<tr>
<td><strong>Talk it through</strong></td>
<td>Seek your friend’s input for where to draw a hotspot.</td>
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<tr>
<td></td>
<td>“Should we draw a hot spot on ___ or ___?” (provide a choice of two). You can have your friend point to where they want to create a hotspot.</td>
</tr>
<tr>
<td></td>
<td>Decide what the hotspot should say. E.g., Should we add cheering? Or say touchdown?</td>
</tr>
<tr>
<td></td>
<td>“Should it say ___ or ___?” (provide a choice of two)</td>
</tr>
<tr>
<td><strong>Add a hotspot</strong></td>
<td>*Select icon and then draw a circle on the photo</td>
</tr>
<tr>
<td><strong>Record a message</strong></td>
<td>*Green to start recording, red to stop</td>
</tr>
<tr>
<td></td>
<td>*To delete or re-record a hotspot click the button</td>
</tr>
<tr>
<td><strong>Together- Use the hotspots</strong></td>
<td>Together use the recorded hotspot and ask a question or make a comment about the video.</td>
</tr>
<tr>
<td></td>
<td>-and wait, respond, expand!</td>
</tr>
<tr>
<td></td>
<td>Each session, continue to add more and more hotspots!</td>
</tr>
</tbody>
</table>
Appendix F

Social Validity Materials

Example of Social Validity Talking Mats Procedures for Participants with ASD
Peer Social Validity Questionnaire: Five-item questionnaire during baseline and intervention

Peer:
Date:
After session:

1. It is important for peer buddies to be able to interact with each other.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

2. It is important for me to be able communicate effectively with my peer buddy.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
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<td>4</td>
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<td>5</td>
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</tr>
</tbody>
</table>

3. I have effective strategies to help my peer buddy understand me.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
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</tbody>
</table>

4. My peer buddy has effective strategies to help me understand him/her.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
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<td>4</td>
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<td>5</td>
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</tr>
</tbody>
</table>

5. I am able to communicative effectively with my peer buddy.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
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<td>5</td>
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</tbody>
</table>
## Peer Social Validity Questionnaire

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Number of Responses per Category (out of 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td></td>
<td>1    2   3   4   5</td>
</tr>
<tr>
<td>Watching videos with a friend is a preferred activity for me</td>
<td>N/A</td>
</tr>
<tr>
<td>I liked the training</td>
<td>N/A</td>
</tr>
<tr>
<td>I learned from the training</td>
<td>N/A</td>
</tr>
<tr>
<td>My buddy and I communicated more after the training</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for me to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for me to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way for me to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>effective</strong> way for my peer buddy to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>efficient</strong> way for my peer buddy to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an <strong>appropriate</strong> way to assist my peer buddy in communicating during the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>I <strong>enjoyed</strong> participating in the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>My peer buddy <strong>enjoyed</strong> participating in the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>I would participate in this activity in the future</td>
<td>N/A</td>
</tr>
</tbody>
</table>
If someone asked you about this activity, what would you say?

What would you say (if anything) was a major challenge to the intervention?

What (if anything) do you feel was the major benefit of the intervention?

Is there anything else you would like to add?
<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Number of Responses per Category (out of 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>It is important for students to have a way to interact with peers</td>
<td>N/A</td>
</tr>
<tr>
<td>Learning to communicate with others is an important goal</td>
<td>N/A</td>
</tr>
<tr>
<td>Watching videos with peers is an age appropriate activity for the student(s)</td>
<td>N/A</td>
</tr>
<tr>
<td>The student’s communication skills improved as a result of the intervention during interactions with their peer buddy</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an effective way for the peer to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an efficient way for the peer to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an appropriate way for the peer in communicating within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an effective way for the student to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an efficient way for the student to communicate within the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The intervention provided an appropriate way to assist the student in communicating during the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>The student(s) enjoyed participating in the activity</td>
<td>N/A</td>
</tr>
<tr>
<td>I would implement this intervention/suggest it to others in the future</td>
<td>N/A</td>
</tr>
</tbody>
</table>
If someone asked you about this activity, what would you say?

What would you say (if anything) was a major challenge to the intervention?

What (if anything) do you feel was the major benefit of the intervention?

Is there anything else you would like to add?
Appendix G

Reliability Materials

Dependent Variable Coding Sheet

Coder: 

Date: 

Video Name: 

Instructions:

- Code communicative turns for both the participant and the peer
- If the participant or peer takes a communicative turn, write the time of the turn and place an X in the column that signifies the modality

A behavior will be considered a symbolic communicative turn if:
(a) the individual produces words (either spoken, speech approximations, or through speech output from the AAC app), conventional signs, or conventional gestures (e.g., nodding head for “yes”);
(b) the individual is oriented toward the partner or an object of joint attention (as demonstrated by body orientation to the partner, tablet, or shared activity)

A turn will be judged to have begun when an individual communicates (either via speech, sign, gesture, or activation of a hotspot on the VSD), and will be judged to have ended when either the partner begins a turn or two seconds pass without a symbolic communicative turn

A frequency count will be used to calculate the number of turns.

Participant: Peer:

<table>
<thead>
<tr>
<th>Time:</th>
<th>Speech</th>
<th>SGD</th>
<th>Sign/Gesture</th>
<th>Time:</th>
<th>Speech</th>
<th>SGD</th>
<th>Sign/Gesture</th>
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<tbody>
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</tbody>
</table>

TOTAL Participant:
TOTAL Peer:
Procedural Integrity Data Sheet

Coder:

Video Name:

<table>
<thead>
<tr>
<th>Probe Sessions:</th>
<th>Mark X for ‘yes’</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dyads seated next to each other</td>
<td></td>
</tr>
<tr>
<td>2. Tablet provided to dyad with sound on</td>
<td></td>
</tr>
<tr>
<td>3. Conducted in a quiet setting</td>
<td></td>
</tr>
<tr>
<td>4. Tablet is set to correct app and user</td>
<td></td>
</tr>
<tr>
<td>5. Initial cue provided verbally (e.g., Hang out and talk about these videos</td>
<td></td>
</tr>
<tr>
<td>for ten minutes)</td>
<td></td>
</tr>
<tr>
<td>6. Researcher remains present (each session is video recorded)</td>
<td></td>
</tr>
<tr>
<td>7. Researcher does not support (prompt) dyad to communicate while watching</td>
<td></td>
</tr>
<tr>
<td>videos</td>
<td></td>
</tr>
<tr>
<td>8. Research provides support as needed (e.g., intervening for behavior issues)</td>
<td></td>
</tr>
<tr>
<td>9. Researcher provides technical support as needed (e.g., intervening to fix</td>
<td></td>
</tr>
<tr>
<td>glitches with the tablet, intervening for navigation of the tablet)</td>
<td></td>
</tr>
<tr>
<td>10. Session lasts approximately 10 minutes</td>
<td></td>
</tr>
</tbody>
</table>

Total points out of 10:
Procedural Integrity Training Procedure Data Sheet

Coder:

Video Name:

<table>
<thead>
<tr>
<th>Training Session:</th>
<th>Mark X for ‘yes’</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tablet provided to dyad with sound on and set to correct app and user</td>
<td></td>
</tr>
<tr>
<td>2. Initial cue provided verbally for training video 1</td>
<td></td>
</tr>
<tr>
<td>(e.g., This video will help you ____ )</td>
<td></td>
</tr>
<tr>
<td>3. Training video one played for dyad</td>
<td></td>
</tr>
<tr>
<td>4. Initial cue provided verbally for training video 2</td>
<td></td>
</tr>
<tr>
<td>(e.g., This video will help you ____ )</td>
<td></td>
</tr>
<tr>
<td>5. Training video two played for dyad</td>
<td></td>
</tr>
<tr>
<td>6. Researcher does not support (prompt) dyad while watching videos or communicating (exceptions: intervening for behavior issues, intervening to fix glitches with the tablet, intervening for navigation of the tablet)</td>
<td></td>
</tr>
<tr>
<td>7. Conducted in a quiet setting</td>
<td></td>
</tr>
</tbody>
</table>

Total score out of 7:
Definition of a Communicative Turn: Extended Definition

A behavior will be considered a symbolic communicative turn if
(a) the individual produces words (either spoken, speech approximations, or through speech output from the AAC app), conventional signs, or conventional gestures (e.g., nodding head for “yes”);

b) the individual is oriented toward the partner or an object of joint attention (as demonstrated by body orientation to the partner, tablet, or shared activity)

A turn will be judged to have begun when an individual communicates (either via speech, sign, gesture, or activation of a hotspot on the VSD), and will be judged to have ended when either the partner begins a turn or two seconds pass without a symbolic communicative turn.

A frequency count will be used to calculate the number of turns.

The primary dependent variable is the frequency of symbolic communicative turns expressed by the participant during the 10-min interaction. Turn definitions were similar to definitions used by Therrien and Light (2017). A symbolic communicative turn was defined as an attempt to interact with a partner using words (either spoken or through speech output from an AAC system), conventional signs, or conventional gestures (e.g., nodding head for ‘yes’). Participants showed intent to communicate either through eye contact or body orientation. Since eye contact is challenging for children with ASD (and increasing eye contact was not a focus of the study), if a child either turned toward their partner or maintained neutral body orientation, the turn was considered communicative. In contrast, turning away from the partner was considered a signal that the utterance or gesture was not an attempt to interact and therefore not coded as a symbolic turn. A turn was considered complete anytime the individual began communicating, or after two-seconds had passed with no communication.

The codes used to further analyze each turn included speech, speech-generating device, sign, sign and speech, and speech and speech-generating device. Speech is defined as the oral expression of language that includes the natural production of intelligible words (Millar, Light, & Schlosser, 2006). Expression with a speech-generating device was coded when the individuals used their high-tech AAC devices or the EasyVSD application (Blischak, 2003). Sign was coded when manual signs or approximations were used and the partner identified and verbalized the sign. Finally, if the individual communicated using a combination within the same turn, this was coded as either speech and sign or speech and speech-generating device.

A turn will be judged to have begun when an individual communicates (either via speech, sign, gesture, or activation of a hotspot on the VSD), and will be judged to have ended when either the partner begins a turn or two seconds pass without a symbolic communicative behavior (speech, speech w SGD, sign, gesture).
Appendix H

Recruitment Materials

Preference Assessment

What videos do you like to watch on YouTube and/or online?

DIY:
• __________________________
• __________________________

Music:
• __________________________
• __________________________

Sports:
• __________________________
• __________________________

Fashion:
• __________________________
• __________________________

Beauty:
• __________________________
• __________________________

Comedy:
• __________________________
• __________________________

Food/Cooking:
• __________________________
• __________________________
Video games:
  • __________________________
  • __________________________

Pranks:
  • __________________________
  • __________________________
  • __________________________

Other:
  • __________________________
  • __________________________
Dear Parent/Guardian,

My name is Salena Babb and I am PhD student at PSU. My research interests involve helping students with disabilities communicate and increase their social interactions with their peers.

This spring, I will be running a research project with some students with disabilities and their peers. The goal of the project is to help increase social interactions between students with disabilities and their peers. The students will be paired up asked to hang out and talk. During the study we will teach your child and a peer partner some strategies that will help them communicate and understand each other more.

I have met with your child’s teacher, and we believe that your son/daughter would benefit from this research project and also enjoy spending some extra time with their peers! (the peer partner will most likely be their best buddy)

This project will take place during the school day and will take about 15 minutes each session, and hopefully occur two times per week. Working with the classroom teacher, we will be sure to schedule the sessions during times during that day that will not interfere with any of your child’s academic learning.

We are very excited about this project and look forward to hopefully working with you and your child!

If you have any questions/concerns, or would like more information on the research project please do not hesitate to contact me at:

Salena Babb: babb.salena@gmail.com

If you would like your child to participate, please fill out this consent form. This form must be completed and returned in order to participate in the project.

Thank you so much! I am very excited about this project and how it will promote stronger social interactions!

Sincerely,

Salena Babb
Dear Parents/Guardians and Best Buddies,

My name is Salena Babb and I am PhD student at PSU. I am looking for some best buddies to volunteer to be a part of a research project. The goal of the project is to help increase social interactions between students with disabilities and their peers.

**WHAT:** Peers will be paired with a buddy (it might be the best buddy you already work with) and you will be asked to hang out and talk. During the study we will teach you some strategies that will help you and your buddy communicate and understand each other more.

**WHEN:** This project will take place during the school day and will take about 15 minutes each session. We are looking for peers who can volunteer on a regular basis (for example, every A day last block). I know that some of you already visit with your best buddy throughout the day, and if you are interested in participating, part of your time with your best buddy could be this social activity.

*I know you are all very busy with your classes. If you have any study halls or flexible periods, that might be an ideal time to meet up with your best buddy! We will only need about 15 minutes of your time!*

*This would be a commitment for most of the third and possible fourth quarter.

**WHO:** Any best buddy or peer who is interested!

If you are interested, please reply via email with any availability you might have for the third quarter! Don't forget the second marking period ends on Jan 23rd.

If you have any questions or would like more information regarding the research project, please do not hesitate to e-mail me at:

Salena Babb at: Babb.salena@gmail.com

If you would like to participate, please fill out this consent form. This form must be completed and returned to me in order to participate in the project.

Complete consent forms can be dropped off in Jenny Lee’s classroom.

Thank you so much! I am very excited about this project and how it will help you and your best buddy communicate together!

Sincerely,

Salena Babb
Hi Best Buddies!

My name is Salena Babb and I am PhD student at PSU. I am looking for some best buddies to volunteer to be a part of a research project. The project is to help increase social interactions between students with disabilities and their peers.

**WHAT:** Peers will be paired with a buddy (it might be the best buddy you already work with) and you will be asked to hang out and talk. During the study we will teach you some strategies that will help you and your buddy communicate and understand each other more.

**WHEN:** This project will take place during the school day and will take about 15-20 each session. We are looking for peers who can volunteer on a regular basis (for example, every A day last block). I know that some of you already visit with your best buddy throughout the day, and if you are interested in participating, part of your time with your best buddy could be this social activity.

*If you are unable to come for the entire block – that is totally fine! We will only need about 15 minutes of your time! *

*This would be a commitment for most of the third and possible fourth quarter.

**WHO:** Any best buddy or peer who is interested!

If you are interested, please reply back with any availability you might have for the third quarter! Don't forget the second marking period ends on Jan 23rd. Even you can only come for 15 minutes of a period, that is totally fine! We can do the activity in that time.

Please reply back to this e-mail or contact:
Salena Babb at: Babb.salena@gmail.com
VITA
Salena M. Babb

EDUCATION

Ph.D. in Special Education, The Pennsylvania State University 2020
M.Ed. in Special Education, The Pennsylvania State University 2019
B.S. in Special Education, The Pennsylvania State University 2013

PROFESSIONAL CERTIFICATIONS

Board Certified Behavior Analystist (BCBA)
Pennsylvania Department of Education: Special Education Teaching Certification Level 1, Special Education PK-12
Certificate for Online Teaching; The Pennsylvania State University
Certificate for College Teaching; The Pennsylvania State University

PROFESSIONAL EXPERIENCES

Teaching Assistant, Guest Lecturer, and Course Instructor, The Pennsylvania State University 2016-2020
Autism Support Special Education Teacher, State College Area School District 2013-2016

PUBLICATIONS


